CBSE SAMPLE PAPER - 01

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. The point which lies on y-axis at a distance of 3 units in the negative direction of y-axis is **[1]**

   a) (0, 3) b) (0, -3)

   c) (-3, 0) d) (3, 0)

2. The base of a right triangle is 8 cm and hypotenuse is 10 cm. Its area will be **[1]**

   a) 48 cm^2 b) 80 cm^2

   c) 40 cm^2 d) 24 cm^2

3. If the length of a chord of a circle is 16 cm and is at a distance of 15 cm from the centre of the circle, then the radius of the circle is **[1]**

   a) 34 cm b) 15 cm

   c) 17 cm d) 16 cm

4. In a histogram the class intervals or the groups are taken along **[1]**

   a) X-axis b) Y-axis

   c) both of X-axis and Y-axis d) in between X and Y axis

5. If $\sqrt{2} = 1.41$ then $\frac{1}{\sqrt{2}} = ?$ **[1]**

   a) 0.709 b) 7.05

   c) 0.75 d) 0.075

6. in ΔABC and ΔDEF it is given that AB = DE and BC = EF in order that $\Delta ABC \cong \Delta DEF$, we must have **[1]**

a) $\angle C = \angle F$ b) $\angle A = \angle D$

c) $\angle B = \angle E$ d) None of these

7. 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)

8. If $p(x) = x^3 - x^2 + x + 1$, then the value of $\frac{p(-1)+p(1)}{2}$ is **[1]**

a) 2 b) 3

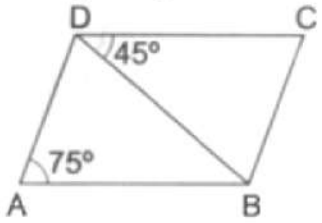
c) 0 d) 1

9. $(125)^{-1/3} = ?$ **[1]**

a) $-\frac{1}{5}$ b) -5

c) $\frac{1}{5}$ d) 5

10. In the given figure, ABCD is a parallelogram in which ∠BDC = 45° and ∠BAD = 75°. Then, ∠CBD = ? **[1]**



a) 60° b) 45°

c) 75° d) 55°

11. The value of $64^{\frac{-1}{3}}\left(64^{\frac{1}{3}} - 64^{\frac{2}{3}}\right)$, is **[1]**

a) -2 b) 1

c) -3 d) $\frac{1}{3}$

12. The force applied on a body is directly proportional to the acceleration produced on it. The equation to represent the above statement is **[1]**

a) y = kx b) y = x

c) y + x = 0 d) none of these

13. The measure of an angle is five times its complement. The angle measures **[1]**

a) 75° b) 65°

c) 25° d) 35°

14. Choose the rational number which does not lie between $-\frac{2}{3}$ and $-\frac{1}{5}$ **[1]**

a) $-\frac{7}{20}$ b) $-\frac{3}{10}$

c) $-\frac{1}{4}$ d) $\frac{3}{10}$

15. Let C be the mid-point of an arc AB of a circle such that $m\overset{\frown}{AB}$ = 183°. If the region bounded by the arc ACB and line segment AB is denoted by S, then the centre O of the circle lies **[1]**

a) on AB and bisect AB

b) on the segment AB

c) in the exterior of S

d) in the interior of S

16. A(-6, 3) be a point on the graph. Draw $AL \perp x - axis$. The co-ordinates of L are **[1]**

a) (-6, 3)

b) (0, 0)

c) (-6, 0)

d) (0, -6)

17. How many linear equations can be satisfied by x = 2 and y = 3? **[1]**

a) only one

b) none of these

c) many

d) two

18. If x + 2 and x -1 are the factors of $x^3 + 10x^2 + mx + n$, then the values of m and n are respectively. **[1]**

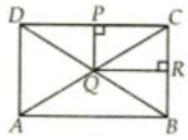
a) 5 and - 3

b) 17 and - 8

c) 23 and -19

d) 7 and - 18

19. **Assertion (A):** ABCD and PQRC are rectangles and Q is a midpoint of AC. Then DP = PC. **[1]**



Reason (R): The line segment joining the midpoint of any two sides of a triangle is parallel to the third side and equal to half of it.

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):** If $\sqrt{2}$ = 1.414, $\sqrt{3}$ = 1.732, then $\sqrt{5} = \sqrt{2} + \sqrt{3}$. **[1]**

Reason (R): Square root of a positive real number always exists.

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.

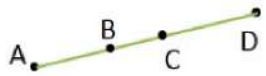
c) A is true but R is false.

d) A is false but R is true.

Section B

21. Ram and Ravi have the same weight. If they each gain weight by 2 kg, how will their new weights be compared? **[2]**

22. In fig., if AC = BD, then prove that AB = CD **[2]**



23. Name the quadrant in which the following points lie :(i) (2, 3)(ii) (–3, 4)(iii) (–3, –10) **[2]**

24. Rationalise the denominator of: $\frac{3-2\sqrt{2}}{3+2\sqrt{2}}$. **[2]**

OR

Simplify the following by rationalizing the denominator : $\frac{30}{5\sqrt{3}-3\sqrt{5}}$

25. How many metres of cloth, 2.5 m wide, will be required to make a conical tent whose base radius is 7 m and height 24 m? **[2]**

OR

Find the surface area of a sphere of radius 5.6 cm.

Section C

26. Simplify the following by rationalizing the denominator: $\frac{4+\sqrt{5}}{4-\sqrt{5}} + \frac{4-\sqrt{5}}{4+\sqrt{5}}$ **[3]**

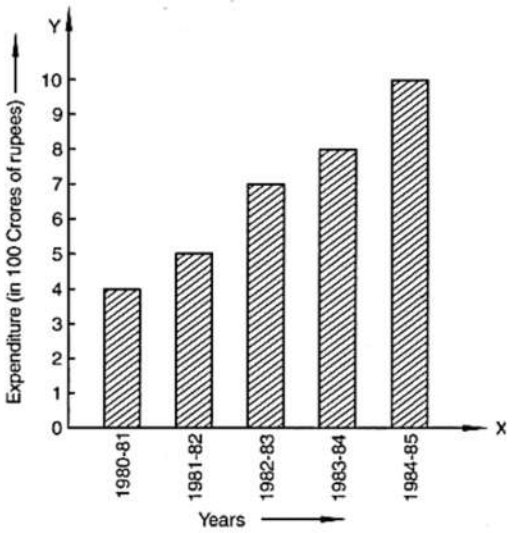
27. The following table shows the number of scooters sold by a dealer during six consecutive years. Draw a bar graph to represent this data. **[3]**

Year	2011	2012	2013	2014	2015	2016
Number of scooters sold (in thousands)	16	20	32	36	40	48

28. ABCD is a rhombus in which altitude from D to side AB bisects AB. Find the angles of the rhombus. **[3]**

29. Find four solutions for the following equation: 12x + 5y = 0 **[3]**

30. Read the bar graph given in Figure and answer the following questions **[3]**



i. What information is given by the bar graph?

ii. What was the expenditure on health and family planning in the year 1982-83?

iii. In which year is the increase in expenditure maximum over the expenditure in previous year? What is the maximum increase?

OR

The production of oil (in lakh tonnes) in some of the refineries in India during 1982 was given below:

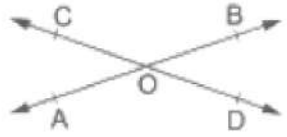
Refinery:	Barauni	Koyali	Mathura	Mumbai	Florida
Production of oil (in lakh tonnes)	30	70	40	45	25

Construct a bar graph to represent the above data so that the bars are drawn horizontally.

31. Factorise: $(2x - 3y)^3 + (3y - 4z)^3 + (4z - 2x)^3$ **[3]**

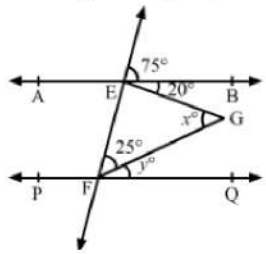
Section D

32. Two lines AB and CD intersect at a point O such that $\angle BOC + \angle AOD = 280^\circ$, as shown in the figure. Find all the four angles. **[5]**



OR

In the given figure, AB || PQ. Find the value of x and y.



33. A tent is of the shape of a right circular cylinder upto a height of 3 metres and then becomes a right circular cone with a maximum height of 13.5 metres above the ground. Calculate the cost of painting the inner side of the tent at the rate of Rs.2 per square metre, if the radius of the base is 14 metres. **[5]**

34. The base of a triangular field is three times its altitude. If the cost of sowing the field at Rs.58 per hectare is Rs.783, find its base and height. **[5]**

OR

Find the area of a triangular field whose sides are 91 m, 98 m and 105 m in length. Find the height corresponding to the longest side.

35. Factorize: $x^3 - 2x^2 - x + 2$ **[5]**

Section E

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

Rainwater harvesting system is a technology that collects and stores rainwater for human use.

Anup decided to do rainwater harvesting. He collected rainwater in the underground tank at the rate of 30 cm^3/sec.

(i) What will be the equation formed if the volume of water collected in x seconds is taken as y cm^3? and also find amount of water collected in 2 hours?

(ii) Write the equation in standard form.

(iii) How much water will be collected in 60 sec?

OR

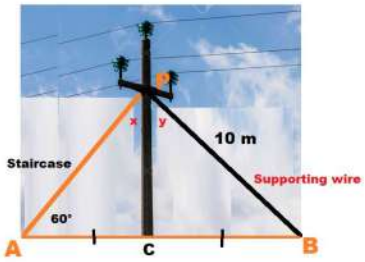
How much time will it take to collect water in 900 cm^3?

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

As shown In the village of Surya there was a big pole PC. This pole was tied with a strong wire of 10 m length. Once there was a big spark on this pole, thus wires got damaged very badly. Any small fault was usually repaired with the help of a rope which normal board electricians were carrying on bicycles.

This time electricians need a staircase of 10 m so that it can reach at point P on the pole and this should make

60° with line AC.



(i) Show that ΔAPC and ΔBPC are congruent.

(ii) Find the value of $\angle x$.

OR

Find the value of $\angle y$.

(iii) What is the value of $\angle PBC$?

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

While dusting a maid found a button whose upper face is of red color, as shown in the figure. The diameter of each of the smaller identical circles is $\frac{1}{4}$ of the diameter of the larger circle whose radius is 16 cm.

(i) Find the area of each of the smaller circle.

(ii) Find the area of the larger circle.

OR

Find the area of quadrant of a smaller circle.

(iii) Find the area of the black colour region.

Solution

CBSE SAMPLE PAPER - 01

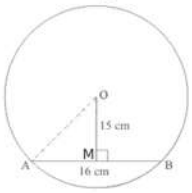
Class 09 - Mathematics

Section A

1. **(b)** (0, -3)
   Explanation: Since, it lies 3 units in the negative direction of the y-axis so its ordinate will be -3 and it also lies on the y-axis so, it's abscissa will be zero, because x-coordinate of any point on y-axis is zero.
   Thus, point will be (0, -3).

2. **(d)** 24 cm^2
   Explanation: Perpendicular = $\sqrt{10^2 - 8^2} = \sqrt{100 - 64} = \sqrt{36}$ = 6 cm
   Area of triangle = $\frac{1}{2}$ x Base x Perpendicular
   = $\frac{1}{2} \times 8 \times 6$
   = 24 sq cm

3. **(c)** 17 cm
   Explanation:
   We will represent the given data in the figure

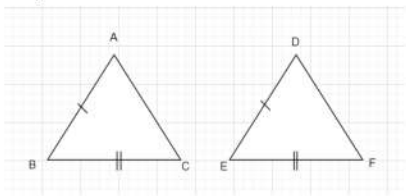


   In the diagram, AB is the given chord of 16 cm length and OM is the perpendicular distance from the centre to AB.
   We know that perpendicular from the centre to any chord divides it into two equal parts.
   So, AM = MB = $\frac{16}{2}$ = 8 cm.
   Now consider right triangle $\triangle$OMA and by using Pythagoras theorem $\angle OMA = 90^\circ$
   $AO^2 = AM^2 + OM^2$
   $AO^2 = 8^2 + 15^2$
   $AO^2 = 64 + 225 = 289$
   $AO = \sqrt{289}$ = 17 cm

4. **(a)** X-axis
   Explanation: Histogram states that a two dimensional frequency density diagram is called as a histogram. The histograms are diagrams which represent the class interval and the frequency in the form of a rectangle. There will be as many adjoining rectangles as there are class intervals.

5. **(a)** 0.709
   Explanation: $\frac{1}{\sqrt{2}} = \frac{1}{1.41} =$ 0.709

6. **(c)** $\angle B = \angle E$
   Explanation:



   Given, AB = DE and BC = EF
   for, $\angle B = \angle E$
   $\Delta ABC \cong \Delta DEF$ [SSA]

7. **(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

8. **(c)** 0

Explanation: $p(x) = x^3 - x^2 + x + 1$

$= \frac{p(-1)+p(1)}{2}$

$= \frac{(-1)^3-(-1)^2+(-1)+1+(1)^3-(1)^2+(1)+1}{2}$

$= \frac{-1-1-1+1+1-1+1+1}{2}$

$= \frac{0}{2}$

= 0

9. **(c)** $\frac{1}{5}$

Explanation: $(125)^{-1/3}$

$=(5^3)^{-1/3}$

$= 5^{-1}$

$\frac{1}{5}$

10. **(a)** 60^o

Explanation: As per the question

$\angle BAD = \angle BCD = 75^o$ (opposite angles of parallelogram)

Now, in $\triangle BCD$,

$\angle BCD + \angle CBD + \angle BCD = 180^o$

$45^o + \angle CBD + 75^o = 180^o$

$\angle CBD = 60^o$

11. **(c)** -3

Explanation: $64^{\frac{-1}{3}}\left(64^{\frac{1}{3}} - 64^{\frac{2}{3}}\right)$

$= \left(4^3\right)^{\frac{-1}{3}}\left[4^{3\times\frac{1}{3}} - (4)^{3\times\frac{2}{3}}\right]$

$= 4^{3\times\left(\frac{-1}{3}\right)}\left[4^{3\times\frac{1}{3}} - 4^{3\times\frac{2}{3}}\right]$

$= 4^{-1}[4^1 - 4^2]$

$= \frac{1}{4}[4 - 16]$

$= \frac{1}{4}(-12)$

= -3

12. **(a)** y = kx

Explanation: let force applied be y and accleration produced be x

The force applied on a body is directly proportional to the acceleration produced on it.

$y \alpha x$

$y = kx$

where k is proportionality constant

13. **(a)** 75°

Explanation: Let the measure of the required angle be x°

Then, the measure of its complement will be (90 − x)°

$\therefore$ x = 5 (90 - x)

$\Rightarrow$ x = 450 - 5x

$\Rightarrow$ 6x = 450

$\Rightarrow$ x = 75°

14. **(d)** $\frac{3}{10}$

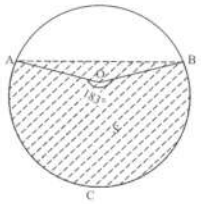
Explanation: Since $\frac{3}{10} > -\frac{2}{3}$ and $\frac{3}{10} > -\frac{1}{5}$

15. **(d)** in the interior of S

Explanation:

Given: m$\widehat{AB}$ = 183° and C is mid-point of arc ABO is the centre.

With the given information the corresponding figure will look like the following,



From the figure, so the centre of the circle O lies inside the shaded region S.

16. **(c)** (-6, 0)

Explanation: Since AL perpendicular to x-axis,

So ,point L lies on x-axis, and we know that for any point on x-axis y-ordinate is zero.

So,we have L= (—6 , 0)

17. **(c)** many

Explanation: There are infinite many eqution which satisfy the given value x = 2, y = 3

for example

x + y = 5

x - y = -1

3x - 2y = 0

etc.....

18. **(d)** 7 and - 18

Explanation: It is given (x + 2) and (x - 1) are the factors of the polynomial

$f(x) = x^3 + 10x^2 + mx + n$

i.e., f(-2) = 0 and f(1) = 0

Now

$f(-2) = (-2)^3 + 10(-2)^2 + m(-2) + n = 0$

-8 + 40 - 2m + n = 0

$\Rightarrow$ -2m + n = -32

$\Rightarrow$ 2m - n = 32 ..... (i)

$f(1) = (1)^3 + 10(1)^2 + m(1) + n = 0$

1 + 10 + m + n = 0

m + n = -11 ..... (ii)

Solving equation (i) and (ii) we get

m = 7 and n = -18

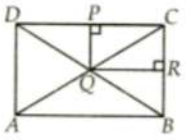
19. **(b)** Both A and R are true but R is not the correct explanation of A.

Explanation:

In ΔADC, Q is the midpoint of AC such that PQ || AD.

P is the mid-point of DC

DP = PC [Using converse of midpoint theorem]



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

Explanation: $\sqrt{2} + \sqrt{3} \neq 5$

$\sqrt{3} + \sqrt{2}$ = 1.732 + 1.414 = 3.146 $\neq \sqrt{5}$ as $\sqrt{5}$ = 2.236

Section B

21. Let x kg be the weight each of Ram and Ravi. On gaining 2 kg, the weight of Ram and Ravi will be (x + 2) each. By Euclid's second axiom, when equals are added to equals, the wholes are equal. Therefore, the weight of Ram and Ravi are again equal.

22. AC = BD . . . . [Given] . . . (1)

    AC = AB + BC . . . . [Point B lies between A and C] . . . . (2)

    BD = BC + CD . . . . [Point C lies between B and D] . . . . (3)

    Substituting (2) and (3) in (1), we get

    AB + BC = BC + CD

    $\Rightarrow$ AB = CD . . . . [Subtracting equals from equals]

23. (i) I quadrant

    (ii) II quadrant

    (iii) III quadrant

24. $\frac{3-2\sqrt{2}}{3+2\sqrt{2}}$

    $= \frac{3-2\sqrt{2}}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$

    $= \frac{(3-2\sqrt{2})^2}{(3)^2-(2\sqrt{2})^2}$

    $= \frac{3^2-2\times3\times2\sqrt{2}+2\sqrt{2}^2}{9-4\times2}$

    $= \frac{9-12\sqrt{2}+8}{9-8}$

    $= \frac{17-12\sqrt{2}}{1}$

    $= 17 - 12\sqrt{2}$

    OR

    $\frac{30}{5\sqrt{3}-3\sqrt{5}} = \frac{30}{5\sqrt{3}-3\sqrt{5}} \times \frac{5\sqrt{3}+3\sqrt{5}}{5\sqrt{3}+3\sqrt{5}}$

    (Multiplying the numerator and denominator by $5\sqrt{3}+3\sqrt{5}$)

    $= \frac{30(5\sqrt{3}-3\sqrt{5})}{(5\sqrt{3})^2-(3\sqrt{5})^2} = \frac{30(5\sqrt{3}-3\sqrt{5})}{75-45}$

    $= \frac{30(5\sqrt{3}-3\sqrt{5})}{30} = \frac{5\sqrt{3}-3\sqrt{5}}{1}$

25. We have radius of the conical tent, r = 7 m

    Height of the conical tent, h = 24 m

    Now, l = $\sqrt{r^2+h^2}$ = $\sqrt{49+576}$ = $\sqrt{625}$ = 25 m

    Curved surface area of the cone = πrl = $\frac{22}{7} \times 7 \times 25 = 550$

    Width of the cloth = 2.5 m

    Therefore, Length of the cloth = $\frac{area\ of\ the\ cloth}{width\ of\ the\ cloth}$ = $\frac{550}{2.5}$ = 220 m

    OR

    r = 5.6 cm

    Surface area of a sphere = $4\pi r^2$

    $= 4 \times \frac{22}{7} \times (5.6)^2 = 394.24\ cm^2$

Section C

26. $\frac{4+\sqrt{5}}{4-\sqrt{5}} + \frac{4-\sqrt{5}}{4+\sqrt{5}}$

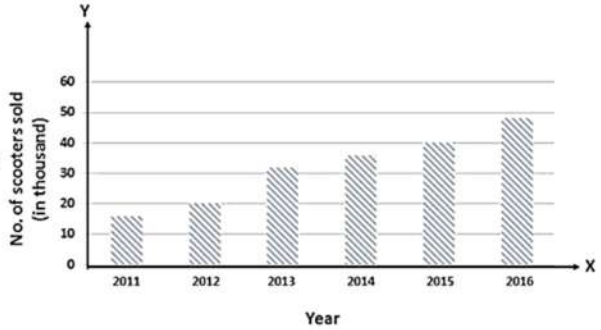
    $= \frac{(4+\sqrt{5})(4+\sqrt{5})+(4-\sqrt{5})(4-\sqrt{5})}{(4-\sqrt{5})(4+\sqrt{5})}$

    $= \frac{(4+\sqrt{5})^2+(4-\sqrt{5})^2}{(4-\sqrt{5})(4+\sqrt{5})}$

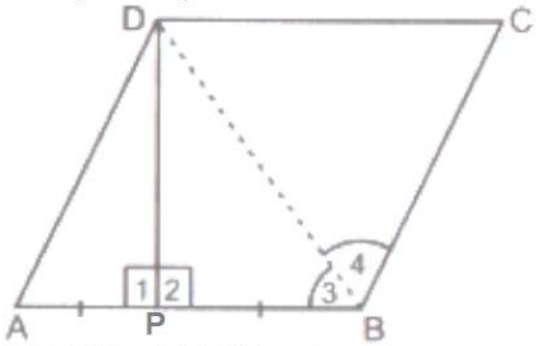
    $= \frac{\left\{(4)^2+2(4)(\sqrt{5})+(\sqrt{5})^2\right\}+\left\{(4)^2-2(4)(\sqrt{5})+(\sqrt{5})^2\right\}}{(4)^2-(\sqrt{5})^2}$

    $= \frac{(16+8\sqrt{5}+5)+(16-8\sqrt{5}+5)}{16-5} = \frac{42}{11}$

27. The bar graph for the given data is shown below:



28. The required diagram is shown below:



In $\triangle APD$ and $\triangle BPD$, we have

AP = BP .....[Given]

$\angle 1 = \angle 2$ .....[$\because$ Each equal to 90^o]

PD = PD ..... [Common side]

So, by SAS Criterion of congruence, we have

$\Delta APD \cong \triangle BPD$

$\therefore \angle A = \angle 3$ .....[CPCT]

But,$\angle 3 = \angle 4$ ..... [$\because$ Diagonals bisect opposite angles of a rhombus]

$\Rightarrow \angle A = \angle 3 = \angle 4$ .....(1)

Now, AD || BC

SO, $\angle A + \angle ABC = 180^\circ$ [$\because$ Sum of consecutive interior angles is 180^o]

$\Rightarrow \angle A + \angle 3 + \angle 4 = 180^\circ$

$\Rightarrow \angle A + \angle A + \angle A = 180^\circ$ [by Using (1)]

$\Rightarrow 3\angle A = 180^\circ$

$\Rightarrow \angle A = \frac{180^\circ}{3} = 60^\circ$

Now, $\angle ABC = \angle 3 + \angle 4$

$= 60^\circ + 60^o$

$= 120^\circ$ ..... [$\because$ Opposite angles of a rhombus are equal]

$\therefore \angle ADC = \angle ABC = 120^\circ$ .... [$\because$ Opposite angles of a rhombus are equal]

29. 12x + 5y = 0

$\Rightarrow$ 5y = –12x

$\Rightarrow y = \frac{-12}{5}x$

Put x = 0, then $y = \frac{-12}{5}(0) = 0$

Put x = 5, then $y = \frac{-12}{5}(5) = -12$

Put x = 10, then $y = \frac{-12}{5}(10) = -24$

Put x = 15, then $y = \frac{-12}{5}(15) = -36$

$\therefore$ (0, 0), (5, –12), (10, –24) and (15, –36) are the four solutions of the equation 12x + 5y = 0

30. i. The bar graph gives the information about the expenditure on health and family planning during 6th five year plan in India.

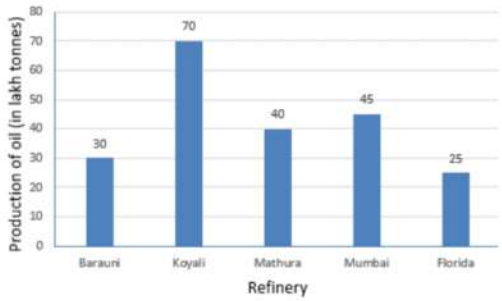
ii. The expenditure on health and family planning in the year 1982 - 1983 = ₹700 crores.....

iii. 1984-85 is the year in which the increase in expenditure was maximum over the expenditure in the previous year.

The maximum increase = 1000 - 780 = 220 crores.

OR

The production of oil (in lakh tonnes) in some of the refineries in India during 1982



31. Let $a = 2x - 3y,\ b = 3y - 4z,\ c = 4z - 2x$

$then\ a + b + c = 2x - 3y + 3y - 4z + 4z - 2x = 0$

$\therefore a^3 + b^3 + c^3 = 3abc$

$(2x - 3y)^3 + (3y - 4z)^3 + (4z - 2x)^3 = 3(2x - 3y)(3y - 4z)(4z - 2x)$

$= 3(2x - 3y)(3y - 4z) \times 2(2z - x)$

$= 6(2x - 3y)(3y - 4z)(2z - x)$

Section D

32. We know that if two lines intersect, then the vertically-opposite angles are equal.

Let $\angle BOC = \angle AOD = x^\circ$

$\angle BOC + \angle AOD = 280^\circ$

$x + x = 280^\circ$

$\Rightarrow 2x = 280^\circ$

$\Rightarrow x = 140^\circ$

$\therefore \angle BOC = \angle AOD = 140^\circ$

Also, let $\angle AOC = \angle BOD = y^\circ$

We know that the sum of all angles around a point is 360°

$\therefore \angle AOC + \angle BOC + \angle BOD + \angle AOD = 360^\circ$

$\Rightarrow y + 140 + y + 140 = 360^\circ$

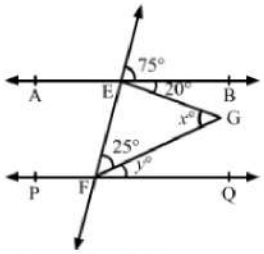
$\Rightarrow 2y = 80^\circ$

$\Rightarrow y = 40^\circ$

Hence, $\angle AOC = \angle BOD = 40^\circ$

$\therefore \angle BOC = \angle AOD = 140^\circ$ and $\angle AOC = \angle BOD = 40^\circ$

OR



Given, AB || PQ

Let CD be the transversal cutting AB and PQ at E and F, respectively.

Then,

$\angle CEB + \angle BEG + \angle GEF = 180^\circ$ [Since CD is a straight line]

$\Rightarrow 75^\circ + 20^\circ + \angle GEF = 180^\circ$

$\Rightarrow \angle GEF = 85^\circ$

We know that the sum of angles of a triangle is 180°.

$\therefore \angle GEF + \angle EGF + \angle EFG = 180$

$\Rightarrow 85^\circ + x + 25^\circ = 180^\circ$

$\Rightarrow x^\circ + 110^\circ = 180^\circ$

$\Rightarrow x^\circ = 180^\circ - 110^\circ$

$\Rightarrow x^\circ = 70^\circ$

And

$\angle FEG + \angle BEG = \angle DFQ$ [Corresponding Angles]

$\Rightarrow 85^\circ + 20^\circ = \angle DFQ$

$\Rightarrow \angle DFQ = 105^\circ$

$\angle EFG + \angle GFQ + \angle DFQ = 180^\circ$ [Since CD is a straight line]

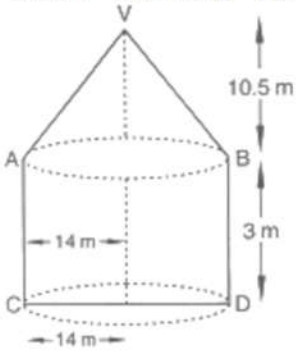
$\Rightarrow 25^\circ + y^\circ + 105^\circ = 180^\circ$

$\Rightarrow$ y° = 50°

$\therefore$ x° = 70° and y° = 50°

33. Let r metres be the radius of the base of the cylinder and h metres be its heigh$\Rightarrow l_1 = \sqrt{306.25}\text{m} = 17.5\text{m}$

Then, r = 14m and h = 3 m



Now we have Curved surface area of the cylinder $..= 2\pi rh\text{m}^2 = \left(2 \times \frac{22}{7} \times 14 \times 3\right)\text{m}^2$ = 264 m^2

Let r_1 m be the radius of the base, h_1 m be the height and Z m be the slant height of the cone. Then, r_1 = 14m, h_1 = (13.5 - 3)m = 10.5m

$\therefore I_1 = \sqrt{r_1^2 + h_1^2}$

$\Rightarrow l_1 = \sqrt{14^2 + (10.5)^2}\text{m} = \sqrt{196 + 110.25}\text{m}$

Therefore Curved surface area of the cone $= \pi r_1 l_1$

$= \frac{22}{7} \times 14 \times 17.5\text{m}^2$ = 770m^2

So, Total area which is to be painted = Curved surface area of the cylinder + Curved surface area of the cone....

= (264 + 770) m2 = 1034 m^2

Now for Flence, total cost of painting = Rs.(1034 $\times$ 2) = Rs.2068 .

34. Let the height of the triangle be h meter

$\therefore$ Base = 3h meter [given]

Now,

Area of triangle $= \frac{\text{Total cost}}{\text{Rate}} = \frac{783}{58}$ = 13.5 ha = 135000 m^2

We have:

Area of triangle = 135000 m^2

$\Rightarrow \frac{1}{2} \times$ Base $\times$ Height = 135000

$\Rightarrow \frac{1}{2} \times 3h \times h$ = 135000

$\Rightarrow h^2 = \frac{135000 \times 2}{3}$

$\Rightarrow$ h^2 = 90000

$\Rightarrow$ h = 300 m [taking square root both sides]

Thus, we have

Height = h = 300 m

Base = 3h = 900 m.

OR

Let:

a = 91 m, b = 98 m, and c = 105 m

$\therefore s = \frac{a+b+c}{2} = \frac{91+98+105}{2}$ = 147 m

$\Rightarrow$ s = 147 m

By Heron's formula, we have:

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

$= \sqrt{147(147-91)(147-98)(147-105)}$

$= \sqrt{147 \times 56 \times 49 \times 42}$

$= \sqrt{7 \times 3 \times 7 \times 2 \times 2 \times 2 \times 7 \times 7 \times 7 \times 7 \times 3 \times 2}$

$= 7 \times 7 \times 7 \times 2 \times 3 \times 2$

= 1446 m^2

We know that the longest side is 105 m.

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

Area of triangle = 4116 m^2

$\Rightarrow \frac{1}{2} \times$ Base $\times$ Height = 4116 $\Rightarrow \frac{1}{2} \times (105)$(Height) = 4116

$\Rightarrow$ Height $= \frac{4116 \times 2}{105} =$ 78.4 m

35. $x^3 - 2x^2 - x + 2$

We need to consider the factors of 2, which are $\pm 1, \pm 2$

Let us substitute 1 in the polynomial $x^3 - 2x^2 - x + 2$ to get

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

Thus, according to factor theorem, we can conclude that $(x - 1)$ is a factor of the polynomial

$x^3 - 2x^2 - x + 2$

Let us divide the polynomial $x^3 - 2x^2 - x + 2$ by $(x - 1)$,to get

$$
\begin{array}{r|l}
x-1 & x^3-2x^2-x+2 \\
 & x^2-x-2 \\
 & x^3-x^2 \\
 & -x^2-x \\
 & -x^2+x \\
 & -2x+2 \\
 & -2x+2 \\
 & 0
\end{array}
$$

$x^3 - 2x^2 - x + 2 = (x - 1)\left(x^2 - x - 2\right).$

$= (x - 1)\left(x^2 + x - 2x - 2\right)$

$= (x - 1)[x(x + 1) - 2(x + 1)]$

$= (x - 1)(x - 2)(x + 1).$

Therefore, we can conclude that on factorizing the polynomial $x^3 - 2x^2 - x + 2$,we get

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

Section E

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

Rainwater harvesting system is a technology that collects and stores rainwater for human use.

Anup decided to do rainwater harvesting. He collected rainwater in the underground tank at the rate of 30 cm^3/sec.

(i) Let 'x be time taken and y be amount of water collected as per given statement.

Equation is 30x = y

Now when x = 2 hours = 120 sec

y = 30 $\times$ 120 = 3600 cm^3

(ii) 30x - y + 0 = 0

Standard form of a linear equation in two variables is ax + by + c = 0

(iii) Since, y = 30x

If x = 60, then, y = 30 × 60

= 1800

Required volume is 1800 cm^3.

OR

Since, y = 30x

If y = 900, then, 900 = 30x

x = $\frac{900}{30}$ = 30

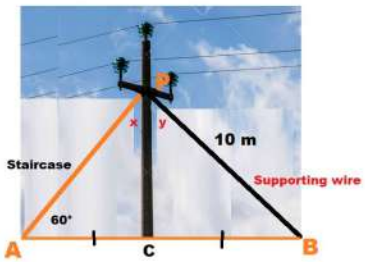
Required time is 30 sec.

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

As shown In the village of Surya there was a big pole PC. This pole was tied with a strong wire of 10 m length.

Once there was a big spark on this pole, thus wires got damaged very badly. Any small fault was usually repaired with the help of a rope which normal board electricians were carrying on bicycles.

This time electricians need a staircase of 10 m so that it can reach at point P on the pole and this should make 60° with line AC.



(i) In △APC and △BPC

AP = BP (Given)

CP = CP (common side)

∠ACP = ∠BCP = 90^o

By RHS criteria △APC ≅ △BPC

(ii) In △ACP

∠APC + ∠PAC + ∠ACP = 180^o

⇒ x + 60^o + 90^o = 180^o (angle sum property of △)

⇒ ∠x = 180^o − 150^o = 30^o

∠x = 30^o

OR

In △APC and △BPC

Corresponding part of congruent triangle

∠X = ∠Y

⇒ ∠Y = 30^o (given ∠X = 30^o)

(iii) In △APC and △BPC

Corresponding part of congruent triangle

∠PAC = ∠PBC

⇒ ∠PBC = 60^o (given ∠PAC = 60^o)

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

While dusting a maid found a button whose upper face is of red color, as shown in the figure. The diameter of each of the smaller identical circles is $\frac{1}{4}$ of the diameter of the larger circle whose radius is 16 cm.

(i) Let r and R be the radii of each smaller circle and larger circle respectively.

d and D are diameter of each smaller circle and larger circle respectively.

We have, d = $\frac{1}{4}$D

$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow r = \frac{1}{4} \times 16 \Rightarrow$ r = 4 cm

Area of smaller circle = πr^2

= $\frac{22}{7} \times 4 \times 4$ = 50.28 cm^2

(ii) Let r and R be the radii of each smaller circle and larger circle respectively.

We have, d = $\frac{1}{4}$D

$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow r = \frac{1}{4} \times 16 \Rightarrow$ r = 4 cm

Area of larger circle = πR^2

= $\frac{22}{7} \times 16 \times 16 = \frac{5632}{7}$ = 804.57 cm^2

OR

Let r and R be the radii of each smaller circle and larger circle respectively.

We have, d = $\frac{1}{4}$D

$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow r = \frac{1}{4} \times 16 \Rightarrow$ r = 4 cm

Area of quadrant of a smaller circle

= $\frac{1}{4} \times$ 50.28 = 12.57 cm^2

(iii) Let r and R be the radii of each smaller circle and larger circle respectively.

We have, d = $\frac{1}{4}$D

$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow r = \frac{1}{4} \times 16 \Rightarrow$ r = 4 cm

Area of the black colour region = Area of larger circle - Area of 4 smaller circles

= 804.57 - 4 $\times$ 50.28 = 603.45 cm^2