CBSE SAMPLE PAPER - 07

Class 09 - Mathematics

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1. Two points having same abscissa but different ordinates lie on **[1]**

 a) y-axis b) x-axis

 c) a line parallel to y-axis d) a line parallel to x-axis

2. The product of difference of semi-perimeter & respective sides of $\triangle ABC$ are given as 13200 m^2.The area of $\triangle ABC$, if its semi-perimeter is 132 m, is given by **[1]**

 a) 1320 m^2 b) 13200 m^2

 c) 132 m^2 d) $20\sqrt{33}$ m^2

3. A chord of length 14 cm is at a distance of 6 cm from the centre of a circle. The length of another chord at a distance of 2 cm from the centre of the circle is **[1]**

 a) 12 cm b) 16 cm

 c) 14 cm d) 18 cm

4. To draw a histogram to represent the following frequency distribution : **[1]**

Class interval	5-10	10-15	15-25	25-45	45-75
Frequency	6	12	10	8	15

The adjusted frequency for the class 25-45 is

 a) 6 b) 5

c) 2

d) 3

5. An irrational number between $\frac{1}{7}$ and $\frac{2}{7}$ is [1]

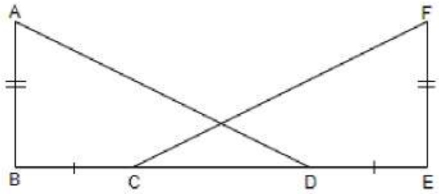
a) $\sqrt{\frac{1}{7} \times \frac{2}{7}}$

b) none of these

c) $\left(\frac{1}{7} \times \frac{2}{7}\right)$

d) $\frac{1}{2}\left(\frac{1}{7} + \frac{2}{7}\right)$

6. In the adjoining figure, AB⊥BE and FE⊥BE. If AB = FE and BC = DE ,then [1]



a) $\triangle ABD \cong \triangle EFC$

b) $\triangle ABD \cong \triangle CEF$

c) $\triangle ABD \cong \triangle ECF$

d) $\triangle ABD \cong \triangle FEC$

7. The graph of the linear equation 2x + 3y = 6 is a line which meets the x-axis at the point [1]

a) (0,3)

b) (3,0)

c) (2, 0)

d) (0 ,2)

8. Which of the following is a true statement? [1]

a) $5x^3$ is a monomial

b) $x^2 + 5x - 3$ is a linear polynomial

c) x + 1 is a monomial

d) $x^2 + 4x - 1$ is a binomial

9. If x =$\sqrt{6} + \sqrt{5}$, then $x^2 + \frac{1}{x^2} - 2 =$ [1]

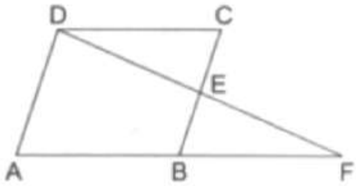
a) $2\sqrt{5}$

b) 20

c) 24

d) $2\sqrt{6}$

10. In given figure, ABCD is a parallelogram and E is the mid-point of BC. DE and AB when produced meet at F. Then, AF = [1]



a) AF = 3AB

b) AF = 3/2 AB

c) $AF^2 = 2AB^2$

d) AF = 2AB

11. When simplified $(x^{-1} + y^{-1})^{-1}$ is equal to [1]

a) xy

b) x + y

c) $\frac{xy}{x+y}$

d) $\frac{x+y}{xy}$

12. The linear equation 3x - 5y = 15 has [1]

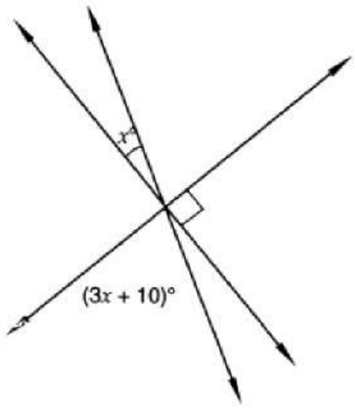
a) no solution

b) infinitely many solutions

c) a unique solution

d) two solutions

13. In Fig., the value of x, is [1]



a) 8°

b) 20°

c) 15°

d) 12°

14. If $2^{-m} \times \frac{1}{2^m} = \frac{1}{4}$, then $\frac{1}{14}\left\{(4^m)^{\frac{1}{2}} + \left(\frac{1}{5^m}\right)^{-1}\right\}$ is equal to **[1]**

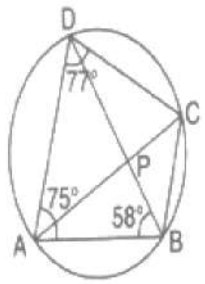
a) 2

b) $-\frac{1}{4}$

c) $\frac{1}{2}$

d) 4

15. In the given figure, ABCD is a cyclic quadrilateral in which $\angle BAD = 75^o$, $\angle ABD = 58^o$ and $\angle ADC = 77^o$, AC and BD intersect at P. the measure of $\angle DPC$ is **[1]**



a) 105^o

b) 94^o

c) 92^o

d) 90^o

16. Ordinate of all points on the y-axis is **[1]**

a) 0

b) -1

c) any number

d) 1

17. Which of the following is not a solution of 2x – 3y = 12? **[1]**

a) (0, -4)

b) (2, 3)

c) (6, 0)

d) (3, -2)

18. If $x^2 - 1$ is a factor of $ax^4 + bx^3 + cx^2 + dx + e$, then **[1]**

a) a + c + e = b + d

b) a + b + c = d + e

c) b + c + d = a + e

d) a + b + e = c + d

19. **Assertion (A):** The consecutive sides of a quadrilateral have one common point. **[1]**

Reason (R): The opposite sides of a quadrilateral have two common point.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** $\sqrt{2}, \sqrt{3}$, are examples of irrational numbers. **[1]**

Reason (R): An irrational number can be expressed in the form $\frac{p}{q}$.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

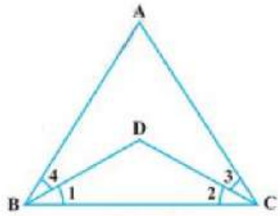
c) A is true but R is false.

d) A is false but R is true.

Section B

21. Given three distinct points in a plane, how many lines can be drawn by joining them? **[2]**

22. In the given figure, we have $\angle ABC = \angle ACB, \angle 4 = \angle 3$. Show that $\angle 1 = \angle 2$. **[2]**



23. In which quadrant will the point lie, if : **[2]**

(i) The y-coordinate is 3 and the x-coordinate is –4?

(ii) The x-coordinate is –5 and the y-coordinate is –3?

(iii) The y-coordinate is 4 and the x-coordinate is 5?

(iv) The y-coordinate is 4 and the x-coordinate is –4?

24. Find three rational numbers lying between $\frac{3}{5}$ and $\frac{7}{8}$. How many rational numbers can be determined between these two numbers? **[2]**

OR

Show that 0.3333... = $0.\bar{3}$ can be expressed in the form $\frac{p}{q}$, where p and q are integers and q $\neq$ 0.

25. A cone, a hemisphere and a cylinder stand on equal bases and have the same height. Find the ratio of their volume. **[2]**

OR

If h, c and v be the height, curved surface and volume of a cone, show that $3\pi vh^3 - c^2h^2 + 9v^2 = 0$

Section C

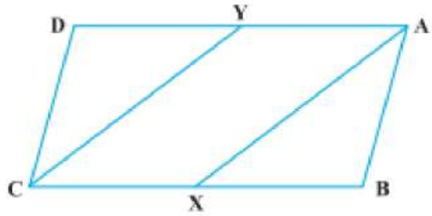
26. Find the values of a and b $\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5}b$ **[3]**

27. The following table gives the quantity of goods (in crore tonnes) **[3]**

Year	1950-51	1960-61	1965-66	1970-71	1980-81	1982-83
Quantity of Goods (in crore tonnes)	9	16	20	20	22	26

Represent this information with the help of a bar graph. Explain through the bar graph if the quantity of goods carried by the Indian Railways in 1965-66 is more than double the quantity of goods carried in the year 1950-51.

28. In Fig. AX and CY are respectively the bisectors of the opposite angles A and C of a parallelogram ABCD. Show that AX || CY **[3]**



29. Find at least 3 solutions for the following linear equation in two variables: x + y – 4 = 0 **[3]**

30. The following table shows the favourite sports of 250 students of a school. Represent the data by a bar graph. **[3]**

Sports	Cricket	Football	Tennis	Badminton	Swimming
No. of students	75	35	50	25	65

OR

Given below are the seats won by different political parties in the polling outcome of a state assembly elections:

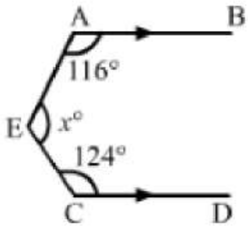
Political party	A	B	C	D	E	F
Seats won	65	52	34	28	10	31

Draw a bar graph to represent the polling results.

31. Find the value of $\frac{1}{27}r^3 - s^3 + 125t^3 + 5rst$, when $s = \frac{r}{3} + 5t$. **[3]**

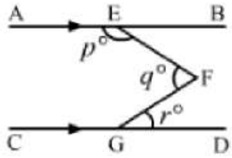
Section D

32. In each of the figures given below, AB || CD. Find the value of x° in each other case. **[5]**



OR

In the given figure, AB || CD. Prove that p + q - r = 180.



33. An iron pillar consists of a cylindrical portion 2.8 m high and 20 cm in diameter and a cone 42 cm high is surmounting it. Find the weight of the pillar, given that 1 cm^3 of iron weighs 7.5 g. **[5]**

34. Find the area of the triangle whose sides are 42 cm, 34 cm and 20 cm in length. Hence, find the height corresponding to the longest side. **[5]**

OR

One side of a right triangle measures 126 m and the difference in lengths of its hypotenuse and other side is 42 cm. Find the measures of its two unknown sides and calculate its area. Verify the result using Heron's Formula.

35. If p(x) = x^3 - $5x^2$ + 4x - 3 and g(x) = x - 2, show that p(x) is not a multiple of g(x). **[5]**

Section E

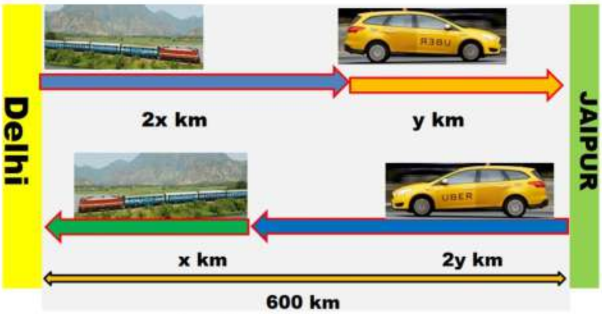
36. **Read the text carefully and answer the questions:** **[4]**

Ajay lives in Delhi, The city of Ajay's father in laws residence is at Jaipur is 600 km from Delhi. Ajay used to travel this 600 km partly by train and partly by car.

He used to buy cheap items from Delhi and sale at Jaipur and also buying cheap items from Jaipur and sale at Delhi.

Once From **Delhi to Jaipur** in forward journey he covered 2x km by train and the rest y km by taxi.

But, while returning he did not get a reservation from Jaipur in the train. So first 2y km he had to travel by taxi and the rest x km by Train. From Delhi to Jaipur he took 8 hrs but in returning it took 10 hrs.



(i) Write the above information in terms of equation.

(ii) Find the value of x and y?

(iii) Find the speed of Taxi?

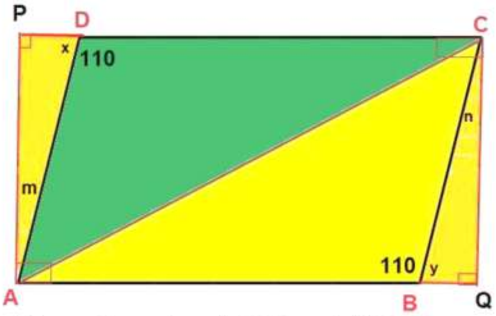
OR

Find the speed of Train?

37. **Read the text carefully and answer the questions:** **[4]**

In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB||CD and AD = BC, AD || BC.

Municipality converted this park into a rectangular form by adding land in the form of ΔAPD and Δ BCQ. Both the triangular shape of land were covered by planting flower plants.



(i) Show that ΔAPD and ΔBQC are congruent.

(ii) PD is equal to which side?

OR

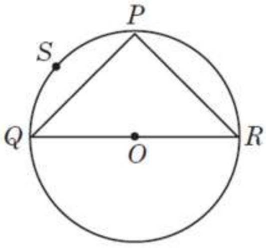
What is the value of ∠m?

(iii) Show that ΔABC and ΔCDA are congruent.

38. **Read the text carefully and answer the questions:** **[4]**

Sanjay and his mother visited in a mall. He observes that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m and between shop P and R is 6 m.

Considering O as the center of the circles.



(i) Find the Measure of ∠QPR.

(ii) Find the radius of the circle.

OR

Find the area of ΔPQR.

(iii) Find the Measure of $\angle QSR$.

Solution

CBSE SAMPLE PAPER - 07

Class 09 - Mathematics

Section A

1. **(c)** a line parallel to y-axis

   Explanation: Two points having same abscissa but different ordinate always make a line which is parallel to the y-axis as abscissa is fixed and the only ordinate keeps changing.

2. **(a)** 1320 m^2

   Explanation: Given: $(s-a)(s-b)(s-c) = 13200$ m and s = 132 m

   Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

   = $\sqrt{13200 \times 132}$

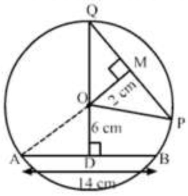
   = 1320 sq. m

3. **(d)** 18 cm

   Explanation:

   We are given the chord of length 14 cm and perpendicular distance from the centre to the chord is 6 cm. We are asked to find the length of another chord at a distance of 2 cm from the centre.

   We have the following figure

   We are given AB = 14 cm, OD = 6 cm, MO = 2 cm, PQ = ?

   Since, perpendicular from centre to the chord divide the chord into two equal parts

   Therefore

   $AO^2 = AD^2 + OD^2$ [using paythagoras theorem]

   = $7^2 + 6^2$

   = 49 + 36

   AO= $\sqrt{85}$

   Now consider the $\triangle$OPQ in which OM = 2 cm

   So using Pythagoras theorem in $\triangle$OPM

   $PM^2 = OP^2 - OM^2$

   = $(\sqrt{85})^2 - 2^2$ ($\because$ OP = AO = radius)

   $PM^2 = 81$

   PM= 9 cm

   Hence PQ = 2PM

   = 2×9

   PQ= 18 cm

4. **(c)** 2

   Explanation: Adjusted frequency = $\left(\frac{\text{frequency of the class}}{\text{width of the class}}\right) \times 5$

   Therefore, Adjusted frequency of 25 - 45 = $\frac{8}{20} \times 5 = 2$

5. **(a)** $\sqrt{\frac{1}{7} \times \frac{2}{7}}$

   Explanation: An irrational number between a and b is given by $\sqrt{ab}$.

   So, an irrational number between $\frac{1}{7}$ and $\frac{2}{7}$ is $\sqrt{\frac{1}{7} \times \frac{2}{7}}$.

6. **(d)** $\triangle ABD \cong \triangle FEC$

   Explanation: Given:

   AB = FE, BC = ED,

AB ⊥ BE and FE ⊥ BE

To Prove: AD = FC

Proof: In △ABD and △FEC,

AB = FE ...(1) (Given)

∠ABD = ∠FEC ...(2)

Each = 90^o

BC = ED (Given)

⇒ BC + CD = ED + DC

⇒ BD = EC ...(3)

In view of (1), (2) and (3),

△ABD ≅ △FEC using SAS congruence rule

7. **(b)** (3,0)

Explanation: 2x + 3y = 6 meets the X-axis.

Put y = 0,

2x + 3(0) = 6

x = 3

Therefore, graph of the given line meets X-axis at (3, 0).

8. **(a)** $5x^3$ is a monomial

Explanation: $5x^3$ is a monomial as it contains only one term.

9. **(b)** 20

Explanation: Given x =$\sqrt{6} + \sqrt{5}$

$x^2 = (\sqrt{6} + \sqrt{5})^2$

= 6+5+2$\sqrt{6}\sqrt{5}$

= 11+2$\sqrt{30}$

Hence x^2 = 11+ 2$\sqrt{30}$

Now,

$\frac{1}{x^2} = \frac{1}{11+2\sqrt{30}}$

$=\frac{1}{11+2\sqrt{30}} \times \frac{11-2\sqrt{30}}{11-2\sqrt{30}}$

$= \frac{11-2\sqrt{30}}{(11)^2-(2\sqrt{30})^2}$

$= \frac{11-2\sqrt{30}}{121-120}$

= 11 - 2$\sqrt{30}$

Hence $\frac{1}{x^2}$= 11 - 2$\sqrt{30}$

Then $x^2 + \frac{1}{x^2} - 2$

= 11 + 2$\sqrt{30}$ + 11 - 2$\sqrt{30}$ -2

=22-2

=20

10. **(d)** AF = 2AB

Explanation: By the congruency of triangles,

BEF and CED (AAS Rule) are congruent

So, DC = BF (CPCT) ...(1)

But DC = AB ...(2)

So AB = BF

but AF = AB + BF

So AF = 2AB

11. **(c)** $\frac{xy}{x+y}$

Explanation: $(x^{-1} + y^{-1})^{-1}$

$= (\frac{1}{x} + \frac{1}{y})^{-1}$

$= \left(\frac{y+x}{xy}\right)^{-1}$
$= \frac{xy}{x+y}$

12. **(b)** infinitely many solutions

Explanation:

Given linear equation: 3x - 5y = 15 Or, x = $\frac{5y+15}{3}$

When y = 0, x = $\frac{15}{3}$ = 5

When y = 3, x = $\frac{30}{3}$ = 10

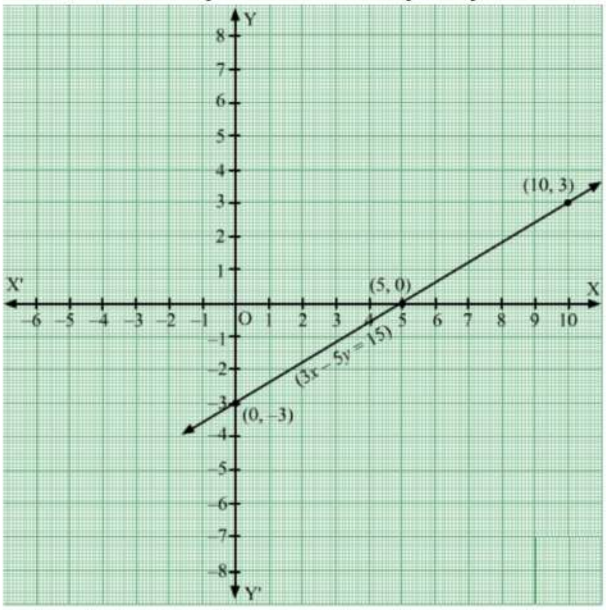
When y = -3, x = $\frac{0}{3}$ = 0

xx	5	10	0
yy	0	3	-3

Plot the points A(5,0) , B(10,3) and C(0,−3). Join the points and extend them in both the directions.

We get infinite points that satisfy the given equation.

Hence, the linear equation has infinitely many solutions.



13. **(b)** 20°

Explanation: Let,

AB, CD and EF intersect at O

∠COB = ∠AOD (Vertically opposite angle)

∠AOD = 3x + 10 ....(i)

∠AOE + ∠AOD + ∠DOF = 180^o (Linear pair)

x + 3x + 10^o + 90^o = 180^o

4x + 100^o = 180^o

4x = 80^o

x = 20^o

14. **(c)** $\frac{1}{2}$

Explanation: $2^{-m} \times \frac{1}{2^m} = \frac{1}{4}$,

$\Rightarrow 2^{-m-m} = \left(\frac{1}{2}\right)^2$

$\Rightarrow 2^{-2m} = 2^{-2}$

Comparing, we get

-2m = -2

$\Rightarrow$ m = $\frac{-2}{-2}$

$\Rightarrow$ m = 1

Now, $\frac{1}{14}\left\{(4^m)^{\frac{1}{2}} + \left(\frac{1}{5^m}\right)^{-1}\right\}$

$= \frac{1}{14}\left[\left\{\left(2^2\right)^m\right\}^{\frac{1}{2}} + \left(5^{-m}\right)^{-1}\right]$

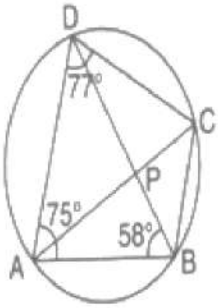
$= \frac{1}{14}\left\{2^{2xm\times\frac{1}{2}} + 5^{-m\times(-1)}\right\}$

$= \frac{1}{14}\ \{2^m + 5^{+m}\}$

$= \frac{1}{14}\ \{2^1 + 5^1\}$

$= \frac{1}{14} \times 7 = \frac{1}{2}$

15. **(c)** 92^o

Explanation: 

Since AD acts as a chord also, So, $\angle ABD = \angle ACD = 58^0$

Again as CD also acts as a chord also, therefore,

$\angle DBC = \angle DAC$

Now, $\angle ABC = \angle ABD + \angle DBC$

Also, $\angle ADC + \angle ABC = 180^o$

$\Rightarrow \angle ABC = 180^o - 77^o = 103^o$

And therefore

$\angle DBC = 103^o - 58^o = 45^o$

Hence, $\angle DAC = 45^o$

Since,

$\angle DAC = 45^o$

So, $\angle CAB = 75^o - 45^o = 30^o$

But, $\angle CAB = \angle BDC$

$\Rightarrow \angle BDC = 30^0$

Now, In triangle CPD,

$\angle C + \angle P + \angle D = 180^o$

$\Rightarrow 58^o + \angle P + 30^o = 180^o$

$\Rightarrow \angle P = 180^o - 30^o - 58^o = 92^o$

16. **(c)** any number

Explanation: In the cartesian plane any point P is written as p(x, y)

when the value of x co-ordinate is equal to zero then the point P lies on y axis,

So,Ordinate of any point on y-axis can be any number but abscissa will be zero

17. **(b)** (2, 3)

Explanation: We have to check (2, 3) is a solution of 2x – 3y = 12 if (2, 3) satisfy the equation then (2, 3) solution of 2x – 3y = 12

LHS = 2x - 3y

$2 \times 2 - 3 \times 3$

4 - 9 = -5

RHS = -5

LHS $\neq$ RHS

So (2, 3) is not a solution of 2x - 3y = 12

18. **(a)** a + c + e = b + d

Explanation: As $(x^2 - 1)$ is a factor of polynomial

$f(x^2) = ax^4 + bx^3 + cx^2 + dx + e$

Therefore,

$f(x) = 0$

And

$f(1) = 0$

$a(1)^4 + b(1)^3 + c(1)^2 + d(1) + e = 0$

$\Rightarrow a + b + c + d + e = 0$

And

$f(-1) = 0$

$a(-1)^4 + b(-1)^3 + c(-1)^2 + d(-1) + e = 0$

$a - b + c - d + e = 0$

Hence, $a + c + e = b + d$

19. **(c)** A is true but R is false.

Explanation: A is true but R is false.

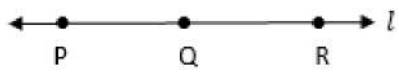
20. **(c)** A is true but R is false.

Explanation: Irrational number cannot be expressed in the form $\frac{p}{q}$, where p and q are integers, $q \neq 0$.

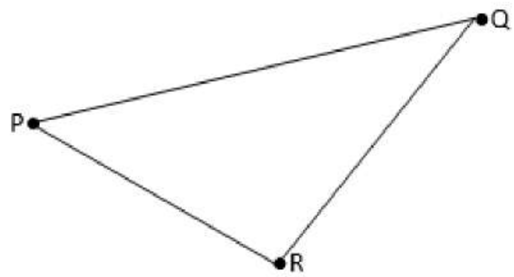
Section B

21. One if they are collinear and three if they are non-collinear

For Collinear Points:



For three non-collinear points:



From the above two figures,it follows that only one line can be drawn if three points are collinear and three lines can be drawn if three points are non-collinear.

22. We have

$\Rightarrow \angle ABC = \angle ACB \ldots(1)$ [(Given)]

And $\angle 4 = \angle 3 \ldots(2)$ [(Given)]

Now, subtracting (2) from (1), we get

Now, by Euclid's axiom 3, if equals are subtracted from equals, the remainders are equal.

$\angle ABC - \angle 4 = \angle ACB - \angle 3$

Hence, $\angle 1 = \angle 2$.

23. (i) II

(ii) III

(iii) I

(iv) II

24. Since $\frac{3}{5} < \frac{7}{8}$

Let $x = \frac{3}{5}, y = \frac{7}{8}$

$\therefore d = \frac{y-x}{n+1} = \frac{\frac{7}{8}-\frac{3}{5}}{3+1} = \frac{\frac{35-24}{40}}{4} = \frac{11}{160}$

Thus, required rational numbers between $\frac{3}{5}$ and $\frac{7}{8}$ are

x + d, x + 2d and x + 3d

ie., $\frac{3}{5} + \frac{11}{160}, \frac{3}{5} + 2 \times \frac{11}{160}$ and $\frac{3}{5} + 3 \times \frac{11}{160}$

ie., $\frac{96+11}{160}, \frac{3}{5} + \frac{11}{80}$ and $\frac{3}{5} + \frac{33}{160}$

ie., $\frac{107}{160}, \frac{48+11}{80}$ and $\frac{96+33}{160}$

ie., $\frac{107}{160}, \frac{59}{80}$ and $\frac{129}{160}$

Three rational numbers between given two rational numbers is $\frac{107}{160}, \frac{59}{80}, \frac{129}{160}$

The number system contains uncountable/infinite number of rational numbers.

There are infinite number of rational numbers lying between all the numbers. Therefore, there are infinity rational between the numbers 3/5 and 7/8.

OR

We have to expressed 0.3333... = $0.\overline{3}$ in the form $\frac{p}{q}$, where p and q are integers and q $\neq$ 0.

Let x = 0.3333... ----(i)

Multiplying eq (i) by 10, we get

10 x = 10 $\times$ (0.333...) = 3.333...----(ii)

Subtracting eq (i) from (ii)

10x - x = 3.333... - .333...

9x = 3, i.e., x = $\frac{1}{3}$

25. V_1(volume of cone) = $\frac{1}{3}\pi r^2 r$

V_2(volume of hemisphere) = $\frac{2}{3}\pi r^3$

V_3(volume of cylinder) = $\pi r^2 \cdot r$

$V_1 : V_2 : V_3 = \frac{1}{3}\pi r^3 : \frac{2}{3}\pi r^3 : \pi r^3 = \frac{1}{3} : \frac{2}{3} : 1$

$V_1 : V_2 : V_3 = 1 : 2 : 3.$

OR

Let the radius of the base and slant height of the cone be r and l respectively.

Then c = curved surface $=\pi rl = \pi r\sqrt{r^2 + h^2} \ldots (1)$

v = volume $= \frac{1}{3}\pi r^2 h \ldots (2)$

$\therefore 3\pi vh^3 - c^2h^2 + 9v^2 = 3\pi(\frac{1}{3}\pi r^2 h)h^3 - \pi^2 r^2(r^2 + h^2)h^2 + 9(\frac{1}{3}\pi r^2 h)^2 \ldots$[Using (1) and (2)]

$= \pi^2 r^2 h^4 - \pi^2 r^4 h^2 - \pi^2 r^2 h^4 + \pi^2 r^4 h^2 = 0$

Hence, $3\pi vh^3 - c^2h^2 + 9v^2 = 0$

Section C

26. $\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5}b$

$\frac{7+\sqrt{5}}{7-\sqrt{5}} \times \frac{7+\sqrt{5}}{7+\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} \times \frac{7-\sqrt{5}}{7-\sqrt{5}} = a + \frac{7}{11}\sqrt{5}b$

$\frac{(7+\sqrt{5})^2}{(7)^2-(\sqrt{5})^2} - \frac{(7-\sqrt{5})^2}{(7)^2-(\sqrt{5})^2} = a + \frac{7}{11}\sqrt{5}b$

$\frac{49+5+14\sqrt{5}}{49-5} - \frac{49+5-14\sqrt{5}}{49-5} = a + \frac{7}{11}\sqrt{5}b$

$= \frac{54+14\sqrt{5}}{44} - \frac{54-14\sqrt{5}}{44} = a + \frac{7}{11}\sqrt{5}b$

$= \frac{54+14\sqrt{5}-54+14\sqrt{5}}{44}$

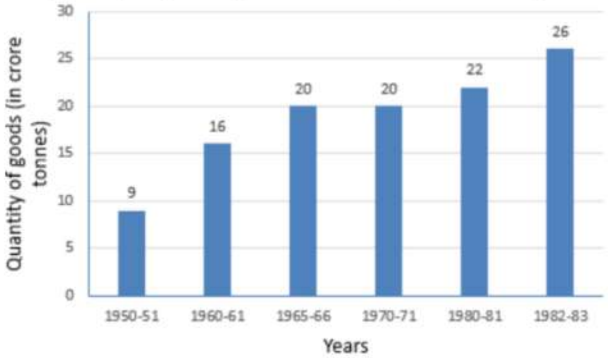
$= a + \frac{7}{11}\sqrt{5}b = \frac{28\sqrt{5}}{44}$

$\Rightarrow \frac{7\sqrt{5}}{11} = a + \frac{7}{11}\sqrt{5}b$

$\Rightarrow 0 + \frac{7\sqrt{5}}{11} = a + \frac{7}{11}\sqrt{5}b$

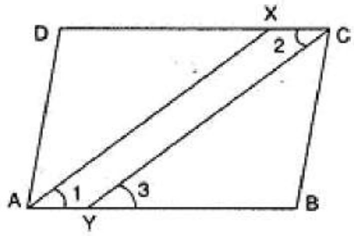
Thus, a = 0 and b = 1.

27. the quantity of goods (in crore tonnes) in different years



Yes, the quantity of goods carried by the Indian Railway in 1965 - 66 is more than double the quantity of goods carried in the year 1950 - 51.

28. Given: ABCD is a parallelogram and line segments AX, CY bisect the angles A and C respectively.



To Prove : AX || CY

Proof : ABCD is a parallelogram.

$\therefore \angle A = \angle C$ . . .[Opposite $\angle$s]

$\Rightarrow \frac{1}{2}\angle A = \frac{1}{2}\angle C$ . . .[As halves of equals are equal]

$\Rightarrow \angle 1 = \angle 2$ ...[As AX bisects $\angle A$ and CY bisects $\angle C$] . .(1)

Now, AB || DC and CY intersects them

$\therefore \angle 2 = \angle 3$ . . . .[Alternate interior $\angle$s] . . . (2)

$\angle 1 = \angle 3$ . . .[From (1) and (2)]

But these are corresponding angles

$\therefore$ AX || CY.

29. $x + y - 4 = 0$

$\Rightarrow y = 4 - x$

Put $x = 0$, then $y = 4 - 0 = 4$

Put $x = 1$, then $y = 4 - 1 = 3$

Put $x = 2$, then $y = 4 - 2 = 2$

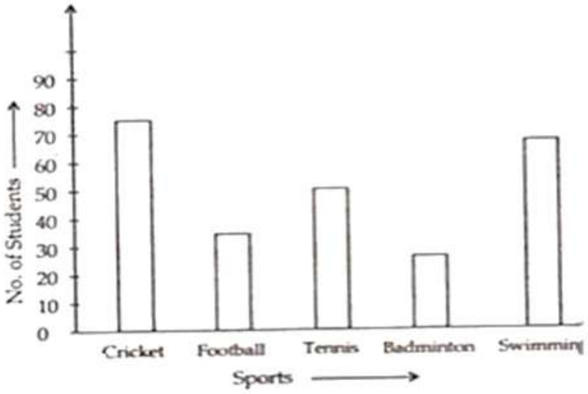
Put $x = 3$, then $y = 4 - 3 = 1$

$\therefore$ (0, 4), (1, 3), (2, 2) and (3, 1) are the solutions of the equation $x + y - 4 = 0$

30. Take the various types of sports along the x-axis and the number of students along the y-axis.

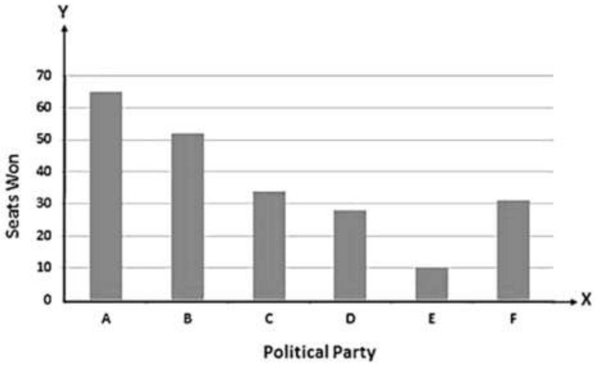
Along the y-axis, take 1 small square = 10 units.

Now we shall draw the bar chart, as shown below:



OR

The bar graph is given below:



31. $\frac{1}{27}r^3 - s^3 + 125t^3 + 5rst$

$= \frac{1}{3^3}r^3 + (-s)^3 + 5^3t^3 + 5rst = \left(\frac{r}{3}\right)^3 + (-s)^3 + (5t)^3 - 3\left(\frac{r}{3}\right)(-s)(5t)$

$= \left(\frac{r}{3} + (-s) + 5t\right)\left[\left(\frac{r}{3}\right)^2 + (-s)^2 + (5t)^2 - \frac{r}{3}\cdot(-s) - (-s)(5t) - \frac{r}{3}(5t)\right]$

$= \left(\frac{r}{3} - s + 5t\right)\left(\frac{r^2}{9} + s^2 + 25t^2 + \frac{rs}{3} + 5st - \frac{5rt}{3}\right)$

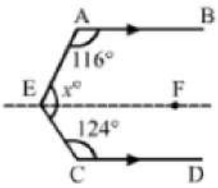
According to the question, s $= \frac{r}{3} + 5t$

$\Rightarrow \frac{r}{3} - s + 5t = 0$

$\therefore \quad \frac{1}{27}r^3 - s^3 + 125t^3 + 5rst$

$= 0 \times \left(\frac{r^2}{9} + s^2 + 25t^2 + \frac{rs}{3} + 5st - \frac{5rt}{3}\right) = 0$

Section D

32. 

Draw EF || AB || CD

Then, $\angle AEF + \angle CEF = x^\circ$

Now, EF || AB and AE is the transversal

$\therefore \angle AEF + \angle BAE = 180^\circ$ [Consecutive Interior Angles]

$\Rightarrow \angle AEF + 116 = 180$

$\Rightarrow \angle AEF = 64^\circ$

Again, EF || CD and CE is the transversal.

$\angle CEF + \angle ECD = 180^\circ$ [Consecutive Interior Angles]

$\Rightarrow \angle CEF + 124 = 180$

$\Rightarrow \angle CEF = 56^\circ$

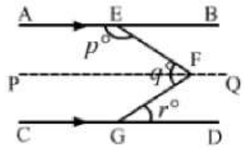
Therefore,

$x^\circ = \angle AEF + \angle CEF$

$x^\circ = (64 + 56)^\circ$

$x^\circ = 120^\circ$

OR



Draw PFQ || AB || CD

Now, PFQ || AB and EF is the transversal.

Then,

$\angle AEF + \angle EFP = 180^\circ$ ...(i)

[Angles on the same side of a transversal line are supplementary]

Also, PFQ || CD.

$\angle PFG = \angle FGD = r^\circ$ [Alternate Angles]

and $\angle EFP = \angle EFG - \angle PFG = q^\circ - r^\circ$

putting the value of ∠EFP in equation (i)

we get,

$p^\circ + q^\circ - r^\circ = 180^\circ$ [$\angle AEF = p^\circ$]

33. We are Given that,

An iron pillar consists of a cylindrical portion and a cone mounted on it.

The height of the cylindrical portion of the pillar, H = 2.8 m = 280 cm.

The height of the conical portion of the pillar, h = 42 cm..

The diameter of the cylindrical portion of the pillar = diameter of the circular base of cone = D = 20 cm.

The radius of the circular base of cylinder/ cone r = $\frac{D}{2}$ = 10 cm.

Now, we have,

Volume of the pillar, (V) = Volume of the cylindrical portion of pillar + volume of the conical portion of the pillar.

$\Rightarrow$ V = $\pi r^2 H + \frac{1}{3}\pi r^2 h$

$\Rightarrow$ V = $\left(\frac{22}{7} \times 10^2 \times 280 + \frac{1}{3} \times \frac{22}{7} \times 10^2 \times 42\right)$ cm^3

$\Rightarrow$ V = (22 × 100 × 40 + 22 × 100 × 2) cm^3

$\Rightarrow$ V = (88000 + 4400) cm^3

$\Rightarrow$ V = 92400 cm^3

Hence, volume of iron pillar is 92400 cm^3

Given,

Weight of 1 cm^3 iron = 7.5 gm.

Hence, weight of 92400 cm^3 iron = 7.5 × 92400 gm.

= 693000 gm.

= 693 Kg.

Since, 1Kg = 1000 gm.

Hence, the weight of iron piller is 693 Kg.

34. Let:

a = 42 cm, b = 34 cm and c = 20 cm

$\therefore s = \frac{a+b+c}{2} = \frac{42+34+20}{2} = 48\text{cm}$

By Heron's formula, we have:

Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{48(48-42)(48-34)(48-20)}$

$= \sqrt{48 \times 6 \times 14 \times 28}$

$= \sqrt{4 \times 2 \times 6 \times 6 \times 7 \times 2 \times 7 \times 4}$

$= 4 \times 2 \times 6 \times 7$

Area of triangle = 336 cm^2

We know that the longest side is 42 cm.

Thus, we can find out the height of the triangle corresponding to 42 cm.

We have:

Area of triangle = 336 cm^2

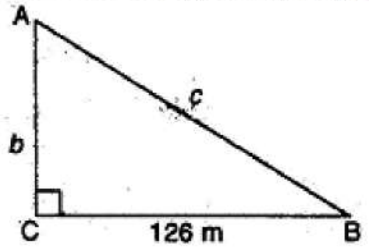
$\Rightarrow \frac{1}{2} \times$ Base × Height = 336

$\Rightarrow \frac{1}{2}$ (42)(height) = 336

$\Rightarrow$ Height $= \frac{336 \times 2}{42}$ = 16 cm

OR

Let ABC be the right triangle right angles at C.



a = 126 m . . . (1)

In right triangle ACB.

$AB^2 = AC^2 + BC^2$ . . .[By Pythagoras theorem]

$\Rightarrow c^2 = a^2 + b^2$

$\Rightarrow c = \sqrt{a^2 + b^2}$ . . .(2)

$\Rightarrow$ c – b = 42 . . .(3)

$\Rightarrow \sqrt{a^2 + b^2}$ - b = 42 . . .[From (2)]

$\Rightarrow \sqrt{126^2 + b^2}$ - b = 42 . . .[From (1)]

$\Rightarrow \sqrt{126^2 + b^2}$ = (42+b)

$\Rightarrow (126)^2 + b^2 = (42 + b)^2$

$\Rightarrow 15876 + b^2 = 1764 + b^2 + 84b$

$\Rightarrow$ 84b = 15876 – 1764

$\Rightarrow$ 84 b = 14112

$\Rightarrow b = \frac{14112}{84}$

$\Rightarrow$ b = 168 m . . . (4)

From (3) and (4)

c – 168 = 42

$\therefore$ c = 168 + 42 = 210 m . . . (5)

$\therefore$ Area of the right triangle = $\frac{1}{2}$ $\times$ base $\times$ height

$= \frac{1}{2} \times 126 \times 168$

= 10584 m^2

Using Heron's Formula

a = 126 m, b = 168 m, c = 210 m

$\therefore$ s = $\frac{a+b+c}{2}$

$= \frac{126+168+210}{2} = \frac{504}{2}$ = 252 m

$\therefore$ Area of the right triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{252(252-126)(252-168)(252-210)}$

$= \sqrt{252(126)(84)(42)}$

$= \sqrt{(63 \times 4)(63 \times 2)(42 \times 2)(42)}$

$= 63 \times 2 \times 2 \times 42 = 10584\ m^2$

35. p(x) = $x^3 - 5x^2 + 4x - 3$

g(x) = x - 2

Putting x = 2 in p(x), we get

p(2) = $2^3 - 5 \times 2^2 + 4 \times 2 - 3 = 8 - 20 + 8 - 3 = -7 \neq 0$

Therefore, by factor theorem, (x - 2) is not a factor of p(x)

Hence, p(x) is not a multiple of g(x).

Section E

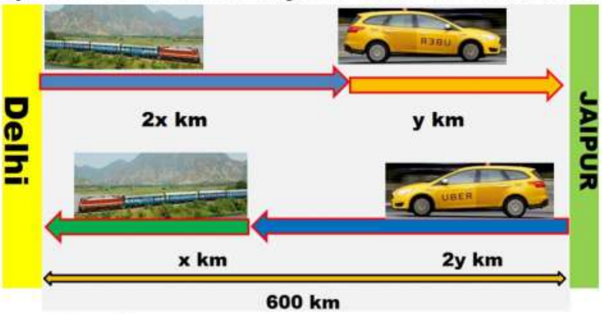
36. **Read the text carefully and answer the questions:**

Ajay lives in Delhi, The city of Ajay's father in laws residence is at Jaipur is 600 km from Delhi. Ajay used to travel this 600 km partly by train and partly by car.

He used to buy cheap items from Delhi and sale at Jaipur and also buying cheap items from Jaipur and sale at Delhi.

Once From **Delhi to Jaipur** in forward journey he covered 2x km by train and the rest y km by taxi.

But, while returning he did not get a reservation from Jaipur in the train. So first 2y km he had to travel by taxi and the rest x km by Train. From Delhi to Jaipur he took 8 hrs but in returning it took 10 hrs.



(i) Delhi to Jaipur: 2x + y = 600

Jaipur to Delhi: 2y + x = 600

Let S_1 and S_2 be the speeds of Train and Taxi respectively, then

Dehli to Jaipur: $\frac{2x}{S_1} + \frac{y}{S_2} = 8$ ...(i)

Jaipur to Delhi: $\frac{x}{S_1} + \frac{2y}{S_2} = 10$ ...(ii)

(ii) 2x + y = 600 ...(1)

x + 2y = 600 ...(2)

Solving (1) and (2) $\times$ 2

2x + y - 2x - 4y = 600 - 1200

$\Rightarrow$ - 3y = - 600

$\Rightarrow$ y = 200

Put y = 200 in (1)

$2x + 200 = 600$

$\Rightarrow x = \frac{400}{2} = 200$

(iii) We know that speed = $\frac{Distance}{Time} \Rightarrow$ Time = $\frac{Distance}{Speed}$

Let S_1 and S_2 are speeds of train and taxi respectively.

Delhi to Jaipur: $\frac{2x}{S_1} + \frac{y}{S_2} = 8$ ...(i)

Jaipur to Delhi: $\frac{x}{S_1} + \frac{2y}{S_2} = 10$ ...(ii)

Solving (i) and (ii) $\times$ 2

$\Rightarrow \frac{2x}{S_1} + \frac{y}{S_2} - \frac{2x}{S_1} - \frac{4y}{S_2} = 8 - 20 = -12$

$\Rightarrow \frac{-3y}{S_2} = -12$

We know that y = 200 km

$\Rightarrow S_2 = \frac{3\times 200}{12} = 50$ km/hr

Hence speed of Taxi = 50 km/hr

OR

We know that x = 200 km

Put S_2 = 50 km/hr ...(i)

$\frac{400}{S_1} + \frac{200}{50} = 8$

$\Rightarrow \frac{400}{S_1} = 8 - 4 = 4$

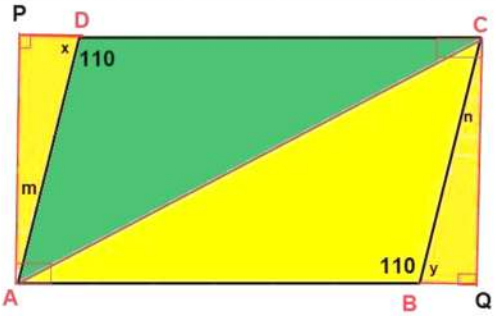
$\Rightarrow S_1 = \frac{400}{4} = 100$ km/hr

Hence speed of Train = 100 km/hr

37. **Read the text carefully and answer the questions:**

In the middle of the city, there was a park ABCD in the form of a parallelogram form so that AB = CD, AB||CD and AD = BC, AD || BC.

Municipality converted this park into a rectangular form by adding land in the form of ΔAPD and Δ BCQ. Both the triangular shape of land were covered by planting flower plants.



(i) In $\triangle$APD and $\triangle$BQC

AD = BC (given)

AP = CQ (opposite sides of rectangle)

$\angle APD = \angle BQC = 90^o$

By RHS criteria $\triangle APD \cong \triangle CQB$

(ii) $\triangle APD \cong \triangle CQB$

Corresponding part of congruent triangle

side PD = side BQ

OR

In $\triangle$APD

$\angle APD + \angle PAD + \angle ADP = 180^o$

$\Rightarrow 90^o + (180^o - 110^o) + \angle ADP = 180^o$ (angle sum property of $\triangle$)

$\Rightarrow \angle ADP = m = 180^o - 90^o - 70^o = 20^o$

$\angle ADP = m = 20^o$

(iii) In $\triangle$ABC and $\triangle$CDA

AB = CD (given)

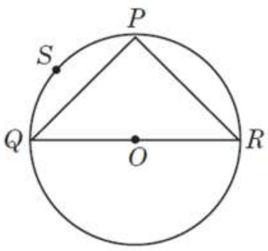
BC = AD (given)

AC = AC (common)

By SSS criteria $\triangle ABC \cong \triangle CDA$

38. **Read the text carefully and answer the questions:**

Sanjay and his mother visited in a mall. He observes that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m and between shop P and R is 6 m. Considering O as the center of the circles.



(i) We know that angle in the semicircle = 90^o

Here QR is a diameter of circle and $\angle QPR$ is angle in semicircle.

Hence $\angle QPR = 90^o$

(ii) $\angle QPR = 90^o$

$\Rightarrow QR^2 = PQ^2 + PR^2$

$\Rightarrow QR^2 = 8^2 + 6^2$

$\Rightarrow QR = \sqrt{64 + 36}$

$\Rightarrow$ QR = 10 m

OR

Area $\Delta PQR = \frac{1}{2} \times PQ \times PR$

$\Rightarrow$ Area $\Delta PQR = \frac{1}{2} \times 8 \times 6 = 24$ sqm

(iii) Measure of $\angle QSR = 90^o$

Angles in the same segment are equal. $\angle QSR$ and $\angle QPR$ are in the same segment.