

National Testing Service Pakistan

(Building Standards in Educational & Professional Testing)



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PATTERNS AND PRACTICE

2 Quantitative Ability

The Quantitative section measures your basic mathematical skills, understanding of elementary mathematical concepts, and the ability to reason quantitatively and solve problems in a quantitative setting. There is a balance of questions requiring basic knowledge of arithmetic, algebra, geometry, and data analysis. These are essential content areas usually studied at the high school level.

The questions in the quantitative section can also be from

- Discrete Quantitative Question
- Quantitative Comparison Question
- Data Interpretation Question etc.

The distribution in this guide is only to facilitate the candidates. This distribution is not a part of test template, so, a test may contain all the questions of one format or may have a random number of questions of different formats.

This chapter is divided into 4 major sections. The first discusses the syllabus /contents in each section of the test respectively and the remaining three sections address the question format, guide lines to attempt the questions in each format and some example questions.

2.1 General Mathematics Review

2.1.1 Arithmetic

The following are some key points, which are phrased here to refresh your knowledge of basic arithmetic principles.

Basic arithmetic

- For any number a , exactly one of the following is true:
 - a is negative
 - a is zero
 - a is positive
- The only number that is equal to its opposite is 0 (e.g. $a = -a$ only if $a = 0$)
- If 0 is multiplied to any other number, it will make it zero ($a \times 0 = 0$).
- Product or quotient of two numbers of the same sign are always positive and of a different sign are always negative. E.g. if a positive number is multiplied to a negative number the result will be negative and if a negative number is divided by another negative number the result will be positive.

See the following tables for all combinations.

+	÷ or ×	+	=	+
+	÷ or ×	-	=	-
-	÷ or ×	+	=	-
-	÷ or ×	-	=	+

- The sum of two positive numbers is always positive.
- The sum of two negative numbers is always negative.
- Subtracting a number from another is the same as adding its opposite
 $a - b = a + (-b)$

$$\frac{1}{a}$$

- The reciprocal of a number a is $\frac{1}{a}$
- The product of a number and its reciprocal is always one

$$a \times \frac{1}{a} = 1$$

- Dividing by a number is the same as multiplying by its reciprocal

$$a \div b = a \times \frac{1}{b}$$

- Every integer has a finite set of **factors** (divisors) and an infinite set of **multipliers**.
- If a and b are two integers, the following four terms are synonyms
 - a is a **divisor** of b
 - a is a **factor** of b
 - b is a **divisible** by a
 - b is a **multiple** of a

They all mean that when a is divided by b there is no **remainder**.

- Positive integers, other than 1, have at least two positive factors.
- Positive integers, other than 1, which have exactly two factors, are known as **prime numbers**.
- Every integer greater than 1 that is not a prime can be written as a product of primes.
 To find the prime factorization of an integer, find any two factors of that number, if both are primes, you are done; if not, continue factorization until each factor is a prime.
 E.g. to find the prime factorization of 48, two factors are 8 and 6. Both of them are not prime numbers, so continue to factor them.
 Factors of 8 are 4 and 2, and of 4 are 2 and 2 ($2 \times 2 \times 2$).
 Factors of 6 are 3 and 2 (3×2).
 So the number 48 can be written as $2 \times 2 \times 2 \times 2 \times 3$.
- The Least Common Multiple (LCM) of two integers a and b is the smallest integer which is divisible by both a and b , e.g. the LCM of 6 and 9 is 18.

- The Greatest Common Divisor (GCD) of two integers a and b is the largest integer which divides both a and b, e.g. the GCD of 6 and 9 is 3.
- The product of GCD and LCM of two integers is equal to the products of numbers itself. E.g. $6 \times 9 = 54$
 $3 \times 18 = 54$ (where 3 is GCD and 18 is LCM of 6 and 9).
- Even numbers are all the multiples of 2 e.g. (... , -4, -2, 0, 2, 4, ...)
- Odd numbers are all integers not divisible by 2 (... , -5, -3, -1, 1, 3, 5, ...)
- If two integers are both even or both odd, their sum and difference are even.
- If one integer is even and the other is odd, their sum and difference are odd.
- The product of two integers is even unless both of them are odd.
- When an equation involves more than one operation, it is important to carry them out in the correct order. The correct order is **P**arentheses, **E**xponents, **M**ultiplication and **D**ivision, **A**ddition and **S**ubtraction, or just the first letters **PEMDAS** to remember the proper order.

Exponents and Roots

- Repeated addition of the same number is indicated by multiplication:
 $17 + 17 + 17 + 17 + 17 = 5 \times 17$
- Repeated multiplication of the same number is indicated by an exponent:
 $17 \times 17 \times 17 \times 17 \times 17 = 17^5$

In the expression 17^5 , 17 is called **base** and 5 is the **exponent**.

- For any number b: $b^1 = b$ and $b^n = b \times b \times \dots \times b$, where b is used n times as factor.
- For any numbers b and c and positive integers m and n:
 - $b^m b^n = b^{m+n}$
 - $\frac{b^m}{b^n} = b^{m-n}$
 - $(b^m)^n = b^{mn}$
 - $b^m c^m = (bc)^m$
- If a is negative, a^n is positive if n is even, and negative if n is odd.
- There are two numbers that satisfy the equation $x^2 = 9$: $x = 3$ and $x = -3$. The positive one, 3, is called the (principal) square root of 9 and is denoted by symbol $\sqrt{9}$. Clearly, each perfect square has a square root:
 $\sqrt{0} = 0$, $\sqrt{9} = 3$, $\sqrt{36} = 6$, $\sqrt{169} = 13$, $\sqrt{225} = 25$ etc.

- For any positive number a there is a positive number b that satisfies the equation $\sqrt{a} = b$.
- For any positive integer, $(\sqrt{a})^2 = \sqrt{a} \times \sqrt{a} = a$.
- For any positive numbers a and b :
 - $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ and $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$
 - $\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$
 as $5 = \sqrt{25} = \sqrt{9+16} \neq \sqrt{9} + \sqrt{16} = 3+4=7$
- Although it is always true that $(\sqrt{a})^2 = a$, $\sqrt{a^2} = a$ is true only if a is positive as $\sqrt{(-5)^2} = \sqrt{25} = 5 \neq -5$
- For any number a , $\sqrt{a^n} = a^{\frac{n}{2}}$.
- For any number a , b and c :
 - $a(b+c) = ab+ac$ $a(b-c) = ab-ac$
 - and if $a \neq 0$
 - $\frac{(b+c)}{a} = \frac{b}{a} + \frac{c}{a}$ $\frac{(b-c)}{a} = \frac{b}{a} - \frac{c}{a}$

Inequalities

- For any number a and b , exactly one of the following is true:
 $a > b$ or $a = b$ or $a < b$.
- For any number a and b , $a > b$ means that $a-b$ is positive.
- For any number a and b , $a < b$ means that $a-b$ is negative.
- For any number a and b , $a = b$ means that $a-b$ is zero.
- The symbol $\geq$ means greater than or equal to and the symbol $\leq$ means less than or equal to. E.g. the statement $x \geq 5$ means that x can be 5 or any number greater than 5.
 The statement $2 < x < 5$ is an abbreviation of $2 < x$ and $x < 5$.
- Adding or subtracting a number to an inequality preserves it.
- If $a < b$, then $a+c < b+c$ and $a-c < b-c$.

e.g. $5 < 6 \Rightarrow 5 + 10 < 6 + 10$ and $5 - 10 < 6 - 10$

- Adding inequalities in same direction preserves it:
If $a < b$ and $c < d$, then $a + c < b + d$.
- Multiplying or dividing an inequality by a positive number preserves it. If $a < b$ and c is a positive number, then $a \times c < b \times c$ and $\frac{a}{c} < \frac{b}{c}$.
- Multiplying or dividing an inequality by a negative number reverses it. If $a < b$ and c is a negative number, then $a \times c > b \times c$ and $\frac{a}{c} > \frac{b}{c}$.
- If sides of an inequality are both positive and both negative, taking the reciprocal reverses the inequality.
- If $0 < x < 1$ and a is positive, then $xa < a$.
- If $0 < x < 1$ and m and n are integers with $m > n$, then $x^m < x^n < x$.
- If $0 < x < 1$, then $\sqrt{x} > x$.
- If $0 < x < 1$, then $\frac{1}{x} > x$ and $\frac{1}{x} > 1$.

Properties of Zero

- 0 is the only number that is neither negative nor positive.
- 0 is smaller than every positive number and greater than every negative number.
- 0 is an even integer.
- 0 is a multiple of every integer.
- For every number a : $a + 0 = a$ and $a - 0 = a$.
- For every number a : $a \times 0 = 0$.
- For every positive integer n : $0^n = 0$.
- For every number a (including 0): $a \div 0$ and $\frac{a}{0}$ are undefined symbols.
- For every number a (other than 0): $0 \div a = \frac{0}{a} = 0$.

- 0 is the only number that is equal to its opposite: $0 = -0$.
- If the product of two or more numbers is 0, at least one of them is 0.

Properties of One

For any number a : $a \times 1 = a$ and $\frac{a}{1} = a$.

- For any number n : $1^n = 1$.
- 1 is the divisor of every integer.
- 1 is the smallest positive integer.
- 1 is an odd integer.
- 1 is not a prime.

Fractions and Decimals

- When a whole is divided into n equal parts, each part is called one n th of the whole, written $\frac{1}{n}$. For example, if a pizza is cut (divided) into 8 equal slices, each slice is one eighth ($\frac{1}{8}$) of the pizza; a day is divided into 24 equal hours, so an hour is one twenty-fourth ($\frac{1}{24}$) of a day and an inch is one twelfth ($\frac{1}{12}$) of a foot. If one works for 8 hours a day, he works eight twenty-fourth ($\frac{8}{24}$) of a day. If a hockey stick is 40 inches long, it measures forty twelfths ($\frac{40}{12}$) of a foot.
- The numbers such as $\frac{1}{8}$, $\frac{1}{24}$, $\frac{8}{24}$ and $\frac{40}{12}$, in which one integer is written over the second integer, are called **fractions**. The center line is called the fraction bar. The number above the bar is called the **numerator**, and the number below the bar is called **denominator**.
- The denominator of a fraction can never be 0.
- A fraction, such as $\frac{1}{24}$, in which the denominator is greater than numerator, is known as a **proper fraction**. Its value is less than one.
- A fraction, such as $\frac{40}{12}$, in which the denominator is less than numerator, is known as an **improper fraction**. Its value is greater than one.

- A fraction, such as, $\frac{12}{12}$ in which the denominator is equal to the numerator, is also known as an **improper fraction**. But, Its value is one.

- Every fraction can be expressed in decimal form (or as a whole number) by dividing the number by the denominator.

$$\frac{3}{10} = 0.3, \quad \frac{3}{4} = 0.75, \quad \frac{8}{8} = 1, \quad \frac{48}{16} = 3, \quad \frac{100}{8} = 12.5$$

- Unlike the examples above, when most fractions are converted to decimals, the division does not terminate, after 2 or 3 or 4 decimal places; rather it goes on forever with some set of digits repeating it.

$$\frac{2}{3} = 0.66666..., \quad \frac{3}{11} = 0.272727..., \quad \frac{5}{12} = 0.416666..., \quad \frac{17}{15} = 1.133333...$$

- To compare two decimals, follow these rules:
 - Whichever number has the greater number to the left of the decimal point is greater: since $11 > 9$, $11.0001 > 9.8965$ and since $1 > 0$, $1.234 > .8$. (Recall that if a decimal is written without a number on left of decimal point, you may assume that a 0 is there, so, $.8 = 0.8$).
 - If the numbers to the left of the decimal point are equal, proceed as follows:
 - If the numbers do not have the same number of digits to the right of the decimal point, add zeroes to the end of the shorter one to make them equal in length.
 - Now compare the numbers ignoring the decimal point.
 - For example, to compare 1.83 and 1.823, add a 0 to the end of 1.83 forming 1.830. Now compare them, thinking of them as whole numbers without decimal point: since $1830 > 1823$, then $1.830 > 1.823$.
- There are two ways to compare fractions:
 - Convert them to decimals by dividing, and use the method already described to compare these decimals. For example to compare $\frac{2}{5}$ and $\frac{1}{4}$, convert them to decimals. $\frac{2}{5} = 0.4$ and $\frac{1}{4} = 0.25$. Now, as $0.4 > 0.25$, $\frac{2}{5} > \frac{1}{4}$.
 - Cross multiply the fractions. For example to compare $\frac{2}{5}$ and $\frac{1}{4}$, cross multiply:

$$\frac{2}{5} \quad \begin{array}{c} \nearrow \\ \searrow \end{array} \quad \frac{1}{4} \quad \text{Since } 2 \times 4 > 1 \times 5, \text{ then } \frac{2}{5} > \frac{1}{4}.$$
- While comparing the fractions, if they have same the denominators, the fraction with the larger numerator is greater. For example $\frac{3}{5} > \frac{2}{5}$.
- **If the fractions have the same numerator, the fraction with the smaller denominator is greater. For example $\frac{3}{5} > \frac{3}{10}$.**
- Two fractions are called **equivalent fractions** if both of them have same decimal value.
 - For example, $\frac{1}{2} = \frac{5}{10}$ as both of these are equal to 0.5.
 - Another way to check the equivalence of two fractions is to cross-multiply. If both of the products are same, the fractions are equivalent. For Example, to compare $\frac{2}{5}$ with $\frac{6}{15}$, cross-multiply. Since $2 \times 15 = 6 \times 5$, both of the fractions are equivalent.
 - Every fraction can be reduced to lowest terms by dividing the numerator and denominator by their greatest common divisor (GCD). If the GCD is 1,

the fraction is already in lowest terms. For example to reduce $\frac{10}{15}$, divide both numerator and denominator by 5 (which is GCD of 10 and 15). This will reduce the fraction to $\frac{2}{3}$.

- To multiply two fractions, multiply their numerators and multiply their denominators. For example $\frac{3}{5} \times \frac{4}{7} = \frac{3 \times 4}{5 \times 7} = \frac{12}{35}$.
- To multiply a number to a fraction, write that number as a fraction whose denominator is 1. For example $\frac{3}{5} \times 7 = \frac{3}{5} \times \frac{7}{1} = \frac{3 \times 7}{5 \times 1} = \frac{21}{5}$.
- When a problem requires you to find the fraction of a number, multiply that fraction with the number. For example, to find two fifth ($\frac{2}{5}$) of 200,

$$\text{multiply: } \frac{2}{5} \times 200 = \frac{2}{5} \times \frac{200}{1} = \frac{400}{5} = 80$$

- The reciprocal of a fraction $\frac{a}{b}$ is another fraction $\frac{b}{a}$ since $\frac{a}{b} \times \frac{b}{a} = 1$
- To divide one fraction by the other fraction, multiply the reciprocal of divisor with the dividend. For example, $\frac{22}{7} \div \frac{11}{7} = \frac{22}{7} \times \frac{7}{11} = \frac{2}{1} = 2$.
- To add or subtract the fractions with same denominator, add or subtract numerators and keep the denominator. For example $\frac{4}{9} + \frac{1}{9} = \frac{5}{9}$ and $\frac{4}{9} - \frac{1}{9} = \frac{3}{9}$.

Percents

- The word **percent** means hundredth. We use the symbol % to express the word **percent**. For example "15 percent" means "15 hundredths" and can be written with a % symbol, as a fraction, or as a decimal. $20\% = \frac{20}{100} = 0.20$.
- To convert a decimal to a percent, move the decimal point two places to the right, adding 0s is necessary, and add the percent symbol (%). For example, $0.375 = 37.5\%$ $0.3 = 30\%$ $1.25 = 125\%$ $10 = 1000\%$
- To convert a fraction to a percent, first convert that fraction to decimal, than use the method stated above to convert it to a percent.
- To convert a percent to a decimal, move the decimal point two places to the left and remove the % symbol. Add 0s if necessary. For example, $25\% = 0.25$ $1\% = 0.01$ $100\% = 1$
- You should be familiar with the following basic conversions:

$$\frac{1}{2} = \frac{5}{10} = 0.50 = 50\% \qquad \frac{1}{5} = \frac{2}{10} = 0.20 = 20\%$$

$$\frac{1}{4} = 0.25 = 25\% \qquad \frac{3}{4} = 0.75 = 75\%$$

- For any positive integer a : $a\%$ of 100 is a .
- For any positive numbers a and b : $a\%$ of $b = b\%$ of a
- The percent change in the quantity is $\frac{\text{actual change}}{\text{original amount}} \times 100\%$. For example:
If the price of a lamp goes from Rs.80 to Rs.100, the actual increase is Rs.20, and the percent increase is $\frac{20}{80} \times 100\% = \frac{1}{4} \times 100\% = 25\%$.
- If $a < b$, the percent increase in going from a to b is always greater than percent decrease in going from b to a .
- To increase a number by $k\%$, multiply it by $1+k\%$, and to decrease a number by $k\%$, multiply it by $1-k\%$. For example, the value of an investment of Rs. 20,000 after 25% increase is $20,000 \times (1+25\%) = 20,000 \times (1.25) = 25,000$.
- If a number is the result of increasing another number by $k\%$, to find the original number divide it by $1+k\%$, and if a number is the result of decreasing another number by $k\%$, to find the original number, divide it by $1-k\%$.
For example, The government announced an 20% increase in salaries. If after the increment, The salary of a particular employee is Rs. 18, 000, what was the original salary?

$$\text{Original salary (in Rs.)} = \frac{\text{current salary}}{1 + \text{percent increase}} = \frac{18,000}{1 + 20\%} = \frac{18,000}{1.20} = 15,000$$

Ratios and Proportions

- A ratio is a fraction that compares two quantities that are measured in the same units. The first quantity is the numerator and the second quantity is denominator. For example, if there are 16 boys and 4 girls, we say that the ratio of the number of boys to the number of girls on the team is 16 to 4, or $\frac{16}{4}$. This is often written as 16:4. Since a ratio is just a fraction, it can be reduced or converted to a decimal or a percent. The Following are different ways to express the same ratio:
 $16 \text{ to } 4, \quad 16:4, \quad \frac{16}{4}, \quad \frac{4}{1}, \quad 0.25, \quad 25\%$
- If a set of objects is divided into two groups in the ration $a:b$, then the first group contains $\frac{a}{a+b}$ of the total objects and similarly the second group

contains $\frac{b}{a+b}$ of the total number of objects. This rule applies to extended ratios, as well. If a set is divided into three groups in the ratio $a:b:c$, then the first group contains $\frac{a}{a+b+c}$ of the total objects, and so on.

- A proportion is an equation that states that two ratios are equivalent. Since ratios are just fractions, any equation such as $\frac{4}{6} = \frac{10}{15}$ in which each side is a single fraction is proportion. This proportion states that 4 relates to 6 in same ratio as 10 relates to 15.
- For each proportion of the form $\frac{a}{b} = \frac{c}{d}$, $ad = bc$. This property can be used to solve proportions for unknowns (variables). For example: "If 3 oranges cost Rs.5, how many oranges can you buy for Rs.100". To solve this problem we have to set up a proportion. If the number of oranges for Rs.100 is x , then:

$$\frac{3}{5} = \frac{x}{100} \Rightarrow 3 \times 100 = x \times 5 \Rightarrow x = \frac{3 \times 100}{5} \Rightarrow x = 60$$

Averages

- The **average** of a set of n numbers is the sum of those numbers divided by n .

$$\text{average} = \frac{\text{sum of } n \text{ numbers}}{n} \quad \text{or simply} \quad A = \frac{\text{Sum}}{n}$$

the technical name for these kind of averages is Arithmetic Mean.

- If you know the average of n numbers, multiply that average with n to get the sum of numbers.
- If all the numbers in a set are the same, then that number is the average.
- Assume that the average of a set of numbers is A . If a new number x is added to that set, the new average will be;
 - **Greater if x is greater than the existing average**
 - **Smaller if x is smaller than the existing average**
 - **Unchanged if x is equal to the existing average**
- Arithmetic sequence is an ordered set of numbers, such that, the difference between two consecutive numbers is the same.
- If there is an arithmetic sequence of n terms, then the average calculation can be made simple by using these rules.
 - The average of the terms in that sequence will be the middle term, if n is odd.
 - If n is even, the average will be the average of two middle terms.

2.1.2 Algebra

Polynomials

- A monomial is any number or variable or product of numbers and variables. For example $3, -4, x, y, 3x, -2xyz, 5x^3, 1.5xy^2, a^3b^2$ are all monomials.
- The number that appears in front of a variable in a monomial is called the coefficient. The coefficient of $5x^3$ is 5. If there is no number, the coefficient is either 1 or -1 , because x means $1x$ and $-x$ means $-1x$.
- A polynomial is a monomial or the sum of two or more monomials. Each monomial that makes up the polynomial is called a term of that polynomial.
- If a polynomial has only one term it is a simple monomial, if it has two terms, it is known as binomial and if it has three terms, it is called trinomial.
- Two terms are called like terms if they differ only in their coefficients. $5x^3$ and $-2x^3$ are like terms, whereas, $5x^3$ and $5x^2$ are not.
- If like terms are involved in a polynomial, they can be combined, by adding their coefficients, to make that polynomial simpler. The polynomial $3x^2 + 4x + 5x - 2x^2 - 7$ is equivalent to the polynomial $x^2 + 9x - 7$.
- All laws of arithmetic are also applicable to polynomials. Most important of them is PEMDAS.
- Polynomials can be added, subtracted, multiplied or divided.
- To add two polynomials, put a plus sign between them, erase the parentheses, and combine like terms.

Example:

What is the sum of $5x^2 + 10x - 7$ and $3x^2 - 4x + 2$?

Solution:

$$\begin{aligned}
 &(5x^2 + 10x - 7) + (3x^2 - 4x + 2) \\
 &= 5x^2 + 10x - 7 + 3x^2 - 4x + 2 \\
 &= 8x^2 + 6x - 5
 \end{aligned}$$

- To subtract two polynomials, reverse the signs of subtrahend, and add two polynomials as done before.

Example:

Subtract $3x^2 - 4x + 2$ from $5x^2 + 10x - 7$

Solution:

$$\begin{aligned}
 & (5x^2 + 10x - 7) - (3x^2 - 4x + 2) \\
 &= (5x^2 + 10x - 7) + (-3x^2 + 4x - 2) \\
 &= 5x^2 + 10x - 7 - 3x^2 + 4x - 2 \\
 &= 2x^2 + 14x - 9
 \end{aligned}$$

- To multiply monomials, first multiply their coefficients, and then multiply their variables by adding the exponents.

Example:

What is the product of $3x^2yz$ from $-2x^2y^2$?

Solution:

$$\begin{aligned}
 & (3x^2yz)(-2x^2y^2) \\
 &= (3 \times -2)(x^2 \times x^2)(y \times y^2)(z) \\
 &= -6x^4y^3z
 \end{aligned}$$

- To multiply a monomial by a polynomial, just multiply each term of the polynomial by the monomial.

Example:

What is the product of $3x$ from $3x^2 - 6xy^2 + 2$?

Solution:

$$\begin{aligned}
 & (3x)(3x^2 - 6xy^2 + 2) \\
 &= (3x \times 3x^2) - (3x \times 6xy^2) + (3x \times 2) \\
 &= 9x^3 - 18x^2y^2 + 6x
 \end{aligned}$$

- To multiply two binomials, multiply each term of first binomial by each term of second binomial, then add the results.

Example:

What is the product of $3x + y$ from $3x^2 - 6xy^2$?

Solution:

$$\begin{aligned}
 & (3x + y)(3x^2 - 6xy^2) \\
 &= (3x \times 3x^2) + (3x \times (-6xy^2)) + (y \times 3x^2) + (y \times (-6xy^2)) \\
 &= (9x^3) + (-18x^2y^2) + (3x^2y) + (-6xy^3) \\
 &= 9x^3 - 18x^2y^2 + 3x^2y - 6xy^3
 \end{aligned}$$

- The three most important binomial products are:

- $(x - y)(x + y) = x^2 + xy - xy + y^2 = x^2 + y^2$
 - $(x + y)(x + y) = x^2 + xy + xy + y^2 = x^2 + 2xy + y^2$
 - $(x - y)(x - y) = x^2 - xy - xy + y^2 = x^2 - 2xy + y^2$
- Memorizing these can save a lot of calculation time during the test.
- To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

Example:

What is the quotient if $32x^2y + 12xy^3z$ is divided by $8xy$?

Solution:

$$\frac{32x^2y + 12xy^3z}{8xy} = \frac{32x^2y}{8xy} + \frac{12xy^3z}{8xy} = 4x + \frac{3}{2}y^2z \text{ (by reducing the terms)}$$

Solving Equations and Inequalities

- The basic principle in solving equations and inequalities is that you can manipulate them in any way as long as you **do the same thing to both sides**. For example you may add a number to both sides, or you may divide or multiply both sides with same number etc.

By using the following six-step method, you can solve most of the equations and inequalities. The method is explained with the help of an example.

Example:

if $\frac{1}{2}x + 3(x - 2) = 2(x + 1) + 1$, what is the value of x ?

Solution:

Step	What to do...	Example
1	Get rid of fractions and decimals by multiplying both sides by the LCD.	Multiply each side by 2 to get: $x + 6(x - 2) = 4(x + 1) + 2$
2	Get rid of all parentheses by solving them.	$x + 6x - 12 = 4x + 4 + 2$
3	Combine like terms on each side.	$7x - 12 = 4x + 6$
4	By adding and subtracting get all the variables on one side (mostly left).	Subtract $4x$ from each side to get: $3x - 12 = 6$
5	By adding or subtracting get all plain numbers on the other side.	Add 12 to each side to get: $3x = 18$
6	Divide both sides by the coefficient of the variable. (If you are dealing with an inequality and you divide with a negative number, remember to reverse the inequality.)	Divide both sides by 3 to get: $x = 6$

- When you have to solve one variable and the equation/inequality involve more than one variable, treat all other variables as plain numbers and apply the six-step method.

Example:

if $a = 3b - c$, what is the value of b in terms of a and c ?

Solution:

Step	What to do...	Example
1	There are no fractions and decimals.	
2	There are no parentheses.	
3	There are no like terms.	
4	By adding and subtracting get all the variables on one side.	Remember there is only one variable b , which is on one side only.
5	By adding or subtracting get all plain numbers on the other side.	Remember we are considering a and c as plain number. Add c to each side to get: $a + c = 3b$

6	Divide both sides by the coefficient of the variable.	Divide both sides by 3 to get: $\frac{a+c}{3} = b$
---	---	---

- It is not necessary to follow these steps in the order specified. Some times it makes the problem much easier, if you change the order of these steps.

Example:

If $x-4=11$, what is the value of $x-8$?

Solution:

Going immediately to step 5, add 4 to each side to get: $x=15$. Now subtract 8 from both sides to get: $x-8=7$.

- Doing the same thing on each side of an equation does **not** mean doing the same thing to each term of the equation. This is very important if you are doing divisions, or dealing with exponents and roots.

Example:

If $a > 0$ and $a^2 + b^2 = c^2$, what is the value of a in terms of b and c .

Solution:

$a^2 + b^2 = c^2 \Rightarrow a^2 = c^2 - b^2$. Now you can't take a square root of each term to get $a = c - b$. You must take the square root of each side:

$$\sqrt{a^2} = \sqrt{c^2 - b^2} \Rightarrow a = \sqrt{c^2 - b^2}$$

- Another type of equation is that in which the variable appears in exponent. These equations are basically solved by inception.

Example:

If $2^{x+3}=32$, what is the value of 3^{x+2} ?

Solution:

$$2^{x+3}=32 \Rightarrow 2^{x+3}=2^5 \Rightarrow x+3=5 \Rightarrow x=2$$

Now as $x=2$, you can get $x=2 \Rightarrow x+2=4 \Rightarrow 3^{x+2}=3^4=81$

- A system of equations is a set of two or more equations having two or more variables. To solve such equations, you must find the value of each variable that will make each equation true.
- To solve a system of equations, add or subtract them to get a third equation. If there are more than two equations you can just add them.

Example:

If $x+y=10$ and $x-y=10$ what is the value of y ?

Solution:

$$x + y = 10$$

$$x - y = 2$$

Add two equations: $\frac{2x}{2x} = 12 \Rightarrow x = 6$

Now replacing x with 6 in the first equation: $6 + y = 10 \Rightarrow y = 4$

- If you know the value of one variable in a system of two equations, you can use this value to get the value of the other variable. As it is done in the previous question.

Word problems

- To solve word problems, first translate the problem from English to Algebra. While translating, use variables to represent unknowns. Once translated, it is easy to solve them using the techniques you have learned in previous sections.
- Following English to Algebra dictionary will be helpful in translating word problems to algebraic expressions.

English words	Mathematical meaning	Symbol
Is, was, will be, had, has, will have, is equal to, is the same as	Equals	=
Plus, more than, sum, increased by, added to, exceeds, received, got, older than, farther than, greater than	Addition	+
Minus, fewer, less than, difference, decreased by, subtracted from, younger than, gave, lost	Subtraction	–
Times, of, product, multiplied by	Multiplication	×
Divided by, quotient, per, for	Division	÷ or $\frac{a}{b}$
More than, greater than	Inequality	>
At least	Inequality	≥
Fewer than, less than	Inequality	<
At most	Inequality	≤
What, how many, etc.	Unknown quantity	x (Some variable)

Examples:

- The sum of 5 and some number is 13. $5 + x = 13$
- Javed was two years younger than Saleem. $J = S - 2$
- Bilal has at most Rs.10,000. $B \leq 10000$
- The product of 2 and a number exceeds that number by 5 (is 5 more than that number). $2N = N + 5$

- In word problems, you must be sure about what you are answering. Do not answer the wrong question.
- In problems involving ages, remember that “years ago” means you need to subtract, and “years from now” means you need to add.

- Distance problems all depend on three variations of the same formula:

- $distance = speed \times time$

- $speed = \frac{distance}{time}$

- $time = \frac{distance}{speed}$

Example:

How much longer, in seconds, is required to drive 1 mile at 40 miles per hour than at 60 miles per hour?

Solution:

The time to drive at 40 miles per hour can be calculated as

$$time1 = \frac{1}{40} \text{ hours} = \frac{1}{40} \times 60 \text{ minutes} = \frac{3}{2} \times 60 \text{ seconds} = 90 \text{ seconds}$$

The time to drive at 60 miles per hour can be calculated as

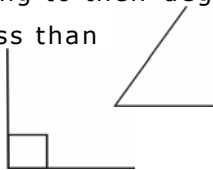
$$time2 = \frac{1}{60} \text{ hours} = \frac{1}{60} \times 60 \text{ minutes} = 1 \times 60 \text{ seconds} = 60 \text{ seconds}$$

$$difference = time1 - time2 = 90 - 60 = 30 \text{ seconds.}$$

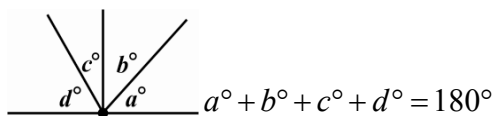
2.1.3 Geometry

Lines and Angles

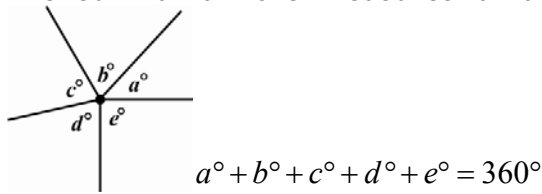
- An **angle** is formed at the intersection of two line segments, rays or lines. The point of intersection is called the **vertex**. Angles are measured in degrees.
- Angles are classified according to their degree measures.
- An **acute** angle measures less than



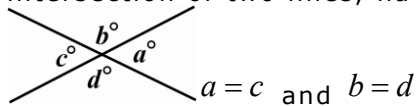
- A **right** angle measures 90°
- An **obtuse** angle measures more than 90° but less than 180°
- A straight angle measures 180°
- If two or more angles combine together to form a straight angle, the sum of their measures is 180° .



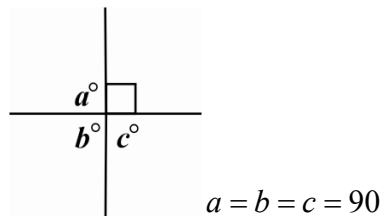
- The sum of all the measures of all the angles around a point is 360°



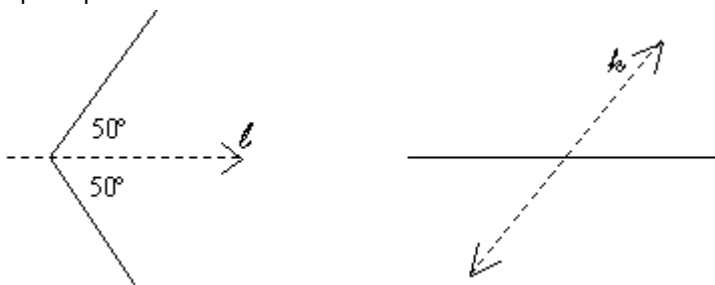
- When two lines intersect, four angles are formed, two angles in each pair of opposite angles are called **vertical angles**. Vertical angles, formed by the intersection of two lines, have equal measures.



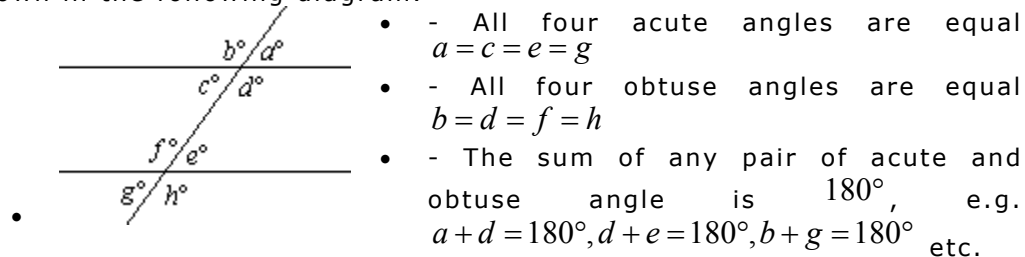
- If one of the angles formed by the intersection of two lines is a right angle, then all four angles are right angles. Such lines are called **perpendicular** lines



- In the figure below a line l divides the angle in two equal parts. This line is said to **bisect** the angle. The other line k bisects another line into two equal parts. This line is said to bisect a line.

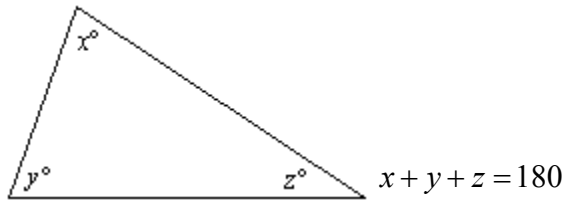


- Two lines are said to be **parallel**, if they never intersect each other. However, if a third line, called a **transversal**, intersects a pair of parallel lines, eight angles are formed. And the relationship among these angles is shown in the following diagram.

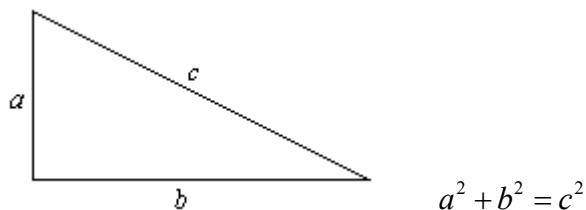


Triangles

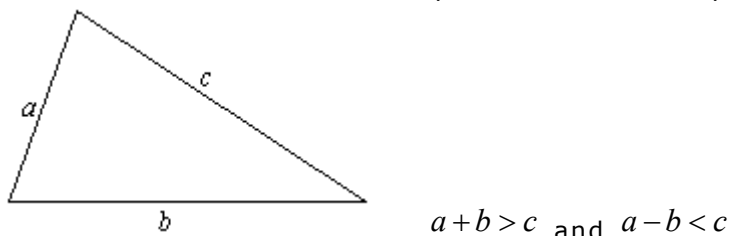
- In any triangle, the sum of the measures of the three angles is 180° .



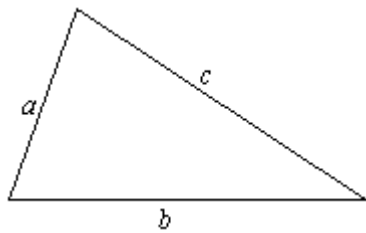
- In any triangle:
 - The longest side of triangle is opposite the largest angle.
 - The shortest side is opposite the smallest angle.
 - Sides with the same length are opposite the angles with the same measure.
- Triangles are classified into three different kinds with respect to the lengths of sides.
 - **Scalene**: in which all three sides are of different lengths.
 - **Isosceles**: in which two of the sides of triangle are equal in length, the third is different.
 - **Equilateral**: in which all three sides are equal in length.
- Triangles are also classified with respect to the angles.
 - **Acute triangle**: in which all three angles are acute.
 - **Obtuse triangle**: in which one angle is obtuse and two are acute.
 - **Right triangle**: This has one right and two acute angles.
- In a right triangle, the opposite to the right angle is known as **hypotenuse** and is the longest side. The other two sides are called **legs**.
- In any right triangle, the sum of the measures of the two acute angles is 90° .



- In any triangle, the sum of any two sides is always greater than the third one. And the difference of any two sides is always less than the third one.

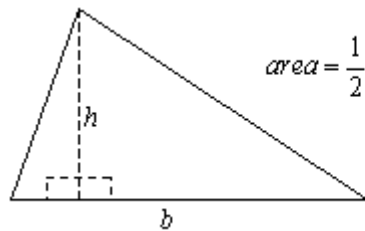


- The **perimeter** of a triangle is calculated by adding the lengths of all the sides of that triangle.

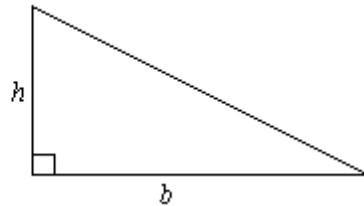


$$\text{perimeter} = a + b + c$$

- The area of a triangle is calculated by the formula: $\text{area} = \frac{1}{2}bh$ where b is the base of the triangle and h is the **height** of the triangle.
 - Any side of triangle can be taken as the base.
 - Height is the altitude (perpendicular) drawn to the base from its opposite vertex.
 - In a right triangle any leg could be taken as the base, the other will be the altitude.

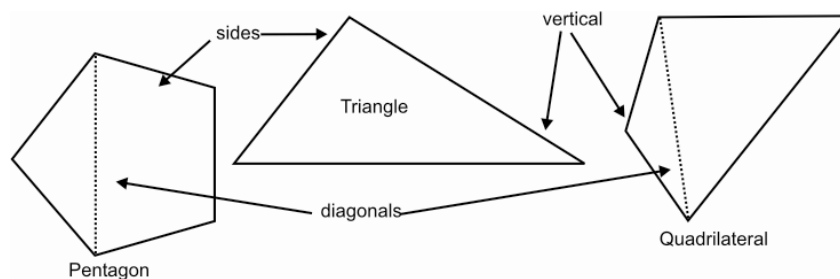


$$\text{area} = \frac{1}{2}bh$$



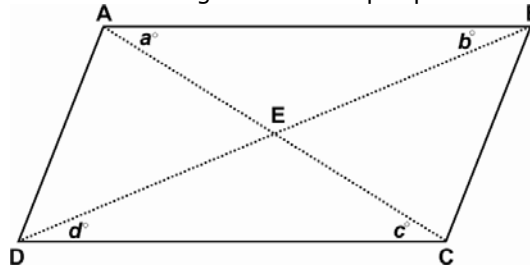
Quadrilateral and other Polygons

- A **polygon** is a closed geometric figure, made up of line segments. The line segments are called **sides** and the end points of lines are called **vertices** (plural of **vertex**). Lines, inside the polygon, drawn from one vertex to the other, are called **diagonals**.

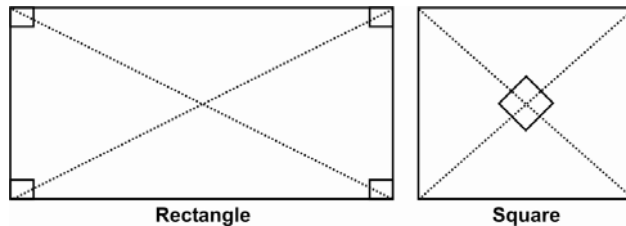


- The sum of the measures of the n angles in a polygon with n sides is always $(n-2) \times 180^\circ$.
- In any quadrilateral, the sum of the measures of the four angles is 360° .
- A **regular polygon** is a polygon in which all of the sides are of the same length. In any regular polygon, the measure of each interior angle is $\frac{(n-2) \times 180^\circ}{n}$ and the measure of each exterior angle is $\frac{360^\circ}{n}$.

- A **parallelogram** is a special quadrilateral, in which both pairs of opposite sides are parallel. The Following are some properties of parallelogram.



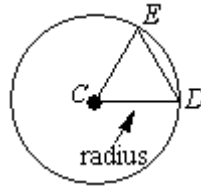
- Lengths of opposite sides are equal. $\overline{AB} = \overline{CD}$ and $\overline{AD} = \overline{BC}$
 - Measures of opposite angles are equal. $a = c$ and $b = d$
 - Consecutive angles add up to 180° . $a + b = 180^\circ$, $b + c = 180^\circ$ etc.
 - The two diagonals bisect each other. $\overline{AE} = \overline{EC}$ and $\overline{BE} = \overline{ED}$
 - A diagonal divides the parallelogram into two triangles that are congruent.
- A **rectangle** is a parallelogram in which all four angles are right angles. It has all the properties of a parallelogram. In addition it has the following properties:
 - The measure of each angle in a rectangle is 90° .
 - The diagonals of a rectangle are equal in length.
- A **square** is a rectangle that has the following additional properties:
 - A square has all its sides equal in length.
 - In a square, diagonals are perpendicular to each other.



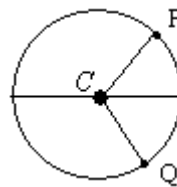
- To calculate the area, the following formulas are required:
 - For a parallelogram, $Area = bh$, where b is the base and h is the height.
 - For a rectangle, $Area = lw$, where l is the length and w is the width.
 - For a square, $Area = s^2$, where s is the side of the square.
- Perimeter for any polygon is the sum of lengths, of all its sides.

Circles

- A **circle** consists of all the points that are the same distance from one fixed point called the **center**. That distance is called the **radius** of a circle. The word radius is also used to represent any of the line segments joining the center and a point on the circle. The plural of radius is **radii**.



- Any triangle, such as $\triangle CED$ in the figure, formed by connecting the end points of two radii, is an isosceles.
- A line segment, such as $\overline{ED}$ in the diagram above, both of whose end points are on a circle is called a **chord**.
- A chord that passes through the center of the circle is called the **diameter** of the circle. The length of the diameter is always double the radius of the circle. The diameter is the longest cord that can be drawn in a circle.
- The total length around a circle is known as the **circumference** of the circle.
- The ratio of the circumference to the diameter is always the same for any circle. This ratio is denoted by the symbol π (pronounced as pi).
- $\pi = \frac{C}{d} \Rightarrow C = \pi d \Rightarrow C = 2\pi r$ where C is the circumference, d is the diameter and r is the radius of the circle.
- Value of π is approximately 3.14
- An arc consists of two points in a circle and all the points between them. E.g. $\overline{PQ}$ is an arc in the diagram.



- An angle whose vertex is at the center of the circle is called the **central angle**. $\angle PCQ$ in the diagram above is a **central angle**.

- The degree measure of a complete circle is 360° .



- The degree measure of an arc is the measure of the central angle that intercepts it. E.g. the degree measure of $\overline{PQ}$ is equal to the measure of $\angle PCQ$ in the diagram above.

- If x is the degree measure of an arc, its length can be calculated as $\frac{x}{360}C$, where C is the circumference.
- The area of a circle can be calculated as πr^2 .
- The area of a sector formed by the arc and two radii can be calculated as $\frac{x}{360}A$, where A is the area of a circle.

2.2 Discrete Quantitative Questions

These are standard multiple-choice questions. Most of such questions require you to do some computations and you have to choose exactly one of the available choices based upon those computations. This section will teach you the basic tactics to attempt such questions.

2.2.1 Question format

Each question will consist of a question statement and the choices labeled from A to E. The number of choices may vary from 2 to 5, but exactly one choice will be correct for each question.

2.2.2 How to attempt?

Following are some tactics, which will lead you to the correct answer.

- Whenever you know how to answer a question directly, just do it. The tactics should be used only when you do not know the exact solution, and you just want to eliminate the choices.
- Remember that no problem requires lengthy or difficult computations. If you find yourself doing a lot of complex arithmetic, think again. You may be going in the wrong direction.
- Whenever there is a question with some unknowns (variables), replace them with the appropriate numeric values for ease of calculation.
- When you need to replace variables with values, choose easy-to-use numbers, e.g. the number 100 is appropriate in most percent-related problems and the LCD (least common denominator) is best suited in questions that involve fractions.
- Apply "back-solving" whenever you know what to do to answer the question but you want to avoid doing algebra. To understand this tactic read the following example:

On Monday, a storeowner received a shipment of books. On Tuesday, she sold half of them. On Wednesday after two more were sold, she had exactly $\frac{2}{5}$ of the books left. How many were in the shipment?

(A) 10 (B) 20 (C) 30 (D) 40 (E) 50

now by this tactic:

Assume that (A) is the correct answer, if so; she must have 3 books on Wednesday. But $\frac{2}{5}$ of 10 are 4, so, (A) is incorrect;

Assume that (B) is the correct answer, if so; she must have 8 books on Wednesday. $\frac{2}{5}$ of 20 are 8, so, (B) is the correct choice, and as there may

be only one correct choice, there is no need to check for remaining choices.

This tactic is very helpful when a normal algebraic solution for the problem involves complex or lengthy calculations.

- If you are not sure how to answer the question, do not leave it unanswered. Try to eliminate absurd choices and guess from the remaining ones. Most of the times four of the choices are absurd and your answer is no longer a guess.

Many things may help you to realize that a particular choice is absurd. Some of them are listed below.

- The answer must be positive but some of the choices are negative so eliminate all the negative ones.
- The answer must be even but some of the choices are odd so eliminate all the odd choices.
- The answer must be less than 100, but some of the choices are greater than 100 (or any other value) so eliminate all choices that are out of range.
- The answer must be a whole number, but some of the choices are fractions so eliminate all fractions.
- These are some examples. There may be numerous situations where you can apply this tactic and find the correct answer even if you do not know the right way to solve the problem.

Example questions with solutions

The following are some examples, which will help you to master these types of questions.

Example

If 25% of 220 equals 5.5% of X, what is X?

- (A) 10 (B) 55 (C) 100 (D) 110 (E) 1000

Solution:

Since 5.5% of X equals 25% of 220, X is much greater than 220. So, choices A, B, C, and D are immediately eliminated because these are not larger than 220. And the correct answer is choice E.

(**Note:** An important point here is that, even if you know how to solve a problem, if you immediately see that four of the five choices are absurd, just pick the remaining choice and move on.)

Example

Science students choose exactly one of three fields (i.e. medical sciences, engineering sciences and computer sciences). If, in a college, three-fifths of the students choose medical sciences, one-fourth of the remaining students take computer sciences, what **percent** of the students take engineering sciences?

- (A) 10 (B) 15 (C) 20 (D) 25 (E) 30

Solution:

The least common denominator of $\frac{3}{5}$ and $\frac{1}{4}$ is 20, so assume that there are 20 students in that college. Then the number of students choosing medical sciences is 12 ($\frac{3}{4}$ of 20). Of the remaining 8 students, 2 ($\frac{1}{4}$ of 8) choose computer sciences. The remaining 6 choose engineering sciences. As 6 is 30% of 20, the answer is E.

Example

If a school cafeteria needs C cans of soup each week for each student and there are S students, for how many weeks will X cans of soup last?

- (A) CX/S (B) XS/C (C) S/CX (D) X/CS (E) CSX

Solution:

Replace C , S and X with three easy to use numbers. Let $C=2$, $S=5$ and $X=20$. Now each student will need 2 cans per week and there are 5 students, so 10 cans are needed per week and 20 cans will last for 2 weeks. Now put these values in choices to find the correct one.

The choices A, B, C, D and E become 8, 50, $1/8$, 2 and 200 respectively. So the choice D represents the correct answer.

2.3 Quantitative Comparison Questions

Some of the questions in the Quantitative section of the test may be quantitative comparison questions. The Following text will explain you the format and techniques u need to attempt the questions of this format.

2.3.1 Question format

Such questions consist of two quantities, one in column A and the other in column B. You have to compare the two quantities. The information concerning one or both quantities is presented before them. Only the following four choices will be given:

- A. The quantity in column A is greater
- B. The quantity in column B is greater
- C. The two quantities in both columns are equal
- D. The relationship cannot be determined from the information given

And as it is clear from the choices, only one will be correct at one time. Your job is to choose one of them after careful comparison. The following text explains some simple tactics to attempt such questions.

2.3.2 How to attempt

Whenever you encounter a quantitative comparison question, the following guidelines will help you to find the correct answer quickly.

- If the question involves some variables, replace them with appropriate numbers. Here are some guidelines in choosing an appropriate number:
 - The very best numbers to use are -1 , 0 and 1 .
 - Often fractions between 0 and 1 are useful (e.g. $1/2$, $3/4$ etc.).
 - Occasionally, "large" numbers such as 10 or 100 can be used.
 - If there is more than one variable, it is permissible to replace each with the same number.
 - Do not impose any un-specified conditions on numbers. Choose them randomly.
- Eliminate the choices and choose from the remaining ones. For example If you found the quantities ever equal, the correct choice could never be A or B, so, eliminate A and B.
- A quantitative comparison question can be treated as an equation or inequality. Either:
 - Column A $<$ Column B, or
 - Column A $=$ Column B, or

Column A > Column B

So, you can perform similar operation on both columns to simplify the problem just as in equations (or inequalities).

Example:

$m > 0$ and $m \neq 1$

m^2	m^3
-------	-------

- In this example divide both the quantities by m^2 . This will change column A to 1 and column B to m . Now the comparison is very simple, as we know that m is greater than 0 and cannot be 1. So the relationship is not determinable using the current information. m can be both greater than 1 or between 0 and less than 1.

2.3.3 Example questions with Answers and Explanations

Example 1:

A student earned a 75 on each of her first three math tests and an 80 on her fourth and fifth tests.	
A	B
Average after 4 tests	Average after 5 tests

- The quantity in column A is greater
- The quantity in column B is greater
- The two quantities in both columns are equal
- The relationship cannot be determined from the information given

Remember you want to know which average is higher, not what the averages are. After 4 tests, the average is clearly less than 80, so an 80 on the fifth test had to raise the average. So the answer is choice (B).

Example 2:

A	B
The time it takes to drive 40 miles at 35 mph	The time it takes to drive 35 miles at 40 mph

- The quantity in column A is greater
- The quantity in column B is greater
- The two quantities in both columns are equal
- The relationship cannot be determined from the information given

Once again there is no need for calculation, as the speed in column B is higher than that in column A. It is obvious that it will take less time to travel shorter distance at a greater speed. So the value in column A is larger. The answer is option (A).

Example 3:

A	B
---	---

$\frac{\sqrt{20}}{2}$	$\frac{5}{\sqrt{5}}$
-----------------------	----------------------

- A. The quantity in column A is greater
 B. The quantity in column B is greater
 C. The two quantities in both columns are equal
 D. The relationship cannot be determined from the information given

Square each column: $\left(\frac{\sqrt{20}}{2}\right)^2 = \frac{20}{4} = 5$ and $\left(\frac{5}{\sqrt{5}}\right)^2 = \frac{25}{5} = 5$. So both columns are equal and the answer is choice (C).

Example 4:

A	B
$13y$	$15y$

To solve this question, subtract $13y$ from both columns to get $13y - 13y = 0$ for column A and $15y - 13y = 2y$ for column B. As there are no restrictions, $2y$ can be greater than, less than or equal to 0. So the correct choice is (D).

2.4 Data Interpretation Questions

These questions are based on the information that is presented in the form of a graph, chart or table. Most of the data is presented graphically. The most common types of graphs are line graphs, bar graphs and circle graphs. The objective of such questions is to test your ability to understand and analyze statistical data.

2.4.1 Question Format

Data interpretation questions always appear in sets, you are presented with some data in any format (chart, graph or table), and you will then be asked with some questions about that data.

The following example explains the format of such questions.

Example:**Question 1:**

What is the average sale, in million Rs., for the period 1994-2000?

- (A) 5.5 (B) 6.0 (C) 7.0 (D) 8.0
 (E) 8.5

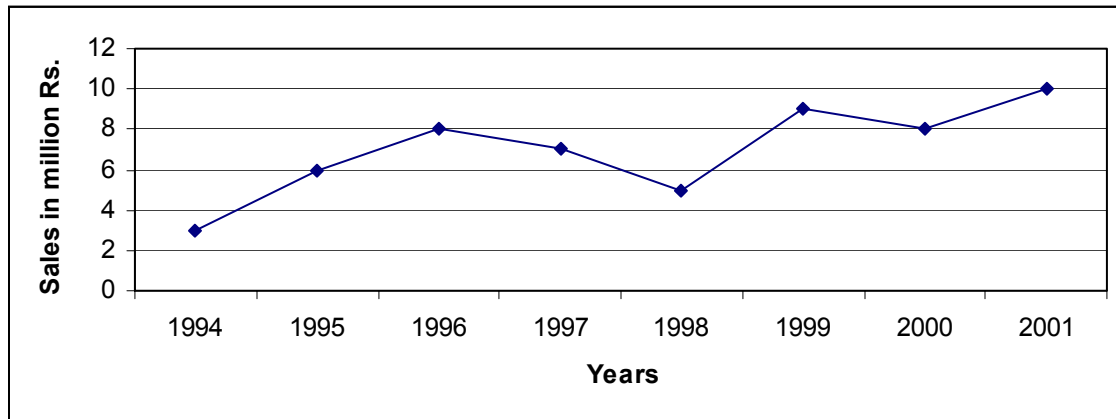
Question 2:

For which year, the percentage increase in sales from the previous year is the greatest.

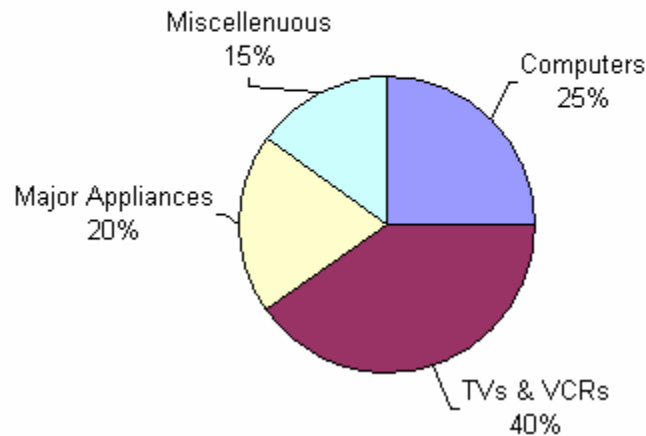
- (A) 1995 (B) 1996 (C) 1999 (D) 2000
 (E) 2001

2.4.2 How to attempt

- Do not try to answer such questions immediately, first of all read the presented data carefully. You must be very clear about the data and its meanings even before reading the first question.
- Do not confuse numbers with percents. This confusion is most likely to occur when data is presented in pie graphs. For example in the following graph



**2001 Sales of XYZ Corporation
by Category**



Now it would be a great mistake here to think that sales of "TVs & VCRs" is 15% more than the sales of Computers in 2001 by XYZ Corporation. To

$$\frac{15}{25} \times 100 = 60\%$$

know this you have to calculate it as

- Try to avoid un-necessary calculations. Most of the questions could easily be solved by observation and estimation. Use estimation to eliminate the choices, if you are not able to find the correct answer without calculation. For example to solve "Question 1" presented in the example at the start of this section, if you are not sure of the correct answer, you can then try to cut down the number of possible choices by observation. You are being asked to tell the percentage increase. Where as, in year 2000, the sale is decreasing instead of increasing, so, you can immediately eliminate choice (D) in that question.

- Your answers must be based upon the information presented in the given charts and graphs. If your knowledge contradicts any of the data presented, ignore what you know and stick to the presented data. The presented data should be the only base for your calculations and estimations.
- Always use the proper units, there may be some questions that ask you to compare different data items possibly from different data sets. Be careful about the units used to represent the data.
- Because graphs and charts present data in a form that enables you to readily see the relationships among values and to make quick comparisons, you should always try to visualize your answer in the same format as the original data was presented.
- Be sure that your answer is reasonable. For example, the profit could never increase the actual sales, or the expenses could never be negative etc. While answering the question, first of all eliminate such unreasonable choices, and then choose from the remaining ones.

2.5 Practice exercise

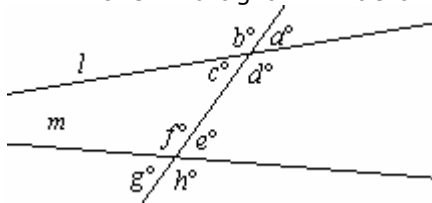
- 1 What is the average of positive integers from 1 to 100 inclusive?

(A) 49
 (B) 49.5
 (C) 50
 (D) 50.5
 (E) 51

- 2 If $x + y = 6$, $y + z = 7$, and $x + z = 9$, what is the average of x , y and z ?

(A) $\frac{11}{3}$ (B) $\frac{11}{2}$ (C) $\frac{22}{3}$ (D) 11 (E) 22

- 3 In the diagram below, lines l and m are not parallel.



If A represents the average measure of all the eight angles, what is the value of A ?

(A) $A = 45$
 (B) $45 < A < 90$
 (C) $A = 90$
 (D) $90 < A < 180$
 (E) $A = 180$

- 4 Aslam has 4 times as many books as Salman and 5 times as many as Javed. If Javed has more than 40 books, what is the least number of books that Aslam could have?

(A) 200 (B) 205 (C) 210 (D) 220 (E) 24

5 Aslam is now 3 times as old as Javed, but 5 years ago, he was 5 times as Javed was. How old is Aslam now?

- (A) 10 (B) 12 (C) 24 (D) 30 (E) 36

6 If $x\%$ of y is 10, what is y ?

- (A) $\frac{10}{x}$
(B) $\frac{100}{x}$
(C) $\frac{1000}{x}$
(D) $\frac{x}{100}$
(E) $\frac{x}{10}$

Answer Key

- 1** D
2 A
3 A
4 D
5 D
6 C

3 Analytical Ability

3.1.1 Question format

Each analytical reasoning question is a logical puzzle, based on a given set of conditions. Like mathematical questions, these questions have exactly one correct answer, which is what you need to select.

Analytical reasoning questions are presented in groups of four or five questions. Each group is based on a short passage followed by a set of conditions. Occasionally, there are graphs and tables instead of a passage. To understand the general format of the question, consider the following example.

Question 1-4:

As part of their sports physical, seven college athletes — F, G, H, I, J, K and L — are being weighed. In announcing the results of the physical exams, the coach has given the following information.

- i. None of the athletes is exactly the same weight as another athlete.
- ii. K is heavier than L, but lighter than H.
- iii. I is heavier than J
- iv. Both F and G are heavier than H.

- 1 Each of the following could be true EXCEPT
 - A. F is the heaviest.
 - B. G is the heaviest.
 - C. I is the heaviest.
 - D. More than three athletes are heavier than K.
 - E. More than three athletes are lighter than K.
- 2 Which of the following, if true, would be sufficient to determine which athlete is the lightest?
 - A. I is the heaviest
 - B. I is lighter than K
 - C. K is heavier than J
 - D. J is heavier than K
 - E. Exactly five students are lighter than F.
- 3 If J is heavier than F, how many different rankings by weight, of the athletes are possible?

A. 1 B. 2 C. 3 D. 4 E. 5
- 4 If H is heavier than I, which of the following CANNOT be true?
 - A. I's weight is equal to the average of F's weight and G's weight.
 - B. I's weight is equal to the average of K's weight and L's weight
 - C. J's weight is equal to the average of K's weight and L's weight
 - D. J is the second lightest.

Answers:

1. E

2. D

3. C

4. A

3.1.2 How to attempt

- Simplify the information by using abbreviations and symbols. The first step is to strip away all of the excess verbiage from the given passage and then to abbreviate the remaining key words with single letters. For example, in the question statement "five musicians — a bassist, a drummer, a guitarist, a pianist, and a trumpeter — are performing in a talent show", you should immediately abbreviate them B, D, G, P and T.

You can use abbreviated letters to represent a whole sentence also. You should use symbols to represent conditions. You may develop your own symbolic conventions for this. The objective is to convert the problem into notations, so that, it is easily understandable. The following is a basic set of symbols, which are most commonly used.

'A' represents the statement "Akbar is going".

'B' represents the statement "Babur is going".

<u>Symbols</u>	<u>Meaning</u>	<u>Examples</u>
$\sim$	Not	$\sim A$ Akbar is not going. Or you can say, "it is not the case that Akbar is going".
$\wedge$	And	$A \wedge B$ Akbar and Babur are going. $A \wedge \sim B$ Akbar is going and Babur is not going.
$\vee$	Or	$A \vee B$ Akbar or Babur is going. $A \vee \sim B$ Akbar is going or Babur is not going.
$\rightarrow$	If, then	$A \rightarrow B$ If Akbar is going then Babur is going. $(A \wedge B) \rightarrow S$ If Akbar and Babur are going, then Saleem is going.
$\leftrightarrow$	If and only if	$A \leftrightarrow B$ Babur is going, if and only if Akbar is going.

- Before learning the tactics to attempt an analytical reasoning question, you must be familiar with some basic logic facts, which are explained in the following text. Consider A and B are two statements.
 - A is true means $\sim A$ is false.
 - $\sim A$ is true means A is false.
 - $(A \wedge B)$ is true means both A and B are true.
 - $(A \wedge B)$ is false means either A or B or both are false.
 - $(A \vee B)$ is true means either A or B or both are true.
 - $(A \vee B)$ is false means both A and B are false.
 - $\sim(A \wedge B)$ is equivalent to $(\sim A \vee \sim B)$.
 - $\sim(A \vee B)$ is equivalent to $(\sim A \wedge \sim B)$.
 - If $(A \rightarrow B)$ is true then
 - If A is true B is also true.
 - If A is false B may be true or false.
 - If $(A \rightarrow B)$ is false then A is true and B is false.
 - $(A \rightarrow B)$ is equivalent to $(\sim B \rightarrow \sim A)$
 - $(A \leftrightarrow B)$ is true means:
 - If A is true B is true.
 - If A is false B is false.
 - $(A \leftrightarrow B)$ is false means:
 - If A is true B is false.
 - If A is false B is true.
 - $(A \leftrightarrow B)$ is equivalent to $[(A \rightarrow B) \wedge (B \rightarrow A)]$.
- You must be familiar with the most common types of analytical reasoning questions. The following four types occur more frequently than the others, and when you see them, you should immediately know what you need to do to answer them.
 - Which of the following could be true?** If only one of the answer choices could be true, then each of the other four choices must be false; that is, each one must violate at least one of the given conditions.

- **Which of the following must be true?** Since only one of the answer choices must be true, then for each of the choices, either it is false or it is possibly (but not definitely) true. You have to choose only that choice which is definitely true.
- **Which of the following cannot be true?** Since only one of the answer choices cannot be true, then each of the other choices could be true. The correct answer is the only choice, which violates at least one of the given conditions or is otherwise inconsistent with what you know must be true.
- **How many possibilities are there?** This question asks, "How many different ways are there to satisfy all of the given conditions?" Here, you must systematically count or list all of the possibilities that do not violate any of the conditions.
- Identify the key words that serve to limit the situation. Certain words are critical to your understanding of the situation. Be sure to incorporate your symbols. Some frequently used key words are listed below:

After	All	Always	At least	At most
Before	But	Can be	Cannot be	Consecutive
Different	Directly	Each	No fewer than	No more than
Only	Possible	Entire	Every	Exactly
Except	Fewer	First	If	If and only if
Immediately	Impossible	Last	Least	Most
Must be	Same	Some	The Least	The Most
Unless	Smallest	Greatest	None	

Note that certain key words have only one function, to rule out a potential ambiguity.

- Eliminating the choices is always a good strategy. While eliminating the choices, first of all, eliminate those which are ruled out by individual conditions: Then work through the remaining choices.
- Study conditions, not merely for what they state but also for what they imply. Certain analytical reasoning questions resemble the inference questions you find in the reading comprehension section. To answer them correctly, you must understand not only what the conditions state explicitly, but also what they imply.
- Often the key to answering analytical reasoning questions is to organize the given information in a list or table.
- On some analytical reasoning questions, an excellent way to deal with the information is to draw a simple diagram, picture, or map. This is particularly helpful when you are dealing with the physical or temporal order of things. It is much easier to tell whether person A can be seated opposite person B if you have sketched a diagram of the table; it is easier to know whether person C is older or younger than person D if you have entered all of the given information on a time line; and it is easier to determine whether town E is east of town W if you have drawn a simple map.

3.1.3 Example questions with Answers and Explanations

Questions 1-5:

Six actors ---- Bob, Carol, Dave Ed, Frank, and Grace audition for a part in an off-Broadway play. The auditions will take place over four consecutive days, starting on a Thursday. Each actor will have one audition; the days on which the different actors will audition must conform to the following conditions.

- i. At least one audition will take place each day.
- ii. No more than two auditions will take place on any day.
- iii. No more than three auditions will take place on any two consecutive days.
- iv. Bob's audition must take place on Saturday.
- v. Carol's audition must take place on the same day as another audition.
- vi. Frank's auditions must take place on the day before Grace's audition.
- vii. Dave's audition must take place on a day after Ed's audition.

- 1 If only one audition takes place on Thursday which actor could have that audition?
(A) Bob (B) Carol (C) Dave (D) Frank (E) Grace
- 2 If Bob's and Frank's auditions are on the same day, which of the following must be true
(A) Dave's audition will take place on Thursday
(B) Dave's audition will take place on Friday
(C) Grace's audition will take place on Thursday
(D) Carol's audition will take place on Sunday
(E) Ed's audition will take place on Sunday
- 3 If the director decides to hold two auditions on Thursday and two on Sunday, how many actors would be eligible to audition on Friday?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5
- 4 If Ed and Grace have their auditions on the same day which of the following must be true?
(A) Ed's audition will take place on Thursday.
(B) Frank's audition will take place on Friday.
(C) Carol's audition will take place on Saturday.
(D) Grace's audition will take place on Saturday.
(E) Carol's audition will take place on Sunday.
- 5 If Ed's audition is on Saturday, which of the following actors cannot audition on the same day as any other actor?
(A) Bob (C) Ed (E) Gr
(B) Carol (D) Frank ace

Questions 6-10:

During the first half of the year, from January through June, the chairperson of the mathematics department will be on sabbatical. The dean of the college has asked each of the six professors in the department --- Arkes, Borofsky, Chang, Denture, Hobbes, and Lee--- to serve as acting chairperson during one of

those months. The mathematicians can decide the order in which they will serve, subject only to the following criteria established by the dean.

- i. Chang will serve as chairperson in February.
 - ii. Arkes will serve as chairperson before Hobbes does.
 - iii. Borofsky and Dexter will serve as chairpersons in consecutive months.
- 6** Which of the following professors could serve as chairperson in January?
- (A) Borodfsky (B) Chang (C) Dexter (D) Hobbes (E) Lee
- 7** In how many ways can the schedule be made up if Lee has to serve as chairperson in May?
- (A) 1
(B) 2
(C) 3
(D) 4
(E) 6
- 8** If Lee serves in April, all of the following could be true EXCEPT
- (A) Arkes serves in January
(B) Hobbes serves in march
(C) Borofsky serves in may
(D) Borofsky serves in June
(E) Hobbes serves in June

- 9 If Borofsky serves in May, what is the latest month in which Arkes could serve?
- (A) January
(B) February
(C) March
(D) April
(E) June
- 10 Which of the following CANNOT be true?
- (A) Arkes and Lee serve in consecutive months.
(B) Lee and Hobbes serve in consecutive months.
(C) Hobbes and Dexter serve in consecutive months.
(D) Arkes and Chang serve in consecutive months.
(E) Borofsky and Chang serve in consecutive months.

Solutions 1-5:

First express each of the conditions symbolically:

B, C, D, E, F, and G: 1 audition each

Days: Thu, Fri, Sat, Sun

Each day: 1 or 2 auditions

2 consecutive days: 2 or 3 auditions

$B = \text{Sat}$ $C \neq \text{Thu}$ $F < G$ $E < D$

- 1 A violates the condition that Bob's audition will take place on Saturday ($B = \text{Sat}$). B violates the condition that Carol's audition cannot be the only audition on a particular day ($C \neq \text{Thu}$). Choices C and E are impossible. Since Dave's audition must take place on a day after Ed's audition ($E < D$) and Grace's audition must take place on a day after Frank's audition ($F < G$) neither can take place on Thursday. Only choice D does not violate any of the given conditions, so this is the correct answer.
- 2 The condition that Bob's and Frank's auditions are on the same day completely determines the schedule. They must take place on Saturday ($B = \text{Sat}$). To avoid having more than three auditions on two consecutive days, there can be only one audition on Friday and one on Sunday, which means there will be two on Thursday. Since Frank must have to precede Grace ($F < G$), Grace's audition will take place on Sunday. Since Ed must precede Dave, Ed's audition will take place on Thursday and Dave's audition on Friday. Finally, Carol's audition will be the second audition on Thursday. The final schedule is "C and E on Thursday, D on Friday, B and F on Saturday and G on Sunday". Only choice B is consistent with this schedule, so "B" is the correct choice.
- 3 Since only one audition can take place on Friday, it cannot be Carol's ($C \neq \text{Fri}$); and, of course, it cannot be Bob's ($B = \text{Sat}$). Any of the other four actors could audition on Friday as indicated in the following schedules:
- E/F on Thu, D on Fri, B on Sat, C/G on Sun
C/F on Thu, E on Fri, B on Sat, D/G on Sun
C/E on Thu, E on Fri, B on Sat, D/G on Sun
E/F on Thu, G on Fri, B on Sat, C/D on Sun
So the correct choice is D.
- 4 The only schedule that fulfils the conditions is "F on Thu, E/G on Fri, B on Sat, and C/D on Sun". Only choice E is consistent with this schedule.
- 5 Since Ed and Bob's auditions are both taking place on Saturday, eliminate choices A and C. Since Carole must audition on the same day as another actor, eliminate B. Finally, since Dave's audition must take place on Sunday ($E < D$), Frank's audition must take place on Thursday and Grace's audition on Friday ($F < G$). Eliminate choice D. The complete schedule is: "C/F on Thu, G on Fri, B/F on Sat, and D on Sun."

Solutions 6-10:

Let A, B, C, D, H, L represents professor names.

$C = \text{February}$, $A < H$, $B < D$ and $D < B$

- 6 Only choice E is there, which does not violate any of the conditions, so is the correct choice.
- 7 With C serving in February and L in May, the only consecutive months available for B and D are March and April. Then since A must serve is before H in June. There are two possible schedules, depending on the order of B and D, so the correct choice is B.
- 8 If L serves in April, the consecutive months available for B and D are May and June; so choices C and D could be true. Since A must serve before H, choices A and B must be true, only choice E cannot be true.
- 9 Since A must serve before H does, A cannot serve in June. Can A serve in April? No, because then, D would serve in June ($B < D$ or $D < B$), and again A would not precede H. The latest that A could serve in March, which could occur in the final order: L, C, A, D, B and H.
- 10 The only professors that can serve in January are A and L, so, one of them must serve in January, and neither serves in February. So choice A cannot be true.

3.2 Logical Reasoning

Each logical reasoning question requires you to analyze an argument presented in a short passage. Often you are asked either to find a conclusion that is a logical consequence of the passage, or to choose a statement that, if true, strengthen or weakens the argument.

3.2.1 Question format

Logical reasoning questions are based upon a passage called argument. You have to analyze the argument presented in the passage. The passage is followed by a question. Occasionally, there is more than one question related to the same passage. No matter what the number is, the questions always aim at your ability to understand the conclusion reached by the author of the passage, and to give argument and contra arguments. Logical reasoning questions are a lot like reading comprehension questions in a verbal section.

For each logical reasoning question, the argument is followed by a multi choice question. The choices are simple statements. Mostly the question statement begins with the phrase "which of the following statements". Here are a few examples:

- Which of the following statements is an assumption on which the conclusion of this argument is based?
- Which of the following statements identifies a flaw in the reasoning of this argument?
- Which of the following statements can be most reasonably inferred, from the statements in the given passage?
- Which of the following statements, if true, would most seriously, weaken the argument offered?
- Which of the following statements, if true, would strengthen the conclusion in the preceding argument?
- Which of the following statements would be the most important to know to evaluate the argument given in the preceding paragraph? Every logical reasoning question does not fit this mold, but you should try.

3.2.2 How to attempt

- While attempting logical reasoning questions, you should read the question statement before reading the argument. Then you should analyze the argument presented in the passage. You must know what aspect of the argument you are to concentrate on, and focus on it. By this, you will not be unnecessarily wasting your time.
- You must be able to spot the question type by reading the question statement. If you do this, you will be better able to approach the argument in hand. The following six categories are those which most commonly occur:

1 Assumption: Questions that test your ability to recognize the premises on which an argument is based, often take the following forms:

- The conclusion above depends on which of the following assumptions?
- The author of the passage above makes which of the following assumptions?
- In the passage above, the author assumes which of the following statement to be true?

2 Inference: Questions, which test your ability to go beyond the author's explicit statements and see what these statements imply, may be worded like these.

- It can be inferred from the passage above that the author believes that ...
- Which of the following is implied by the passage above?
- From the information above, which of the following is the most reasonable inference?

3 Conclusion: Questions that test your ability to determine what claim can logically be made on the basis of evidence in the passage above?

- If the statements above are true, which of the following is a conclusion that can be properly drawn?
- The statements in the passage, if true, best supports which of the following conclusions?

4 Central Point: Questions that test your ability to understand the thrust of an argument.

- The statement cited above conveys which of the following propositions?
- The author of the passage above argues that...
- Which of the following expresses the point the author of the passage above makes?

5 Support: Questions that test your ability to recognize whether an assertion supports or undermines an argument.

- Which of the following, if true, best supports the author's conclusion?
- Which of the following, if true, most weakens the author's conclusion?

6 Argument Evaluation: Questions that test your ability to judge an argument.

- Which of the following identifies a flaw in the speaker's reasoning?
- Which of the following would be most important to know when evaluating the accuracy of the argument above?

- Do not try to skim the passage, read each argument carefully. It is not enough to have a general idea about the argument; you must be able to analyze it very carefully.
- You must find the conclusion of the argument, which the author claims to have reached. That most common situations are as follows:
 - The conclusion is the last sentence of the passage, often starting by words such as so, therefore, thus, hence, consequently etc.
 - The conclusion is the first sentence of the passage followed by the supporting evidence.
 - Occasionally, the conclusion is not present in the passage; in this case, the question asks you to identify the conclusion.
- Pay particular attention to signal words such as accordingly, for this reason, hence, although, but, except, in contrast, nevertheless, unlike etc.
- Eliminating the choices is always the best strategy if you do not know what the correct answer is. This process will eliminate some obvious wrong choices. And you will be able to make an educated guess from the remaining ones.
- Every argument is based upon certain assumptions made by the author. If an argument's basic premises are sound, the argument is strengthened. If an argument's basic premises are flawed, the argument is weakened. In support questions, where you have to decide about weakening or strengthening the question, pinpoint what the argument assumes. Then compare that assumption with the answer choices. If the question asks you to find the choice, which most strengthens the argument, look for the choice that is most in keeping with the argument's basic assumption. If the question asks you to choose the choice that most weakens the argument, look for the answer that casts the most doubt on that assumption.
- Some logical reasoning questions are essentially mini analytical reasoning questions, so, be familiar with all of the important logical facts and apply whenever needed. Example questions with Answers and Explanations

3.2.3 Example Questions with Answers and Explanations

Questions 1-2:

The microwave oven has become a standard appliance in many kitchens, mainly because it offers a fast way of cooking food. Yet, some homeowners believe that the ovens are still not completely safe. Microwaves, therefore, should not be a standard appliance until they have been carefully researched and tested.

- 1** Which of the following, if true, would most weaken the conclusion of the passage above?
- (A) Homeowners, often purchase items despite knowing they may be unsafe.
 - (B) Those homeowners in doubt about microwave safety ought not to purchase microwaves.
 - (C) Research and testing of home appliances seldom reveals safety hazards.
 - (D) Microwaves are not as dangerous as steam irons, which are used in almost every home.
 - (E) Homeowners often purchase items that they do not need.
- 2** Which one of the following, if true, would most strengthen the conclusion of the passage above?
- (A) Homeowners often doubt the advertised safety of all new appliances.
 - (B) Speed of food preparation is not the only concern of today's homeowner.

- (C) Modern homeowners have more free time than ever before.
(D) Food preparation has become almost a science, with more complicated and involved recipes.
(E) Many microwave ovens have been found to leak radioactive elements.
- 3** Years ago, a poll concluded that there are more televisions than there are bathtubs in American homes. No doubt that fact remains today, especially in light of the growing popularity of home computers. Now, in addition to owning televisions for entertainment, more and more families are purchasing TV monitors for use with a personal computer. We can safely guess that there are still many more people staring at a picture tube than singing in the shower. Which of the following statements can be inferred from this passage?
(A) Personal computers probably cost less than installing a shower or bathtub.
(B) People can wash themselves without a tub or shower, but they cannot watch television unless they own a television set.
(C) TV monitors will work with personal computers in place of regular computer monitors.
(D) As many computers are sold today as television sets a few years ago.
(E) More television monitors are now used with personal computers than are used to watch commercial television broadcasts.
- 4** Some scientists have proposed that, over two hundred million years ago, one giant land mass, rather than various continents and islands, covers one third of the earth. Long before there was any human life, and over vast periods of time, islands and continents drifted apart. Australia was the first to separate, while South America and Africa were late in splitting apart. Some islands, of course, were formed by volcanoes and were never part of the great land mass.

All the following would support the author's claim EXCEPT

- (A) Many of the plants of the South American rain forests are markedly similar to those of African rain forests.
(B) Australia has more animals that are not found in any other continent than have several of the much larger continents.
(C) Volcanic islands like Hawaii have ecosystems very different from those of continental lands with the same average temperature.
(D) The plants of similar conditions in South America have less in common with those of Australia than with those of Asia, Africa or Europe.
(E) The primitive languages of Australia are unlike those of Africa, which resembles those of South America.
- 5** Every Saturday, Amir has pizza for lunch and then goes to the movies. If the statement above is true, which of the following statements must also be true?
- 1 If it is not Saturday, then Amir is not having pizza for lunch and is not going to the movies.
 - 2 If Amir has pizza for lunch and then goes to the movies, it is Saturday.
 - 3 If Amir has pizza for lunch, but does not go to the movies, it is not a Saturday.
- (A) 1 only
(B) 2 only
(C) 3 only
(D) 1 and 2 only
(E) 2 and 3 only
- 6** Antifreeze lowers the melting point of any liquid to which it is added so that the liquid will not freeze in cold weather. It is commonly used to maintain the cooling system in automobile radiators. Of course, the weather may become so cold that even antifreeze is not effective, but such a severe climatic condition rarely occurs in well-traveled places.

Which of the following can be deduced from the passage?

- (A) Well-traveled places have means of transportation other than automobiles.
- (B) Antifreeze does not lower the melting point of certain liquids in extreme conditions.
- (C) Severe climatic conditions rarely occur.
- (D) It is not often that many travelers who use antifreeze have their cooling system freeze.
- (E) Antifreeze raises the melting point of some liquids.

Solutions:

- 1 The conclusion of the passage is that, because of safety concerns, more research and testing ought to be done before microwaves become standard household appliances. If, however, research and testing are ineffective means of discerning safety problems (as choice C says), then research and testing would be irrelevant. This criticism seriously weakens the conclusion. So choice C is the correct answer.
- 2 If many microwave ovens have been found to leak radioactive elements (as choice E says), then the conclusion — that microwaves should not be standard appliances until they are more carefully researched and tested — is further strengthened because more safety concerns need to be addressed. So, choice E is the correct answer.
- 3 Though Choices A and B may well be true, they cannot be inferred from the information in the passage. But choice C can be inferred since, "more and more families are purchasing TV monitors for use with a personal computer." TV monitors must work with these computers, otherwise, people would not buy them for that purpose. Choices D and E may or may not be true, but they are not inferences from the passage, simply additional information. So, the correct choice is C.
- 4 If Australia was the first continent to separate, it would follow that its flora and fauna would develop in isolation over a longer period of time. Similarly, we may expect the plants and animals of South America and Africa that separated later, to be more alike. Choices A, B, and D support these ideas. The separately developed islands are different at is also in accord with the passage. However the languages of all the continents would have developed in isolation, since man did not evolve until after the break-up of the landmass, and it is surprising that African and South American languages are similar. Human likeness or differences are irrelevant to the claims of the passage. So choice E is the correct answer.
- 5 This logical reasoning question is very easy as soon as you express the given statement symbolically. "If it is Saturday, then Amir has Pizza and goes to Movies" translates as $S \rightarrow (P \wedge M)$. This is equivalent to $\sim (P \wedge M) \rightarrow \sim S$, which is equivalent to $(\sim P \vee \sim M) \rightarrow \sim S$. So if either P or M is false, then S is false. Therefore, 3 is true, neither 1 nor 2 are true. So, the correct choice is C.
- 6 Choice D is the correct answer. Since severe climatic conditions rarely occur in well-traveled places, it is not necessarily true that "It is not often that many travelers who use antifreeze have their cooling systems freeze." Choice A mentions other means of transportation, which is not addressed in the passage. Choice B refers to "certain" liquids.

4 Verbal Ability

The purpose of the Verbal Test is to evaluate and analyze your English comprehension and understanding towards the language. The questions will be basically asked to judge the sentence completion, analogy and critical reading skills. The questions of different types i.e. about sentence completion and analogy testing will be asked randomly. The questions about the critical reading however will be asked separately.

4.1 About the Verbal Questions

As already discussed, this section will consist of the following types of questions i.e. sentence completion, analogy and the critical reading. The detail about each section is as below;

4.1.1 Sentence Completion

The questions that come under this category are provided with various choices. You are asked to complete the sentences by filling in the blanks with the most suitable choice.

The questions for sentence completion can be related to any of the other areas of study i.e. science, literature, history, geography etc but the subject matter would not hinder your language abilities. You are asked to complete the sentence with the use of correct grammar or vocabulary.

These questions try to determine your ability to recognize the correct sentence structure, right grammar and how you make the correct choice of vocabulary.

Techniques for Sentence Completion

For the sentence completion a few choices are given that could be selected for completing the sentences. Only one choice is correct out of the several choices. You have to complete the sentence by selecting the correct choice according to the grammar or vocabulary. For making the right choice you can benefit from the following techniques;

- After you read the incomplete sentence do not look at the choices. Try to think about the correct answer yourself. If you think that you have completed the sentence and found the correct choice you can consult your list of choices. If the answer you thought matches one of the choices mentioned in the list that is most probably the right choice to be marked. If it does not match with the choice you can look for a synonym replacement. This tactic is very helpful in finding the right answer, it prevents you from confusing yourself with the wrong choices.
- Do not select the choice hastily. Even if you are satisfied with your choice try to substitute it with the other choices so that you are more satisfied with your decision. Sometimes the other choice fits more appropriately to the sentence.
- When you are asked to complete a sentence, which has two spaces to be filled in, try to put the first word of every choice in the first blank. Note down the choice that you find best. Now for the second blank try every second choice of all choices. Note the choice that you think is most appropriate. Check if the two selected choices are matching one of the given pair of choices. If it does then select it as your correct choice, if not then consider this pair as a wrong choice and try with the other choices.
- If you find difficulty in making sense out of certain words and you are not very familiar with them you can try to make a guess with reference to the

context of the sentence. Try to break the word into various parts and analyze its meaning e.g. if you do not know the meaning of the word "civilization" break it into two i.e. 'civilize' and 'ation' now you may know the meaning of civilize and through the term 'ation' you can make out that the word is a noun of civilize. If you find the word unfamiliar with prefixes and suffixes divide the word into its parts e.g. prerecording. This word consists of both prefix and suffix. You can break the word like pre-record-ing. Here you know that pre means before, record means to store and -ing is a term of continuous tense. So you can find this break up of words quite helpful in making out the right sense. If none of the technique works try making a guess with reference to the context.

- When long and complex sentences confuse you then try to break that sentence into smaller more sentences by rephrasing it. After you divide it compare with the original sentence to avoid any misinterpretation. If you are satisfied read the smaller sentences to get the idea more clearly.

Example Questions

1. Multan _____ a very hot climate.
A. Has
B. Have
C. Has been
D. With
2. One of the least effective ways of sorting information is learning _____ it.
A. Repeat
B. Repeating
C. To repeat
D. how repeat
3. Salman finished _____ two of his published compositions before his twelfth birthday.
A. Written
B. Writing
C. To write
D. Wrote
4. Sofia _____ collect stamps, but now she has other interests.
A. Used to
B. Was used to
C. Used to be
D. Using to
5. After passing through a great trauma of her husband's death, she _____ hard to achieve mental relaxation.
A. Struggled
B. Struggling
C. Struggle
D. To struggle
6. In partnership with Pakistan, South Korea _____ on Motor way.
A. Helped worked
B. Helping work
C. Helped working
D. To help working
7. We will wait if you _____ go.
A. Wanted to
B. Want
C. Want to

- D. Wanting to
8. If I had more time I _____ checked my paper.
A. Would have
B. Would
C. Would had
D. Will have
 9. I thought that he _____ coming today.
A. Has been
B. Is
C. Was
D. Has
 10. That professor enjoys teaching and _____.
A. Writing
B. Written
C. To write
D. Write
 11. Just _____ the files on my table.
A. Let
B. Leaves
C. Stay
D. Leave
 12. Thank you for _____ me your book.
A. Borrowing
B. Lending
C. Borrowed
D. Had lent
 13. _____ discovery of insulin, it was not possible to treat diabetes.
A. Prior
B. Before to the
C. Prior to the
D. To prior the
 14. Distribute the handouts _____ the candidates.
A. Between
B. Among
C. To
D. In
 15. Only _____ were present at the seminar.
A. a few people
B. a little people
C. a few peoples
D. the little people

Answer Key

- | | |
|------|-------|
| 1. A | 9. C |
| 2. C | 10. A |
| 3. B | 11. D |
| 4. A | 12. B |
| 5. A | 13. C |
| 6. C | 14. B |
| 7. C | 15. A |
| 8. A | |

4.1.2 Analogy Questions

Analogy means similarity in examples or describing likeness between two or more words. These questions ask the reader to analyze the relationship between two words in a pair and look for another similar or equivalent pair of words. You are provided with five other pairs of words. You are expected to match the original pair, which is given in the question with one of the pairs in the given choices on the bases of similar relationships between them. This exercise or such questions try to determine your basic understanding towards vocabulary and your ability to recognize the relationship between words. Some questions may also ask you to select a suitable antonym for a given word.

Techniques for Analogy Questions

For the analogy questions you can follow the guidelines mentioned below;

- Do not read the choices before you have analyzed the relationship between the pair of words, yourself. Try to understand the words more appropriately and think on which basis the relationship between the words is formed. After you reach a conclusion read the given choices afterwards to get a proper match with another pair having the same relationship.
- When you find yourself stuck with a word of difficult vocabulary, do not feel confused. Try to understand its meaning reference to the context or if it is somewhat familiar try to remember where and when you heard the word before. It can be a great help.
- Sometimes you find that there is more than one pair that fits well to the question and is appropriate for the choice, give the original pair a little more thought so that you can further study the relationship between the words and narrow it down to a more distinct one. After you have been successful in finding a closer relationship you can now scrutinize the two other pairs that confused you earlier. Repeating the same procedure with these words would prove useful.
- Do not get caught up by the tricks of the test makers. Sometimes the questions are provided with very tricky and dodging choices that misguide greatly. Try to think of every choice more specifically and narrowly.
- If you are familiar with the parts of speech and their nature, it can be beneficial in making a more sensible choice. Remember if the words in the original pair are a noun and an adjective, the correct choice you make should also contain the words in the same grammatical order. Otherwise, your choice is wrong. So, if you are confused with two pairs and cannot choose the correct choice you can easily look at their grammatical order and give preference to the one, which matches the original one.
- Exclude the choice from your consideration that you think is incorrect, e.g. the choices that do not have the same grammatical unit as of the original pair cannot match the original pair in anyway. Spend more time on considering the more possible choices.
- You should know about the various kinds of analogies that are more frequently asked. Some of the common analogy types are as follows;
 - i. **Synonyms**
Some words are linked together in a pair which means the same or has a similar dictionary definition.e.g Pretty- Beautiful

- ii. **Describing Qualities**
Some pairs have some words in which one word describes the other word. Heavy- Rain
- iii. **Class and Member**
Some pairs have words which are based on class and member basis e.g. Electronics-Radio
- iv. **Antonyms**
Some pairs consist of the words that are opposite to each other e.g.
Love- Hate
- v. **Describing Intensity**
Some pairs consist of the words in which one describes the intensity of the other e.g.
Smile-Laughter
- vi. **Function**
In some pairs a word describes the function of the other word e.g.
Pen-Write
- vii. **Manners**
Some words in a speech describe the manners and behavior e.g.
Polite-Speech
- viii. **Worker-Workplace**
Some pairs in a word describe the profession and its workplace e.g.
Doctor-Clinic

Example Questions

1. HEIGHT: MOUNTAIN

- (A) Depth : Trench
- (B) Shade : Tree
- (C) Weight : Age
- (D) Speed : Highway
- (E) Mineral : Mine

2. OBLIVIOUS : AWARENESS

- (A) Comatose : Consciousness
- (B) Serene : Composure
- (C) Erudite : Knowledge
- (D) Adroit : Skill
- (F) Invigorate : Energy

3. BELLWETHER : BAROMETER

- (A) Proselyte : Spark plug
- (B) Panhandler : Kill
- (C) Embezzler : Abduct
- (D) Cynosure : Magnet
- (F) Morass : Catalyst

4. ACT : ACTION

- (A) Therapy : Thermometer
- (B) Oblivion : Obvious
- (C) Liturgy : Literature
- (D) Image : Imagine
- (E) Bowl : Bowdlerize

5. BIBULOUS : DRINK

- (A) Rapacious : Clothing
- (B) Gluttonous : Food
- (C) Altruistic : Money
- (D) Vegetarian : Meat
- (E) Controversy : Reconcile

6. SONG : RECITAL

- (A) Author : Bibliography
- (B) Episode : Series
- (C) Coach : Team
- (D) Dancer : Agile
- (E) Poetry : Prose

7. HOUSE : BIG

- (A) Home : Live
- (B) School : Daily
- (C) Water : Cold
- (D) Clothes : Socks

8. ANIMAL : MONKEY

- (A) Zebra : Giraffe
- (B) Stationery: Pencil
- (C) Book : Cap
- (D) Tree : Wood

9. HEAVEY : LIGHT

- (A) Fat : Thin
- (B) Stupid : Idiot
- (C) Rough : Surface
- (D) Beautiful : Diary

Choose the lettered word or phrase that is most nearly opposite in meaning to the word in capital letters.

10. DETER

- (A) Twist
- (B) Intimidate

- (C) Encourage
- (D) Straighten
- (E) Supply

11. INDIGENOUS

- (A) Modern
- (B) Alien
- (C) Ornamental
- (D) Natural
- (E) Conceal

12. THERAPEUTIC

- (A) Curative
- (B) Injurious
- (C) Medicinal
- (D) Practical
- (E) Slander

13. QUIZZICAL

- (A) Amused
- (B) Unequivocal
- (C) Contorted
- (D) Dissimilar
- (E) Lax

14. ANCILLARY

- (A) Dependent
- (B) Concomitant
- (C) Appendix
- (D) Primary
- (E) Buffet

15. VIRTUOSO

- (A) Wicked
- (B) Dazzling
- (C) Mediocre
- (D) Honorable
- (E) Bawdy

Answer Key

- | | | | | |
|-------------|-------------|-------------|--------------|--------------|
| 1. A | 4. D | 7. C | 10. C | 13. B |
| 2. A | 5. B | 8. B | 11. B | 14. D |
| 3. A | 6. B | 9. A | 12. B | 15. E |

4.1.3 Critical Reading Questions

Questions related to critical reading try to judge your reading skills and how you understand and interpret what you read. The paper includes a few passages that ask answering questions related to the passage.

Techniques for Critical Reading Exercises

There are a few techniques related to the Critical Reading Questions that prove to be a good guideline for solving such questions.

- Do not read the questions before reading the whole passage. Try to skim through the whole passage and then read the questions to look for a more specific answer. Read the passage quickly with understanding but do not panic. Try to analyze what the whole passage is about and what the author really intends to convey. While reading mark the lines where you think the passage carries the most important points. These strategies would definitely help you find the answers.
- When you find yourself stuck with a question, do not waste your time on it and go ahead for the next questions. Sometimes, answering other questions guide you about the earlier question. But, if you still do not find the answer mark it for doing in the end more calmly, having enough time to think.
- Try to familiarize yourself with the types of critical reading questions. Once you know the nature of such questions, you will be able to find the answers more quickly even when you are reading the passage. The examples of some commonly asked questions are as follows:
 - **Central Idea**
Mostly, questions are asked to explain the central idea or main theme of the whole passage, which analyzes how you skim through it. Sometimes, the opening and closing lines can give you a better clue about answering such questions properly.
 - **Specific Details**
Sometimes to analyze your scanning abilities you are asked to answer some specific details about the passage. Such questions are about 'when', 'where', 'which' and 'who'. You can get the answers of this kind of questions from the area of the passage which you marked in the first reading, where you think the most important and informational remarks of the author lies.
 - **Making Inferences**
Most of the questions ask you to infer from the passages, making your opinion about what is said in the paragraph, implying meaning and making your own point of view. These questions try to assess your judgment; you must be clear in your mind about what the author is referring to and then make your own opinion according to your understanding and comprehension. Read and think about all the choices and analyze each of it logically according to your comprehension rather than the author's point of view.

- **Meaning in Context**

Some selected words from the passage are pointed out to explain them with reference to the context to check your reading comprehension. Sometimes the word that describes something in a dictionary portrays it the other way when it appears in the context. The test tries to judge your ability to make sense of the word in the context.

- **Author's Approach**

Some questions ask you to explain the mood in which the author is writing whether it is sarcastic, humorous, witty, sad etc. When you are asked questions like these you can look for certain expressions, words, phrases or exclamations, which describe the tone, mood or style of the author. The feelings of the writer are mostly exhibited through choice of words. While answering these questions read the message carefully observing particularly the use of words.

- **Title Selection**

Some passages ask for selecting a title that best suits the passage. Remember that the chosen title should not be narrowly or broadly selected. Try to avoid choosing those titles that describes only one or two paragraphs but the one, which is applicable to the whole passage and portrays it best.

Example Questions

Passage I:

We are profoundly ignorant about the origins of language and have to content ourselves with more or less plausible speculations. We do not even know for certain when language arose, but it seems likely that it goes back to the earliest history of man, perhaps half a million years. We have no direct evidence, but it seems probable that speech arose at the same time as tool making and the earliest forms of specifically human cooperation. In the great Ice Ages of the Pleistocene period, our earliest human ancestors established the Old Stone Age culture; they made flint tools and later tools of bone, ivory, and antler; they made fire and cooked their food; they hunted big game, often by methods that called for considerable cooperation and coordination. As their material culture gradually improved, they became artists and made carvings and engravings on bones and pebbles, and wonderful paintings of animals on the walls of caves. It is difficult to believe that the makers of these Paleolithic cultures lacked the power of speech. It is a long step Admittedly, from the earliest flint weapons to the splendid art of the late Old Stone Age: the first crude flints date back perhaps to 500,000 B.C., while the finest achievements of Old Stone Age man are later than 100,000 B.C.; and, in this period, we can envisage a corresponding development of language, from the most primitive and limited language of the earliest human groups to a fully developed language in the flowering time of Old Stone Age culture.

How did language arise in the first place? There are many theories about this, based on various types of indirect evidence, such as the language of children, the language of primitive societies, the kinds of changes that have taken place in languages in the course of recorded history, the

behavior of higher animals like chimpanzees, and the behavior of people suffering from speech defects. These types of evidence may provide us with useful pointers, but they all suffer from limitations, and must be treated with caution. When we consider the language of children, we have to remember that their situations are quite different from that of our earliest human ancestors, because the child is growing up in an environment where there is already a fully developed language, and is surrounded by adults who use that language and are teaching it to him. For example, it has been shown that the earliest words used by children are mainly the names of things and people ("Doll," "Spoon," "Mummy"); but, this does not prove that the earliest words of primitive man were also the names of things and people. When the child learns the name of an object, he may then use it to express his wishes or demands: "Doll!: often means "Give me my doll!" Or "I've dropped my doll: pick it up for me!"; the child is using language to get things done, and it is almost an accident of adult teaching that the words used to formulate the child's demands are mainly nouns, instead of words like "Bring!" "Pick up!"; and so on.

1 The main idea of this excerpt is

- A. to provide evidence of the origin of language.
- B. to present the need for language.
- C. to discuss how early man communicated.
- D. to present the culture of early man.
- E. to narrate the story of English.
- F.

2 Theories of the origin of language include all of the following EXCEPT

- A. Changes occurring through the years.
- B. The need to communicate.
- C. Language of children.
- D. The first man's extensive vocabulary.
- E. Communication among primitive men.

3 The purpose of the discussion of the word, "Doll," is intended to

- A. Trace the evolution of a noun.
- B. Support the fact that naming things is most important.
- C. Indicate how adults teach language to children.
- D. Show the evolution of many meanings for one word.
- E. Evince man's multiple uses of single words

4 The implication of the author regarding the early elements of language is that

- A. There were specific real steps followed to develop our language.
- B. Care must be exercised when exhuming what we consider the roots of language.
- C. We owe a debt of gratitude to the chimpanzee contribution.
- D. Adults created language in order to instruct their children.
- E. Language was fully developed by primitive man.

5 If we accept that primitive man existed for a very long period of time without language, then we may assume that

- A. Language is not necessary to man's existence.
- B. Language developed with the developing culture of primitives.
- C. Primitives existed in total isolation from one another.

- D. Children brought about a need for language.
- E. Mankind was not intended to communicate.

6 After a reading of this article, one might infer that

- A. Society creates problems with language.
- B. Language is for adults to instruct children.
- C. Society uses language to improve itself.
- D. With the evolution of language came wisdom.
- E. Language brings power.

Answer Key

- 1. A 2. D 3.C 4. B 5. B 6. E**

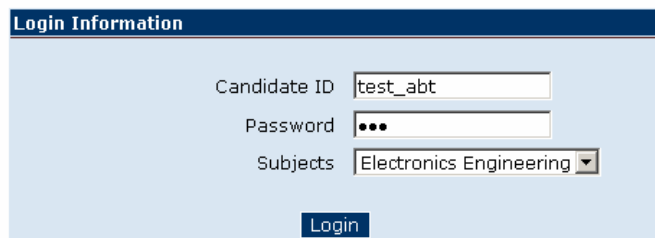
COMMON QUERIES

Q. How to take NTS Online Test?

You will go through the following screen shots to learn how to take NTS Online test.

Step: 1

This is the first screen named as **Candidate Login Screen**. You will enter your Candidate ID and Password provided to you by NTS

A screenshot of the 'Candidate Login Screen' form. The form has a title bar 'Login Information' in a dark blue box. Below the title bar, there are three input fields: 'Candidate ID' with the text 'test_abt', 'Password' with three dots, and 'Subjects' with a dropdown menu showing 'Electronics Engineering'. At the bottom of the form is a blue 'Login' button.

Step: 2

You will see Test Instructions' Screen after you successfully login. Please read the instructions carefully to avoid any confusion during the test. After reading the instructions, press **Start Test** button on center bottom of the page.



Instructions

test_abt

Please read the instructions carefully:

1. Your Test duration is 120 minutes.
2. You have to complete 100 questions during the test.
3. If you want to attempt a question at the end, you can place it in the Pass Box for attempting later.
4. You can not reattempt a question that you have already answered.
5. As soon as you will finish the test, the result will be displayed at the screen.
6. In case of a system failure during the test, you will have to log-in again and the system will start from the same question where you had left. No information will be lost while the system was unavailable.
7. You have successfully logged in. Click on the Start Test button to start your test.

Best of Luck!

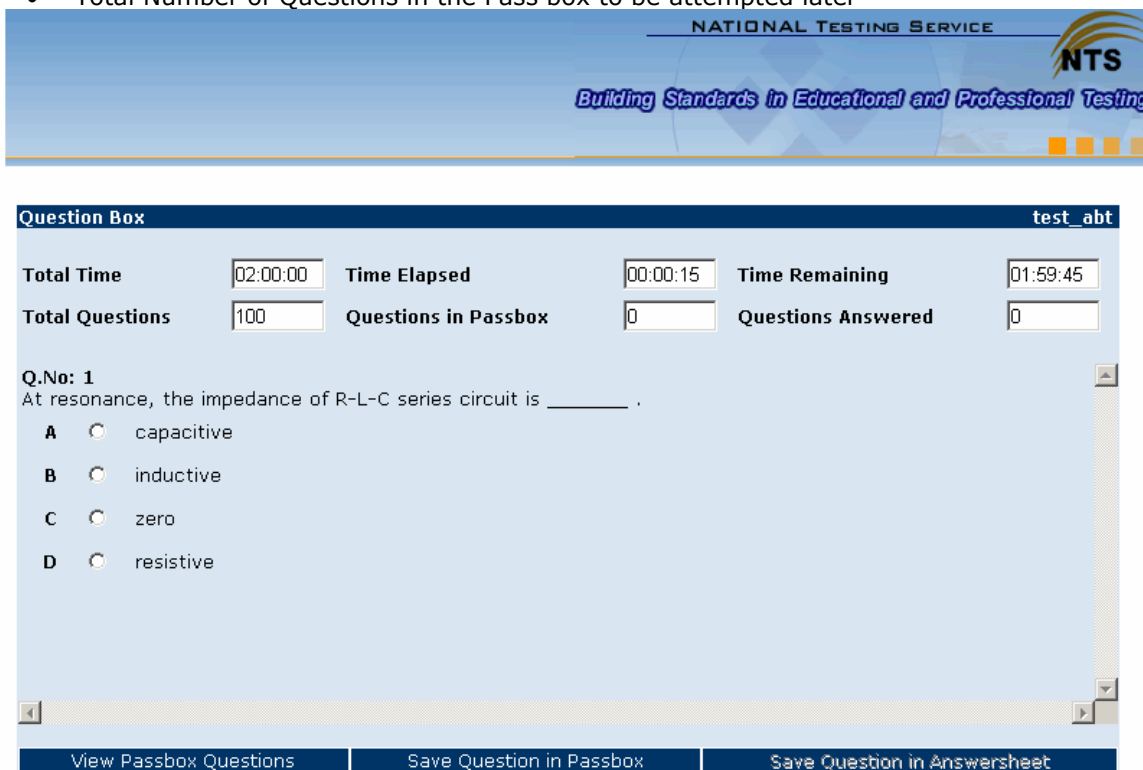
National Testing Service (NTS).

Start Test

Step: 3

After you click on the Start Test button your test starts and a page appears which shows your first question of the test. Each question has various choices, if you know the answer you can select the correct choice for your answer and press **Next Question** button. You can also add this question in the **Pass Box** to answer it at some another stage. You will also find some additional information about your test on this page. This information includes:

- Total Number of Questions in the Test
- Total Number of Questions Answered by you
- Total Number of Questions in the Pass box to be attempted later



The screenshot shows the NTS test interface. At the top, it says "NATIONAL TESTING SERVICE" and "Building Standards in Educational and Professional Testing". Below this is a "Question Box" section. It contains a table with the following information:

Question Box		test_abt	
Total Time	02:00:00	Time Elapsed	00:00:15
Time Remaining	01:59:45		
Total Questions	100	Questions in Passbox	0
Questions Answered	0		

Below the table, the question is displayed:

Q.No: 1
At resonance, the impedance of R-L-C series circuit is _____ .

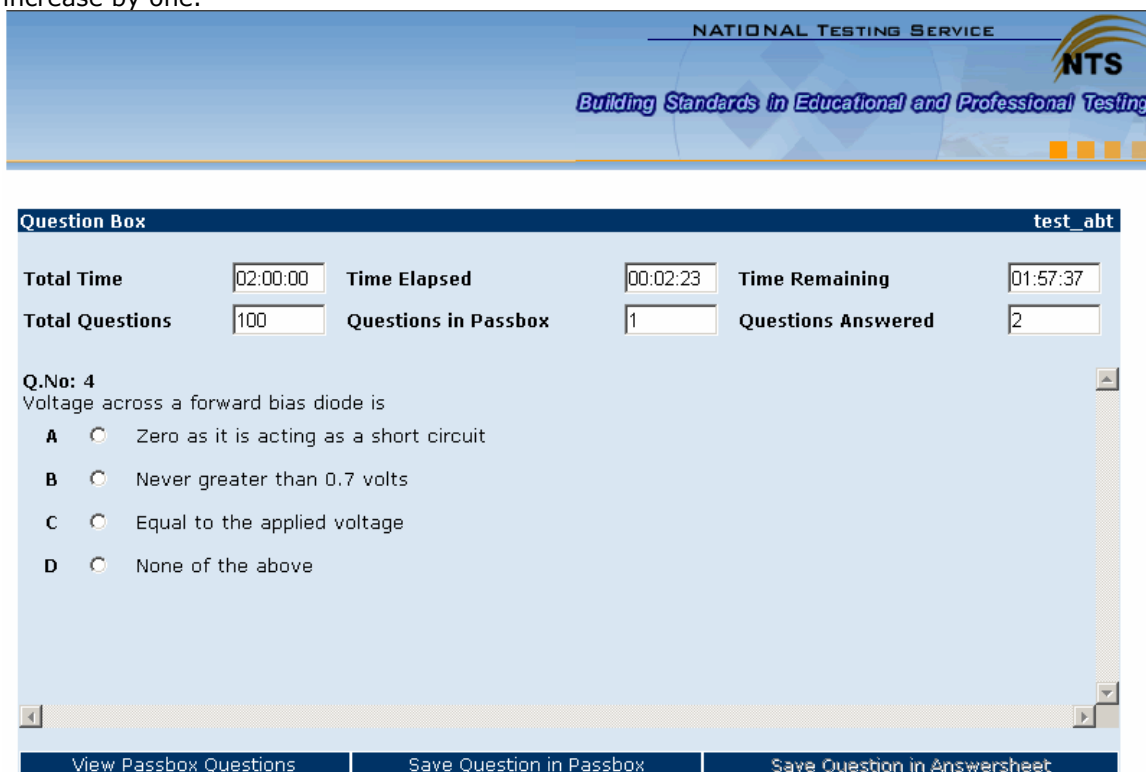
The options are:

- A ☐ capacitive
- B ☐ inductive
- C ☐ zero
- D ☐ resistive

At the bottom of the question box, there are three buttons: "View Passbox Questions", "Save Question in Passbox", and "Save Question in Answersheet".

Step: 4

If you place a question in **Pass Box** you will notice that the **Questions in Pass Box** field will increase by one.



The screenshot shows the NTS Question Box interface. At the top, there is a header with the NTS logo and the text "NATIONAL TESTING SERVICE" and "Building Standards in Educational and Professional Testing". Below the header, there is a table with the following data:

Question Box		test_abt	
Total Time	02:00:00	Time Elapsed	00:02:23
Time Remaining	01:57:37	Total Questions	100
Questions in Passbox	1	Questions Answered	2

Below the table, there is a question box with the following content:

Q.No: 4
Voltage across a forward bias diode is

- A ☐ Zero as it is acting as a short circuit
- B ☐ Never greater than 0.7 volts
- C ☐ Equal to the applied voltage
- D ☐ None of the above

At the bottom of the interface, there are three buttons: "View Passbox Questions", "Save Question in Passbox", and "Save Question in Answersheet".

Step: 5

If you want to answer the questions in **Pass Box**, simply click on **Questions in Pass Box** link at the top. It will take you on the following screen. Now click **Answer this Question** button for the question you want to answer.

NATIONAL TESTING SERVICE

Building Standards in Educational and Professional Testing

Pass Box				test abt	
Total Time	02:00:00	Time Elapsed	00:05:45	Time Remaining	01:54:15
Total Questions	100	Questions in Passbox	10	Questions Answered	12
Question No.					
1	To answer this question click here				
4	To answer this question click here				
5	To answer this question click here				
6	To answer this question click here				
7	To answer this question click here				
8	To answer this question click here				
9	To answer this question click here				
10	To answer this question click here				
18	To answer this question click here				
22	To answer this question click here				
Go to Question Box					

Step: 6

You have selected this question from **Pass Box** now select its answer and proceed for next question.

NATIONAL TESTING SERVICE


Building Standards in Educational and Professional Testing

Question Box

test_abt

Total Time	02:00:00	Time Elapsed	00:02:23	Time Remaining	01:57:37
Total Questions	100	Questions in Passbox	1	Questions Answered	2

Q.No: 4
Voltage across a forward bias diode is

A ☐ Zero as it is acting as a short circuit

B ☐ Never greater than 0.7 volts

C ☐ Equal to the applied voltage

D ☐ None of the above

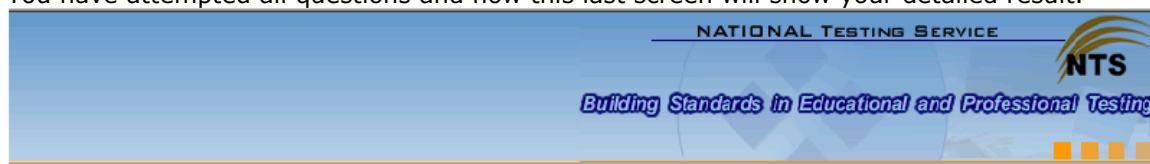
View Passbox Questions

Save Question in Passbox

Save Question in Answersheet

Step: 7

You have attempted all questions and now this last screen will show your detailed result.



Test Completed			
You have successfully completed your test.			
Candidate ID	Marks Obtained	Total Marks	Percentage Marks
test_abt	23	100	23.00

Wish You Good Luck with your Test.

National Testing Service

Q. How is NTS Online Test different from paper-based Test?**For the Paper-based Test,**

- A pencil, eraser and a sharpener is required to attempt the paper-based test.
- You can make the changes in the answer that you have already marked.
- The announcement of results is delayed than the online tests.
- You have to fill in a separate answer sheet to mark your answers.

Where as for the Online Test,

- No stationery items are required to attempt online test.
- If you want to attempt a question at the end, you can place it in the Pass Box for attempting later.
- You can not reattempt a question that you have already answered.
- As soon as you finish the test, the result is displayed on the screen.
- In case of a system failure during the test, you will have to log-in again and the test will start from the same question where you had left. No information will be lost while the system was unavailable.

Q. How Can I Ask for Result Reporting?

Your result is reported to you right after you finish your test. You are given the certificate fifteen days after the conduct of the test of the last batch. If you still do not get the result you can Contact Us. You can also visit the website of NTS to check your result. The final result is sent to you by email.

Q. Is There Any Negative Marking While Scoring?

There is no negative marking for wrong answers. However the negative marking may be activated if it is required by the allied institute or organization.

Q. What are the Rules and Regulations that apply to me in the Test Center when taking the Online General Test?

Rules and Regulations:

- If you do not appear with the Identity Card (NIC) on the Test Center, you will not be allowed to take the test.
- The test will be given on the day and at the scheduled time. You are asked to observe punctuality. Arriving late at the center may disqualify you from taking the test.
- You are not allowed to bring any testing aids inside the test center. Nothing, except the original Identity Card is required to be taken along.
- You are not allowed to smoke, eat or drink inside the test center.
- No discussion or any form of communication with the fellow candidates is allowed during the testing session.
- You will also not be allowed to leave the test center without the permission of the supervisor.
- Test centers do not have large waiting areas. Friends or relatives who accompany you to the test center will not be permitted to wait in the test center or contact you while you are taking the test.
- You will be required to sign the attendance sheet before and after the test session and any time you leave or enter the premises where the test is being conducted.
- If you need to leave your seat at any time during the test (which shall only be allowed in case of serious illness), raise your hand and ask the invigilator.
- Repeated unscheduled breaks will be documented and reported to NTS. NTS reserves the right to videotape all or any of Testing Sessions and use it to determine any misconduct, etc.
- If at any time during the test you believe that you have a problem with your test, or need the Invigilation Staff for any reason, raise your hand to notify the Invigilation Staff.

NOTE: The rest of the queries regarding the test format, contents and other procedures have almost the same answers as of the paper based tests, given above.

DRILL TESTS

General

Note: The sample papers do not include quantitatively the same number of questions as there would be in the actual papers. They are merely meant to provide conceptual guidance to the users or prospective candidates.

Drill Test I

I

Choose the correct answer for each question and shade the corresponding CIRCLE on the answer sheet

Quantitative Section**No. Of Questions****10**

1. The number of degrees through which the hour hand of a clock moves in 2 hours and 12 minutes is

- A. 66
- B. 72
- C. 732
- D. 723
- E. None of these

☐ A ☐ B ☐ C ☐ D ☐ E

2. A cylindrical container has a diameter of 14 inches and a height of 6 inches. Since one gallon equals 231 cubic inches, the capacity of the tank is approximately

- A. $2\frac{2}{7}$ gallons
- B. 4 gallons
- C. $1\frac{1}{7}$ gallons
- D. $2\frac{2}{7}$ gallons
- E. None of these

☐ A ☐ B ☐ C ☐ D ☐ E

3. A train running between two towns arrives at its destination 10 minutes late when it goes 40 miles per hour and 16 minutes late when it goes 30 miles per hour. The distance between the two towns is

- A. 720 miles
- B. 12 miles
- C. $8\frac{6}{7}$ miles
- D. $12\frac{7}{7}$ miles
- E. None of these

☐ A ☐ B ☐ C ☐ D ☐ E

4. If the base of a rectangle is increased by 30% and the altitude is decreased by 20% the area is increased by

- A. 25%
- B. 10%
- C. 5%
- D. 1%
- E. 4%

☐ A ☐ B ☐ C ☐ D ☐ E

5. If the sum of the edges of a cube is 48 inches, the volume of the cube is

- A. 512 inches
- B. 96 cubic inches
- C. 64 cubic inches

- D. 698 cubic inches
 E. None of these

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

6. A certain triangle has sides, which are, respectively, 6 inches, 8 inches, and 10 inches long. A rectangle equal in area to that of the triangle has a width of 3 inches. The Perimeter of the rectangle, expressed in inches, is

- A. 11
 B. 16
 C. 22
 D. 23
 E. 24

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

7. The cube of $\frac{1}{3}$ is

- A. $\frac{3}{9}$
 B. $\frac{3}{27}$
 C. $\frac{1}{81}$
 D. $\frac{1}{27}$
 E. $\frac{1}{9}$

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

8. In general, the sum of the squares of two numbers is greater than twice the product of the numbers. The pair of numbers for which this generalization is not valid is

- A. 8,9
 B. 9,9
 C. 9,10
 D. 9,8
 E. 8,10

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

9. A piece of wire 132 inches long is bent successively in the shape of an equilateral triangle, a square, a regular hexagon, a circle. The plane surface of the largest area is included when the wire is bent into the shape of a

- A. Circle
 B. Square
 C. Hexagon
 D. Triangle
 E. Line

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

10. If pencils are bought at 35 cents per dozen and sold at 3 for 10 cents the total profit on $5\frac{1}{2}$ dozen is

- A. 25 cents
- B. 35 cents
- C. 27 1/2 cents
- D. 28 1/2 cents
- E. 31 1/2 cents

☒ A ☐ B ☐ C ☐ D ☐ E

II**ANALYTICAL
Section****No. Of
Questions****20****Choose the correct answer for
each question and shade the
corresponding CIRCLE in the
answer sheet****For question 1 to 4**

Three adults—R, S, and V—will be traveling in a van with five children—F, H, J, L, and M. The van has a driver's seat and one passenger seat in the front, and two benches behind the front seats, one bench behind the first. Each bench has room for exactly three people. Everyone must sit in a seat or on a bench, and seating is subject to the following restrictions: An adult must sit on each bench. Either R or S must sit in the driver's seat. J must sit immediately beside M.

1. Which of the following can sit in the front passenger seat?

- A: J
B: L
C: R
D: S
E: V

☐ A ☐ B ☐ C ☐ D ☐ E

2. Which of the following groups of three can sit together on a bench?

- A: F, J, and M
B: F, J, and V
C: F, S, and V
D: H, L, and S
E: L, M, and R

☐ A ☐ B ☐ C ☐ D ☐ E

3. If F sits immediately beside V, which of the following CANNOT be true?

- A: J sits immediately beside S.
B: L sits immediately beside V.
C: H sits in the front passenger seat.
D: F sits on the same bench as H.
E: H sits on the same bench as R.

☐ A ☐ B ☐ C ☐ D ☐ E

4. If S sits on a bench that is behind where J is sitting, which of the following must be true?

- A: H sits in a seat or on a bench that is in front of where M is sitting.
B: L sits in a seat or on a bench that is in front of where F is sitting.
C: F sits on the same bench as H.
D: L sits on the same bench as S

E: M sits on the same bench as V.

- (A) (B) (C) (D) (E)

For question 5 to 9

The principal of a school is forming a committee. There are to be five members: three teachers, chosen from Mr. J, Ms. K, Ms. L, Mr. M, and Mr. N; and two students, chosen from O, P, Q, and R. The composition of the committee must conform to the following conditions: Ms. J will serve only if R is also on the committee. Ms. L will not serve unless Ms. K and O also serve. Neither Mr. M nor Mr. N will serve without the other. If P serves, neither Q nor R can serve.

5. Which of the following is an acceptable committee?

- A: J, L, M, N, O
B: K, L, N, O, P
C: K, M, N, O, R
D: L, M, N, O, R
E: M, N, O, P, Q

- (A) (B) (C) (D) (E)

6. How many different committees could include Mr. J and Q?

- A: 1
B: 2
C: 3
D: 4
E: 5

- (A) (B) (C) (D) (E)

7. If Q and R are both on the committee, who else must be on the committee?

- A: J
B: K
C: L
D: M
E: O

- (A) (B) (C) (D) (E)

8. If M is not on the committee, each of the following must be on the committee EXCEPT

- A: J
B: L
C: O
D: Q
E: R

- (A) (B) (C) (D) (E)

9. In how many different ways can the principal select an acceptable committee?

- A: Fewer than 3
B: 3

- C: 5
D: 7
E: More than 7

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

For question 10 to 13

A contractor will build five houses in a certain town on a street that currently has no houses on it. The contractor will select from seven different models of houses—T, U, V, W, X, Y, and Z. The town's planning board has placed the following restrictions on the contractor: No model can be selected for more than one house. Either model W must be selected or model Z must be selected, but both cannot be selected. If model Y is selected, then model V must also be selected. If model U is selected, then model W cannot be selected.

10. If model U is one of the models selected for the street, then which of the following models must also be selected?

- A: T
B: W
C: X
D: Y
E: Z

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

11. If T, U, and X are three of the models selected for the street, then which of the following must be the other two models selected?

- A: V and W
B: V and Y
C: V and Z
D: W and Y
E: Y and Z

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

12. Which of the following is an acceptable combination of models that can be selected for the street?

A: T, U, V, X, Y
B: T, U, X, Y, Z
C: T, V, X, Y, Z
D: U, V, W, X, Y
E: V, W, X, Y, Z

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

13. If model Z is one model not selected for the street, then the other model NOT selected must be which of the following?

A: T
B: U
C: V
D: W
E: X

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

For question 14 to 16

Seven children—F, J, K, M, R, S, and T—are eligible to enter a spelling contest. From these seven, two teams must be formed, a red team and a green team, each team consisting of exactly three of the children. No child can be selected for more than one team. Team selection is subject to the following restrictions: If M is on the red team, K must be selected for the green team. If F is on the red team, R, if selected, must be on the green team. R cannot be on the same team as S. J cannot be on the same team as K.

14. Which of the following can be the three members of the Red team?

A: F, J, and K
B: F, R, and T
C: J, K, and T
D: K, M, and R
E: M, R, and T

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

15. If M and F are both on the red team, the green team can consist of which of the following?

A: J, K, and R
B: J, S, and T
C: K, R, and S
D: K, R, and T
E: R, S, and T

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

16. If M is on the red team, which of the following, if selected, must also be on the red team?

- A: F
- B: J
- C: R
- D: S
- E: T

(A) (B) (C) (D) (E)

For question 17 to 20

A mail carrier must deliver mail by making a stop at each of six buildings: K, L, M, O, P, and S. Mail to be delivered are of two types, ordinary mail and priority mail. The delivery of both types of mail is subject to the following conditions: Regardless of the type of mail to be delivered, mail to P and mail to S must be delivered before mail to M is delivered. Regardless of the type of mail to be delivered, mail to L and mail to K must be delivered before mail to S is delivered. Mail to buildings receiving some priority mail must be delivered, as far as the above conditions permit, before mail to buildings receiving only ordinary mail.

17. If K is the only building receiving priority mail, which of the following lists the buildings in an order, from first through sixth, in which they can receive their mail?

- A: L, K, P, S, O, M
- B: L, K, S, P, M, O
- C: K, L, P, M, S, O
- D: K, P, L, S, O, M
- E: O, K, L, P, S, M

(A) (B) (C) (D) (E)

18. If L, M, and S are each receiving priority mail, which of the following lists the buildings in an order, from first to sixth, in which they must receive their mail?

- A: K, L, P, S, O, M
- B: L, K, O, P, S, M
- C: L, K, S, P, M, O
- D: M, L, S, P, K, O
- E: S, L, M, P, K, O

(A) (B) (C) (D) (E)

19. If the sequence of buildings to which mail is delivered is O, P, L, K, S, M and if S is receiving priority mail, which of the following is a complete and accurate list of buildings that must also be receiving priority mail?

A: O, L

B: O, P

C: P, L

D: P, M

E: O, P, L, K

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

20. If only one building is to receive priority mail, and, as a result, O can be no earlier than fourth in the order of buildings, which of the following must be the building receiving priority mail that day?

A: K

B: L

C: M

D: P

E: S

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

III**VERBAL
Section****No. Of
Questions****20****Choose the correct answer for each
question and shade the
corresponding CIRCLE in the
answer sheet**

Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath the sentence are five lettered words or sets of words. Choose the word or set of words that, when inserted in the sentence, best fits the meaning of the sentence as a whole.

1. Florence Nightingale was ____ in the development of modern medicine, ____ such practices as sanitization of hospital wards and isolation of actively infected patients.

A. a collaborator...rejecting
B. a maverick...protesting
C. an innovator...initiating
D. a pioneer...criticizing
E. an individualist...standardizing

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

2. As a journalist who works to overturn erroneous convictions, Griffin Nicholson was opposed to the court ruling ____ appeals for inmates who might be ____ .

A. barring...culpable
B. curbing...exonerated
C. encouraging...innocent
D. scrutinizing...eligible
E. shielding...esteemed

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

3. Linda Greenhouse's articles for the New York Times are an outstanding example of ____, capsulizing prose into a necessarily limited space.

A. Callousness
B. Brevity
C. Intuition
D. Propriety
E. Fortitude

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

4. Roberto Clement was seen as ____ during his life because of both his selflessness on the baseball field and his humanitarian work in his native Nicaragua.

- A. An individualist
- B. a grandstander
- C. a sybarite
- D. an altruist
- E. an opportunist

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

5. His habit of spending more than he earned left him in a state of perpetual----- but he-----hoping to see a more affluent day.

- A. indigence: persevered in
- B. confusion: compromised by
- C. enervation: retaliated by
- D. motion: responded

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

6. Known for his commitment to numerous worthy causes, the philanthropist deserved----- for his-----.

- A. recognition: folly
- B. blame: hypocrisy
- C. reward: modesty
- D. credit: altruism

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

7. You should -----this paragraph in order to make your essay more-----.

- A. Delete, succinct
- B. Enlarge, redundant
- C. Remove, discursive
- D. Revise, abstruse

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

8. A-----glance pays-----attention to details.

- A. Furtive: meticulous
- B. Cursory: little
- C. Cryptic: close
- D. Keen: scanty

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

Each question below consists of a related pair of words or phrases, followed by five lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

9. TIRADE: ABUSIVE

- A. Diatribe: familial
- B. Satire: pungent
- C. Panegyric: laudatory
- D. Eulogy: regretful

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

10. SOLDIER: REGIMENT

- A. Colonel: martinet
- B. Dancer: balletomane
- C. Singer: chorus
- D. Trooper: rifle

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

11. ASYLUM: SHELTER

- A. Harbor: concealment
- B. Palisade: display
- C. Stronghold: defense
- D. Cloister: storage

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

12. STATIC: MOVEMENT

- A. Humdrum: excitement
- B. Chronic: timeliness
- C. Ecstatic: decay
- D. Diligent: industry

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

13. INTEREST: FASCINATE

- A. Vex: enrage
- B. Vindicate: condemn
- C. Regret: rue
- D. Appall: bother

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

14. LAUREL: VICTOR

- A. Chevrons: army
- B. Oscar: movie star
- C. Power: glory
- D. blue ribbon: cooking

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

15. PRECEDENT: JUSTIFICATION

- A. Kindness: obedience
- B. Authority: sanction
- C. Usage: submission
- D. Tradition: novelty

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

16. IMPLICATE: COMPLICATE

- A. Vitality: inevitable
- B. Empathy: sympathy
- C. Importune: construct
- D. Imply: simplify

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

17. PERMEATE: RUEFUL

- A. Truculent: merciful
- B. Sadden: pitiful
- C. Evaporate: mournful
- D. Penetrate: sorrowful

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

18. ENERVATE: STRENGTHEN

- A. Aver: attribute
- B. Divert: turn
- C. Apprise: appraise
- D. Stultify: enliven

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

Read the passages and answer the questions given at the end:

Recent technological advances in manned undersea vehicles have overcome some of the limitations of divers and diving equipment. Without vehicles, divers often become sluggish and their mental concentration was limited. Because of undersea pressure that affected their speech organs, communication among divers was difficult or impossible. But today, most oceanographers make observations by the means of instruments that are lowered into the ocean or from samples taken from the water direct observations of the ocean floor are made not only by divers of more than seven miles and cruise at the depth of fifteen thousand feet. Radio equipment buoys can be operated by remote

control in order to transmit information back to land based laboratories, including data about water temperature, current and weather.

Some of mankind's most serious problems, especially those concerning energy and food, may be solved with the help of observations made by these undersea vehicles.

19. With what topic is the passage primarily concerned?

- A. Recent technological advances.
- B. Communication among divers.
- C. Direct observation of the ocean floor
- D. Undersea vehicles

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

20. Divers have problems in communicating underwater because?

- A. The pressure affected their speech organs
- B. The vehicles they used have not been perfected.
- C. They did not pronounce clearly
- D. The water destroyed their speech organs.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

Drill Test II

**I
Quantitative
Section****No of
Questions****10****Choose the correct answer for
each question and shade the
corresponding CIRCLE in the
answer sheet**

1. A piece of wood 35 feet, 6 inches long was used to make 4 shelves of equal length. The length of each shelf was
A. 9 feet, 1 1/2 inches
B. 8 feet, 10 1/2 inches
C. 7 feet, 10 1/2 inches
D. 7 feet, 1 1/2 inches
E. 6 feet, 8 1/2 inches
☐ A ☐ B ☐ C ☐ D ☐ E
2. The tiles in the floor of a bathroom are 15/16 inch squares. The cement between the tiles is 1/16 inch. There are 3240 individual tiles in this floor. The area of the floor is
A. 225 sq. yds.
B. 2.5 sq. yds.
C. 250 sq. ft.
D. 22.5 sq. yds
E. 225 sq. ft.
☐ A ☐ B ☐ C ☐ D ☐ E
3. A man bought a TV set that was listed at \$160. He was given successive discounts of 20% and 10%. The price he paid was
A. \$129.60
B. \$119.60
C. \$118.20
D. \$115.20
E. \$112.00
☐ A ☐ B ☐ C ☐ D ☐ E
4. Mr. Jones' income for a year is \$15,000. He pays 15% of this in federal taxes and 10% of the remainder in state taxes. How much is left?
A. \$12,750
B. \$9,750
C. \$14,125
D. \$13,500
E. \$11,475
☐ A ☐ B ☐ C ☐ D ☐ E
5. The radius of a circle which has a circumference equal to the perimeter of a hexagon whose sides are each 22 inches long is closest in length to which one of the following?
A. 7
B. 21
C. 14
D. 28
E. 24
☐ A ☐ B ☐ C ☐ D ☐ E

6. If a is a multiple of 5 and $b = 5a$, which of the following could be the value of $a + b$?

- I. 60 II. 100 III. 150

- A. I only
B. III only
C. I and III only
D. II and III only
E. None of these

(A) (B) (C) (D) (E)

7. Which of the following expressions has the greatest value?

- A. $4 \times 4 \div 4 + 4$
B. $4 \div 4 \times 4 + 4$
C. $4 \times 4 - 4 \times 4$
D. $4 \div 4 + 4 \times 4$
E. $2 \div 2 + 2 \times 2$

(A) (B) (C) (D) (E)

8. If $(a + 3) / 5$ is an integer, what is remainder when 'a' is divided by 5?

- A. 1
B. 2
C. 3
D. 4
E. 5

(A) (B) (C) (D) (E)

9. The integral part of logarithm is called

- A. Characteristic
B. Mantissa
C. Solution
D. Root
E. None of these

(A) (B) (C) (D) (E)

10. On the y-axis, the x-coordinate is

- A. 1
B. ∞
C. zero
D. $-\infty$
E. -1

(A) (B) (C) (D) (E)

II**ANALYTICAL
Section****No. Of
Questions****20****Choose the correct answer for
each question and shade the
corresponding CIRCLE in the
answer sheet****For question 1 to 3**

A volunteer uses a truck to pick up donations of unsold food and clothing from stores and to deliver them to locations where they can be distributed. He drives only along a certain network of roads. In the network there are two-way roads connecting each of the following pairs of points: 1 with 2, 1 with 3, 1 with 5, 2 with 6, 3 with 7, 5 with 6, and 6 with 7. There are also one-way roads going from 2 to 4, from 3 to 2, and from 4 to 3. There are no other roads in the network, and the roads in the network do not intersect. To make a trip involving pickups and deliveries, the volunteer always takes a route that for the whole trip passes through the fewest of the points 1 through 7, counting a point twice if the volunteer passes through it twice. The volunteer's home is at point 3. Donations can be picked up at a supermarket at point 1, a clothing store at point 5, and a bakery at point 4. Deliveries can be made as needed to a tutoring center at point 2, a distribution center at point 6, and a shelter at point 7.

1. If the volunteer starts at the supermarket and next goes to the shelter, the first intermediate point his route passes through must be

A: 2
B: 3
C: 5
D: 6
E: 7

☐ A ☐ B ☐ C ☐ D ☐ E

2. If, starting from home, the volunteer is then to make pickups for the shelter at the supermarket and the bakery (in either order), the first two intermediate points on his route, beginning with the first, must be

A: 1 and 2
B: 1 and 3
C: 2 and 1
D: 2 and 4
E: 4 and 2

☐ A ☐ B ☐ C ☐ D ☐ E

3. If, starting from the clothing store, the volunteer next is to pick up bread at either the supermarket or the bakery (whichever stop makes his route go through the fewest of the points) and then is to go to the shelter, the first two points he reaches after the clothing store, beginning with the first, must be

A: 1 and 2
B: 1 and 3
C: 4 and 2
D: 6 and 2
E: 6 and 4

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

For question 4 to 5

There are seven cages next to each other in a zoo. The following is known about the cages. Each cage has only one animal, which is either a monkey or a bear. There is a monkey in each of the first and last cages. The cage in the middle has a bear. No two adjacent cages have bears in them. The bear's cage in the middle has two monkey cages on either side. Each of the two other bear cages are between and next to two monkey cages

4. How many cages have monkeys in them?

A: 2
B: 3
C: 4
D: 5
E: 6

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

5. The bear cage in the middle must have

A: No other bear cage to its left
B: No monkey cage on its right.
C: A bear cage to its left and to its right
D: Other bear cages next to it.
E: No monkey cage to its left.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

For question 6 to 8

A nursery class in a school has a circular table with eleven seats around it. Five girls (Kiran, Lado, Maryam, Omera and Parveen) and five boys (Farhan, Ghaus, Haris, Imdad and Jahangir) are seated around the table. None of the girls are seated in a seat adjacent to another girl. Kiran sits between Farhan and Ghaus, and next to each of them. Jahangir does not sit next to Imdad.

6. Which of the following is a possible seating order around the table?

A: Empty seat, Farhan, Kiran, Ghaus, Lado, Omera, Haris, Imdad, Parveen, Jahangir, and Maryam.

- B: Empty seat, Farhan, Kiran, Ghaus, Lado, Jahangir, Parveen, Omera, Imdad, Maryam, Haris.
C: Empty seat, Farhan, kiran, Ghaus, Omera, Jahangir, Parveen, Imdad, Maryam, Haris, Lado.
D: Empty seat, Omera, Farhan, Kiran, Ghaus, Lado, Jahangir, Imdad, Parveen, Haris, Maryam.
E: Empty seat, Maryam, Farhan, Kiran, Ghaus, Lado, Jahangir, Perveen, Imdad, Omera, Haris.

(A) (B) (C) (D) (E)

7. If Lado, Haris, Maryam, Jahangir, and Ghaus are seated in that order, which of the following is a correct completion of the seating order after Ghaus?

- A : Kiran, Farhan, Omera, Imdad, Parveen, empty seat.
B : Kiran, Farhan, Imdad, Omera, empty seat, Parveen
C : Farhan, Parveen, Kiran, Imdad, Omera, empty seat.
D : Kiran, Farhan, Parveen, Imdad, empty seat, Omera.
E : Kiran, Farhan, Omera, empty seats, Parveen, Imdad.

(A) (B) (C) (D) (E)

8. If Jahangir leaves his seat and occupies the empty seat, his new seating position would be between:

- A : Farhan and Kiran
B : Maryam and Ghaus
C : Kiran and Ghaus
D : Imdad and Lado
E : Parveen and Lado

(A) (B) (C) (D) (E)

For question 9 to 11

Four telephone operators (Abid, Baqir, Chauhan, and Daud) each have to perform duties at the telephone exchange on four different days, Thursday through Sunday. The following is known about their duty schedule: Chauhan has his duty day before Abid. Daud has his duty day later than Baqir.

9. Which of the following is a possible order of duty days for the four operators?

- A: Chauhan, Daud, Abid and Baqir.
B: Daud, Chauhan, Abid, and Baqir.
C: Baqir, Chauhan, Daud and Abid.
D: Abid, Chauhan, Daud and Baqir.
E: Abid, Baqir, Daud and Chauhan.

(A) (B) (C) (D) (E)

10. If Chauhan has his duty day on Saturday, who must have his duty day on Thursday?

- A: Either Abid or Daud.

- B: Daud
C: Abid
D: Either Baqir or Daud.
E: Baqir.

(A) (B) (C) (D) (E)

11. Each of the following is possible EXCEPT:

- A: Chauhan has his duty on Thursday.
B: Baqir has his duty on Thursday.
C: Daud has his duty on Saturday.
D: Baqir has his duty on Sunday
E: Abid has his duty on Sunday.

(A) (B) (C) (D) (E)

For question 12 to 13

There are 12 seats facing the blackboard in a classroom, four seats (A1, A2, A3 & A4) in that order are in row A, the first row from the blackboard. Immediately behind row A is row B with four seats (B1, B2, B3 & B4) in that order. Immediately behind row B, is the last row C with four seats (C1, C2, C3 & C4) in that order. Six students attend the class the following is known about there seating arrangement: Ejaz sits exactly in front of Comil, Seat A2 is always unoccupied Daud does not sit next to Farhat, Gharuy sits in seat A4 Hamid does not sit in seat B4 All the seats in row C always remain empty

12. If Daud sits in seat B3, then Farhat must sit in seat:

- A: A3
B: A1
C: B4
D: B2
E: C2

(A) (B) (C) (D) (E)

13. Suppose that Hamid and Ejaz are sitting in seats A1 and A3 respectively, then it CANNOT be true that seat:

- A: B1 is occupied by Daud.
B: B2 is empty
C: B1 is empty
D: B3 is OCCUPIED BY Comil
E: B4 is empty

(A) (B) (C) (D) (E)

For question 14 to 17

The principal of a school is forming a committee. There are to be five members: three teachers, chosen from Mr. J, Ms. K, Ms. L, Mr. M, and Mr. N; and two students, chosen from O, P, Q, and R. The composition of the committee must conform to the following conditions: Ms. J will serve only if R is also on the committee. Ms. L will

not serve unless Ms. K and O also serve. Neither Mr. M nor Mr. N will serve without the other. If P serves, neither Q nor R can serve.

14. Which of the following is an acceptable committee?

- A: J, L, M, N, O
- B: K, L, N, O, P
- C: K, M, N, O, R
- D: L, M, N, O, R
- E: M, N, O, P, Q

☐ A ☐ B ☐ C ☐ D ☐ E

15. How many different committees could include Mr. J and Q?

- A: 1
- B: 2
- C: 3
- D: 4
- E: 5

☐ A ☐ B ☐ C ☐ D ☐ E

16. If Q and R are both on the committee, who else must be on the committee?

- A: J
- B: K
- C: L
- D: M
- E: O

☐ A ☐ B ☐ C ☐ D ☐ E

17. In how many different ways can the principal select an acceptable committee?

- A: Fewer than 3
- B: 3
- C: 5
- D: 7
- E: More than 7

☐ A ☐ B ☐ C ☐ D ☐ E

For question 18 to 20

Three adults—R, S, and V—will be traveling in a van with five children—F, H, J, L, and M. The van has a driver's seat and one passenger seat in the front, and two benches behind the front seats, one bench behind the other. Each bench has room for exactly three people. Everyone must sit in a seat or on a bench, and seating is subject to the following restrictions: An adult must sit on each bench. Either R or S must sit in the driver's seat. J must sit immediately beside M.

18. Which of the following can sit in the front passenger seat?

- A: J
- B: L
- C: R
- D: S
- E: V

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

19. Which of the following groups of three can sit together on a bench?

- A: F, J, and M
- B: F, J, and V
- C: F, S, and V
- D: H, L, and S
- E: L, M, and R

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

20. If F sits immediately beside V, which of the following CANNOT be true?

- A: J sits immediately beside S.
- B: L sits immediately beside V.
- C: H sits in the front passenger seat.
- D: F sits on the same bench as H.
- E: H sits on the same bench as R.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

III**VERBAL
Section****No. Of
Questions****20****Choose the correct answer for each
question and shade the corresponding
CIRCLE in the answer sheet**

Each sentence below has one or two blanks; each blank indicates that something has been omitted. Beneath the sentence are five lettered words or sets of words. Choose the word or set of words that, when inserted in the sentence, best fits the meaning of the sentence as a whole.

1. Surprisingly enough, it is more difficult to write about the-----than about the--
-and strange.

A. specific, foreign
B. abstract, prosaic
C. commonplace, exotic
D. simple, routine

(A) (B) (C) (D) (E)
2. A-----response is one that is made with-----.

A. stupid, fear
B. speedy, alacrity
C. sure, slowness
D. harmful, grimaces

(A) (B) (C) (D) (E)
3. A----is a-----.

A. norm, standard
B. criterion, mistake
C. discipline, school
D. doctrine, follower

(A) (B) (C) (D) (E)
4. It is widely believed that a nuclear war could ____ enough smoke and dust to
block out the sun and freeze the earth.

A. billow
B. extinguish
C. generate
D. duplicate
E. decimate

(A) (B) (C) (D) (E)

5. Consumption of red meat has ____ because its fat content has become a worrisome and ____ matter.
- A. abated ... dubious
 B. skyrocketed ... stressful
 C. abounded ... divisive
 D. stabilized ... newsworthy
 E. declined ... controversial
- Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
6. It takes ____ character to ____ the extremities of the arctic region.
- A. an unflappable ... sustain
 B. a dictatorial ... brook
 C. a Spartan ... negotiate
 D. an inimitable ... resist
 E. a nomadic ... espouse
- Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
7. Consumers refused to buy meat products from the company because of rumors that the water supply at the meat processing plant was ____; the rumors, however, were quite ____, with no hard evidence to back them up.
- A. uninspected .. reckless
 B. contaminated .. unsubstantiated
 C. impure .. damaging
 D. misdirected .. scandalous
 E. unscrupulous .. vicious
- Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
8. Many kinds of harmful viruses are unhindered when passing through different parts of the host organism; indeed, there are few organic substances which such viruses' cannot ____.
- A. undermine
 B. disseminate
 C. aerate
 D. exterminate
 E. perforate
- Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
9. Their conversation was unsettling, for the gravity of their topic contrasted so oddly with the ____ of their tone
- A. uniqueness
 B. rapidity
 C. lightness
 D. precision
 E. reverence
- Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

10. Throughout the animal kingdom, _____ bigger than the elephant.

- A. whale is only the
- B. only the whale is
- C. is the whale only
- D. only whale is the
- E. whale is only

(A) (B) (C) (D) (E)

Each question below consists of a related pair of words or phrases, followed by five lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

11. YAWN: BOREDOM ::

- A. dream : sleep
- B. anger : madness
- C. smile : amusement
- D. face : expression
- E. impatience : rebellion

(A) (B) (C) (D) (E)

12. OBSTRUCTION : BUOY ::

- A. construction : building
- B. boy : girl
- C. danger : red light
- D. iceberg : titanic
- E. arise : lay down

(A) (B) (C) (D) (E)

13. CONCERT : MUSIC ::

- A. performance : artist
- B. exhibition : art
- C. play : actor
- D. operetta : singer
- E. rock : role

(A) (B) (C) (D) (E)

14. TEAMMATE : ADVERSARY ::

- A. felon : criminal
- B. enemy : associate
- C. pacifier : agitator
- D. winner : loser
- E. friend : foe

(A) (B) (C) (D) (E)

For Question 15-20 read the following passage:

A popular theory explaining the evolution of the universe is known as the Big Bang Model. According to the model at some time between twenty billion years ago, all present matter and energy were **compressed** into a small ball only a few kilometers in diameter. It was, in effect, an atom that contained in the form of pure energy all of the components of the entire universe. Then, at a moment in time that astronomers refer to as $T = 0$, the ball exploded, hurling the energy into space. Expansion occurred. As the energy cooled most of **it** became matter in the form of protons, neutrons and electrons. These original particles combined to form hydrogen and helium and continued to expand. Matter formed into galaxies with stars and planets.

15. Which sentence best summarizes this passage?

- A. The big band theory does not account for the evolution of the universe
- B. According to the Big Bang Model, an explosion caused the formation of the universe
- C. The universe is made of hydrogen and helium
- D. The universe is more than ten billion years old

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

16. According to this passage when were the galaxies formed?

- A. Ten Billion Years ago
- B. Fifteen billion Years ago
- C. At $T = 0$
- D. Twenty billion years ago

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

17. The word "compressed" in the passage could best be replaced by

- A. Excited
- B. Balanced
- C. Reduced
- D. Controlled

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

18. It may be inferred that

- A. Energy and matter are the same
- B. Protons, neutrons, and electrons are not matter
- C. Energy may be converted into matter
- D. The galaxies stopped expanding as energy cooled

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

19. The word "it" in the passage refers to

- A. Energy
- B. Space
- C. Expansion
- D. Matter

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

20. The environment before the Big Bang is described as all the following EXCEPT

- A. Compressed matter
- B. Energy
- C. All the components of the universe
- D. Protons, electrons and neutrons

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

Drill Test III

I Quantitative Section			Choose the correct answer for each question and shade the corresponding OVAL in the answer sheet
	No. Of Questions	20	

Row One → ★ ★ ★
 ★ ★ ★ ★
 ★ ★ ★ ★ ★

1. If the pattern of dots shown above is continued so that each row after Row One contains 1 dot more than the row immediately above it, which row will contain 12 dots?

A. Seven
B. Eight
C. Nine
D. Ten
E. Twelve

(A) (B) (C) (D) (E)
2. Each of Steve's buckets has a capacity of 11 gallons, while each of Mark's buckets can hold 8 gallons. How much more water in gallons can 7 of Steve's bucket's hold compared to 7 of Mark's buckets?

A. 3
B. 7
C. 21
D. 24
E. 56

(A) (B) (C) (D) (E)
3. Two integers have a sum of 42 and a difference of 22. The greater of the two integers is

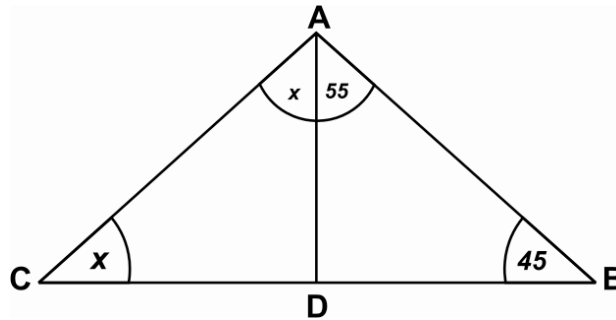
A. 22
B. 25
C. 28
D. 31
E. 32

(A) (B) (C) (D) (E)
4. The average of five numbers is 34. If three of the numbers are 28, 30 and 32, what is the average of the other two?

A. 40
B. 50
C. 60
D. 70

E. 80

(A) (B) (C) (D) (E)

5. In the figure above, what is the value of x ?

- A. 30
- B. 40
- C. 50
- D. 80
- E. 100

(A) (B) (C) (D) (E)

6. In a certain cake, two straight cuts (made along two different radii) succeed in removing $\frac{4}{15}$ of the total cake. What is the central angle in degrees of the piece cut?

- A. 26
- B. 60
- C. 85
- D. 92
- E. 96

(A) (B) (C) (D) (E)

7. If an equilateral triangle and a square have the same perimeter, what is the ratio of the length of the sides of the equilateral triangle to the lengths of the sides of the square?

- A. 3:4
- B. 4:3
- C. 1:4
- D. 1:3
- E. 3:1

(A) (B) (C) (D) (E)

8. If 2 and 4 each divide q without remainder, which of the following must q divide without remainder.

- A. 1
- B. 2
- C. 4
- D. 8
- E. It cannot be determined from the information given.

(A) (B) (C) (D) (E)

9. The ratio of boys to girls in a certain classroom was 2 : 3. If boys represented five more than one third of the class, how many people were there in the classroom?

- A. 15
- B. 25
- C. 30
- D. 45
- E. 75

(A) (B) (C) (D) (E)

10. Let $xy = z$, where x, y, z and nonzero numbers. If x is multiplied by 3 and z is divided by 3, this is equivalent to multiplying y by

- A. $1/9$
- B. $1/3$
- C. 1
- D. 3
- E. 9

(A) (B) (C) (D) (E)

11. If $5x = 3$, then $(5x + 3)^2 =$

- A. 0
- B. 9
- C. 18
- D. 36
- E. 81

(A) (B) (C) (D) (E)

12. If the postal charges for a package are 62 cents for the first five ounces and 8 cents for each additional ounce, what is the weight of a package for which the charges are \$1.66? (Assume there are 16 ounces in one pound)

- A. 1.05 pounds
- B. 1.1 pounds
- C. 1.125 pounds
- D. 1.25 pounds
- E. 1.5 pounds

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

13. If $m/n = .75$, then what is $3m + 2n$?

- A. 0
- B. 8
- C. 14
- D. 17
- E. 24

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

14. Which is greater?

Column A

Column B

$$(10/4) / (3/2) * (3/7) \quad (3/4) * (10/7) / (3/2)$$

- A. if the quantity in Column A is greater
- B. if the quantity in Column B is greater
- C. if the two quantities are equal
- D. if there is no relationship between these two quantities
- E. if the relationship cannot be determined from the information given

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

15. Which of the following has a graph that is symmetric to the x-axis

- A. $y = x$
- B. $y = x^2 + 3$
- C. $y^2 = x$
- D. $y = x^3 - x$
- E. $y \neq x$

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

16. The prime factors of 96 are:

- A. 2 and 3
B. 6 and 8
C. 2, 3 and 4
D. 8 and 12
E. 3 and 9

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

17. 8 are what percent of the 6?

- A. 1.25
B. 75
C. 125
D. 133.333
E. 150

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

18. $2 - 3 =$

- A. -8
B. 8
C. -6
D. $-1/8$
E. $1/8$

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

19. If $x + 1 < 3x + 5$, then

- A. $x > -2$
B. $x < -2$
C. $x = 0\sqrt{\sqrt{\sqrt{}}}$
D. $x < 2$
E. $x > 2$

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

20. Which of the numbers cannot be represented by a repeating decimal?

- A. $11/9$
B. $23/7$
C. $\sqrt{3}$
D. $4 \frac{1}{3}$
E. 2

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

**II
Analytical
Reasoning****No. of
Questions****15****Choose the correct answer for each
question and shade the
corresponding CIRCLE in the answer
sheet**

The office staff of the XYZ Corporation presently consists of three bookkeepers (L, M and N) and five secretaries (O, P, Q, R and S). Management is planning to open a new office in another city sending three secretaries and two bookkeepers from the present staff. To do so they plan to separate certain individuals who do not function well together. The following guidelines were established to set up the new office:

- (a) Bookkeepers L and N are constantly finding faults with one another therefore should not be sent together to the new office.
 - (b) N and P function well alone but not as a team. They should be separated.
 - (c) O and R have not been on speaking terms for many months. They should not go together.
 - (d) Since O and Q have been competing for a promotion, they should not be in one team.
- Based on the information given above find the correct answers to the following Questions:

1. If M insists on staying back then how many combinations are possible?
A. 1
B. 2
C. 3
D. None
(A) (B) (C) (D) (E)
2. If L is to be moved as one of the bookkeepers, which of the following CANNOT be a possible working unit?
A. LMOPS
B. LMPQS
C. LMORS
D. LMPRS
(A) (B) (C) (D) (E)
3. If N is sent to the new Office which member of the staff CANNOT be sent?
A. O
B. M
C. Q
D. R
(A) (B) (C) (D) (E)
4. If O is sent to the new office then which of the following is a possible team?
A. LMOPR
B. MNOQS
C. MNOPS
D. LMOPS
(A) (B) (C) (D) (E)
5. If both N and Q are moved to the new office, how many combinations are possible?
A. 2
B. 3
C. 4

D. 1

(A) (B) (C) (D) (E)

6. A map representing countries R, S, W, X, Y and Z is to be drawn. Adjacent countries cannot have the same color in the map.

The countries adjacent to each other are as follows:

Each of R, S, X and Y is adjacent to W.

X is adjacent to Y.

Each of R and S is adjacent to Z.

If X is the same color as Z then it must be true that

- A. W is a different color from any other country.
- B. S is a different color from any other country.
- C. X is the same color as Y.
- D. S is the same color as X.

(A) (B) (C) (D) (E)

Two statements, labeled I. & II, follow each of the following questions. The statements contain certain information. In the questions you do not actually have to compute an answer, rather you have to decide whether the information given in the statements I. and II. is sufficient to find a correct answer by using basic mathematics and every day facts?

7. A long distance runner has just completed running 28 miles. How long did it take him to finish the journey?

I. His record speed is 8.25 miles per hour.

II. His average speed through the journey was 8 miles per hour.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
- B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
- C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
- D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

8. Captain of the national cricket team has to be the most popular member of the team. Who is the captain of Pakistan's national cricket team?

I. Waqar is the best player on the team.

II. Waseem is the senior-most member.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
- B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
- C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
- D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

9. In a BCE class at CIIT, 30 boys and 10 girls registered Calculus II. How many boys passed the course?

I. 5 students could not pass.
 II. There were 2 girls who obtained A grade.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
 B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
 C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
 D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

10. A horse ran 100 miles without stopping. What was its average speed in miles per hour?

I. The journey started at 8 PM and ended at 4 AM the following day.
 II. The horse ran 20 miles per hour for the first 50 miles.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
 B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
 C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
 D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

11. How much time will computer a need to solve 150 problems?
 I. The computer needs 50 seconds to solve one problem.
 II. Computer never takes more than 60 seconds to solve a problem.
- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
 B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
 C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
 D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

12. How many pencils does Raheel have?

- I. He bought two boxes each containing 10 pencils.
 II. He lent two pencils to Khaleel

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
 B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
 C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
 D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

13. In a certain farm there are 47 goats. How many large brown goats are there?

- I. 16 of the goats are large.
 II. There are 18 brown goats in the farm.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
 B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
 C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
 D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

14. Can there be more than 200 pictures in a 60-page book?

- I. There is at least one picture in each page.
 II. There are no more than 3 pictures in any page.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
 B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
 C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
 D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

15. If $P > Q$ and $R > S$, then, $P + R > Q + S$. Is $X > Y$?

I. $X + A > Y + B$

II. $A > B$

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
- B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
- C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
- D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

III		
VERBAL Section	Choose the correct answer for each question and shade the corresponding CIRCLE in the answer sheet	
	No of Questions	10

Each sentence below has one or two blanks, each blank indicates that something has been omitted. Beneath the sentence are five lettered words or sets of words. Choose the word or set of words that, when inserted in the sentence, best fits the meaning of the sentence as a whole.

- Although its publicity has been ____, the film itself is intelligent, well-acted, handsomely produced and altogether ____
A. tasteless ... respectable
B. extensive ... moderate
C. sophisticated ... moderate
D. risqué ... crude
E. perfect ... spectacular
(A) (B) (C) (D) (E)
- The Inuit natives of Alaska's North Slope worry that ____ oil exploration might ____ their sensitive natural environment.
A. additional...assist
B. current...bolster
C. curtailed...shatter
D. unregulated...damage
E. controlled...reassess
(A) (B) (C) (D) (E)
- Ants live in colonies based on ____; each member contributes to the good of all by actively working with others in performing necessary tasks.
A. Heredity
B. Individualism
C. Cooperation
D. Reasoning
E. Instinct
(A) (B) (C) (D) (E)

Each question below consists of a related pair of words or phrases, followed by five lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

- STUDYING: LEARNING::
A. running : jumping
B. investigating : discovering
C. reading : writing

- D. dancing : swimming
- E. talking : listening

(A) (B) (C) (D) (E)

5. AFTERNOON : DUSK ::

- A. breakfast : dinner
- B. yesterday : tomorrow
- C. Sunday : Saturday
- D. night : dawn
- E. arise : lay down

(A) (B) (C) (D) (E)

6. VIBRATION: SOUND :

- A. gravity : pull
- B. watercolor : paint
- C. accident : death
- D. worm : reptile
- E. arrive : home

(A) (B) (C) (D) (E)

7. RUN : RACE ::

- A. walk : pogo stick
- B. swim : boat
- C. fly : kite
- D. sink : bottle
- E. repair : automobile

(A) (B) (C) (D) (E)

Read the passages and answer the questions asked at its end.

Almost a century ago Alfred Binet, a gifted psychologist, was asked by the French Ministry of Education to help determine who would experience difficulty in school. Given the influx of provincials to the capital, along with immigrants of uncertain stock, Parisian officials believed they needed to know who might not advance smoothly through the system. Proceeding in an empirical manner, Binet posed many questions to youngsters of different ages. He ascertained which questions when answered correctly predicted success in school, and which questions when answered incorrectly foretold school difficulties. The items that discriminated most clearly between the two groups became, in effect, the first test of intelligence.

Binet is a hero to many psychologists. He was a keen observer, a careful scholar, an inventive technologist. Perhaps even more important for his followers, he devised the instrument that is often considered psychology's greatest success story. Millions of people who have never heard Binet's name have had aspects of their fate influenced by instrumentation that the French psychologist inspired. And thousands of psychometricians — specialists in the measurement of psychological variables — earn their living courtesy of Binet's invention.

Although it has prevailed over the long run, the psychologist's version of intelligence is now facing its biggest threat. Many scholars and observers — and even some iconoclastic psychologists — feel that intelligence is too important to be left to the psychometricians. Experts are extending the breadth of the concept — proposing much intelligence, including emotional intelligence and moral intelligence. They are experimenting with new methods of ascertaining intelligence, including some that avoid tests altogether in favor of direct measures of brain activity. They are forcing citizens everywhere to confront a number of questions: What is intelligence? How ought it to be assessed? And how do our notions of intelligence fit with what we value about human beings? In short, experts are competing for the "ownership" of intelligence in the next century.

8. According to the passage, which of the following is most similar to the "barometer" developed by Binet?

- A. The S.A.T. or other standardized college admission test.
- B. The written portion of a driver's license test.
- C. Open tryouts for a varsity athletic team
- D. An electronic scan of brain-wave activity.
- E. The trivia questions of a game show.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

9. The author suggests which of the following about "citizens everywhere"?

- A. They do not have a sufficiently accurate definition of intelligence to evaluate recent scientific developments.
- B. They stand to benefit from recent progress in the scientific assessment of intelligence.
- C. The experiments they are performing with new methods of intelligence measurement are valuable and interesting.
- D. They are at odds with the experts over who should have the right to define "intelligence."
- E. Traditionally they have not given careful consideration to some important issues concerning intelligence.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

10. As used in line # 8, "discriminated" most nearly means

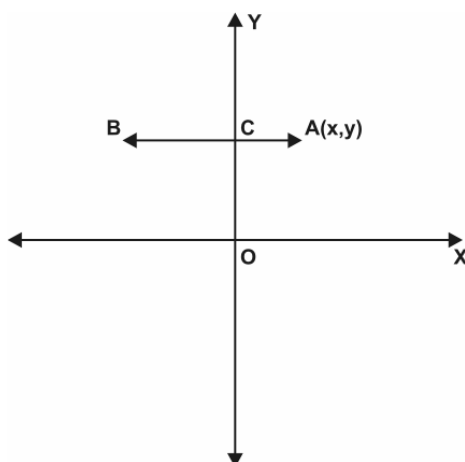
- A. equalized
- B. predetermined
- C. showed favoritism
- D. displayed intolerance
- E. distinguished

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

Drill Test IV

I**Quantitative
Section****No.
Questions****Of 20****Choose the correct answer for each
question and shade the
corresponding CIRCLE in the
answer sheet**

1



1. If the length of BC is twice the length of AC, what are the coordinates of B where $A=(x,y)$?

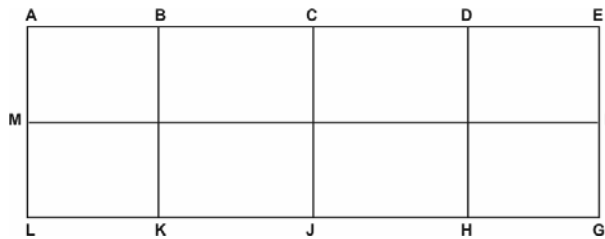
- A. $(x,2y)$
B. $(-x,2y)$
C. $(2x,y)$
D. $(-2x,y)$
E. $(-2x,2y)$

☐ A ☐ B ☐ C ☐ D ☐ E

2. The average of five numbers is 34. If three of the numbers are 28, 30 and 32, what is the average of the other two?

- A. 40
B. 50
C. 60
D. 70
E. 80

☐ A ☐ B ☐ C ☐ D ☐ E



3. In the figure above, rectangle AEJL has been divided into 8 congruent squares with each of the 8 squares having an area of 16. What is the length of $AE + MF + LG + AL + BK + CJ + DH + EG$?

A. 32
 B. 44
 C. 88
 D. 128
 E. 176

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

4. For any positive integer x , $\#x = x^2/3$ and $\&x = 9/x$. Which of the following is an expression for the product of $\#x$ and $\&x$?

A. $3x$
 B. x
 C. 1
 D. $x^3/64$
 E. $27x^3$

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

5. In a certain town, p gallons of gasoline are needed per month for each car. How long will q gallons last at this rate given that there are r cars in town?

A. pr/q
 B. qr/p
 C. r/pq
 D. q/pr
 E. pqr

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

6. Let $xy = z$, where x, y, z are nonzero numbers. If x is multiplied by 3 and z is divided by 3, this is equivalent to multiplying y by

A. $1/9$
B. $1/3$
C. 1
D. 3
E. 9

(A) (B) (C) (D) (E)

7. If x , y , and z are different positive odd integers and $x + y + z = 11$, what is the greatest possible value of z ?

A. 10
B. 9
C. 8
D. 7
E. 6

(A) (B) (C) (D) (E)

8. If the postal charges for a package are 62 cents for the first five ounces and 8 cents for each additional ounce, what is the weight of a package for which the charges are \$1.66? (Assume there are 16 ounces in one pound)

A. 1.05 pounds
B. 1.1 pounds
C. 1.125 pounds
D. 1.25 pounds
E. 1.5 pounds

(A) (B) (C) (D) (E)

9. What fraction of two weeks is 24 minutes?

A. $1/120$
B. $1/336$
C. $1/840$
D. $1/2880$
E. $1/20160$

(A) (B) (C) (D) (E)

10. If the vertices of a triangle are at $(0,0)$, $(-3, 4)$ and $(3, 4)$, what is the area of the triangle?

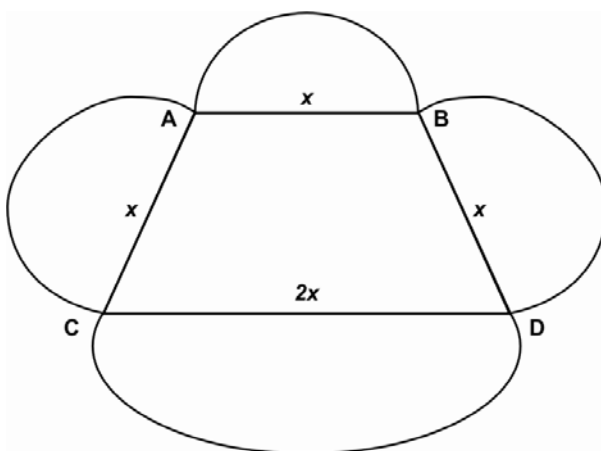
- A. 4
- B. 6
- C. 12
- D. 14
- E. 18

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

11. A water-tank has a base with dimensions 2 feet by 6 feet. If a cube with each side 1 foot is totally immersed in the water, how many inches will the water rise? (12 inches = 1 foot)

- A. 1
- B. 2
- C. 4
- D. 8
- E. It cannot be determined from the information given

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ



12. In the figure above, the quadrilateral ABCD is a trapezoid with $x = 2$. The diameter of each semicircle is a side of the trapezoid. What is the sum of the lengths of the four drawn semicircles? (Round to the nearest whole number.)

- A. 13
- B. 16
- C. 19
- D. 22
- E. 31

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

13. If $n + 3 = n \times 3$, then $n =$

- A. 0.5
- B. 1.5
- C. 2
- D. 2.5
- E. 3

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

14. If an equilateral triangle and a square have the same perimeter, what is the ratio of the length of the sides of the equilateral triangle to the lengths of the sides of the square?

- A. 3:4
- B. 4:3
- C. 1:4
- D. 1:3
- E. 3:1

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

15. A restaurant has a special whereby both parents can eat for \$20 and each child can eat for \$5. Assuming a family group consists of both parents and at least one child, what is the maximum number of family groups that could have attended given that the restaurant took \$115?

- A. 6
- B. 5
- C. 4
- D. 3
- E. 2

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

16. Which of the following points lays in the interior of the circle whose radius is 10 and whose center is at the origin?

- A. (-9, 4)
- B. (5, -19)
- C. (0, -10)
- D. (10, -1)
- E. (0,15)

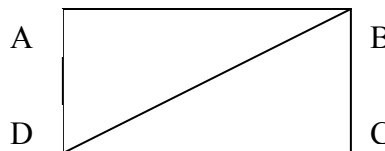
Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

II**Analytical Reasoning****No. Of Questions****15**

Choose the correct answer for each question and shade the corresponding CIRCLE in the answer sheet

17. If the perimeter of the rectangle ABCD is 14, what is the perimeter of $\triangle BCD$?

- A. 7
- B. 12
- C. $7 + \sqrt{29}$
- D. 86
- E. It cannot be determined from the information given.



(A) (B) (C) (D) (E)

18. The roots of $ax^2 + bx + c = 0$ are real only if

- A. $b^2 - 4ac \geq 0$
- B. $b^2 - 4ac = 0$
- C. $b^2 + 4ac = 0$
- D. $b^2 - 4ac < 0$
- E. $b^2 - 4bc < 0$

(A) (B) (C) (D) (E)

19. The two numbers, whose sum is -13 and product -30, are

- A. 2, 15
- B. 2, -15
- C. -3, 10
- D. 3, 10
- E. -3, -13

(A) (B) (C) (D) (E)

20. Let A = total area of five circles of radius r and let B = total area of three circles of radius s. If $A = B$, then $r / s =$

- A. $3/5$
- B. $\sqrt{3} / \sqrt{5}$
- C. $3\pi / 5$
- D. $\sqrt{(3\pi)} / \sqrt{5}$
- E. 3π

(A) (B) (C) (D) (E)

Two statements labeled I & II, follow each of the following questions. The statements contain certain information. In the questions you do not actually have to compute an answer, rather you

have to decide whether the information given in the statements I. and II. is sufficient to find a correct answer by using basic mathematics and every day facts?

1. What day of the week is today?

I. Today is March 25.

II. Akram left Pakistan on Wednesday.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
- B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
- C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
- D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

2. Can any of the four rivers be more than 300 meters wide?

I. The narrowest of the four rivers is 240 meters wide.

II. Average width of the four rivers is 300 meters.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
- B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
- C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
- D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer

(A) (B) (C) (D) (E)

3. If it is raining then there must be clouds. Are there clouds?

I. It is not raining.

II. It rained yesterday.

- A. Statement I. ALONE is sufficient but II. ALONE is not sufficient to answer this question.
- B. Statement II. ALONE is sufficient but I. ALONE is not sufficient to answer this question.
- C. Statements I. and II. TOGETHER are sufficient to answer the question but NEITHER of them is sufficient ALONE.
- D. Statements I. and II. COMBINED are NOT sufficient to answer the question and additional information is needed to find the correct answer.

(A) (B) (C) (D) (E)

Read the passage to answer the question 4-5

A map representing countries R, S, W, X, Y and Z is to be drawn. Adjacent countries cannot have the same color in the map. The countries adjacent to each other are as follows:

Each of R, S, X and Y is adjacent to W.

X is adjacent to Y.

Each of R and S is adjacent to Z.

4. Which of the following countries can be the same color as W?

- A. S
- B. X
- C. Y
- D. Z

(A) (B) (C) (D) (E)

5. Which of the following is a pair of countries that can be the same color?

- A. R and S
- B. S and W
- C. W and X
- D. X and Y

(A) (B) (C) (D) (E)

Questions 6 to 11 depends on the following passage

A college president wishes to select four members of a faculty-student committee as special representatives to meet with the college's board of trustees.

The faculty-student committee consists of eight members four of which (F, G, H and I) are faculty members whereas the other four (R, S, T and U) are students.

The president can select any four of the eight committee members as long as the following rules are observed:

The four representatives must consist of exactly two faculty members and two students.

Either F or G must be one of the representatives but F and G both cannot be the representatives.

If R is a representative then H must also be a representative.

If T is a representative then G cannot be a representative.

6. If T is a representative but H is not a representative then the whole group can be determined if it were also true that:

- A. F is a representative.
- B. I is a representative.
- C. R is not a representative.
- D. U is not a representative.

(A) (B) (C) (D) (E)

7. If R is a representative then which of the following CANNOT be a representative?

- A. H
- B. I
- C. S
- D. T

(A) (B) (C) (D) (E)

8. If G is a representative then which of the following can be the other three representatives?

- A. F, S and U
- B. H, I and R
- C. H, R and S
- D. I, R and U

9. If neither S nor U is a representative then which of the following is the pair of faculty-member representatives?
- (A) (B) (C) (D) (E)
- A. F and G
B. F and H
C. F and I
D. G and H
- (A) (B) (C) (D) (E)
10. If G, I and S are representatives then which of the following must also be a representative?
- A. H
B. R
C. T
D. U
- (A) (B) (C) (D) (E)
11. If F and I are representatives then which of the following is not a representative?
- A. I
B. S
C. U
D. R
- (A) (B) (C) (D) (E)

Questions 12 to 14 depends on the following passage

At a congress of the Ruling Party, the seven top party leaders, who are all cabinet ministers, are seated on a platform in order of rank the Prime Minister being in the center. The closer a person is to the Prime Minister; the higher is his/her rank. Moreover, a person sitting on the right of the PM outranks the one sitting equidistant on the left of the PM. The seven leaders are T, U, V, W, X, Y, and Z.

Y is four places to the left of the Minister of Agriculture, who is two places to the right of V.

U's neighbors are T and the Minister of Agriculture.

Z is two places to the left of W.

The Ministers of Education, Mining and Culture are seated together, in order, from left to right.

The remaining Ministers are those of Social Welfare and Defense.

12. The fifth ranking person in the party hierarchy is:
- A. Z, the Minister of Mining
B. Y, the Minister of Culture
C. W, the Prime Minister.
D. X, the minister of Defense.

(A) (B) (C) (D) (E)

13. How many of the seven party leaders outrank the Minister of Education?

- A. 3
- B. 4
- C. 5
- D. 6

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

14. The lowest ranking Minister is

- A. Minister of Social Welfare.
- B. Minister of Defense.
- C. Minister of Education.
- D. Minister of Mining.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

15. "A meadow in springtime is beautiful, even if no one is there to appreciate it."
This statement would be a logical opposite to which of the following claims?

- A. People will see only what they want to see.
- B. Beauty exists only in the eyes of the beholder.
- C. Beauty does not depend on seasons.
- D. The greatest pleasure available to mankind is the contemplation of beauty.

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

III**VERBAL
Section****No. Of
Questions****10****Choose the correct answer for each
question and shade the
corresponding CIRCLE in the answer
sheet**

Each sentence below has one or two blanks, each blank indicates that something has been omitted. Beneath the sentence are five lettered words or sets of words. Choose the word or set of words that, when inserted in the sentence, best fits the meaning of the sentence as a whole.

1. Some illnesses such as smallpox, which have been almost eliminated in the United States are still _____ in many places abroad.
A. discussed
B. prevalent
C. scarce
D. unknown
E. hospitalized
(A) (B) (C) (D) (E)
2. A recent study indicates that the crime rate in the United States remains _____ and that one in three households _____ some form of major crime in any year
A. incredible ... witnesses
B. astronomical ... experiences
C. simultaneous ... perpetrates
D. unsuccessful ... initiates
E. defeated ... prosecutes
(A) (B) (C) (D) (E)

Each question below consists of a related pair of words or phrases, followed by five lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

3. SALVAGE : TREASURE
A. settle : argument
B. incorporate : company
C. send : correspondence
D. rescue : victim
E. recycle : newspaper
(A) (B) (C) (D) (E)
4. CONTROVERSY : ARBITRATOR
A. peacemaker : conflict
B. artifact : anthropologist
C. game : referee
D. dispute : mediator
E. disease : pathologist
(A) (B) (C) (D) (E)

Read the passages and answer the questions given at its end:

We are profoundly ignorant about the origins of language and have to content ourselves with more or less plausible speculations. We do not even know for certain when language arose, but it seems likely that it goes back to the earliest history of man, perhaps half a million years. We have no direct evidence, but it seems probable that speech arose at the same time as tool making and the earliest forms of specifically human cooperation. In the great Ice Ages of the Pleistocene period, our earliest human ancestors established the Old Stone Age culture; they made flint tools and later tools of bone, ivory, and antler; they made fire and cooked their food; they hunted big game, often by methods that called for considerable cooperation and coordination. As their material culture gradually improved, they became artists and made carvings and engravings on bones and pebbles, and wonderful paintings of animals on the walls of caves. It is difficult to believe that the makers of these Paleolithic cultures lacked the power of speech. It is a long step Admittedly, from the earliest flint weapons to the splendid art of the late Old Stone Age: the first crude flints date back perhaps to 500,000 B.C., while the finest achievements of Old Stone Age man are later than 100,000 B.C.; and, in this period, we can envisage a corresponding development of language, from the most primitive and limited language of the earliest human groups to a fully developed language in the flowering time of Old Stone Age culture.

How did language arise in the first place? There are many theories about this, based on various types of indirect evidence, such as the language of children, the language of primitive societies, the kinds of changes that have taken place in languages in the course of recorded history, the behavior of higher animals like chimpanzees, and the behavior of people suffering from speech defects. These types of evidence may provide us with useful pointers, but they all suffer from limitations, and must be treated with caution. When we consider the language of children, we have to remember that their situations are quite different from that of our earliest human ancestors, because the child is growing up in an environment where there is already a fully developed language, and is surrounded by adults who use that language and are teaching it to him. For example, it has been shown that the earliest words used by children are mainly the names of things and people ("Doll," "Spoon," "Mummy"): but, this does not prove that the earliest words of primitive man were also the names of things and people. When the child learns the name of an object, he may then use it to express his wishes or demands: "Doll!: often means "Give me my doll!" Or "I've dropped my doll: pick it up for me!"; the child is using language to get things done, and it is almost an accident of adult teaching that the words used to formulate the child's demands are mainly nouns, instead of words like "Bring!" "Pick up!"; and so on.

5. The main idea of this excerpt is
- (A) to provide evidence of the origin of language.
 - (B) to present the need for language.
 - (C) to discuss how early man communicated.
 - (D) to present the culture of early man.
 - (E) to narrate the story of English.
- (A) (B) (C) (D) (E)
6. Theories of the origin of language include all of the following EXCEPT
- (A) changes occurring through the years.
 - (B) the need to communicate.
 - (C) language of children.
 - (D) the first man's extensive vocabulary.
 - (E) communication among primitive men.

(A) (B) (C) (D) (E)

7. The purpose of the discussion of the word, "Doll," is intended to

(A) Trace the evolution of a noun.
(B) Support the fact that naming things is most important.
(C) Indicate how adults teach language to children.
(D) Show the evolution of many meanings for one word.
(E) Evince man's multiple uses of single words

(A) (B) (C) (D) (E)

8. The implication of the author regarding the early elements of language is that

(A) There were specific real steps followed to develop our language.
(B) Care must be exercised when exhuming what we consider the roots of language.
(C) We owe a debt of gratitude to the chimpanzee contribution.
(D) Adults created language in order to instruct their children.
(E) Language was fully developed by primitive man.

(A) (B) (C) (D) (E)

9. If we accept that primitive man existed for a very long period of time without language, then we may assume that

(A) language is not necessary to man's existence.
(B) language developed with the developing culture of primitives.
(C) primitives existed in total isolation from one another.
(D) children brought about a need for language.
(E) mankind was not intended to communicate.

(A) (B) (C) (D) (E)

10. After a reading of this article, one might infer that

(A) society creates problems with language.
(B) language is for adults to instruct children.
(C) society uses language to improve itself.
(D) with the evolution of language came wisdom.
(E) language brings power.

(A) (B) (C) (D) (E)

Answer Keys to Drill Tests

DRILL TEST I - ANSWER KEY**Section-I Quantitative**

1. ☒ A ☐ B ☐ C ☐ D ☐ E
2. ☐ A ☐ B ☐ C ☐ D ☐ E
3. ☐ A ☒ B ☐ C ☐ D ☐ E
4. ☐ A ☐ B ☐ C ☐ D ☒ E
5. ☐ A ☐ B ☒ C ☐ D ☐ E
6. ☐ A ☐ B ☒ C ☐ D ☐ E
7. ☐ A ☐ B ☐ C ☒ D ☐ E
8. ☐ A ☒ B ☐ C ☐ D ☐ E
9. ☒ A ☐ B ☐ C ☐ D ☐ E
10. ☐ A ☐ B ☒ C ☐ D ☐ E

Section-II Analytical Reasoning

1. ☐ A ☒ B ☐ C ☐ D ☐ E
2. ☐ A ☐ B ☐ C ☒ D ☐ E
3. ☐ A ☐ B ☐ C ☐ D ☒ E
4. ☐ A ☐ B ☐ C ☐ D ☒ E
5. ☐ A ☐ B ☒ C ☐ D ☐ E
6. ☒ A ☐ B ☐ C ☐ D ☐ E
7. ☐ A ☒ B ☐ C ☐ D ☐ E
8. ☐ A ☐ B ☐ C ☒ D ☐ E
9. ☐ A ☐ B ☐ C ☒ D ☐ E
10. ☐ A ☐ B ☐ C ☐ D ☒ E
11. ☐ A ☐ B ☒ C ☐ D ☐ E
12. ☐ A ☐ B ☒ C ☐ D ☐ E
13. ☐ A ☒ B ☐ C ☐ D ☐ E
14. ☐ A ☐ B ☐ C ☐ D ☒ E

15. ☐ A ☐ B ☐ C ☒ D ☐ E
16. ☐ A ☒ B ☐ C ☐ D ☐ E
17. ☐ A ☐ B ☐ C ☒ D ☐ E
18. ☐ A ☐ B ☒ C ☐ D ☐ E
19. ☐ A ☒ B ☐ C ☐ D ☐ E
20. ☐ A ☐ B ☐ C ☐ D ☒ E

Section-III Verbal

1. ☐ A ☐ B ☒ C ☐ D ☐ E
2. ☐ A ☐ B ☒ C ☐ D ☐ E
3. ☐ A ☒ B ☐ C ☐ D ☐ E
4. ☐ A ☒ B ☐ C ☐ D ☐ E
5. ☒ A ☐ B ☐ C ☐ D ☐ E
6. ☐ A ☐ B ☐ C ☒ D ☐ E
7. ☒ A ☐ B ☐ C ☐ D ☐ E
8. ☐ A ☒ B ☐ C ☐ D ☐ E
9. ☐ A ☐ B ☐ C ☒ D ☐ E
10. ☐ A ☐ B ☒ C ☐ D ☐ E
11. ☐ A ☐ B ☒ C ☐ D ☐ E
12. ☒ A ☐ B ☐ C ☐ D ☐ E
13. ☒ A ☐ B ☐ C ☐ D ☐ E
14. ☐ A ☒ B ☐ C ☐ D ☐ E
15. ☐ A ☒ B ☐ C ☐ D ☐ E
16. ☐ A ☒ B ☐ C ☐ D ☐ E
17. ☐ A ☐ B ☐ C ☒ D ☐ E
18. ☐ A ☐ B ☐ C ☒ D ☐ E
19. ☐ A ☐ B ☐ C ☒ D ☐ E
20. ☒ A ☐ B ☐ C ☐ D ☐ E

DRILL TEST II - ANSWER KEY

Section-I Quantitative				
1.	(A)	●	(C)	(D) (E)
2.	(A)	●	(C)	(D) (E)
3.	(A)	(B)	(C)	● (E)
4.	(A)	(B)	(C)	(D) ●
5.	(A)	●	(C)	(D) (E)
6.	(A)	(B)	●	(D) (E)
7.	(A)	(B)	(C)	● (E)
8.	(A)	●	(C)	(D) (E)
9.	(A)	(B)	●	(D) (E)
10.	(A)	(B)	(C)	● (E)
Section-II Analytical Reasoning				
1.	(A)	●	(C)	(D) (E)
2.	●	(B)	(C)	(D) (E)
3.	(A)	●	(C)	(D) (E)
4.	(A)	(B)	●	(D) (E)
5.	(A)	(B)	●	(D) (E)
6.	(A)	(B)	(C)	(D) ●
7.	●	(B)	(C)	(D) (E)
8.	(A)	(B)	(C)	(D) ●
9.	(A)	(B)	●	(D) (E)
10.	(A)	(B)	(C)	(D) ●
11.	(A)	(B)	(C)	● (E)
12.	●	(B)	(C)	(D) (E)
13.	(A)	(B)	(C)	(D) ●
14.	(A)	(B)	●	(D) (E)
Section-III Verbal				
1.	(A)	(B)	●	(D) (E)
2.	(A)	●	(C)	(D) (E)
3.	●	(B)	(C)	(D) (E)
4.	(A)	(B)	●	(D) (E)
5.	(A)	(B)	(C)	(D) ●
6.	(A)	(B)	●	(D) (E)
7.	(A)	●	(C)	(D) (E)
8.	(A)	(B)	(C)	● (E)
9.	(A)	(B)	●	(D) (E)
10.	(A)	●	(C)	(D) (E)
11.	(A)	(B)	●	(D) (E)
12.	(A)	(B)	●	(D) (E)
13.	(A)	●	(C)	(D) (E)
14.	(A)	(B)	(C)	(D) ●
15.	(A)	●	(C)	(D) (E)
16.	(A)	(B)	●	(D) (E)
17.	(A)	(B)	●	(D) (E)
18.	(A)	(B)	●	(D) (E)
19.	●	(B)	(C)	(D) (E)
20.	(A)	(B)	(C)	● (E)

DRILL TEST III - ANSWER KEY**Section-I Quantitative**

1. ☐ A ☐ B ☐ C ☒ D ☐ E
2. ☐ A ☐ B ☒ C ☐ D ☐ E
3. ☐ A ☐ B ☐ C ☐ D ☒ E
4. ☒ A ☐ B ☐ C ☐ D ☐ E
5. ☐ A ☒ B ☐ C ☐ D ☐ E
6. ☐ A ☐ B ☐ C ☐ D ☒ E
7. ☐ A ☒ B ☐ C ☐ D ☐ E
8. ☐ A ☐ B ☐ C ☐ D ☒ E
9. ☒ A ☐ B ☐ C ☐ D ☐ E
10. ☒ A ☐ B ☐ C ☐ D ☐ E
11. ☐ A ☐ B ☐ C ☒ D ☐ E
12. ☐ A ☐ B ☒ C ☐ D ☐ E
13. ☐ A ☐ B ☐ C ☒ D ☐ E
14. ☐ A ☐ B ☒ C ☐ D ☐ E
15. ☐ A ☐ B ☒ C ☐ D ☐ E
16. ☒ A ☐ B ☐ C ☐ D ☐ E
17. ☐ A ☐ B ☐ C ☒ D ☐ E
18. ☐ A ☐ B ☐ C ☐ D ☒ E
19. ☒ A ☐ B ☐ C ☐ D ☐ E
20. ☐ A ☐ B ☒ C ☐ D ☐ E

Section-II Analytical Reasoning

1. ☐ A ☐ B ☐ C ☒ D ☐ E
2. ☐ A ☐ B ☒ C ☐ D ☐ E
3. ☒ A ☐ B ☐ C ☐ D ☐ E
4. ☐ A ☐ B ☐ C ☒ D ☐ E
5. ☐ A ☐ B ☐ C ☒ D ☐ E
6. ☒ A ☐ B ☐ C ☐ D ☐ E
7. ☐ A ☒ B ☐ C ☐ D ☐ E
8. ☐ A ☐ B ☐ C ☒ D ☐ E
9. ☐ A ☐ B ☐ C ☒ D ☐ E
10. ☒ A ☐ B ☐ C ☐ D ☐ E

11. ☒ A ☐ B ☐ C ☐ D ☐ E
12. ☐ A ☐ B ☒ C ☐ D ☐ E
13. ☐ A ☐ B ☐ C ☒ D ☐ E
14. ☐ A ☒ B ☐ C ☐ D ☐ E
15. ☐ A ☐ B ☐ C ☒ D ☐ E

Section-III Verbal

1. ☒ A ☐ B ☐ C ☐ D ☐ E
2. ☐ A ☐ B ☐ C ☒ D ☐ E
3. ☐ A ☐ B ☒ C ☐ D ☐ E
4. ☐ A ☒ B ☐ C ☐ D ☐ E
5. ☐ A ☐ B ☐ C ☒ D ☐ E
6. ☒ A ☐ B ☐ C ☐ D ☐ E
7. ☐ A ☐ B ☒ C ☐ D ☐ E
8. ☒ A ☐ B ☐ C ☐ D ☐ E
9. ☐ A ☐ B ☐ C ☐ D ☒ E
10. ☐ A ☐ B ☐ C ☐ D ☒ E

DRILL TEST IV - ANSWER KEY**Section-I Quantitative**

1. ☐ A ☐ B ☐ C ☒ D ☐ E
2. ☒ A ☐ B ☐ C ☐ D ☐ E
3. ☐ A ☐ B ☒ C ☐ D ☐ E
4. ☒ A ☐ B ☐ C ☐ D ☐ E
5. ☐ A ☐ B ☐ C ☒ D ☐ E
6. ☒ A ☐ B ☐ C ☐ D ☐ E
7. ☐ A ☐ B ☐ C ☒ D ☐ E
8. ☐ A ☐ B ☒ C ☐ D ☐ E
9. ☐ A ☐ B ☒ C ☐ D ☐ E
10. ☐ A ☐ B ☒ C ☐ D ☐ E
11. ☒ A ☐ B ☐ C ☐ D ☐ E
12. ☐ A ☒ B ☐ C ☐ D ☐ E
13. ☐ A ☒ B ☐ C ☐ D ☐ E
14. ☐ A ☒ B ☐ C ☐ D ☐ E
15. ☐ A ☐ B ☒ C ☐ D ☐ E
16. ☒ A ☐ B ☐ C ☐ D ☐ E
17. ☐ A ☐ B ☐ C ☐ D ☒ E
18. ☒ A ☐ B ☐ C ☐ D ☐ E
19. ☐ A ☒ B ☐ C ☐ D ☐ E
20. ☐ A ☒ B ☐ C ☐ D ☐ E

Section-II Analytical Reasoning

1. ☐ A ☐ B ☐ C ☒ D ☐ E
2. ☐ A ☐ B ☒ C ☐ D ☐ E
3. ☐ A ☐ B ☐ C ☒ D ☐ E
4. ☐ A ☐ B ☐ C ☒ D ☐ E
5. ☒ A ☐ B ☐ C ☐ D ☐ E
6. ☐ A ☐ B ☐ C ☒ D ☐ E
7. ☐ A ☒ B ☐ C ☐ D ☐ E
8. ☐ A ☐ B ☒ C ☐ D ☐ E
9. ☐ A ☒ B ☐ C ☐ D ☐ E
10. ☐ A ☐ B ☐ C ☒ D ☐ E

11. ☐ A ☐ B ☐ C ☒ D ☐ E
12. ☒ A ☐ B ☐ C ☐ D ☐ E
13. ☐ A ☐ B ☐ C ☒ D ☐ E
14. ☐ A ☐ B ☒ C ☐ D ☐ E
15. ☐ A ☒ B ☐ C ☐ D ☐ E

Section-III Verbal

1. ☐ A ☒ B ☐ C ☐ D ☐ E
2. ☐ A ☐ B ☐ C ☐ D ☒ E
3. ☐ A ☐ B ☐ C ☒ D ☐ E
4. ☐ A ☐ B ☐ C ☒ D ☐ E
5. ☒ A ☐ B ☐ C ☐ D ☐ E
6. ☐ A ☐ B ☐ C ☒ D ☐ E
7. ☐ A ☐ B ☒ C ☐ D ☐ E
8. ☐ A ☒ B ☐ C ☐ D ☐ E
9. ☐ A ☒ B ☐ C ☐ D ☐ E
10. ☐ A ☐ B ☐ C ☐ D ☒ E

SAMPLE TEST

General

Note: The Sample Test does not include quantitatively the same number of questions as there would be in the actual papers. They are merely meant to provide conceptual guidance to the users or prospective candidates.

I		Choose the correct answer for each question and shade the corresponding CIRCLE in the answer sheet	
VERBAL Section	No. Of Questions	15	

Each sentence below has one or two blanks, each blank indicates that something has been omitted. Beneath the sentence are five lettered words or sets of words. Choose the word or set of words that, when inserted in the sentence, best fits the meaning of the sentence as a whole.

1. Despite the millions of dollars spent on improvements, the telephone system in India remains _____ and continues to _____ the citizens who depend upon it.
A. Primitive...inconvenience
B. Bombastic...upset
C. Suspicious...connect
D. Outdated...elate
E. Impartial...vex
2. Unlike the images in symbolist poetry which are often vague and _____, the images of surrealist poetry are startlingly _____ and bold.
A. extraneous...furtive
B. trivial...inadvertent
C. obscure...concrete
D. spectacular...pallid
E. symmetrical...virulent
3. A good trial lawyer will argue only what is central to an issue, eliminating _____ information or anything else that might _____ the client.
A. Seminal...amuse
B. Extraneous...jeopardize
C. Erratic...enhance
D. Prodigious...extol
E. Reprehensible...initiate
4. Pollen grains and spores that are 200 millions old are now being extracted from shale and are _____ the theory that the breakup of the continents occurred in stages; in fact, it seems that the breakups occurred almost _____.
A. refining...blatantly
B. reshaping...simultaneously
C. countermanding...imperceptibly
D. forging...vicariously
E. supporting...haphazardly

Each question below consists of a related pair of words or phrases, followed by five lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

5. DETENTION : RELEASE ::

- A.** viciousness : attack
- B.** calamity : repair
- C.** qualification : employ
- D.** induction : discharge
- E.** therapy : confuse

6. PONDEROUS : WEIGHT ::

- A.** eternal : temporality
- B.** convincing : decision
- C.** gargantuan : size
- D.** ancient : value
- E.** prototypical : affection

7. FEBRILE : ILLNESS ::

- A.** tenacious : astonishment
- B.** juvenile : maturity
- C.** classic : cultivation
- D.** eccentric : discrimination
- E.** delusional : insanity

8. EQUIVOCATION : MEANING ::

- A.** feint : intention
- B.** secrecy : stealth
- C.** geniality : amiability
- D.** travesty : insight
- E.** refinement : innovation

Choose the lettered word or phrase that is most nearly opposite in meaning to the word in capital letters.

9. WHIMSICAL :

- A.** chivalrous
- B.** perfect
- C.** predictable
- D.** hidden
- E.** backward

10. REVERE :

- A.** collide
- B.** succumb
- C.** threaten
- D.** divide
- E.** despise

11. INURED :

- A. authoritative
- B. dissolute
- C. bereft
- D. sensitive
- E. taxing

12. ALACRITY :

- A. skullduggery
- B. reluctance
- C. interment
- D. bellicosity
- E. specificity

Read the passages and answer the questions asked at its end.

Art, like words, is a form of communication. Words, spoken and written, render accessible to humans of the latest generations all the knowledge discovered by the experience and reflection, both of preceding generations and of the best and foremost minds of their own times. Art renders accessible to people of the latest generations all the feelings experienced by their predecessors, and those already felt by their best and foremost contemporaries. Just as the evolution of knowledge proceeds by dislodging and replacing that which is mistaken, so too the evolution of feeling proceeds through art. Feelings less kind and less necessary for the well-being of humankind are replaced by others kinder and more essential to that end. This is the purpose of art, and the more art fulfills that purpose the better the art; the less it fulfills it, the worse the art.

13. The author develops the passage primarily by

- A. theory and refutation
- B. example and generalization
- C. comparison and contrast
- D. question and answer
- E. inference and deduction

14. According to the author, knowledge is

- A. evolutionary and emotional
- B. cumulative and progressive
- C. static and unmoving
- D. dynamic and cyclical
- E. practical and directionless

15. According to the passage, all of the following are true EXCEPT:

- A. Art is a form of communication.
- B. Art helps to refine sensibilities.
- C. Art is a repository of experience.
- D. Real art can never be bad.
- E. Art is a progressive human endeavor.

II**Analytical
Reasoning
Section****No. Of
Questions****20****Choose the correct answer for
each question and shade the
corresponding CIRCLE in the
answer sheet****Questions 16-19 are based on the following.**

The Western Derby is a race held annually at Bayshore Racetrack. There are eight gates at the racetrack, but only seven horses are entered in this race—Julius Caesar, King's Bounty, Longshot, Man Among Boys, Nocturnal, Odyssey, and Phantom. One of the gates is left empty. The horses are at the gate, waiting for the race to begin.

Gate 1, on the inside of the racetrack, is occupied.

Phantom is at a gate inside of Nocturnal.

The number of gates separating Julius Caesar and King's Bounty equals the number of gates separating Longshot and Man among Boys.

Nocturnal and Odyssey are next to each other.

16. If Odyssey is at Gate 2, which of the following must be true?

- A.** Nocturnal is at the innermost gate.
- B.** King's Bounty is at the outermost gate.
- C.** A horse occupies the outermost gate.
- D.** Phantom is at the innermost gate.
- E.** The outermost gate is not empty.

17. Which of the following is a possible assignment for the horses, from the inside to the outside?

- A.** Phantom, King's Bounty, Julius Caesar, Odyssey, Nocturnal, Man Among Boys, Longshot, vacant
- B.** vacant, Phantom, Julius Caesar, Longshot, King's Bounty, Man Among Boys, Nocturnal, Odyssey
- C.** Longshot, Man Among Boys, Nocturnal, vacant, Phantom, Odyssey, King's Bounty, Julius Caesar
- D.** Julius Caesar, King's Bounty, Longshot, Phantom, vacant, Man Among Boys, Nocturnal, Odyssey
- E.** Phantom, Julius Caesar, Nocturnal, vacant, Odyssey, King's Bounty, Longshot, Man Among Boys

18. If Julius Caesar is at Gate 6, King's Bounty is at Gate 7, and Odyssey is at Gate 4, which of the following must be true?

- I.** Longshot is at Gate 1.
- II.** Nocturnal is at Gate 5.
- III.** Man Among Boys is at Gate 2.
- IV.** Gate 8 is vacant.

- A. I and II only
- B. II and III only
- C. II and IV only
- D. I, II, and III only
- E. I, II, III, and IV

19. If Julius Caesar and King's Bounty are at the second and fourth gates, respectively, all of the following can be true EXCEPT

- A. Phantom is at Gate 1
- B. Man Among Boys is at Gate 3
- C. Longshot is at Gate 6
- D. Odyssey is at Gate 7
- E. Nocturnal is at Gate 7

20. Studies have shown that families who install smoke detectors and own fire extinguishers have a reduced risk of losing a child in a house fire. Therefore, no family who installs smoke detectors and owns a fire extinguisher will lose a child in a house fire.

Of the following, the best criticism of the argument above is that the argument does not

- A. take into account the possibility of losing a child in a house fire despite all precautionary measures
- B. indicate that fire extinguishers are effective during early stages of a fire
- C. cite the fact that smoke detectors have proven to be effective in waking sleeping children during a house fire
- D. differentiate between the two major causes of house fires: cooking and heating
- E. take into account that families who buy smoke detectors are also more likely to purchase fire insurance

21. LSD is a drug known to cause synesthesia, a phenomenon in which sensory input somehow becomes interchanged in the brain: a person with synesthesia might smell a symphony, hear sun light, or taste a pinprick. While most cases are drug induced, some people suffer from synesthesia in various forms since birth.

Which of the following can be most safely inferred from the information above?

- A. Synesthesia is not always a drug-induced phenomenon.
- B. Some great artists of this century have been known for their synesthetic proclivities.
- C. LSD is an addictive drug.
- D. Synesthesia is rarely bothersome to those who experience it.
- E. Synesthesia at birth is a result of mothers who have tried LSD.

22. Palindromes are easier to solve than acrostics, but acrostics are more difficult to create than palindromes. Rebuses are more difficult to solve than acrostics, yet rebuses are easier to create than palindromes.

If the above information is true, then it must also be true that

- A. acrostics are more difficult to create than rebuses
- B. palindromes are more difficult to solve than rebuses
- C. rebuses are easier to solve than acrostics
- D. acrostics are easier to create than rebuses
- E. rebuses are easier to solve than palindromes

Questions 23-25 are based on the following.

A university has a procedure for registering and recording complaints. Due to strict bureaucratic regulations, the following system of passing complaints must be observed:

A is the first registrar to receive all incoming complaints.

F is the recorder and final administrator to handle a complaint.

Personnel B, C, D, and E may pass complaints only as follows:

A to B

B to either C or D

C to either B or E

D to C

E to either D or F

23. Which is an acceptable path for a complaint to follow, passing from A?

- A. B to C to D to F
- B. B to D to C to F
- C. B to C to E to F
- D. B to E to F
- E. D to C to F

24. If a complaint is received and is handled by each personnel member only one time, which of the following could be one of the passes?

- A. A to C
- B. C to B
- C. C to F
- D. D to C
- E. E to D

25. Between which two personnel may a complaint pass by means of two different paths without any duplication of passes?

- A. B to E
- B. C to D
- C. C to E
- D. D to B
- E. E to B

Questions 26-31 are based on the following.

In a baseball field, one team can practice at a time. There are seven teams—the Aces, the Bears, the Cubs, the Ducks, the Eagles, the Falcons, and the Giants. The baseball field is open seven evenings a week from Monday to Sunday (Sunday being considered the last day of the week), and the allocation of practice times is governed by the following rules:

On any evening, only one team can play.

The Aces must practice on Monday.

The Ducks practice exactly one day before the Falcons practice.

The Falcons practice exactly one day before the Giants practice.

The Cubs and the Bears must practice earlier in the week than the Eagles.

26. The latest day in the week that the Bears can practice is

- A. Tuesday
- B. Wednesday
- C. Thursday
- D. Friday
- E. Saturday

27. If a person went to the baseball field on three consecutive evenings, he or she could see which of the following teams in the order listed?

- A. the Falcons, the Giants, the Cubs
- B. the Falcons, the Giants, the Ducks
- C. the Aces, the Ducks, the Cubs
- D. the Bears, the Cubs, the Falcons
- E. the Ducks, the Eagles, the Falcons

28. One week, the Cubs practiced on Wednesday and the Ducks practiced the next day. That week, the Bears must have practiced on

- A. Monday
- B. Tuesday
- C. Friday
- D. Saturday
- E. Sunday

29. If the Giants practice on Thursday, the Eagles and the Ducks must practice on which days, respectively?

- A. Sunday and Tuesday
- B. Saturday and Tuesday
- C. Friday and Wednesday
- D. Wednesday and Thursday
- E. Tuesday and Monday

30. If the Falcons practice on Saturday, the Eagles must practice on what day?

- A. Tuesday

- B. Wednesday
- C. Thursday
- D. Friday
- E. Sunday

31. The practice schedule has to adhere to which of the following?

- A. The Ducks practice earlier in the week than the Eagles.
- B. The Falcons practice on a later day than the Eagles.
- C. The Falcons practice earlier in the week than the Giants.
- D. The Cubs practice earlier in the week than the Ducks.
- E. The Bears practice earlier in the week than the Cubs.

32. Wine, cheese, butter, and raisins are all examples of early techniques to preserve food. In modern times, food scientists have developed other techniques such as dehydration, hermetic sealing, and radiation. Of these, radiation is the most controversial because preliminary studies have shown that radiation alters the natural chemical bonds in fruits and vegetables. Instead of providing salutary effects, eating radiated produce may well introduce irritating chemicals into the body, creating a possible health hazard.

Which of the following, if true, supports the conclusion that eating radiated produce poses a possible health hazard?

- A. Radiation affects only those chemical bonds associated with water, that is, hydrogen and oxygen.
- B. Radiation kills microorganisms that hasten food decay.
- C. The radiation-induced bonds are unlike any of those found in non-radiated produce.
- D. Certain microorganisms, namely those found in yogurt cultures, are essential for proper digestion.
- E. Radiation has no effect on foods preserved by drying.

33. Blue Blood, Inc., is a private blood products company that buys blood only from qualified donors. To qualify, a person must weigh at least 105 pounds, must not have taken malaria medication in the last three years, must never have had hepatitis, and must never have used intravenous drugs. Blue Blood nurses know that traveling has an effect on the possibilities for blood donation: Everyone who travels to Malaysia is required to take malaria medication; no one who enters Singapore can have ever used intravenous drugs; everyone traveling to Gorisimi gets hepatitis.

Which of the following situations would not automatically disqualify a person from selling blood to Blue Blood?

- A. traveling to Malaysia two years ago
- B. having once weighed 110 pounds and now weighing 95 pounds
- C. being denied admission to Singapore
- D. traveling to Gorisimi five years ago
- E. using intravenous drugs that were legal at the time

- 34.** Before marriage, couples should be tested for AIDS and any other sexually communicable diseases. Negative results will guarantee the health and safe-ness of their marriage.

Which of the following is an assumption of the argument in the passage above?

- A.** Current state laws require couples who are planning to get married to be tested for infectious disease in order to prevent possible health problems in the future.
- B.** There are many infectious diseases that can be sexually transmitted from one individual to another.
- C.** Fortunately even if a test proves positive for a communicable disease, couples can still lead healthy marriages by taking the proper precautions.
- D.** Due to advances in medical research over the years, infectious diseases that used to be fatal can now be effectively treated.
- E.** All the diseases detectable through testing have no incubation period and the results of these tests can immediately indicate whether or not the individual has the disease.

Question 35 is based on the following.

Nine athletes attend a sports banquet. Three of the athletes—J, K, and L—are varsity football players; two of the athletes—M and N—are varsity basketball players. The other four athletes—O, P, Q, and R—belong to the hockey club. All nine athletes will be seated at three small tables, each seating three athletes. The athletes must be seated according to the following rules: O and J do not sit at the same table.

P sits together with at least one of K or M.

There can be at most only one football player at a table.

There can be at most only one basketball player at a table.

- 35.** Suppose just one varsity athlete sits at a certain table, and that athlete happens to be J. If so, who else sits with J?

- A.** P, Q
- B.** P, R
- C.** Q, R
- D.** O, Q
- E.** O, P

**III
Quantitative
Section****No of
Questions****15****Choose the correct answer for
each question and shade the
corresponding CIRCLE in the
answer sheet**

36. If $\sqrt{y} = 9$, then $y^2 - \sqrt{y} =$

- A.** $\sqrt{3}-9$
- B.** 0
- C.** $9-\sqrt{3}$
- D.** 6552
- E.** 6561

37. If $(x+3)/6 = 12/(x+4)$, what is the positive value of x ?

- A.** 2
- B.** 3
- C.** 5
- D.** $\sqrt{60}$
- E.** 12

38. Cindy wants to paint her office. She can buy three cans of the same-priced paint and three identical brushes for \$21, or she can buy four cans of the same paint and one brush for \$22. How much does a can of paint cost?

- A.** \$2
- B.** \$3
- C.** \$4
- D.** \$5
- E.** \$6

39. Which of the following must be true?

- I. $(25 - 81) = (5 - 9) (5 + 9)$
- II. $7(9 + 6) = 7(9) + 7(6)$
- III. $6 \div (3 - 1) = (6 \div 3) - (6 \div 1)$

- A.** I only
- B.** II only
- C.** III only
- D.** I and II only
- E.** I, II, and III

40. The sum of a and $9 - 2a$ is less than 8. Which of the following is (are) the value(s) of a ?

- I. $a < -1$
- II. $a < 1$

III. $a > 1$

- A. I only
- B. II only
- C. III only
- D. I and II only
- E. I and III only

41. Susan is having a party. At 7:00 P.M., guests begin arriving at a uniform rate of 8 people every 15 minutes. If this pattern continues, how many guests will have arrived by 9:30 P.M.?

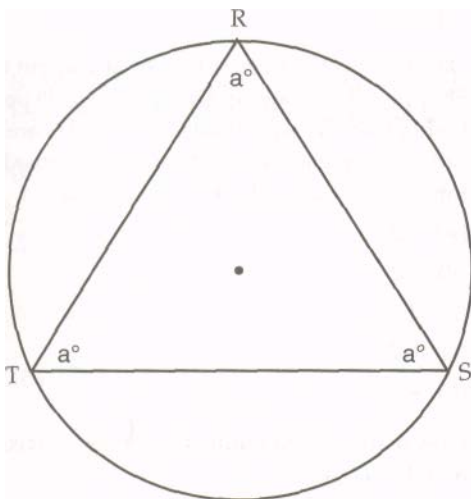
- F. 10
- G. 20
- H. 40
- I. 64
- J. 80

42. For positive integers p and q , if $p^2 + 2q^2 = 41$, and $2p^2 + q^2 = 34$, then $p^2 =$

- A. 2.5
- B. 7
- C. 3
- D. 9
- E. 16

43. If $a:b$ is $7:6$ and $3b:2c$ is $2:3$, what is c/a ?

- A. $14/27$
- B. $7/9$
- C. $6/7$
- D. $9/7$
- E. $27/14$



- 44.** In the figure above, if the radius of the circle is 8, and triangle TRS is inscribed in the circle, then the length of arc TRS is
- A.** $16\pi/3$
 - B.** $(32\pi)/3$
 - C.** 16π
 - D.** $(128\pi)/3$
 - E.** 64π
- 45.** For developing pictures, XYZ Photo Lab charges a service fee of \$3 for every order it receives in addition to a printing fee. If the order consists of 12 pictures or less, the printing fee per picture is \$0.36. If the order consists of more than 12 pictures, the printing fee per picture is \$0.24. What is the total cost per picture for an order consisting of 30 pictures?
- A.** \$0.11
 - B.** \$0.24
 - C.** \$0.34
 - D.** \$0.46
 - E.** \$3.24
- 46.** Lisa found an easy way to add up a sequence of positive even integers with an even number of terms. She formed pairs of equal sums by adding the first integer to the last, the second integer to the next-to-last, and so on. She then computed the total by adding these equal sums. If the total Lisa obtained was 930, how many terms were there in the sequence of positive even integers if the sequence started with the number 2?
- A.** 30
 - B.** 39
 - C.** 40
 - D.** 60
 - E.** 465
- 47.** December is the busiest month at Lamont's Gift Shoppe, where sales in December are 40 percent higher than average. If sales in February are typically 20 percent lower than average, what is the ratio of February sales to December sales?
- A.** 1:2
 - B.** 4:2
 - C.** 4:5
 - D.** 4:7
 - E.** 6:7
- 48.** How many 4-digit numbers are there that consist of only odd digits?
- A.** 20
 - B.** 625
 - C.** 1,024
 - D.** 4,500
 - E.** 5,000

49. For some integer m , let $[m]$ be defined by the equation $\{m\} = m(1 - m)$. If $n + 1 = \{n + 1\}$, then $n =$

- A. -2
- B. -1
- C. 0
- D. 1
- E. 2

50. Box A and box B have 6 cards each. Each card is marked with one integer, 1 through 6. Both boxes can have more than one card with the same integer, but the sum of all the integers in each box must be 18. Two of the cards in box A are 6's and two of the cards in box B are 5's. If one card is drawn from box A and one from box B, but neither a 6 nor a 5 is drawn, what is the largest possible sum of the integers on the cards drawn from the two boxes?

- A. 3
- B. 4
- C. 7
- D. 8
- E. 12