Grade 10 Tamil Nadu Mathematics 2024

PART – I

Q1. If $n(A \times B) = 6$ and $A = \{1,3\}$, then $n(B)$ is:

(a) 1

(b) 2

(c) 3

(d) 6

Solution:

Correct answer: (c)

$n(A \times B) = 6$

$n(A) = 2$

$n(A \times B) = n(A) \times n(B)$

$6 = 2 \times n(B)$

$n(B) = \frac{6}{2} = 3$

Q2. If $f: A \rightarrow B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to:

(a) 7

(b) 49

(c) 1

(d) 14

Solution:

Correct answer: (a)

In a bijective function, $n(A) = n(B)$

$\Rightarrow n(A) = 7$

Q3. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is

(a) 2025

(b) 5220

(c) 5025

(d) 2520

Solution:

Correct answer: (d)

LCM of all the numbers from 1 to 10 is 2520.

Hence, 2520 is the lease number that is divisible by all the numbers from 1 to 10.

Q4. An A.P. consists of 31 terms. If its 16^{th} term is m, then the sum of all the terms of this A.P. is:

(a) 16 m

(b) 62 m

(c) 31 m

(d) $\frac{31}{2}$ m

Solution:

Correct answer: (c)

$t_{16} = m$

$S_{31} = \left(\frac{31}{2}\right)(2a + 30d)$

$= \left(\frac{31}{2}\right)(2(a + 15d))$

$(\because t_{16} = a + 15d)$

$= 31(t_{16}) = 31\, m$

Q5. Which of the following should be added to make $x^4 + 64$ a perfect square ?

(a) $4x^2$

(b) $16x^2$

(c) $8x^2$

(d) $-8x^2$

Solution:

Correct answer: (b)

$x^2 + 64 = (x^2)^2 + 82 - 2 \times (x^2) \times 8$

$= (x^2 - 8)^2$

$2 \times (x^2) \times 8$ must be added i.e., $16x^2$ must be added.

Q6. Graph of a linear equation is a:

(a) straight line

(b) circle

(c) parabola.

(d) hyperbola

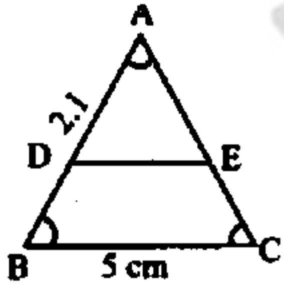
Solution:

Correct answer: (a)

The graph of a linear equation is always a straight line.

Q7. If in $\triangle ABC, DE \| BC, AB = 3.6$ cm, AC = 2.4 cm and AD = 2.1 cm then the length of AE is:

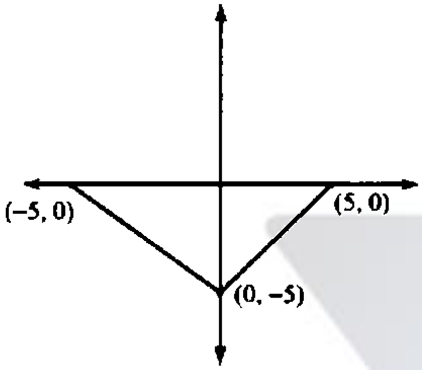
(a) 1.4 cm

(b) 1.8 cm
(c) 1.2 cm
(d) 1.05 cm
Solution:
Correct answer: (a)


$\frac{AB}{AD} = \frac{AC}{AE}$
$\frac{3.6}{2.1} = \frac{2.4}{AE}$
$(3.6) \times (AE) = 2.1 \times 2.4$
$AE = 1.4$ cm

Q8. How many tangents can be drawn to the circle from an exterior point?
(a) One
(b) Two
(c) Infinite
(d) Zero
Solution:
Correct answer: (b)
From an exterior point, two tangents can be drawn to a circle.

Q9. The area of triangle formed by the points $(-5,0), (0,-5)$ and $(5,0)$ is:
(a) 0 sq. units
(b) 25 sq. units
(c) 5 sq. units
(d) 10 sq. units
Solution:
Correct answer: (b)



$$\Delta = \frac{1}{2}\begin{vmatrix} -5 & 0 & 5 & -5 \\ 0 & -5 & 0 & 0 \end{vmatrix}$$

$$= \frac{1}{2}(25 - (-25))$$

$= \frac{1}{2}(50) = 25$ sq. units.

Q10. If $x = atan\ \theta$ and $y = bsec\ \theta$, then:

(a) $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$

(b) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

(c) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

(d) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 0$

Solution:

Correct answer: (a)

$$x = a\tan\ \theta \Rightarrow \frac{x}{a} = \tan\ \theta$$

$$y = b\sec\ \theta \Rightarrow \frac{y}{b} = \sec\ \theta$$

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = \tan^2\ \theta - \sec^2\ \theta$$

$$= \sec^2\ \theta - 1 - \sec^2\ \theta$$

$$\Rightarrow \frac{x^2}{a^2} - \frac{y^2}{b^2}. = -1$$

$$\Rightarrow \frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$$

Q11. The curved surface area of a right circular cylinder of height 4 cm and base diameter 10 cm is:

(a) 40π sq. cm

(b) 20π sq. cm
(c) 14π sq. cm
(d) 80π sq. cm
Solution:
Correct answer: (a)
Given that the base diameter is 10 cm, the radius (r) is half of the diameter, so $r = \frac{10}{2} = 5\ cm$. Height (h) = 4 cm.
So, the curved surface area of the cylinder is $2\pi rh$.
$= 2 \times \pi \times 5 \times 4$
$= 40\pi$ sq. cm

Q12. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is:
(a) 1: 2: 3
(b) 2: 1: 3
(c) 1: 3: 2
(d) 3: 1: 2
Solution:
Correct answer: (d)
Let $2r$ be the diameter of cylinder, cone of sphere.
$\therefore$ Height of sphere $= 2r$
Then height of cone $=$ Height of cylinder $= 2r$.
Now, $V_1 : V_2 : V_3 =$ Volume of cylinder : Volume of cone : Volume of sphere
$= \pi r^2 h : \frac{1}{3}\pi r^2 h : \frac{4}{3}\pi r^3 (\because\ h = 2r)$
$= 2\pi r^3 : \frac{2\pi r^3}{3} = \frac{4\pi r^3}{3}$
$= 2 : \frac{2}{3} : \frac{4}{3}$ (On dividing by πr^3)
$= 6 : 2 : 4$ (On multiplying by 3)
$= 3 : 1 : 2$ (On dividing by 2)
Hence, the ratio of their volumes is 3: 1: 2.

Q13. Which of the following values cannot be a probability of an event?
(a) 0
(b) 0.5
(c) 1.05
(d) 1

Solution:

Correct answer: (c)

The probability of an event cannot be more than 1. Therefore, 1.05 cannot be the probability of an event.

Q14. The probability of getting a job for a person is $\frac{x}{3}$. If the probability of not getting the job is $\frac{2}{3}$, then the value of x is:

(a) 2

(b) 1

(c) 3

(d) 1.5

Solution:

Correct answer: (b)

$$P(\bar{J}) = \frac{2}{3} = 1 - \frac{x}{3}$$

$$\Rightarrow 1 - \frac{x}{3} = \frac{2}{3}$$

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

$$\Rightarrow 3 - x = 2 \Rightarrow x = 1$$

PART – II

Q15. If $A \times B = \{(3,2),(3,4),(5,2),(5,4)\}$ then find A and B.

Solution:

$A = \{3, 5\}$

$B = \{2, 4\}$

Q16. If $f(x) = 3x - 2, g(x) = 2x + k$ and $f \circ g = g \circ f$, then find the value of k.

Solution:

$f \circ g = g \circ f$

$(3x - 2) \circ (2x + k) = (2x + k) \circ (3x - 2)$

$3(2x + k) - 2 = 2(3x - 2) + k$

$6x + 3k - 2 = 6x - 4 + k$

$2k = -2$

$k = -1$

Q17. ' a ' and ' b ' are two positive integers such that $a^b \times b^a = 800$. Find ' a ' and ' b '.

Solution:

$a^b \times b^a = 800$

$5^2 \times 2^5 = 800$

Therefore, $a = 2, b = 5$ or $a = 5, b = 2$

Q18. Simplify: $\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4}$

Solution:

$\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4}$

$= \frac{3xz^3}{y^3}$

Q19. Find the sum and product of the roots for following quadratic equation.

$x^2 + 8x - 65 = 0.$

Solution:

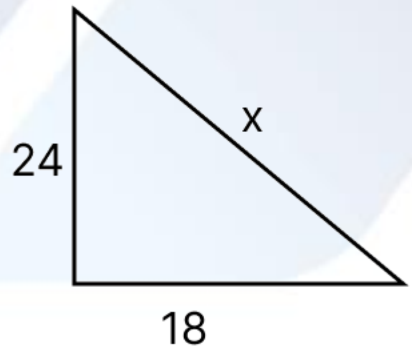
$a = 1, b = 8, c = -65$

Sum of the roots = $-\frac{b}{a} = -\frac{8}{1} = -8.$

Product of the roots = $\frac{c}{a} = -\frac{65}{1} = -65$

Q20. A man goes 18 m due East and then 24 m due North. Find the distance of his current position from the starting point.

Solution:



Applying Pythagorean theorem in the above right-angled triangle, we get

$x^2 = 18^2 + 24^2$

$= 324 + 576$

$x^2 = 900$

$x = 30\ m$

Q21. If the points $A(-3,9), B(a,b)$ and $C(4,-5)$ are collinear and if $a+b=1$, then find a and b.

Solution:

Slope of AB = Slope of BC

$$\frac{b-9}{a+3}=\frac{-5-9}{4+3}$$

$$\frac{b-9}{a+3}=\frac{-14}{7}$$

$$\frac{b-9}{a+3}=-2$$

$b-9=-2(a+3)$

$b-9=-2a-6$

$2a+b=3$ ....(1)

$a+b=1$ ....(2)

$(1)-(2)$

$a=2$

Sub $a=2$ in (2), we get

$2+b=1$

$b=-1$

Q22. Find the equation of a straight line which has slope $\frac{-5}{4}$ and passing through the point $(-1,2)$.

Solution:

$m=-\frac{5}{4}$ and $(x_1,\ y_1)=(-1,2)$

Equation of a line is given by

$y-y_1=m(x-x_1)$

$y-2=-\frac{5}{4}(x+1)$

$4(y-2)=-5(x+1)$

$4y-8=-5x-5$

$5x+4y-3=0$

Q23. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}=\operatorname{cosec}\theta+\cot\theta$.

Solution:

LHS

$$=\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}$$

$$= \sqrt{\frac{1+\cos\ \theta}{1-\cos\ \theta}} \times \sqrt{\frac{1+cos\theta}{1+cos\theta}}$$
$$= \sqrt{\frac{(1+cos\theta)^2}{1-\cos^2\theta}}$$
$$= \sqrt{\frac{(1+cos\theta)^2}{\sin^2\theta}}$$
$$= \frac{1+cos\theta}{sin\ \theta} = \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$$
$= coesec\ \theta + \cot\theta$ = RHS.

Q24. If the base area of a hemispherical solid is 1386 sq. metres, then find its total surface area.

Solution:

Area of a hemisphere = $\pi r^2 = 1386$ sq. m

Total surface area of a hemisphere = $3\pi r^2 = 3 \times 1386 = 4158$ sq. m.

Q25. Find the volume of cylinder whose height is 2 m and base area is 250 sq. m.

Solution:

Volume of a cylinder $= \pi r^2 h$

$h = 2\ m$ and $\pi r^2 = 250\ m^2$

Volume of the given cylinder = $2 \times 250 = 500\ m^3$.

Q26. Find the range and coefficient of range of the following data:

25,67,48,53,18,39,44

Solution:

$Range = maximum\ value - minimum\ value$

$= 67 - 18 = 49$

Coefficient of Range = $\frac{Maximum\ value\ -\ minimum\ value}{Maximum\ value\ +\ minimum\ value}$

$$= \frac{67-18}{67+18} = \frac{49}{85} = 0.576$$

Q27. What is the probability that a leap year selected at random will contain 53 Saturdays?

Solution:

366 days = 52 weeks + 2 days

Sample space = $\{SM, MT, TW, WT, TF, FS, SS\}$

$n(s) = 7$

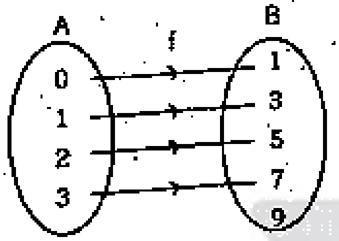
A $=\{FS, SS\}$
$n(A) = 2$
$P(A) = \frac{n(A)}{n(s)} = \frac{2}{7}$

Q28. Find the HCF of 23 and 12.
Solution:
$23 = 23 \times 1$
$12 = 12 \times 1$
Therefore, 1 is the HCF of 23 and 12.

PART – III

Q29. Let A $= \{x \in$ N | $1 < x < 4\}$, B $= \{x \in$ W | $0 \leq x < 2\}$ and C $= \{x \in$ N | $x < 3\}$.
Then verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$.
Solution:
$A = \{2,3\}, B = \{0,1\}, C = \{1,2\}$
$B \cup C = \{0,1,2\}$
LHS = $A \times (B \cup C) = \{2,3\} \times \{0,1,2\}$
$= \{(2,0), (2,1), (2,2), (3,0), (3,1), (3,2)\}$.......(1)
$A \times B = \{(2,0), (2,1), (3,0), (3,1)\}$
$A \times C = \{(2,1), (2,2), (3,1), (3,2)\}$
RHS = $(A \times B) \cup (A \times C) = \{(2,0), (2,1), (2,2), (3,0), (3,1), (3,2)\}$.......(2)
From (1) & (2) LHS $= RHS$.

Q30. Let $A = \{0,1,2,3\}$ and $B = \{1,3,5,7,9\}$ be two sets. Let $f: A \to B$ be a function given by $f(x) = 2x + 1$. Represent this function
(i) by arrow diagram
(ii) in a table form
(iii) as a set of ordered pairs
(iv) in a graphical form
Solution:
$f: A \to B, f(x) = 2x + 1$
$f(0) = 0 + 1 = 1$
$f(1) = 2(1) + 1 = 2 + 1 = 3$
$f(2) = 2(2) + 1 = 4 + 1 = 5$
$f(3) = 2(3) + 1 = 6 + 1 = 7$
(i) Arrow diagram



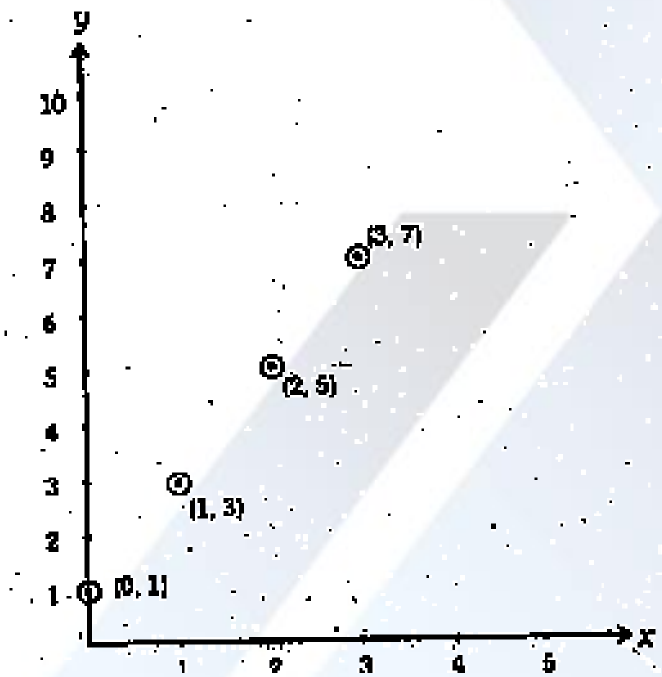
(ii) Table form

x	0	1	2	3
$f(x)$	1	3	5	7

(iii) set of ordered pairs

$\{(0,1),(1,3)(2,5),(3,7)\}$

(iv) Graph



Q31. Find the sum of $9^3+10^3+\cdots+21^3$.

Solution:

$\Rightarrow (9^3+10^3+\cdots+21^3)=(1^3+2^3+3^3+\cdots+21^3)-(1^3+2^3+\cdots+8^3)$

$=\left(\frac{21\times 22}{2}\right)^2-\left(\frac{8\times 9}{2}\right)^2$

$=(21\times 11)^2-(4\times 9)^2$

$=(231)^2-(36)^2$

$=53361-1296$

$=52065$

Q32. Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$.

Solution:

$8x^2$) $64x^4$ - $16x^3$ + $17x^2$ - 2x + 1 ($8x^2$

$64x^4$

(-)

$16x^2$ - x) - $16x^3$ + $17x^2$ (-x

- $16x^3$ + x^2

(-)

$16x^2$ - 2x + 1) $16x^2$ - 2x + 1 (1

$16x^2$ - 2x + 1

(-)

0

Adding the quotients = $8x^2 - x + 1$

The square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$ is $8x^2 - x + 1$.

Q33. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 5A + 7I_2 = 0$.

Solution:

We have, $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

$A^2 = AA = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix}$

So, $A^2 - 5A + 7I$

$= \begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} - 5\begin{bmatrix} 8 & 5 \\ -5 & 3 \end{bmatrix} + 7\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

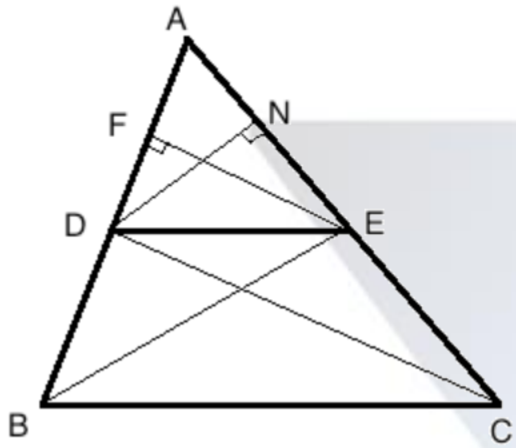
$= \begin{bmatrix} 8 - 15 + 7 & 5 - 5 + 0 \\ -5 + 5 + 0 & 3 - 10 + 7 \end{bmatrix}$

$= \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = 0$

Q34. State and prove Thales Theorem.

Solution:

Statement: If a line is drawn parallel to one side of a triangle, to interest the other two sides at distinct points, the other two sides are divided in the same ratio.



To prove: $\frac{AD}{BD} = \frac{AE}{CE}$

Consider $\triangle$ ABC.Let DE $\parallel$ BC. Drop FE and DN perpendicular to sides AB and AC respectively.

Now,

Area of $\triangle$ ADE $= \frac{1}{2} \times FE \times AD$.......(i)

Area of $\triangle$ ADE $= \frac{1}{2} \times AE \times DN$........(ii)

Also,

Area of $\triangle$ AEB $= \frac{1}{2} \times FE \times AB$ ....(iii)

Area of $\triangle$ ADC $= \frac{1}{2} \times AC \times DN$.........(iv)

Now, since $\triangle$ BDE and $\triangle$ CED are on the same base DE and between two parallel lines DE and BC , therefore,

Area of $\triangle$ BDE $=$ Area of $\triangle$ CED

Adding area of $\triangle$ ADE on both the sides, we get,

Area of $\triangle$ BDE $+\triangle$ ADE $=$ Area of $\triangle$ CED $+\triangle$ ADE

$\Rightarrow$ Area of $\triangle$ AEB $=$ Area of $\triangle$ ADC ....(v)

Now, (i) $\div$ (iii), we get,

$\frac{ar\Delta ADE}{ar\Delta ADC} = \frac{\frac{1}{2}\times FE\times AD}{\frac{1}{2}\times FE\times AB} = \frac{AD}{AB}$ ....(vi)

Now, (ii) $\div$ (iv), we get,

$\frac{ar\ \Delta ADE}{ar\ \Delta AEB} = \frac{\frac{1}{2}\times AE\times DN}{\frac{1}{2}\times AC\times DN} = \frac{AE}{AC}$........(vii)

From (v), (vi) and (vii), we get,

$\Rightarrow \frac{AD}{AB} = \frac{AE}{AC}$ or $\frac{AB}{AD} = \frac{AC}{AE}$

Subtracting 1 from both sides, we get,

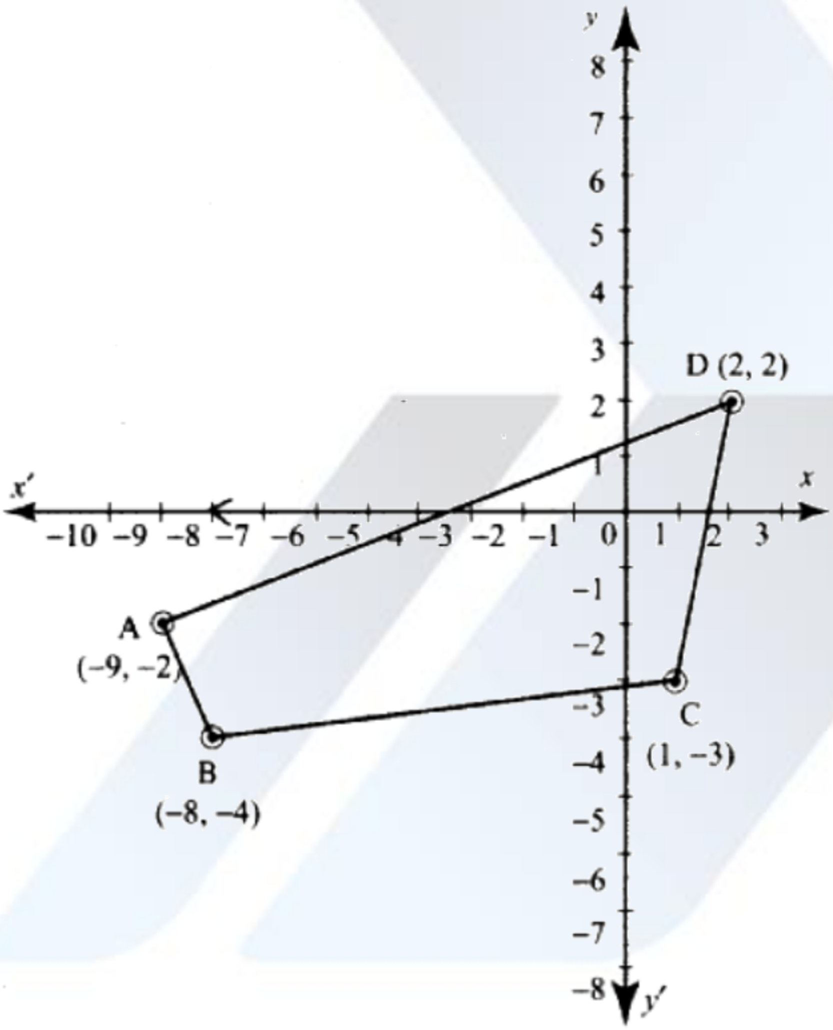
$$\Rightarrow \frac{AB - AD}{AD} = \frac{AC - AE}{AE}$$

$$\Rightarrow \frac{BD}{AD} = \frac{CE}{AE}$$

Thus, $\frac{AD}{BD} = \frac{AE}{CE}$

Q35. Find the area of quadrilateral whose vertices are at $(-9,-2), (-8,-4), (2,2)$ and $(1,-3)$.

Solution:



$(x_1, y_1) = A(-9,-2), (x_2, y_2) = B(-8,-4), (x_3, y_3) = C(1,-3), (x_4, y_4) = D(2,2)$

Area of the quadrilateral is given by

$$= \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{vmatrix} \text{ sq. units}$$

$$= \frac{1}{2}\begin{vmatrix} -9 & -8 & 1 & 2 & -9 \\ -2 & -4 & -3 & 2 & -2 \end{vmatrix} \text{ sq. units.}$$

$$= \frac{1}{2}[(36 + 24 + 2 - 4) - (16 - 4 - 6 - 18)]$$

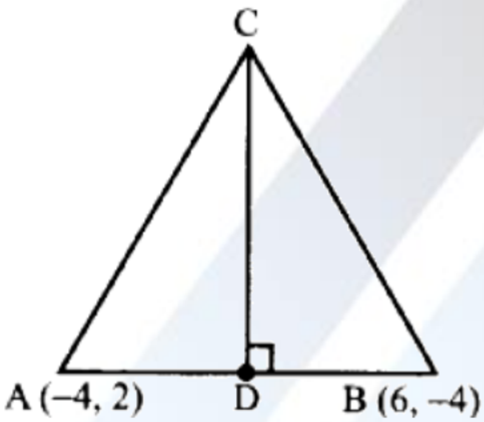
$$= \frac{1}{2}[58 - (-12)]$$

$$= \frac{1}{2}(70)$$

$= 35$ sq. units

Q36. Find the equation of the perpendicular bisector of the line joining the points $A(-4,2)$ and $B(6,-4)$.

Solution:



Mid-point AB is D $\left(\frac{-4+6}{2}, \frac{2+(-4)}{2}\right) = \left(\frac{2}{2}, \frac{-2}{2}\right) = (1, -1)$

Slope of $AB = \frac{-4-2}{6-(-4)} = \frac{-6}{10} = \frac{-3}{5}$

$\therefore$ Slope of CD $= \frac{-1}{-\frac{3}{5}} = \frac{5}{3}$

$[\because CD \perp AB]$

$\therefore$ Equation of CD is

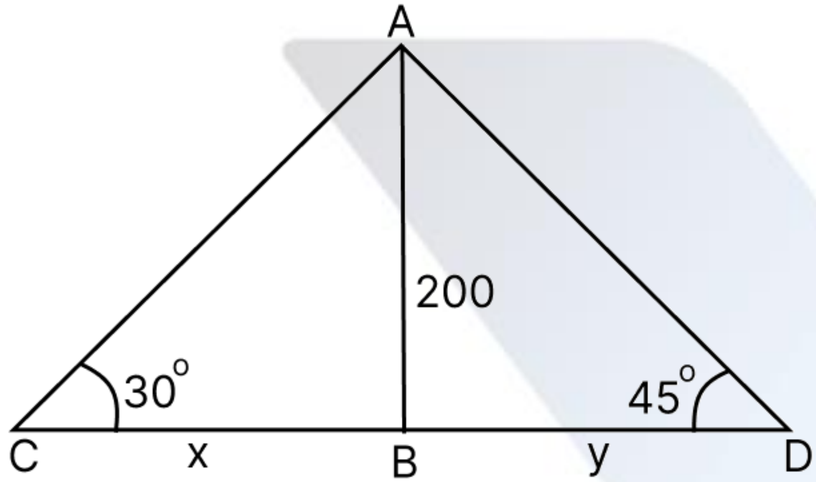
$$y - (-1) = \frac{5}{3}(x - 1)$$

$3(y + 1) = 5x - 5 \Rightarrow 3y + 3 = 5x - 5$

$5x - 3y - 8 = 0$ is the required equation of the line.

Q37. Two ships are sailing in the sea on either sides of a lighthouse. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is 200 m high, find the distance between the two ships. ($\sqrt{3} = 1.732$).

Solution:



In ΔABC,

$\frac{200}{x} = \tan 30°$

$\frac{200}{x} = \frac{1}{\sqrt{3}}$

$x = 200\sqrt{3}$ m

In ΔABD,

$\frac{200}{y} = \tan 45°$

$\frac{200}{y} = 1$

$y = 200$ m

Required distance = $x + y = 200\sqrt{3} + 200$

$= 200(1 + \sqrt{3})$

$= 200 \times 2.732$

$= 546.4$ m

Q38. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.

Solution:

$h = 45\ cm, R = 28\ cm, r = 7\ cm$

Volume of a frustum $V = \frac{\pi h}{3}(R^2 + r^2 + Rr)$

$= \frac{22 \times 45}{7 \times 3} \times (28^2 + 7^2 + 28 \times 7)$

$= \frac{22 \times 15}{7} \times 1029$

$= 22 \times 15 \times 147$
$= 48510\ cm^3$.

Q39. A right circular cylindrical container of base radius 6 cm and height 15 cm is full of ice-cream. The ice-cream is to be filled in cones of height 9 cm and base radius 3 cm, having a hemispherical cap. Find the number of cones needed to empty the container.

Solution:

Volume of the cylindrical container = number of cones × (Volume of the cone + Volume of the hemispherical cap)

$V_1 = n(V_2 + V_3)$

$\pi r_1^2 h_1 = n\left[\frac{1}{3}\pi r_2^2 h_2 + \frac{2}{3}\pi r_2^3\right]$

$\pi \times 6 \times 6 \times 15 = \pi n\left[\frac{3 \times 3 \times 9}{3} + \frac{2 \times 3 \times 3 \times 3}{3}\right]$

$6 \times 6 \times 15 = n(27 + 18)$

$6 \times 6 \times 15 = 45n$

$n = \frac{6 \times 6 \times 15}{45}$

$n = 12$

Q40. Find the coefficient of variation of 24,26,33,37,29,31.

Solution:

$\bar{x} = \frac{24+26+33+37+29+31}{6}$

$= \frac{180}{6}$

$= 30$

x_i	$d_i = x_i - 30$	d_i^2
24	-6	36
26	-4	16
29	-1	1
31	1	1
33	3	9
37	7	49
	0	$\sum d_i^2 = 112$

$\sigma = \sqrt{\frac{\sum d_i^2}{n}} = \sqrt{\frac{112}{6}} = \sqrt{18.67}$

$\sigma = 4.32$

$Coefficient\ of\ variation = \frac{\sigma}{\bar{x}} \times 100\%$

$= \frac{4.32}{30} \times 100 = 1.44 \times 10 = 14.4\%$

Q41. Two dice are rolled once. Find the probability of getting an even number on the first die or the total of face sum 8.

Solution:

Sample space when two dice are thrown is

$$S = \begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

$n(S) = 36$

$A =$ even number on the first die

$A = \{(2,1), \ldots (2,6), (4,1) \cdots (4,6), (6,1) \cdots (6,6)\}$

$n(A) = 18, P(A) = \frac{18}{36}$

$B =$ total of face sum is 8

$B = \{(2,6), (3,5), (4,4), (5,3), (6,2)$

$n(B) = 5, P(B) = \frac{5}{36}$

$A \cap B = \{(2,6), (4,4), (6,2)\}$

$n(A \cap B) = 3, P(A \cap B) = \frac{3}{36}$

$P(A \cup B) = P(A) + P(B) - P(AnB)$

$= \frac{18}{36} + \frac{5}{36} - \frac{3}{36} = \frac{20}{36} = \frac{5}{9}$

Q42. Find the sum to n terms of the series $7 + 77 + 777 +$ .....

Solution:

Given,

$7 + 77 + 777 + \cdots$

Sum of first n terms

$S_n = 7 + 77 + 777 + \cdots .. + (n \text{ terms})$

$S_n = 7(1 + 11 + 111 + \cdots . + n \text{ terms })$

$= \left(\frac{7}{9}\right) [9 + 99 + 999 + \cdots + n \text{ terms }]$

$= \left(\frac{7}{9}\right) [(10 - 1) + (100 - 1) + (1000 - 1) + \cdots . + (10^n - 1)]$

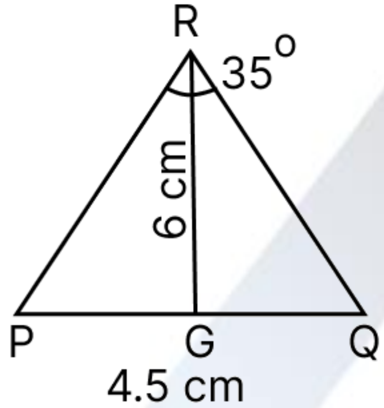
$$= \left(\frac{7}{9}\right)[(10 + 10^2 + 10^3 + \cdots + 10^n) - (1 + 1 + 1 + \cdots + n \text{ terms })]$$
$$= \left(\frac{7}{9}\right)\left\{\left[\frac{10(10^n - 1)}{10 - 1}\right] - n\right\}$$
$$= \left(\frac{7}{9}\right)\left\{\left[\frac{10(10^n - 1)}{9}\right] - n\right\}$$
$$= \left(\frac{70}{81}\right)(10^n - 1) - \frac{7n}{9}$$

PART – IV

Q43. Construct a △ PQR which the base PQ = 4.5 cm, $R = 35^\circ$ and the median RG from R to PQ is 6 cm.

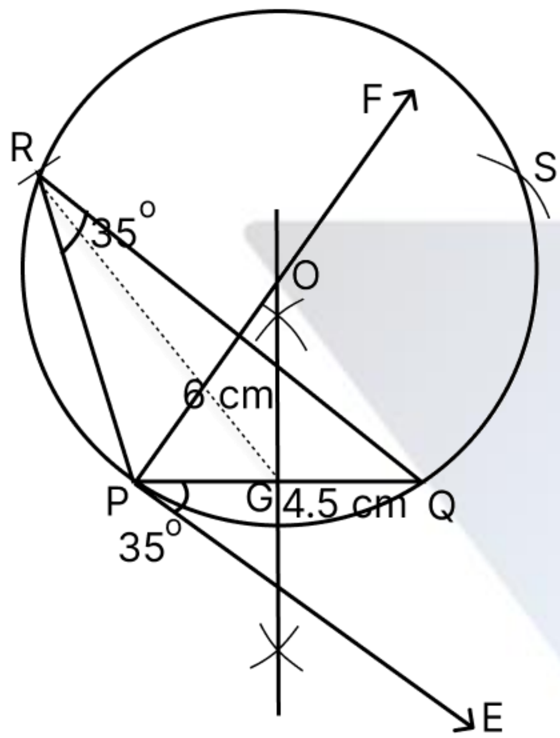
Solution:

Rough diagram:



Steps of construction:

1. Draw a line segment $PQ = 4.5$ cm
2. At P, draw PE such that $\angle QPE = 60^\circ$
3. At P, draw PF such that $\angle EPF = 90^\circ$
4. Draw the perpendicular bisect to PQ, which intersects PF at O and PQ at G
5. With O as centre and OP as radius draw a circle.
6. From G mark arcs of radius 5.8 cm on the circle. Mark them at R and S
7. Join PR and RQ.
8. PQR is the required triangle.



(b) Draw a circle of diameter 6 cm. from a point P, which is 8 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their length.

Solution:

Steps of construction:

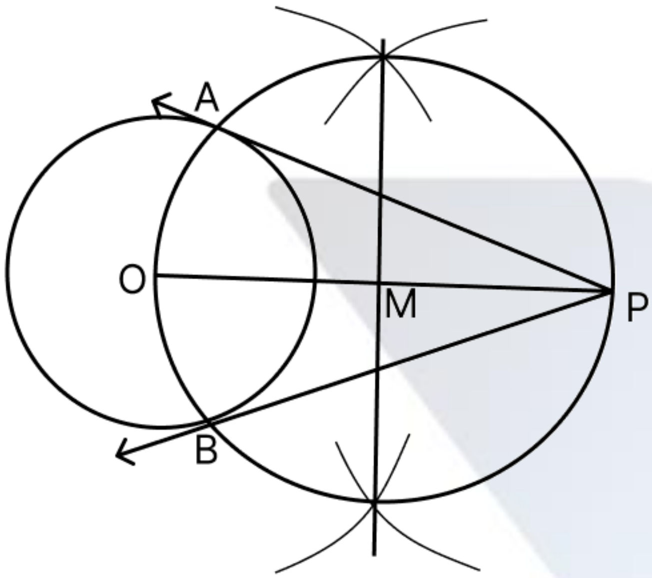
1. With O as centre, draw a circle of radius 3 cm.
2. Draw a line $OP = 8$ cm.
3. Draw a perpendicular bisector of OP, which cuts OP at M.
4. With M as centre and MO as radius, draw a circle which cuts the previous circles A and B.
5. Join AP and BP. AP and BP are the required tangents. Length of the tangents $PA = PB = 7.4$ cm

Verification: In the right-angle triangle OAP

$PA^2 = OP^2 - OA^2 = 8^2 - 3^2 = 64 - 9 = 55$

$PA = \sqrt{55} = 7.4$ cm

Length of the tangents $= 7.4$ cm.



Q44. Draw the graph of $y = 2x^2 - 3x - 5$ and hence solve $2x^2 - 4x - 6 = 0$.

Solution:

Step 1: Draw the graph of $y = 2x^2 - 3x - 5$ by preparing the table of values given below.

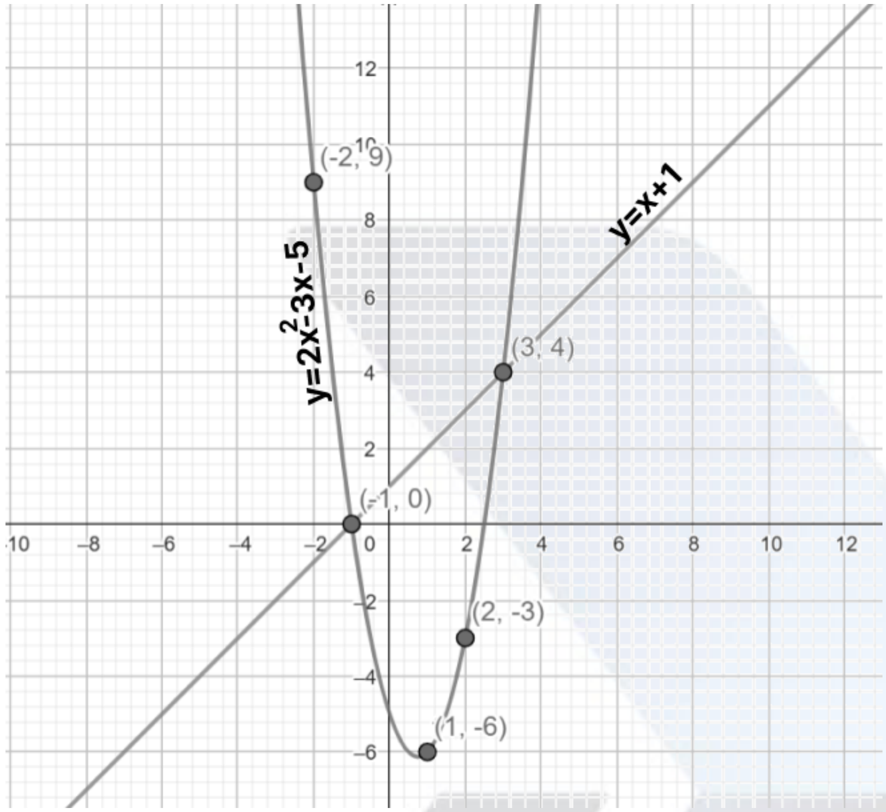
x	-4	-3	-2	-1	0	1	2	3	4
x^2	16	9	4	1	0	1	4	9	16
$2x^2$	32	18	8	2	0	2	8	18	32
$-3x$	12	9	6	3	0	-3	-6	-9	-12
-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
y	39	22	9	0	-5	-6	-3	4	15

Step 2: Plot the points $(-3,22), (-2,9), (-1,0), (0,-5), (1,-6), (2,-3), (3,4), (4,15)$ on the graph sheet using suitable scale.

Step 3: To solve $2x^2 - 4x - 6 = 0$ subtract $2x^2 - 4x - 6 = 0$ from $y = 2x^2 - 3x - 5$. We get $y = x + 1$.

Step 4: $y = x + 1$ is a straight line.

x	-4	-2	0	2	3	4
y	-3	-1	1	3	4	5



Step 5: The straight line intersects the curve at $(-1,0)$ and $(3,4)$.

Step 6: From the two-point draw perpendicular lines to the x-axis it will intersect at -1 and 3. The solution set is $(-1,3)$

(b) Draw the graph of $xy = 24, x, y > 0$. Using the graph find,

(i) y when $x = 3$ and

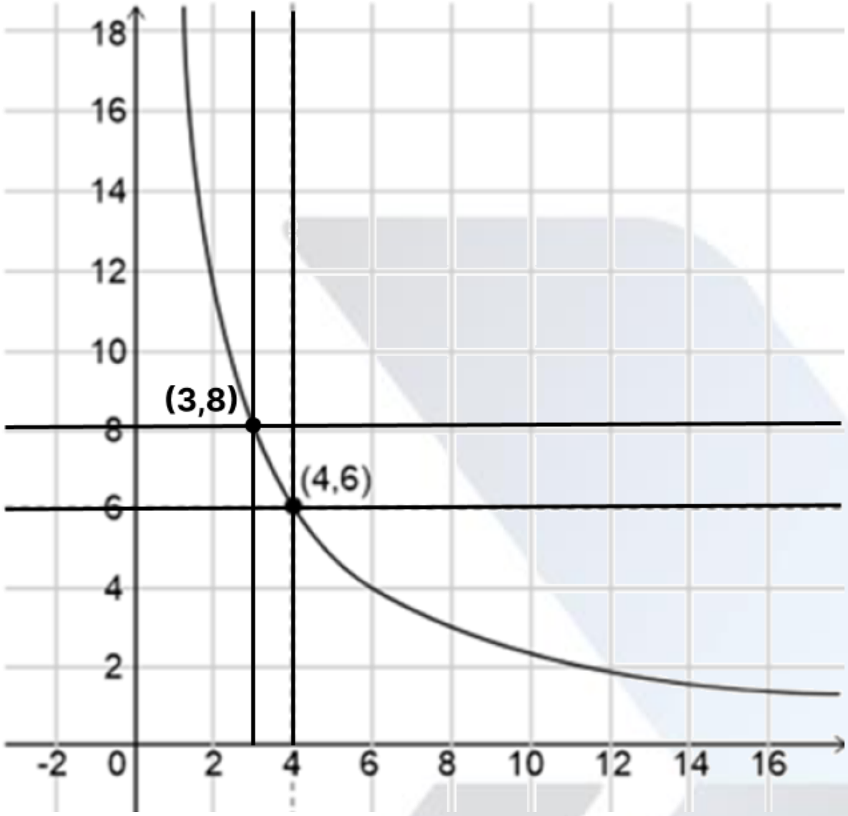
(ii) x when $y = 6$.

Solution:

Given, $xy = 24,\ x, y > 0$.

x	2	3	4	6	8	12
y	12	8	6	4	3	2

Plot the points, $(2,12), (3,8), (4,6), (6,4), (8,3), (12,2)$ on graph.



Hence, from the graph.
when $y = 6$ then $x = 4$.
when $x = 3$ then $y = 8$.