MATHEMATICS

CLASS X

As per the latest revised syllabus prescribed by CBSE

More than 500 Multiple Choice Solved Questions with Full Explanation

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01
Real Numbers

Revision of Key Formulas

1. A number is prime if it has only two factors, 1 and itself.
2. Every composite number can be expressed as a product of prime factors.
3. H C F of two numbers = Product of the smaller power of common factors in the numbers.
4. L C M of two numbers = Product of the greatest power of prime factors involved in the numbers.
5. Product of HCF and LCM of two numbers = Product of the two numbers $HCF(a, b)$ x $LCM(a, b)$ = a x b
6. Product of HCF and LCM of three numbers is not equal to the product of three numbers $HCF(a, b, c)$ x $LCM(a, b, c)$ $\neq a$ x b x c
7. Euclid's division Lemma: Given positive integers a and b there exist whole numbers q and r satisfying $a = bq + r$, $0 \leq r < b$
8. The Fundamental Theorem of Arithmetic: Every composite number can be expressed (factorized) as a product of primes, and this factorisation is unique expect for the order in which the prime factors occur.
9. Let a be a positive integer and p be a prime number such that $p|a^2$, then $p|a$
10. A positive integer n is prime, if it is not divisible by any prime number less than or equal to $\sqrt{n}$.
11. If p is a positive prime, then $\sqrt{p}$ is an irrational number.
12. Let x be a rational number whose decimal expansion terminates. Then x can be expressed in the form $\frac{p}{q}$,
    Where p and q are co-prime, and the prime factorisation of q is of the form $2^m X\, 5^n$, where m, n are non-negative integers.
13. Let $x = \frac{p}{q}$ be a rational number, such that the prime factorisation of q is not of the form $2^m X\, 5^n$, where m, n are non-negative integers. Then x has non-terminating repeating decimal expansion.

Multiple Choice Question

1)If p and q are two distinct prime numbers, then their HCF is

a)2 b)0 c) either 1 or 2 d) 1

Solution: Ans: d) 1

Given p and q are prime number.

A prime number has no factor other than 1 and the number itself.

∴ Factors of $p = 1, p$ and Factors of $q = 1, q$

Hence HCF $(p, q) = 1$

2)If p and q are two distinct prime numbers, then LCM (p, q) is

a)1 b) p c) q d) pq

Solution: Ans: d) pq

Factors of $p = 1, p$ and Factors of $q = 1, q$

Hence LCM $(p, q) = 1 \times p \times q = pq$

3)The LCM of smallest two-digit composite number and smallest composite number is

a)12 b)20 c)4 d)44

Solution: Ans: b)20

Smallest two-digit composite number

$= 10 = 2^1 \times 5^1$

Smallest composite number $= 4 = 2^2$.

∴ LCM$(4, 10) = 2^2 \times 5^1 = 4 \times 5 = 20.$

4)The smallest number divisible by all natural numbers between 1 and 10 (both inclusive) is

a)2020 b)2520 c)1010 d)5040

Solution: Ans: b)2520

LCM of $(1, 2, 3, 4, 5, 6, 7, 8, 9, 10)$

LCM of $(1, 1 \times 2, 3 \times 1, 2^2, 5 \times 1, 2 \times 3, 7 \times 1, 2^3, 3^2, 2 \times 5^1)$

$= 1 \times 2^3 \times 3^2 \times 5^1 \times 7^1 = 1 \times 8 \times 9 \times 5 \times 7$

$= 72 \times 35 = 2520$

Product of the roots $\alpha\beta\gamma = -\frac{d}{a} = -\frac{9}{a}$

Now $\alpha + \beta + \gamma = 0$

$\Rightarrow \alpha^3 + \beta^3 + \gamma^3 = 3\alpha\beta\gamma = 3(-\frac{a}{a}) = -\frac{27}{a}$

But $\alpha^3 + \beta^3 + \gamma^3 = 27$(given)

$\therefore -\frac{27}{a} = 27 \Rightarrow a = -1$

22) The product of the zeros $x^3 + 4x^2 + x - 6$ is

a)-4 b) 4 c) 6 d)-6

Solution: Ans: c) 6

Here $a = 1, b = 4, c = 1, d = -6$

Let α, β, γ are zeros of $x^3 + 4x^2 + x - 6$

Product of the zeros $= \alpha\beta\gamma = -\frac{d}{a} = -\frac{(-6)}{1} = 6$

23) If the sum of the zeros of the polynomial $f(x) = 2x^3 - 3kx^2 + 4x - 5$ is 6, then the value of k is

a) 2 b) 4 c)-2 d)-4

Solution: Ans: b) 4

Let α, β, γ are the zeros of

$f(x) = 2x^3 - 3kx^2 + 4x - 5$

Compare this with $ax^3 + bx^2 + cx + d$

Here $a = 2, b = -3k, c = 4, d = -5$

Given that $\alpha + \beta + \gamma = -\frac{b}{a} = -\frac{(-3k)}{2} = \frac{3k}{2}$

But $\alpha + \beta + \gamma = 6$

$\therefore \frac{3k}{2} = 6 \Rightarrow 3k = 12 \Rightarrow k = \frac{12}{3} = 4$

24) If sum of the zeros of the quadratic polynomial $(k-1)x^2 + kx + 1$ is -3, then the value of k is

a)$\frac{3}{2}$ b)$-\frac{4}{3}$ c)$\frac{2}{3}$ d)$-\frac{2}{3}$

Solution: Ans: a) $\frac{3}{2}$

Let α, β, γ be the zeros of

$f(x) = (k-1)x^2 + kx + 1$

Compare this with $ax^2 + bx + c$

Here $a = k - 1, b = k, c = 1$

Given that sum of the zeros $\alpha + \beta = -\frac{b}{a} = -3$

i.e., $\frac{-k}{k-1} = -3$ (given)

$-k = -3(k-1) \Rightarrow -k = -3k + 3$

$3k - k = 3 \Rightarrow 2k = 3 \Rightarrow k = \frac{3}{2}$

25) If the product of zeros of the polynomial $f(x) = ax^3 - 6x^2 + 11x - 6$ is 4 then $a =$

a)$\frac{3}{2}$ b)$-\frac{3}{2}$ c)$\frac{2}{3}$ d)$-\frac{2}{3}$

Solution: Ans: a)$\frac{3}{2}$

Let α, β, γ be the zeros of the polynomial $f(x)$

Compare this polynomial $ax^3 - 6x^2 + 11x - 6$

with $ax^3 + bx^2 + cx + d$

Here $a = a, b = -6, c = 11, d = -6$

Product of the zeros $\alpha\beta\gamma = -\frac{d}{a} = 4$ (given)

i.e., $-\frac{(-6)}{a} = 4 \Rightarrow \frac{6}{a} = 4$

$\Rightarrow a = \frac{6}{4} = \frac{3}{2}$

26) If α, β are the zeros of the polynomial $p(x) = 4x^2 + 3x + 7$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to

a)$\frac{7}{3}$ b)$-\frac{7}{3}$ c)$\frac{3}{7}$ d)$-\frac{3}{7}$

Solution: Ans: d)$-\frac{3}{7}$

α, β are the zeros of the polynomial

$f(x) = 4x^2 + 3x + 7$

Compare this $f(x)$ with $ax^2 + bx + c$

Here $a = 4, b = 3, c = 7$

Sum of the zeros $\alpha + \beta = -\frac{b}{a} = -\frac{3}{4}$

Product of the zeros $\alpha\beta = \frac{c}{a} = \frac{7}{4}$

Now, $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-3/4}{7/4} = -\frac{3}{4} \times \frac{4}{7} = -\frac{3}{7}$

27) If the product of two zeros of the polynomial $f(x) = 2x^3 + 6x^2 - 4x + 9$ is 3, then its third zero is

a)$\frac{3}{2}$ b)$-\frac{3}{2}$ c)$\frac{9}{2}$ d)$-\frac{9}{2}$

Solution: Ans: b)$-\frac{3}{2}$

Let α, β, γ be the zeros of

$f(x) = 2x^3 + 6x^2 - 4x + 9$

Compare this polynomial $f(x) = 2x^3 + 6x^2 - 4x + 9$

with $ax^3 + bx^2 + cx + d$

Here $a = 2, b = 6, c = -4, d = 9$

14) The value of k for which the system of equations $x+2y-3=0$ and $5x+ky+7=0$ has no solutions, is

a) 10 b) 6 c) 3 d) 1

Solution: Ans: a) $k=10$

The system of equation has no solution if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}$

Here $a_1=1, b_1=2$

$a_2=5, b_2=k,$

$\frac{a_1}{a_2}=\frac{b_1}{b_2} \Longrightarrow \frac{1}{5}=\frac{2}{k} \Longrightarrow k=10$

15) The value of k for which the system of equations $3x+5y=0$ and $kx+10y=0$ has a non-zero solutions, is

a) 0 b) 2 c) 6 d) 8

Solution: Ans: c) $k=6$

The system of equation has non-zero solution if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}$.

Here $a_1=3, b_1=5, a_2=k, b_2=10$

$\therefore \frac{a_1}{a_2}=\frac{b_1}{b_2} \Longrightarrow \frac{3}{k}=\frac{5}{10} \Longrightarrow 5k=10\times 3$

$\Longrightarrow k=\frac{10\times 3}{5}=6$

16) The value of k for which the system of equations $x+2y=5$ and $3x+ky+15=0$ has no solutions, is

a) 6 b)-6 c)$\frac{3}{2}$ d) none of these

Solution: Ans: a) $k=6$

The system of equation has no solution if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}$.

Here $a_1=1, b_1=2$ and $a_2=3, b_2=k$

$\therefore \frac{a_1}{a_2}=\frac{b_1}{b_2} \Longrightarrow \frac{1}{3}=\frac{2}{k} \Longrightarrow k=6$

17) If a pair of linear equations in two variables is consistent, then the lines represented by two equations are

a) intersecting b) parallel

c)always coincident

d)intersecting or coincident

Solution: Ans: d)intersecting or coincident

If the pair of linear equations intersect at a point, then we say that the pair is consistent. If the pair of lines coincident, then we say that the pair is consistent with infinitely many solution.

18) If the system of equations $2x+3y=5$ and $4x+ky=10$ has infinitely many solutions, then $k=?$

a) 1 b)$\frac{1}{2}$ c) 3 d) 6

Solution: Ans: d) $k=6$

The system of equations has infinitely many solutions, if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ —— (01)

Here $a_1=2, b_1=3, c_1=5$

$a_2=4, b_2=k, c_2=10$

$\therefore$ Eqn 1 $\Longrightarrow \frac{2}{4}=\frac{3}{k}=\frac{5}{10}$

Consider $\frac{2}{4}=\frac{3}{k} \Longrightarrow 2k=12 \Longrightarrow k=6$

19) If $x=a, y=b$ is a solution of the system of equations $x-y=2$ and $x+y=4$, then the values of a and b respectively.

a) 3 and 1 b)3 and 5

c)5 and 3 d)-1 and -3

Solution: Ans: a) $(3,1)$

Given equations are $x-y=2$ —— (01)

and $x+y=4$ —— (02)

$x-y=2$ —— (01)

$x+y=4$ —— (02)

$1+2 \Longrightarrow$ $2x \quad =6$

$x=\frac{6}{2}$

$x=3$

$x+y=4$ —— (02)

$x-y=2$ —— (01)

$2-1 \Longrightarrow$ $2y=2$

$y=1$

$= \left(\frac{3}{\sqrt{3}}, -\frac{1}{\sqrt{3}}\right) = \left(\sqrt{3}, -\frac{1}{\sqrt{3}}\right)$

18) The positive root of $\sqrt{3x^2+6} = 9$ is

a) 3 **b) 4** **c) 5** **d) 7**

Solution: Ans: c) 5

Given equation is $\sqrt{3x^2+6} = 9$

Squaring on both sides

$\left(\sqrt{3x^2+6}\right)^2 = 9^2 \Rightarrow 3x^2 + 6 = 81$

$3x^2 = 81 - 6$

$3x^2 = 75$

$x^2 = 25$

$x = \pm 5$

∴ the positive roots is $x = 5$

19) If $x^2 + 2kx + 4 = 0$ has a root $x = 2$, then the value of k is

a)-1 **b)-2** **c) 2** **d)-4**

Solution: Ans: b)-2

Given equation $x^2 + 2kx + 4 = 0$

$x = 2$ is a root of the equation.

$\therefore 2^2 + 2k(2) + 4 = 0 \Rightarrow 4 + 4k + 4 = 0$

$4k + 8 = 0 \Rightarrow 4(k+2) = 0$

$\Rightarrow k + 2 = 0 \Rightarrow k = -2$

20) The number of real roots of the equation $x^2 + 3|x| + 2 = 0$ is

a) 2 **b) 3** **c) 0** **d) 4**

Solution: Ans: c) 0

Given equation is $x^2 + 3|x| + 2 = 0$

$(|x|+2)(|x|+1) \neq 0$ for any x.

Hence the given equation has no real roots.

21) The number of real roots of the equation $x^2 - 3|x| + 2 = 0$

a) 4 **b) 3** **c) 2** **d) 1**

Solution: Ans: a) 4

Given equation is $x^2 - 3|x| + 2 = 0$

$x^2 - 3|x| + 2 = (|x|-2)(|x|-1) = 0$

$\Rightarrow (|x|-2) = 0$ or $|x| - 1 = 0$

$\Rightarrow |x| = 2$ or $|x| = 1$

ie $x = \pm 2$ or $x = \pm 1$

Now x has 4 roots $(-1, -2, 1, 2)$

22) If the sum and product of the roots of the equation $kx^2 + 6x + 4k = 0$ are equal, then the value of k is

a)$-\frac{3}{2}$ **b)$\frac{3}{2}$** **c)$\frac{2}{3}$** **d)$-\frac{2}{3}$**

Solution: Ans: a)$-\frac{3}{2}$

Given equation is $kx^2 + 6x + 4k = 0$

Compare this equation with $ax^2 + bx + c = 0$

Here $a = k, b = 6, c = 4k$

Sum of the roots $= -\frac{b}{a} = -\frac{6}{k}$

Product of the roots $= \frac{c}{a} = \frac{4k}{k} = 4$

Given that they are equal.

ie, $-\frac{6}{k} = 4 \Rightarrow k = -\frac{6}{4} = -\frac{3}{2}$

23) If one root of the equation $3x^2 = 8x + (2k+1)$ is seven times the other, then the value of k is

a)$\frac{7}{3}$ **b)$\frac{5}{3}$** **c)$-\frac{5}{3}$** **d)$-\frac{7}{3}$**

Solution: Ans: c)$-\frac{5}{3}$

Given equation is $3x^2 = 8x + (2k+1)$

$3x^2 - 8x - (2k+1) = 0$

Here $a = 3, b = -8, c = -(2k+1)$

Given that roots are $\alpha, 7\alpha$

Sum of the roots $= \alpha + 7\alpha = \frac{-b}{a} = -\frac{(-8)}{3} = \frac{8}{3}$

$\Rightarrow 8\alpha = \frac{8}{3} \Rightarrow \alpha = \frac{1}{3}$

$\alpha = \frac{1}{3}$ is one of the root

$\therefore 3\left(\frac{1}{3}\right)^2 = 8\left(\frac{1}{3}\right) + (2k+1) \Rightarrow \frac{3}{9} - \frac{8}{3} = 2k + 1$

$\frac{3-24}{9} = 2k + 1 \Rightarrow -\frac{21}{9} = 2k + 1$

$-\frac{7}{3} - 1 = 2k \Rightarrow \frac{-7-3}{3} = 2k \Rightarrow 2k = -\frac{10}{3}$

$k = -\frac{10}{2\times 3} = -\frac{5}{3}$

26) The sum of first 16 terms of the A.P $10, 6, 2, ...$ is

a)- 320 **b) 320** **c) – 352** **d) – 400**

Solution: Ans: a) - 320

Given A.P is 10, 6, 2, ….

Here $a = 10, d = 6 - 10 = -4, n = 16.$

$S_{16} = \frac{n}{2}[2a + (n-1)d]$

$= \frac{16}{2}[2(10) + (16-1)(-4)] = 8[20 + 15(-4)]$

$= 8[20 - 60] = 8[-40] = -320$

27) If the first term of an A.P is – 5 and the common difference is 2, then the sum of first 6 terms is

a)0 **b)5** **c)6** **d)15**

Solution: Ans: a) 0

First term $a = -5$.

Common difference $d = 2$.

Number of terms $n = 6$.

$\therefore S_n = \frac{n}{2}[2a + (n-1)d] = \frac{6}{2}[2(-5) + (6-1)(2)]$

$= 3[-10 + 10] = 3[0] = 0$

28) The 4th term from the end of the A.P $-11, -8, -5, ... 49$ is

a)37 **b)40** **c)43** **d)58**

Solution: Ans: b) 40

n^{th} term from the end $= l - (n-1)d$

Here $l = 49, n = 4, d = a_2 - a_1 = -8 - (-11)$

$= -8 + 11 = 3$

$\therefore$ 4^{th} term from the end

$= 49 - (4-1)(3) = 49 - 3(3) = 49 - 9 = 40$

29) Which term of the A.P $21, 42, 63, 84,$ is 210?

a)9^{th} **b)10^{th}** **c)11^{th}** **d)12^{th}**

Solution: Ans: b)10^{th} term

Given A.P is 21, 42, 63, 84, …

Here $a = 21, d = a_2 - a_1 = 42 - 21 = 21$

Let $a_n = 210$

That is $a + (n-1)d = 210$

$21 + (n-1)21 = 210$

$(n-1)21 = 210 - 21 = 189 \Rightarrow n - 1 = \frac{189}{21} = 9$

$n - 1 = 9 \Rightarrow n = 10$

Hence 10^{th} term is 210.

30) If the 2^{nd} term of an A.P is 13 and 5^{th} term is 25, what is its 7^{th} term?

a)30 **b)33** **c)37** **d)38**

Solution: Ans: b) 33

Given $a_2 = 13$ and $a_5 = 25$

That is $a + d = 13$ ——— (01)

$a + 4d = 25$ ——— (02)

$2 - 1 \Rightarrow$ $3d = 12$

$d = \frac{12}{3} = 4$

Substitute $d = 4$ in 1

$a + 4 = 13 \Rightarrow a = 13 - 4 = 9 \Rightarrow a = 9$

$\therefore a_7 = a + 6d = 9 + 6(4) = 9 + 24 = 33$

31) The first and last terms of an A.P are 1 and 11. If the sum of its terms is 36, then the number of terms will be

a)5 **b)6** **c)7** **d)8**

Solution: Ans: b) 6

Given $a = 1, l = 11, S_n = 36$

$S_n = \frac{n}{2}[a + l] = 36$ (Given)

$= \frac{n}{2}[1 + 11] = 36 \Rightarrow \frac{n}{2} \times 12 = 36$

$6n = 36 \Rightarrow n = \frac{36}{6} = 6$

$\therefore$ Number of terms $n = 6$.

32) If four numbers in A.P are such that their sum is 50 and the greatest number is 4 times the least, then the numbers are

a)5, 10, 15, 20 **b)4, 10, 16, 22**

c) 3, 7, 11, 15 **d) none of these**

Solution: Ans: (a) 5, 10, 15, 20

$\frac{AC}{AD} = \frac{AB}{AC} = \frac{BC}{CD}$

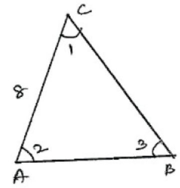
$\frac{8}{3} = \frac{AB}{AC} \Rightarrow \frac{8}{3} = \frac{AB}{8}$

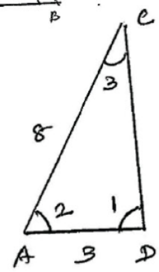
$\Rightarrow 3AB = 64 \Rightarrow AB = \frac{64}{3}$

Now, $AB = AD + DB$

$\frac{64}{3} = 3 + DB \ \Rightarrow DB = \frac{64}{3} - 3$

$= \frac{64-9}{3} = \frac{55}{3}$



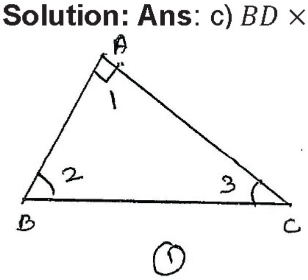


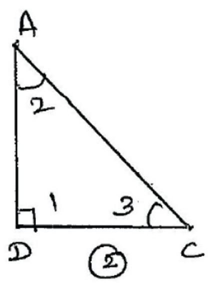
11) If in the figure $\angle BAC = 90°$ and $AD \perp rBC$, then

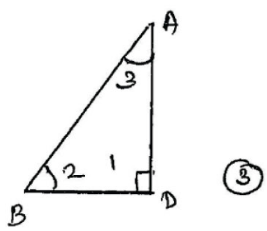
a) $BD \times CD = BC^2$ b) $AB \times AC = BC^2$

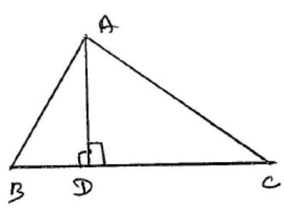
c) $BD \times CD = AD^2$ d) $AB \times AC = AD^2$

Solution: Ans: c) $BD \times CD = A^2$









From the figure 1 and 2

$\angle BAC = \angle ADC = 90°$

$\angle C$ is common

$\therefore$ By AA similarity

$\Delta ABC \sim \Delta ADC$ ——— (01)

From the figure 1 and 3

$\angle BAC = \angle ADB = 90°$

$\angle B$ is common

$\therefore \Delta ABC \sim \Delta ABD$ ——— (02)

from 1 and 2

$\Delta ADC \sim \Delta ABD$.

$\Rightarrow \frac{AD}{BD} = \frac{AC}{AB} = \frac{DC}{AD}$

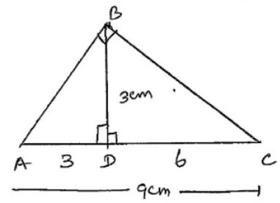
consider $\frac{AD}{BD} = \frac{DC}{AD} \Rightarrow AD^2 = BD \times DC$

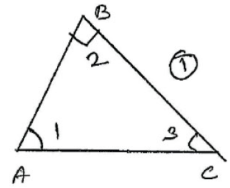
12) In $\Delta ABC, \angle B = 90°, BD \perp AC,$ if $AC = 9\ cm$ and $AD = 3\ cm$, then BD is equal to

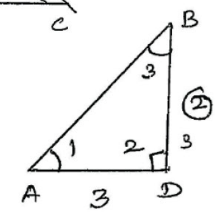
a) $2\sqrt{2}\ cm$ b) $3\sqrt{2}\ cm$

c) $2\sqrt{3}\ cm$ d) $3\sqrt{3}\ cm$

Solution: Ans: b) $3\sqrt{2}\ cm$





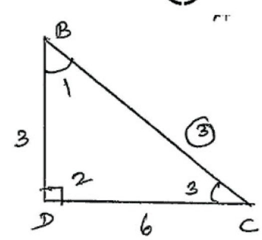


From the figure 1 and 2

$\angle A$ is common.

$\angle ABC = \angle ADE = 90°$

$\therefore$ By AA similarity: $\Delta ABC \sim \Delta ABD$ ——— (01)



From the figure 1 and 3

$\angle ABC = \angle BDC = 90°$

$\angle C$ is common.

$\therefore$ By AA similarity:

$\Delta ABC \sim \Delta BDC$ ——— (02)

From 1 and 2

$\Delta ABD \sim \Delta BDC \Rightarrow \frac{AD}{BD} = \frac{BD}{DC} = \frac{AB}{BC}$

$\Rightarrow BD^2 = AD \times DC = 3 \times 6 = 18$

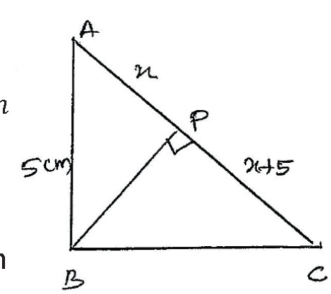
$\therefore BD = \sqrt{18} = \sqrt{9 \times 2} = 3\sqrt{2}\ cm$

13) In the figure, ΔABC, is a right triangle right angled at B. The length of PC is

a) $2.5\ cm$ b) $4.5\ cm$

c) $6\ cm$ d) $7.5\ cm$

Solution: Ans: d) $7.5\ cm$



ΔABC is a right angled triangle at B.

BP is perpendicular from a hypotenuse AC.

$\therefore BP^2 = AP \times PC = x(x + 5)$

In $\Delta APB, AB^2 = AP^2 + BP^2$

$5^2 = x^2 + x(x + 5) \Rightarrow 25 = x^2 + x^2 + 5x$

$\Delta ABC \sim \Delta PQR$

$\therefore \frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{AM^2}{PN^2} \Longrightarrow \frac{121}{64} = \frac{(12.1)^2}{PN^2} \Longrightarrow \frac{12.1}{PN} = \frac{11}{8}$

$\therefore PN = \frac{12.1 \times 8}{11} = 1.1 \times 8 = 8.8\ cm$

42) The perimeter of an isosceles right triangle the length of whose hypotenuse is $10\ cm$ is

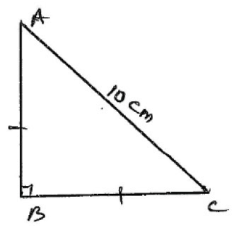
a) $20\ cm$ **b) $20\sqrt{2}cm$**

c) $10(\sqrt{2}+1)cm$ **d) $(10\sqrt{2}+9)cm$**

Solution: Ans: c) $10(\sqrt{2}+1)cm$

Given ΔABC is an isosceles right-angled triangle.

Hypotenuse $AC = 10\ cm.$



In right angled triangle $ABC,$

$AC^2 = AB^2 + BC^2$

$10^2 = x^2 + x^2$

(Because $AB = x = x$)

$100 = 2x^2$

$x^2 = 50 \Longrightarrow x = \sqrt{50} = \sqrt{25 \times 2} = 5\sqrt{2}.$

$\therefore AB = BC = 5\sqrt{2}.$

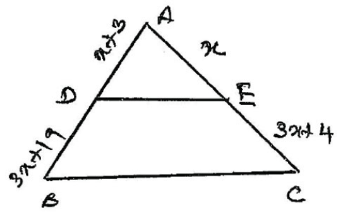
Hence perimeter of $\Delta ABC = AB + BC + AC$

$= 5\sqrt{2} + 5\sqrt{2} + 10 = 10\sqrt{2} + 10 = 10(\sqrt{2}+1)cm$

43) In the figure, the value of x for which $DE||BC$ is

a) 4 **b) 1** **c) 3** **d) 2**

Solution: Ans: d) 2



In $\Delta ABC, DE||BC$

$\therefore$ By BPT, $\frac{AD}{DB} = \frac{AE}{EC}$

$\Longrightarrow \frac{x+3}{3x+19} = \frac{x}{3x+4}$

$(3x+4)(x+3) = (3x+19)x$

$3x^2 + 9x + 4x + 12 = 3x^2 + 19x$

$13x + 12 = 19x \Longrightarrow 12 = 19x - 13x \Longrightarrow 12 = 6x$

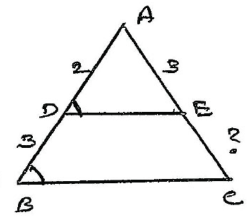
$\therefore x = \frac{12}{6} = 2$

44) In the figure, if $\angle ADE = \angle ABC,$ then $CE =$

a) 2 **b) 5** **c) $\frac{9}{2}$** **d) 3**

Solution: Ans: c) $\frac{9}{2}$

Given $\angle ADE = \angle ABC$



$\Longrightarrow DE||BC$ (By CBPT)

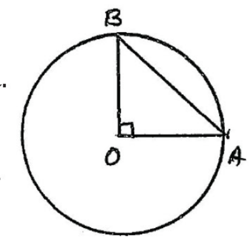
By BPT, $\frac{AD}{DB} = \frac{AE}{EC} \Longrightarrow \frac{2}{3} = \frac{3}{EC}$

$2EC = 9 \Longrightarrow EC = \frac{9}{2} = 4.5\ cm$

45) A chord of a circle of radius $10\ cm$ subtends a right angle at the centre. The length of the chord is (in cm)

a) $5\sqrt{2}$ **b) $10\sqrt{2}$** **c) $\frac{5}{\sqrt{2}}$** **d) $10\sqrt{3}$**

Solution: Ans: b) $10\sqrt{2}\ cm$



Given radius $OA = OB = 10\ cm.$

$\angle AOB = 90°, AB$ is a chord.

By Theorem, $AB^2 = OA^2 + OB^2$

$= 10^2 + 10^2$

$= 100 + 100 = 200$

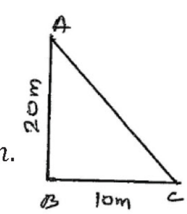
$\therefore AB = \sqrt{200} = \sqrt{100 \times 2} = 10\sqrt{2}cm.$

46) A vertical stick $20\ m$ long casts a shadow $10\ m$ long on the ground. At the same time, a tower casts a shadow $50\ m$ long on the ground. The length of the tower is

a) $100\ m$ **b) $120\ m$**

c) $25\ m$ **d) $200\ m$**

Solution: Ans: a) $x = 100\ m$

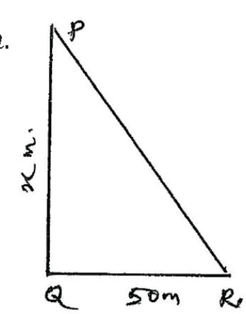


Given length of the stick $AB = 2\ cm.$

Shadow of the stick $BC = 10\ m.$

Let length of the tower $PQ = x\ m.$

Shadow of the tower $QR = 50\ m.$



In $\Delta ABC, \frac{AB}{BC} = \frac{20}{10} = 2$

In $\Delta PQR, \frac{PQ}{QR} = \frac{x}{50}$

$\Delta ABC \sim \Delta PQR.$

$\therefore \frac{x}{50} = 2 \Longrightarrow x = 100\ m.$

47) Two isosceles triangles have equal angles and their areas are in the ratio $16:25$. The ratio of their corresponding height is

a) $4:5$ **b) $5:4$** **c) $3:2$** **d) $5:7$**

Solution: Ans: a) $4:5$

42) If $(-2,1)$ is the centroid of the triangle having its vertices at $(x,2),(10,-2),(-8,y)$ then x,y satisfy the realtion

a) $3x+8y=0$ **b) $3x-8y=0$**
c) $8x+3y=0$ **d) $8x=2y$**

Solution: Ans: a) $3x+8y=0$

$(-2,1)$ is the centroid of the triangle having vertices $(x,2),(10,-2),(-8,y)$.

$\therefore \left(\frac{x+10-8}{3},\frac{2-2+y}{3}\right)=(-2,1) \Rightarrow \left(\frac{x+2}{3},\frac{y}{3}\right)=(-2,1)$

$\frac{x+2}{3}=-2$	$\frac{y}{3}=1$
$x+2=-6$	$y=3$
$x=-8$	$y=3$

$3x+8y=3(-8)+8(3)=-24+24=0$

43) The coordinates of the fourth vertex of the rectangle formed by the points $(0,0),(2,0),(0,3)$ are

a) $(3,0)$ **b) $(0,2)$** **c) $(-2,3)$** **d) $(3,2)$**

Solution: Ans: c) $(-2,3)$.

Three vertices of the rectangle be $A(0,0),B(2,0),C(0,3)$.

The fourth vertex

$D(x,y)=((x_1-x_2+x_3),(y_1-y_2+y_3))$
$=((0-2+0),(0-0+3))=(-2,3)$

44) If the coordinates of one end of a diameter of a circle are $(2,3)$ and the coordinates of its centre are $(-2,5)$ then the coordinates of the other end of the diameter are

a) $(-6,7)$ **b) $6,-7)$** **c) $(6,7)$** **d) $(-6,-7)$**

Solution: Ans: a)$(-6,7)$.

One end of diameter of the circle is $(2,3)$.

Let the other end be (x,y).

The mid point of the diameter = center of the circle

$\left(\frac{x+2}{2},\frac{y+3}{2}\right)=(-2,5)$ (given)

$\Rightarrow \frac{x+2}{2}=-2$	$\frac{y+3}{2}=5$
$x+2=-4$	$y+3=10$
$x=-4-2$	$y=10-3$
$x=-6$	$y=7$

$\therefore$ the other end of the diameter is $(-6,7)$.

45) If $A(4,9),B(2,3),C(6,5)$ are the vertices of ΔABC, then the length of median through C is

a) 5 units **b) $\sqrt{10}$ units**
c) 25units **d) 10 units**

Solution: Ans: b) $\sqrt{10}$

Let CD be the length of the median of the triangle ABC through C and D is mid of AB.

$\therefore$ the point $D=\left(\frac{4+2}{2},\frac{9+3}{2}\right)=(3,6)$

Length of the median

$CD=\sqrt{(6-3)^2+(5-6)^2}=\sqrt{3^2+(-1)^2}$
$=\sqrt{9+1}=\sqrt{10}$ units.

46) If $P(2,4),Q(0,3),R(3,6)$ and $S(5,y)$ are the vertices of a parallelogram $PQRS$, then the value of y is

a) 7 **b) 5** **c)-7** **d)-8**

Solution: Ans: a)7

Given that $PQRS$ is a parallelogram.

$\Rightarrow$ Diagonals bisect each other

$\Rightarrow$ mid point of PR = mid point of QS

$\left(\frac{2+3}{2},\frac{4+6}{2}\right)=\left(\frac{0+5}{2},\frac{3+y}{2}\right) \Rightarrow \left(\frac{5}{2},\frac{10}{2}\right)=\left(\frac{5}{2},\frac{3+y}{2}\right)$

$\Rightarrow \frac{3+y}{2}=5 \Rightarrow 3+y=10 \Rightarrow y=10-3=7$

47) The perimeter of a triangle with vertices $(0,4),(0,0)$ and $(3,0)$ is

a) $7+\sqrt{5}$ **b) 5** **c) 10** **d) 12**

Solution: Ans: d) 12

Let the points be $A(0,4),B(0,0),C(3,0)$.

$AB=\sqrt{(0-0)^2+(4-0)^2}=\sqrt{4^2}=4$

$BC=\sqrt{(3-0)^2+(0+0)^2}=\sqrt{3^2}=3$

$AC=\sqrt{(3-0)^2+(0-4)^2}=\sqrt{3^2+4^2}$
$=\sqrt{9+16}=\sqrt{25}=5$

09
Some Applications of Trigonometry

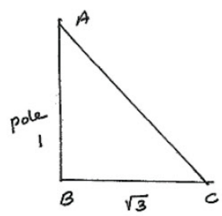
Multiple Choice Question

1) The ratio of the length of a pole and its shadow is $1:\sqrt{3}$. The angle of elevation of the sun is

a) $90°$ **b)** $60°$ **c)** $30°$ **d)** $45°$

Solution: Ans: c) $30°$

The ratio of the length of a pole and its shadow is $1:\sqrt{3}$.



$\therefore \tan\theta = \frac{1}{\sqrt{3}}$

$\Rightarrow \theta = 30°$

2) A ladder of $10\ m$ length touches a wall at height of $5\ m$. The angle θ made by it with the horizontal is

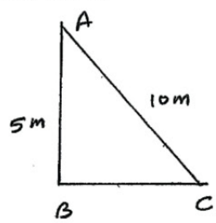
a) $90°$ **b)** $60°$ **c)** $45°$ **d)** $30°$

Solution: Ans: d) $30°$

Let Angle between wall and ladder be θ.

Height of the wall $AB = 5\ m$.

Length of ladder $AC = 10\ m$.



$\therefore \sin\theta = \frac{AB}{AC} \Rightarrow \sin\theta = \frac{5}{10} = \frac{1}{2}$

$\Rightarrow \theta = 30°$

3) The measure of angle of elevation of top of tower $75\sqrt{3}\ m$ high from a point at a distance of $75\ m$ from foot of tower in a horizontal plane is

a) $30°$ **b)** $60°$ **c)** $90°$ **d)** $45°$

Solution: Ans: b) $60°$

Height of the tower $AB = 75\sqrt{3}\ m$ and distance between tower and a point is $75\ m$.

$\therefore \tan\theta = \frac{AB}{BC} = \frac{75\sqrt{3}}{75} = \sqrt{3}$

$\therefore \theta = 60°$

4) If the altitude of the sun is $60°$, the hight of a tower which casts a shadow of length $30\ m$ is

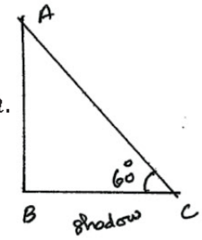
a) $30\sqrt{3}m$ **b)** $\frac{30}{3}\sqrt{3}m$ **c)** $15\sqrt{3}m$ **d)** $15\ m$

Solution: Ans: a) $30\sqrt{3}m$

Let AB be the tower.

The shadow of a tower $BC = 30\ m$.

Sun's altitude is $60°$



$\therefore \tan 60° = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{AB}{30}$

$\therefore AB = 30\sqrt{3}m$

Hence height of the tower $AB = 30\sqrt{3}m$

5) The length of the string of a kite flying at $100\ m$ above the ground with the elevation of $60°$ is

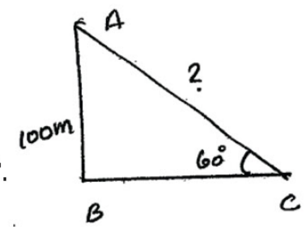
a) $100\ m$ **b)** $100\sqrt{2}m$ **c)** $\frac{200}{\sqrt{3}}$ **d)** $200\ m$

Solution: Ans: c) $\frac{200}{\sqrt{3}}m$

Let AC be the string.

$AB = 100\ m$.

Angle of elevation is $60°$.



$\sin 60° = \frac{AB}{AC}$

$\frac{\sqrt{3}}{2} = \frac{100}{AC} \Rightarrow AC = \frac{100\times 2}{\sqrt{3}} = \frac{200}{\sqrt{3}}m.$

$\therefore$ length of the string $AC = \frac{200}{\sqrt{3}}m.$

6) The length of the shadow of a $20\ m$ tall pole, on the ground when the sun's elevation is $45°$ is

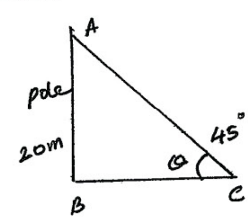
a) $20\ m$ **b)** $20\sqrt{2}m$ **c)** $50\ m$ **d)** $40\sqrt{2}m$

Solution: Ans: a) $20\ m$.

The pole of height $AB = 20\ m$.

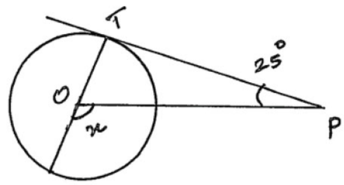
The shadow of the pole AB is BC.

Angle of elevation is $45°$



$\therefore \tan 45° = \frac{AB}{BC}$

$1 = \frac{20}{BC} \Rightarrow BC = 20\ m.$



$\therefore \angle OTP = 90°$

In $\Delta OTP, \angle OTP = 90°$

and $\angle TPO = 25°$

$\therefore x = 90 + 25 = 115°$

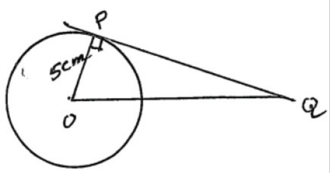
[exterior angle is sum of two interior opposite angle].

15) A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q such that OQ=12 cm. Length PQ is

a) $12\ cm$ **b)** $13\ cm$

c) $8.5\ cm$ **d)** $\sqrt{119}\ cm$

Solution: **Ans**: d) $\sqrt{119}$



Given, PT is a tangent to the circle at P and radius $OP = 5\ cm, OQ = 12\ cm.$

In right angled triangle OPQ,

$OQ^2 = OP^2 + PQ^2 \implies 12^2 = 5^2 + PQ^2$

$144 = 25 + PQ^2$

$\therefore PQ^2 = 144 - 25 = 119$

$\therefore PQ = \sqrt{119}$

16) From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm. The radius of the circle is

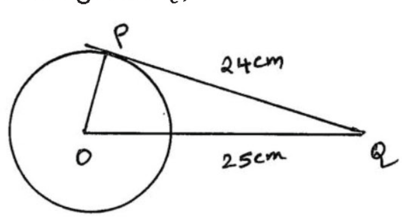
a) $7\ cm$ **b)** $12\ cm$ **c)** $15\ cm$ **d)** $24.5\ cm$

Solution: Ans: a) $7\ cm.$

From the point Q, the length of the tangent $PQ = 24\ cm.$

$OP = 25\ cm$ and OP is radius.

In right angled triangle OPQ,



$OQ^2 = OP^2 + PQ^2 \implies 25^2 = OP^2 + 24^2$

$OP^2 = (25 + 24)(25 - 24) = (49)(1)$

$\therefore OP = \sqrt{49} = 7\ cm$

17) How many parallel tangents can a circle have?

a)1 **b)2**

c)infinite **d)none.**

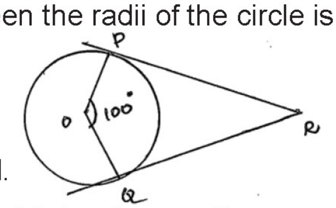
Ans: c)infinite

18) If the angle between the radii of a circle is $100°$, then the angle between the tangents at the end of these two radii is

a) $50°$ **b)** $60°$ **c)** $80°$ **d)** $90°$

Solution: Ans: c) $80°$

Given that angle between the radii of the circle is $100°$.



ie $\angle POQ = 100°$

$POQR$ is a quadrilateral.

By the definition of Quadrilateral, opposite angles are supplimentary

$\therefore \angle POQ + \angle PRQ = 180°$

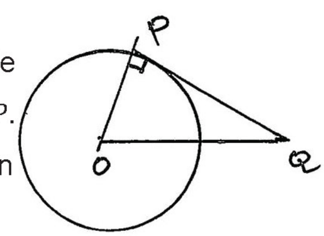
$100 + \angle PRQ = 180°$

$\therefore \angle PRQ = 180 - 100 = 80°$

19) PQ is a tangent to a circle with centre O at the point P. If ΔOPQ is an isosceles triangle, then $\angle OQP$ is equal to

a) $30°$ **b)** $45°$ **c)** $60°$ **d)** $90°$

Solution: Ans: b) $45°$



PQ is a tangent to the circle with centre O at the point P.

Also, given that ΔOPQ is an isosceles triangle.

$\therefore \angle POQ = \angle PQO = x.$

$\angle OPQ = 90°$[tangent is $\perp r$ to the radius through the point of contact].

In ΔOPQ,

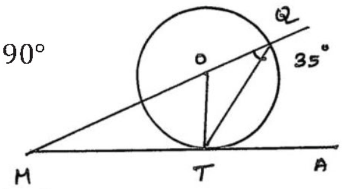
$\angle OPQ + \angle PQO + \angle POQ = 180°$

$90° + x + x = 180°$

$2x = 180 - 90 = 90° \implies x = \frac{90}{2} = 45°$

$\therefore \angle OQP = 45°$

We know that, $\angle OTA = 90°$



(Since radius is $\perp r$ to the tangent at the point of contact)

$\angle OTA = \angle OTQ + \angle ATQ$

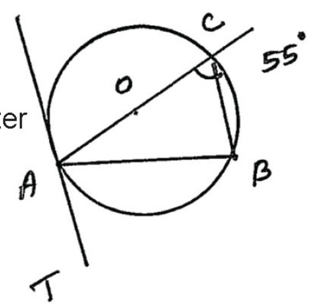
$90° = 35° + \angle ATQ$

$\therefore \angle ATQ = 90 - 35 = 55°$

37) In the given figure, AB is a chrod of circle and AOC is diameter such that angle $ACB = 55°$. If AT is a tangent to the circle at point A, then angle BAT is

a) $65°$ **b)** $40°$ **c)** $50°$ **d)** $55°$

Solution: **Ans**: d) $55°$



From the figure, AB is a chord and AOC is a diameter the circle with centre O.

Given that $\angle ACB = 55°$

We know that $\angle ABC = 90°$

(Since angle in the semi circle is $90°$)

In right angled triangle ABC,

$\angle ABC + \angle ACB + \angle BAC = 180°$

$90 + 55 + \angle BAC = 180°$

$145 + \angle BAC = 180°$

$\therefore \angle BAC = 180 - 145 = 35°$

We know that $\angle CAT = 90°$

$\angle CAB + \angle BAT = 90°$

$35 + \angle BAT = 90°$

$\therefore \angle BAT = 90 - 35 = 55°$

38) In the figure, if PA and PB are tangents to the circle with centre O such that $\angle APB = 50°$, then $\angle OAB$ is

a) $25°$ **b)** $30°$ **c)** $50°$ **d)** $40°$

Solution: **Ans**: a) $25°$

From the figure, PA and PB are tangents and $\angle APB = 50°$

$APBO$ is a quadrilateral

$\therefore \angle APB + \angle AOB = 180°$

$50 + \angle AOB = 180$

$\angle AOB = 180 - 50 = 130°$

In $\Delta OAB, OA = OB(radii)$

$\therefore \Delta OAB$ is an isosceles triangle.

$\Rightarrow \angle OAB = \angle OBA$

Let $\angle OAB = \angle OBA = x$

In $\Delta OAB, \angle OAB + \angle OBA + \angle AOB = 180°$

$x + x + 130° = 180°$

$2x + 130° = 180°$

$2x = 180 - 130 = 50$

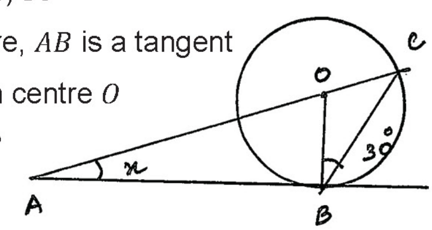
$x = \frac{50}{2} = 25°$

$\therefore \angle OAB = x = 25°$

39) In the given figure, $\angle OBC = 30°$, then the value of x is

a) $100°$ **b)** $110°$ **c)** $30°$ **d)** $15°$

Solution: **Ans**: c) $30°$



In the given figure, AB is a tangent to the circle with centre O and $\angle OBC = 30°$

$\therefore \angle OCB = 30°$

[Since OBC is an isosceles triangle. $OB = OC = radius$]

In ΔOBC,

$\angle OBC + \angle OCB + \angle BOC = 180°$

$30 + 30 + \angle BOC = 180°$

$\therefore \angle BOC = 180 - 60 = 120°$

AC is a straight line.

$\therefore \angle AOB + \angle BOC = 180°$

$\angle AOB + 120° = 180°$

$\therefore \angle AOB = 180 - 120 = 60°$

We know that $\angle OBA = 90°$

The diameter of two given circles are $36\ cm$ and $20\ cm$ respectively.

$\therefore r_1 = \frac{36}{2} = 18$ and $r_2 = \frac{20}{2} = 10\ cm.$

As per the condition.

$2\pi r = 2\pi r_1 + 2\pi r_2 = 2\pi(r_1 + r_2) = 2\pi(18 + 10)$

$= 2\pi(28)$

$\therefore r = 28\ cm.$

3) The diameter of a circle whose area is equal to the sum of the areas of two circles of radius $24\ cm$ and $7\ cm$ is

a) $31\ cm$ b) $25\ cm$ c) $62\ cm$ d) $50\ cm$

Solution: Ans: d) $50\ cm$

Let r be the radius of the required circle.

The radius of two given circles are $24\ cm$ and $7\ cm$ respectively.

As per the condition,

$\pi r^2 = \pi(24^2 + 7^2) = \pi(576 + 49) = \pi(625)$

$\Longrightarrow r^2 = 625 \Longrightarrow r = 25$

$\therefore$ diameter of the circle is $2r = 2(25) = 50\ cm$

4) If the area of the circle is $64\ \pi\ cm^2$, then its circumference is

a) $7\ \pi\ cm$ b) $16\ \pi$
c) $14\ \pi\ cm$ d) $21\ \pi\ cm$

Solution: Ans: b) $16\ \pi\ cm$

Let r be the radius of the circle.

Then $\pi r^2 = 64\pi \Longrightarrow r^2 = 64$

$r = \sqrt{64} = 8\ cm.$

The circumference of the circle is

$2\pi r = 2\pi(8) = 16\ \pi\ cm.$

5) If the areas of two circles are in the ratio $4:9$ then the ratio of the perimeter of their semi-circles is

a) $2:3$ b) $3:2$ c) $1:2$ d) $1:3$

Solution: Ans: a) $2:3$

Let the radius of two circles be r_1 and r_2.

Given that $\pi {r_1}^2 : \pi {r_2}^2 = 4:9 \Longrightarrow {r_1}^2 : {r_2}^2 = 4:9$

$\Longrightarrow r_1 : r_2 = 2:3$

Let p_1 and p_2 be the perimeter of two semi circles.

Here $p_1 = \pi r_1 + 2r_1$ and

$p_2 = \pi r_2 + 2r_2$

Now $p_1 : p_2 = (\pi r_1 + 2r_1) : (\pi r_2 + 2r_2)$

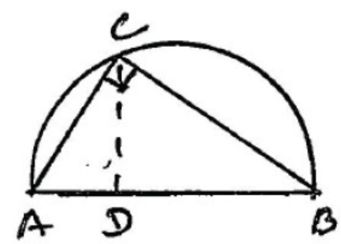
$= r_1(\pi + 2) : r_2(\pi + 2) = r_1 : r_2 = 2:3$

6) The area of the largest triangle that can be inscribed in a semi-circle of radius r is

a) $2r$ b) r^2 c) r d) $\sqrt{r}$

Solution: Ans: b) r^2

Let r be the radius of the circle.



Area of $\Delta ABC = \frac{1}{2} base \times height = \frac{1}{2} \times AB \times CD$

Clearly it is given that the triangle is largest, so the height CD is maximum value.

The maximum value of CD is r.

$\therefore$ Area of the $\Delta ABC = \frac{1}{2} \times AB \times CD = \frac{1}{2} \times 2r \times r$

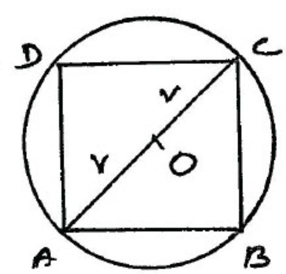
Area of the $\Delta ABC = r^2$

7) A square $ABCD$ is inscribed in a circle of radius $'r'$. The area of the square units is

a) $3r^2$ b) $2r^2$ c) $4r^2$ d) r^2

Solution: Ans: b) $2r^2$

Let r be the ratdius of the circle and $'a'$ be the side of the square.



In a square,

The diagonal $AC = 2r$

But $AC = \sqrt{AB^2 + BC^2} = \sqrt{a^2 + a^2} = \sqrt{2a^2}$

ie $2r = \sqrt{2a^2} = a\sqrt{2}$

ie, $\frac{x+x+3+x+6+x+9+x+12}{5} = 10$

$\frac{5x+50}{5} = 10 \Rightarrow 5x + 30 = 50 \Rightarrow 5x = 50 - 30$

$\Rightarrow 5x = 20 \Rightarrow x = \frac{20}{5} = 4$

$x = 4$

23) If the median of the data $24, 25, 26, x+2, x+3, 30, 31, 34$ is 27.5 then $x =$

a) 27 **b) 25** **c) 28** **d) 30**

Solution: Ans: b) 25

Total number of terms $= 8$

The median = The value of $\frac{1}{2}[\frac{8}{2} th\ term + \left(\frac{8}{2}+1\right)^{th} term]$

= value of $\frac{1}{2}[4^{th} term\ +\ 5^{th}\ term] = \frac{1}{2}[x+2+x+3] = \frac{1}{2}[2x+5]$

Given that median of the data is 27.5

ie, $\frac{1}{2}[2x+5] = 27.5$

$2x + 5 = 55 \Rightarrow 2x = 55 - 5 \Rightarrow 2x = 50$

$x = 25$

24) If the median of the data $6, 7, x-2, x, 17, 20$ written in ascending order is 16. Then $x =$

a) 15 **b) 16** **c) 17** **d) 18**

Solution: Ans: c) 17

Total number of terms $= 6$. (Even)

Median = The value of $\frac{1}{2}\left[\frac{6^{th}}{2}\ term + \left(\frac{6}{2}+1\right)^{th} term\right]$

= The value of $\frac{1}{2}[3^{rd} term +\ 4^{th}\ term] = \frac{1}{2}[x-2+x] = \frac{1}{2}[2x-2] = \frac{1}{2} \times 2(x-1) = x-1$

But, median of given data is 16

$x - 1 = 16 \Rightarrow\ x = 17$

25) The median of first 10 prime number is

a) 11 **b) 12** **c) 13** **d) 14**

Solution: Ans: b) 12

First 10 prime numbers are $2, 3, 5, 7, 11, 13, 17, 19, 23, 29$

Total number of terms $= 10$

Median = The value of $\frac{1}{2}\left[\frac{10^{th}}{2}\ term + \left(\frac{10}{2}+1\right)^{th} term\right]$ = The value of $\frac{1}{2}[5^{th}\ term +\ 6^{th}\ term]$

$= \frac{1}{2}[11+13] = \frac{24}{2} = 12$

26) If the mode of the data $64, 60, 48, x, 43, 48, 43, 34$ is 43, then $x + 3 =$

a) 44 **b) 45** **c) 46** **d) 48**

Solution: Ans: c) 46

47) For the following distribution the upper limit of the median class is

Class	0-5	6-11	12-17	18-23	24-29
Frequency	13	10	15	8	11

a) $\mathbf{18.5}$ b) $\mathbf{20.5}$ c) $\mathbf{25.5}$ d) $\mathbf{17.5}$

Solution: Ans: d) 17.5

Class	0.5-5.5	5.5-11.5	11.5-17.5	17.5-23.5	23.5-29.5
Frequency	13	10	15	8	11
Cf	13	23	38	46	57

Here $N = 57 \implies \frac{n}{2} = \frac{57}{2} = 28.5$

28.5 lies in the interval $11.5 - 17.5$

So, the median class is $11.5 - 17.5$

∴ upper limit of the median class is 17.5

48) For the following distribution the model class is

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
Number of Students	3	12	27	57	75	80

a) $\mathbf{10-20}$ b) $\mathbf{20-30}$ c) $\mathbf{30-40}$ d) $\mathbf{50-60}$

Solution: Ans: c) $30 - 40$

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Number of Students	3	12	27	57	75	80
Cf	3	9	15	30	18	5

Highest frequency is 30 which belongs is $30 - 40$.

Hence Model class is $30 - 40$.

49) Consider the data,

Class	65 - 85	85 - 105	105 - 125	125 - 145	145 - 165	165 - 185	185 - 205
F	4	5	13	20	14	7	4

The difference of the upper limit of the median class and the lower limit of the modal class is

a) $\mathbf{0}$ b) $\mathbf{19}$ c) $\mathbf{20}$ d) $\mathbf{38}$

Solution: Ans: c) 20

Class	65 - 85	85 - 105	105 - 125	125 - 145	145 - 165	165 - 185	185 - 205
F	4	5	13	20	14	7	4
Cf	4	9	22	42	56	63	67

Here $n = 67 \implies \frac{n}{2} = \frac{67}{2} = 33.5$

33.5 lies in the class interval $125 - 145$

So, median class is $125 - 145$

Highest frequency is 20 which lies in $125 - 145$

Hence the Model class is $125 - 145$

The difference of the upper limit of the median class and lower limit of the model class is $145 - 125 = 20$

27) Which of the following cannot be the probability of occurrence of an event?

a) 0.2 b) 0.4 c) 0.8 d) 1.6

Ans: d) 1.6

28) A number is selected from first 50 natural numbers. What is the probability that it is a multiple of 3 or 5?

a) $\frac{18}{25}$ b) $\frac{81}{37}$ c) $\frac{12}{25}$ d) $\frac{23}{50}$

Solution: Ans: d) $\frac{23}{50}$

$S = \{1, 2, 3, \dots\dots 50\}$ $\therefore n(s) = 50$

Let A denote event of getting a number which is multiple of 8 of 5.

multiples of $5 = \{5, 10, 15, 20, 25, 30, 35, 40, 45, 50\}$

$= 10$ numbers.

multiples of $3 = \{3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48\}$

$= 16$ numbers.

Three numbers $15, 30, 45$ which are multiples of 3 and 5.

So, there are $10 + 14 - 3 = 23$ numbers,

Which are either multiple of 3 or 5.

Now, $n(A) = 23$.

Hence, required probability $P(A) = \frac{n(A)}{n(S)} = \frac{23}{50}$.

29) A die is thrown once. The probability of getting a prime number is

a) $\frac{2}{3}$ b) $\frac{1}{3}$ c) $\frac{1}{2}$ d) $\frac{1}{6}$

Solution:

$S = \{1, 2, 3, 4, 5, 6\}$ $n(s) = 6$

Let A denote the event of getting a prime number. $A = \{2, 3, 5\}$ $n(A) = 3$

Hence, required probability $P(A) = \frac{n(A)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

30) Two different coins are tossed simultaneously. The probability of getting at least one head is

a) $\frac{1}{4}$ b) $\frac{1}{8}$ c) $\frac{3}{4}$ d) $\frac{7}{8}$

Solution: Ans: c) $\frac{3}{4}$

$S = \{HH, HT, TH, TT\}$ $\therefore n(s) = 4$

Let A denote the event of getting at least one head. $A = \{HH, HT, TH\}$ $\therefore n(A) = 3$

Hence, required probability $P(A) = \frac{n(A)}{n(S)} = \frac{3}{4}$

31) If two different dice are rolled together, the probability of getting an even number on both dice, is

a) $\frac{1}{36}$ b) $\frac{1}{2}$ c) $\frac{1}{6}$ d) $\frac{1}{4}$

Solution: Ans: d) $\frac{1}{4}$

$S = \{(1,1), \dots\dots\dots\dots (6,6)\}$ $\therefore n(s) = 36$

Let A denote the event of getting an even number on both dice.

$$A = \begin{Bmatrix} (2,2), (2,4), (2,6) \\ (4,2), (4,4), (4,6) \\ (6,2), (6,4), (6,6) \end{Bmatrix} \qquad n(A) = 9$$

Hence, required probability $P(A) = \frac{n(A)}{n(S)} = \frac{9}{36} = \frac{1}{4}$

32) A card is drawn at random from a pack of 52 cards. The probability that the drawn card is not an ace is

a) $\frac{1}{13}$ b) $\frac{9}{13}$ c) $\frac{4}{13}$ d) $\frac{12}{13}$

Solution: Ans: d) $\frac{12}{13}$

Total number cards $n(S) = 52$

Let A denote, event of getting an ace card.

$n(A) = 4$ $P(A) = \frac{n(A)}{n(S)} = \frac{4}{52} = \frac{1}{13}$

Let A' denote event of getting not an ace. $\therefore$,

$P(A') = 1 - P(A) = 1 - \frac{1}{13} = \frac{13-1}{13} = \frac{12}{13}$