CBSE SAMPLE PAPER - 05

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 abscissa of any point on y-axis is **[1]**

   a) 1 b) any number

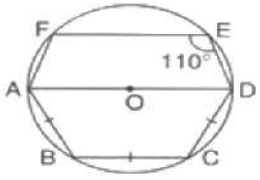
   c) -1 d) 0

2. An isosceles right triangle has area 8 cm^2. The length of its hypotenuse is **[1]**

   a) $\sqrt{32}$ cm b) $\sqrt{24}$ cm

   c) $\sqrt{16}$ cm d) $\sqrt{48}$ cm

3. in the given figure, AD is a diameter of the circle with centre O. Chords AB, BC and CD are equal. If $\angle DEF = 110^o$, then $\angle FAB$ is equal to **[1]**



   a) 120^o b) 130^o

   c) 110^o d) 140^o

4. In a histogram the area of each rectangle is proportional to **[1]**

   a) the class size of the corresponding class interval

   b) cumulative frequency of the corresponding class interval

c) the class mark of the corresponding class interval

d) frequency of the corresponding class interval

5. An irrational number between 2 and 2.5 is **[1]**

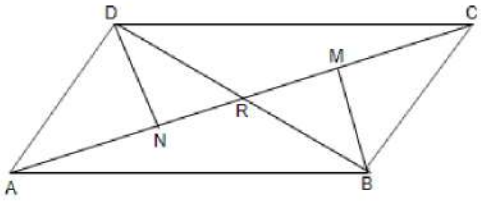
a) $\sqrt{5}$

b) $\sqrt{11}$

c) $\sqrt{22.5}$

d) $\sqrt{12.5}$

6. In quadrilateral ABCD, BM and DN are drawn perpendiculars to AC such that BM = DN. If BR = 8 cm. then BD is **[1]**



a) 12 cm

b) 4 cm

c) 16 cm

d) 2 cm

7. If (-2, 5) is a solution of 2x + my = 11, then the value of 'm' is **[1]**

a) -2

b) 2

c) 3

d) -3

8. $(x^2 - 4x - 21) = ?$ **[1]**

a) (x - 7) (x + 3)

b) (x - 7) (x - 3)

c) None of these

d) (x + 7) (x - 3)

9. The value of $0.\overline{2}$ in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$ is **[1]**

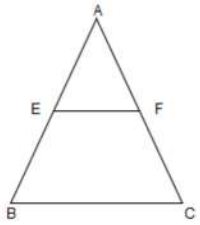
a) $\frac{2}{9}$

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

c) $\frac{2}{5}$

d) $\frac{1}{8}$

10. E and F are the mid-points of the sides AB and AC of a $\triangle$ABC. If AB = 6cm, BC = 5cm and AC = 6cm, Then EF is equal to **[1]**



a) 4 cm

b) 3 cm

c) 2.5 cm

d) None of these

11. If $10^x = 64$, what is the value of $10^{\frac{x}{2}+1}$? **[1]**

a) 18

b) 80

c) 81

d) 42

12. The line represented by the equation x + y = 16 passes through (2, 14). How many more lines pass through the point (2, 14) **[1]**

a) 10

b) 2

c) many

d) 100

13. If two angles are complements of each other then each angle is **[1]**

a) a reflex angle

b) an acute angle

c) a straight angle

d) an obtuse angle

14. If x = $3 + 2\sqrt{2}$, then the value of $x + \frac{1}{x}$ is **[1]**

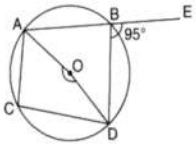
a) 0

b) 3

c) 1

d) 6

15. In the given figure, O is the centre of the circle ABE is a straight line. If $\angle DBE = 95^o$ then $\angle AOD$ is equal to **[1]**



a) 170^o

b) 180^o

c) 190^o

d) 175^o

16. P(5, -7) be a point on the graph. Draw the PM $\perp$ y-axis. The coordinates of M are **[1]**

a) (0, -7)

b) (0, 0)

c) (-7, 0)

d) (-7, 5)

17. **The cost of a notebook is twice the cost of a pen.** The equation to represent this statement is **[1]**

a) 2x = 3y

b) x = 3y

c) none of these

d) x - 2y = 0

18. If $x + \frac{1}{x} = 2$, then $x^3 + \frac{1}{x^3}$ = **[1]**

a) 14

b) 64

c) 2

d) 8

19. **Assertion (A):** If the angles of a quadrilateral are in the ratio 2 : 3 : 7 : 6, then the measure of angles are 40^o, 60^o, 140^o, 120^o, respectively. **[1]**

Reason (R): The sum of the angles of a quadrilateral is 360^o.

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):** 0.271 is a terminating decimal and we can express this number as $\frac{271}{1000}$ which is of the form $\frac{p}{q}$, where p and q are integers and q $\neq$ 0. **[1]**

Reason (R): A terminating or non-terminating decimal expansion can be expressed as rational number.

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. Study the following statement: **[2]**

Two intersecting lines cannot be perpendicular to the same line

Check whether it is an equivalent version to the Euclid's fifth postulate.

[Hint: Identify the two intersecting lines l and m and the line n in the above statement.]

22. If P, Q, and R are three points on a line and Q is between P and R, then prove that PR - QR = PQ. **[2]**

23. Which of the following points lie on the x-axis? **[2]**

i. A (0,8)

ii. 6(4,0)

iii. C(0,-3)

iv. D (-6,0)

v. E (2,1)

vi. F(-2, -1)

vii. G (-1, 0)

viii. H(0, -2)

24. Evaluate: $\frac{(25)^{\frac{5}{2}} \times (729)^{\frac{1}{3}}}{(125)^{\frac{2}{3}} \times (27)^{\frac{2}{3}} \times 8^{\frac{4}{3}}}$. **[2]**

OR

Give two rational numbers between 0.515115111511115... and 0.5353353335 ...

25. The surface area of a sphere is the same as the curved surface area of a cone having the radius of the base as 120 cm and height 160 cm. Find the radius of the sphere. **[2]**

OR

Two cones have their heights in the ratio 1 : 3 and radii 3 : 1. What is the ratio of their volumes?

Section C

26. Find the values of a and b in each of $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - 6\sqrt{3}$ **[3]**

27. On a certain day, the temperature in a city was recorded as under: **[3]**

Time	5 a.m.	8 a.m.	11 a.m.	3 p.m.	6 p.m.
Temperature (in °C)	20	24	26	22	18

Illustrate the data by a bar graph.

28. In a parallelogram, show that the angle bisectors of two adjacent angles intersect at right angles. **[3]**

29. A family spends Rs. 500 monthly as a fixed amount on milk and extra milk costs Rs.20 per kg. Taking quantity of extra milk as x and total expenditure on milk as y. Write a linear equation and fill the table. **[3]**

x	0	-	2
y	-	1000	-

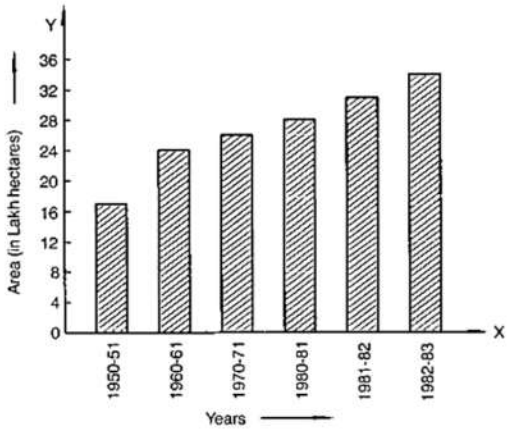
30. The production of saleable steel in some of the steel plants of our country during 1999 is given below: **[3]**

Plant	Bhilai	Durgapur	Rourkela	Bokaro
Production (In thousand tonnes)	160	80	200	150

Construct a bar graph to represent the above data on a graph paper by using the scale 1 big divisions = 20 thousand tonnes.

OR

Read the bar graph given in Figure and answer the following questions:



i. What information is given by the bar graph?

ii. In which years the areas under the sugarcane crop were the maximum and the minimum?

iii. State whether true or false:

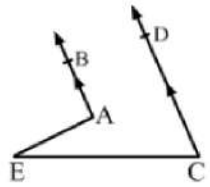
The area under the sugarcane crop in the year 1982-83 is three times that of the year 1950-51.

31. Factorize: **[3]**

$8a^3 + b^3 + 12a^2b + 6ab^2$

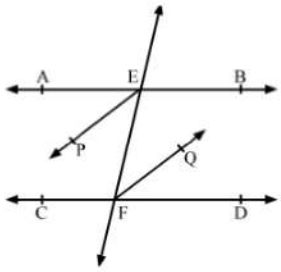
Section D

32. In the given figure, AB || CD. Prove that $\angle BAE - \angle DCE = \angle AEC$. **[5]**



OR

In the given figure, AB || CD and a transversal t cuts them at E and F respectively. If EP and FQ are the bisectors of ∠AEF and ∠EFD respectively, prove that EP || FQ.



33. A right angled triangle with sides 3 cm and 4 cm is revolved around its hypotenuse. Find the volume of the double cone thus generated. **[5]**

34. Calculate the area of the triangle whose sides are 18 cm, 24 cm and 30 cm in length. Also, find the length of the altitude corresponding to the smallest side. **[5]**

OR

If each side of a triangle is doubled, then find the ratio of area of new triangle thus formed and the given triangle.

35. Find rational roots of the polynomial f (x) = $2x^3 + x^2 - 7x - 6$. **[5]**

Section E

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

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon. Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).

Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total

was found 120.

Reeta just entered in the class, she did not know any number.

The teacher said Reeta to form the 1st equation with two variables x and y.

Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.

Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

(i) What are the equation formed by Reeta and Veena?

(ii) What was the equation formed by Veena?

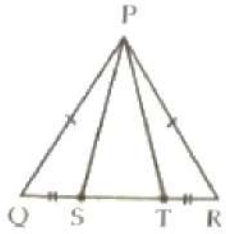
(iii) Which number did Peter think?

OR

Which number did Kelvin think?

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

A children's park is in the shape of isosceles triangle said PQR with PQ = PR, S and T are points on QR such that QT = RS.



(i) Which rule is applied to prove that congruency of △PQS and △PRT.

(ii) Name the type of △PST.

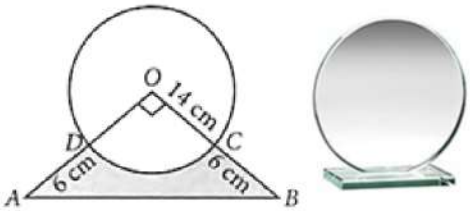
OR

If ∠QPR = 80^o find ∠PQR?

(iii) If PQ = 6 cm and QR = 7 cm, then find perimeter of △PQR.

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

Director of a company selected a round glass trophy for awarding their employees an annual function. The design of each trophy is made as shown in the figure, where its base ABCD is golden plated from the front side at the rate of ₹6 per cm^2.



(i) Find the area of sector ODCO.

(ii) Find the area of △AOB.

OR

Find the area of major sector formed in the given figure.

(iii) Find the total cost of golden plating.

Solution

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Class 09 - Mathematics

Section A

1. **(d)** 0

   Explanation: The abscissa of any point on y-axis is always zero. This means that this point hasn't covered any distance on x-axis.

2. **(a)** $\sqrt{32}$ cm

   Explanation: Area of isosceles triangle = $\frac{1}{2}$ × Base × Height

   Since in an isosceles triangle, Base and Height are equal.

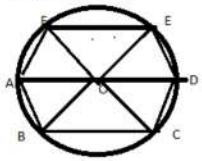
   $\Rightarrow$ 8 = $\frac{1}{2}$ × Base × Base

   $\Rightarrow$ Base = Height = 4 cm

   Hypotenuse = $\sqrt{4^2 + 4^2}$ = $\sqrt{32}$ cm

3. **(b)** 130^o

   Explanation:

   Here, given AB = BC = CD

   Now, equal chords subtend equal angles at centre.so, $\angle AOC = \angle BOC = \angle COD$

   Also, they lie in straight line so, $\angle AOC + \angle BOC + \angle COD$ = 180°

   $\angle AOB = \angle BOC = \angle COD$ = 60°

   In $\triangle AOB$

   $AO = OB, \ \angle OAB = \ \angle OBA$

   Since, $\angle AOB = 60^\circ, \ \angle OAB = \ \angle OBA = 60^\circ$

   Now, $\angle DOE = \angle AOB = 60^\circ$ (vertically opposite angle)

   In $\triangle DOE, OD = OE$ (radius)

   so, $\angle ODE = \angle OED$

   $\triangle DOE, \angle DOE + \angle ODE + \angle OED = 180^\circ$

   2 $\angle ODE = \angle OED$ = 180 - 60 = 120°

   $\angle ODE = \angle OED$ = 60°

   given was, $\angle DEF = 110^o$, so, $\angle OEF = 110 - 60 = 50^\circ$

   Now, in $\triangle EOF$ OE = OF

   So, $\angle OEF = \angle OFE = 50^\circ$

   In, $\triangle EOF \ \angle FOE = 180 - (50 + 50) = 80^\circ$

   Now, $\angle DOE + \angle FOE + \angle AOF = 180^\circ$ (All lie on same straight line)

   So, $\angle AOF = 180 - (80 + 60) = 40^\circ$

   Now, in $\triangle AOF$ AO = FO

   SO, $\angle OFA = \angle OAF$

   In$\triangle AOF$, 2 $\angle OAF + \angle FOA = 180^\circ$

   2 $\angle OAF + \angle FOA = 180^\circ$

   $\angle OAF = 90 - 20 = 70^\circ$

   So, $\angle FAB = \angle FAO + \angle OAB$

   = 70° + 60° = 130°

4. **(d)** frequency of the corresponding class interval

   Explanation: A histogram is a display of statistical information that uses rectangles to show the frequency of data items in successive numerical intervals of equal size. In the most common form of histogram, the independent variable is plotted along the horizontal axis and the dependent variable is plotted along the vertical axis.

5. **(a)** $\sqrt{5}$

Explanation: $\sqrt{5}$ = 2.23606797749978969, Which is a non-terminating and non- repeating decimal therefore it is an irrational and also lies between 2 and 2,5

6. **(c)** 16 cm

Explanation: In triangles $\triangle DNR$ and $\triangle BMR$,

$\angle$N = $\angle$M = 90^o

$\angle$NRD = $\angle$MRB (vertically opposite angles)

BM = DN(Given)

Therefore, $\triangle DNR$ and $\triangle MRB$ are congruent

Therefore, BR = DR = 8 cm

BD = 16 cm

7. **(c)** 3

Explanation: If (-2, 5) is a solution of 2x + my = 11

then it will satisfy the given equation

2 .(-2)+5 m=11

-4+5 m=11

5 m=11+4

5 m=15

$m = \frac{15}{5} = 3$

m=3

8. **(a)** (x - 7) (x + 3)

Explanation: (x^2 - 4x - 21) = x^2 - 7x + 3x - 21

= x(x - 7) + 3 (x - 7)

= (x - 7) (x + 3)

9. **(a)** $\frac{2}{9}$

Explanation: Let x= 0.222...---(i)

multiply eq. (i) by 10, we get

10 x = 2.222....---(ii)

10 x - x = 2.222...-0.222...

9x=2

x= $\frac{2}{9}$

10. **(c)** 2.5 cm

Explanation: since E and F are the mid points of sides AB and AC respectively.

according to mid point theorem of triangle;

EF = $\frac{1}{2} \times BC$

EF = $\frac{1}{2} \times 5$

11. **(b)** 80

Explanation: 10^X = 64

$\Rightarrow \sqrt{10^x} = \sqrt{64}$

$\Rightarrow (10^x)^{\frac{1}{2}}$ = 8

$\Rightarrow 10^{\frac{x}{2}}$ = 8

Now, $10^{\frac{x}{2}+1} = 10^{\frac{x}{2}} \times 10^1$

= 8 $\times$ 10 = 80

12. **(c)** many

Explanation: There are many lines pass through the point (2, 14).

For example

x - y = -12

2x + y = 18

and many more.

13. **(b)** an acute angle

Explanation: an acute angle

If two angles are complements of each other, that is, the sum of their measures is 90°, then each angle is an acute angle.

14. **(d)** 6

Explanation: $x + \frac{1}{x}$

$\Rightarrow \frac{x^2+1}{x}$

Put the value of x,

$\Rightarrow \frac{(3+2\sqrt{2})^2+1}{3+2\sqrt{2}}$

$\Rightarrow \frac{9+8+12\sqrt{2}+1}{3+2\sqrt{2}}$

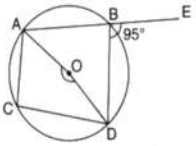
$\Rightarrow \frac{18+12\sqrt{2}}{3+2\sqrt{2}}$

$\Rightarrow \frac{6(3+2\sqrt{2})}{3+2\sqrt{2}}$

$\Rightarrow 6$

15. **(a)** 170^o

Explanation:



$\angle ABD = 180^0 - 95^0 = 85^0$ (Linear Pair)

Since, $\angle AOD = 2\angle ABD = 2 \times 85^0 = 170^0$

16. **(a)** (0, -7)

Explanation: Here, PM Perpendicular to y-axis.

So point M lies on the y-axis, and for any point on y-axis always the value of x = 0.

So Co-ordinate of M = (0, -7).

17. **(d)** x - 2y = 0

Explanation: Let the cost of the notebook is ₹ x and pen is ₹ y and we have given that the cost of a notebook is twice the cost of a pen.

So we have

x = 2y

or x - 2y = 0

18. **(c)** 2

Explanation: On cubing we get

$\left(x + \frac{1}{x}\right)^3 = x^3 + \left(\frac{1}{x^3}\right) + 3x \cdot \frac{1}{x}\left(x + \frac{1}{x}\right)$

$\Rightarrow 2^3 = x^3 + \left(\frac{1}{x^3}\right) + 3\times2$

$\Rightarrow x^3 + \left(\frac{1}{x^3}\right) = 8 - 6$

$\Rightarrow x^3 + \left(\frac{1}{x^3}\right) = 2$

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

Explanation: Both A and R are true and R is the correct explanation of A.

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

Explanation: A is true but R is false.

Section B

21. The equivalent versions of Euclid's fifth postulate are mentioned as follows:

i. For every line l and for every point P not lying on Z, there exists a unique line m passing through P and parallel to Z.

ii. Two distinct intersecting lines cannot be parallel to the same line.

From above two statements it follows given statements is not an equivalent version to the Euclid's fifth postulate.

22. From the given condition, we get the following figure

In the above figure, PQ coincides with PR - QR.

So, according to Euclid's axiom, “things” which coincide with one another are equal to ‘one another’. We have,

PQ + QR = PR i.e. PR - QR = PQ.

23. The coordinates of every point on the X-axis are of the form (x, 0). that means y coordinate is always zero on x-axis.

Hence, the following points lie on the x-axis:

(ii) B(4, 0)

(iv) D(-6, 0)

(vii) G(-1, 0)

24. $\frac{25^{\frac{5}{2}} \times 729^{\frac{1}{3}}}{125^{\frac{2}{3}} \times 27^{\frac{2}{3}} \times 8^{\frac{4}{3}}}$

$= \frac{(5^2)^{\frac{5}{2}} \times (9^3)^{\frac{1}{3}}}{(5^3)^{\frac{2}{3}} \times (3^3)^{\frac{2}{3}} \times (2^3)^{\frac{4}{3}}}$

$= \frac{5^{2\times\frac{5}{2}} \times 9^{3\times\frac{1}{3}}}{5^{3\times\frac{2}{3}} \times 3^{3\times\frac{2}{3}} \times 2^{3\times\frac{4}{3}}}$

$= \frac{5^5 \times 9^1}{5^2 \times 3^2 \times 2^4}$

$= \frac{5^3}{2^4}$

$= \frac{125}{16}$

OR

Let, a = 0.515115111511115 ... = $0.\overline{51}$

and, b = 0.5353353335 ... = $0.\overline{53}$

Clearly, a < b since the second decimal place of a has digit 1 and b has digit 3.

Thus two rational numbers lies between $0.\overline{51}$ and $0.\overline{53}$ are 0.52 and 0.522

[Note: Between two irrational numbers there exist infinitely many rational numbers]

25. The Slant height of cone

$l = \sqrt{(120)^2 + (160)^2}$

$= \sqrt{14400 + 25600}$

$= \sqrt{40000}$

= 200

Surface area of sphere = surface area of cone

$4\pi r_1^2 = \pi rl$

$\mathbf{r}_1^2 = \frac{rl}{4}$

$r_1^2 = \frac{120\times200}{4}$

r_1^2=6000

Radius of sphere

$r_1 = \sqrt{6000}$

= 77.46

OR

Ratio of heights of two cones = 1 : 3

and ratio of their radius = 3 : 1

Let r_1, r_2 be their radii and h_1, h_2 be their heights hence,

$\frac{r_1}{h_2} = \frac{3}{1}$ and $\frac{h_1}{h_2} = \frac{1}{3}$

Now $\frac{Volume\ of\ first\ cone}{Volume\ of\ second\ cone}$

$= \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

$= \left(\frac{3}{1}\right)^2 \times \frac{1}{3} = \frac{9}{1} \times \frac{1}{3} = \frac{3}{1}$

∴ Their ratio = 3 : 1

Section C

26. LHS $= \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = \frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$

$= \frac{(5+2\sqrt{3})(7-4\sqrt{3})}{(7)^2-(4\sqrt{3})^2}$

$= \frac{35-20\sqrt{3}+14\sqrt{3}-24}{49-48}$

$= \frac{11-6\sqrt{3}}{1} = 11 - 6\sqrt{3}$

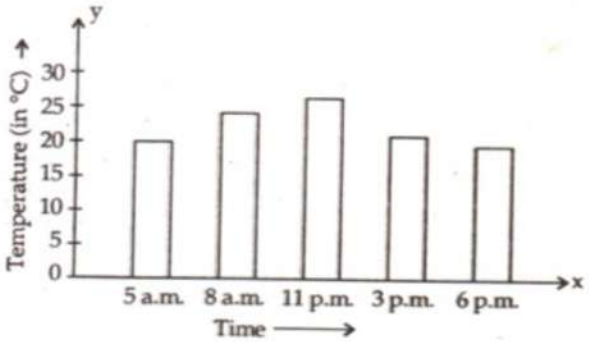
Now, $11 - 6\sqrt{3} = a - 6\sqrt{3}$

$\Rightarrow$ a = 11

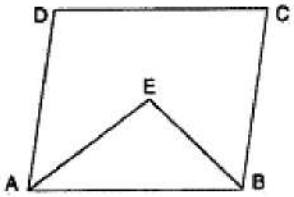
27. Along the y-axis, take 1 small square=5 units.

All the bars should be of same width and same space should be left between the consecutive bars.

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



28. Given: ABCD is a parallelogram. The angle bisectors AE and BE of adjacent angles A and B meet at E.



To Prove : $\angle AEB = 90^o$

Proof : AD || BC . . . [Opposite sides of || gm]

$\therefore \angle DAB + \angle CBA = 180^o$ . . .[As the sum of interior angles on the same side of a transversal is 180^o]

$\Rightarrow 2\angle EAB + 2\angle EBA = 180^o$ . . .[As AE and BE are the bisectors of $\angle DAB$ and $\angle CBA$ respectively]

$\Rightarrow \angle EAB + \angle EBA = 90^o$

In $\triangle EAB$,

$\angle EAB + \angle EBA + \angle AEB = 180^o$ . . .[As the sum of three angles of a triangle is 180^o]

$\Rightarrow 90^o + \angle AEB = 180^o$ . . . [From (1)]

$\Rightarrow \angle AEB = 90^o$

29. According to the question x is extra milk and y is the expenditure for the month

If the quantity of extra milk be 'x' and expenditure be Rs. 'y' then the given condition.

y = 20x + 500 (As Rs.500 is the fixed expenditure) ...(i)

Put x = 0 in equation (i)

y = 20(0) + 500 = 0 + 500

y = Rs.500

When no extra milk is taken the expenditure remains Rs.500 same

Put y = 1000 in equation (i)

1000 = 20x + 500

1000 - 500 = 20x

500 = 20x

x = $\frac{500}{20} = 25\text{kg}$

When the 25 kg of milk is taken extra the expenditure increased as Rs.1000

Put x = 2 in equation (i)

y = 20(2) + 500

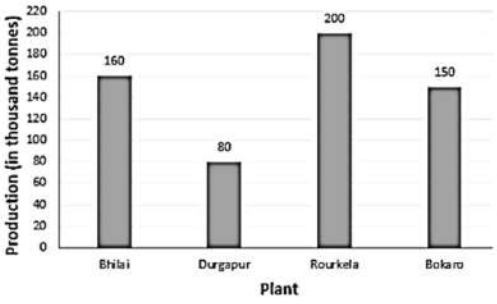
y = 40 + 500

y = Rs. 540

When the 2 kg of milk is taken extra the expenditure increased by Rs.40 i.e. Rs. 540

x	0	25	2
y	500	1000	540

30. Required Bar graph



OR

i. It gives the information about the areas (in lakh hectors) under sugarcane crop during different years in India.

ii. The areas under the sugarcane crops were the maximum and minimum in 1982-83 and 1950-51 respectively.

iii. The area under sugarcane crop in the year 1982-83= 34 lakh hectares.

The area under sugarcane crop in the year 1950-51= 17 lakh hectares.

Clearly, the area under sugarcane crop in the year 1982-83 is not 3 times that of the year 1950-51

So, the given statement is false.

31. $8a^3 + b^3 + 12a^2b + 6ab^2$

The expression $8a^3 + b^3 + 12a^2b + 6ab^2$ can also be written as

$= (2a)^3 + (b)^3 + 3 \times 2a \times 2a \times b + 3 \times 2a \times b \times b$

$= (2a)^3 + (b)^3 + 3 \times 2a \times b\,(2a + b)\,.$

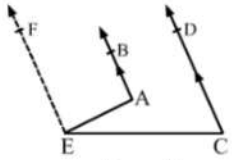
Using identity $(x + y)^3 = x^3 + y^3 + 3xy\,(x + y)$ with respect to the expression

$(2a)^3 + (b)^3 + 3 \times 2a \times b\,(2a + b)$ *we get* $(2a + b)^3$

Therefore, after factorizing the expression $8a^3 + b^3 + 12a^2b + 6ab^2$ we get (2a + b)^3

Section D

32. To Prove : ∠BAE - ∠DCE = ∠ACE



Draw EF || AB || CD through E.

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

Then, $\angle BAE + \angle AEF = 180^\circ$

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

Again, EF || CD and CE is the transversal

Then,

$\angle DCE + \angle CEF = 180^\circ$

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

$\Rightarrow \angle DCE + (\angle AEC + \angle AEF) = 180^\circ$

$\Rightarrow \angle DCE + \angle AEC + 180^\circ - \angle BAE = 180^\circ$

$\Rightarrow \angle BAE - \angle DCE = \angle AEC$

OR

It is given that, AB || CD and t is a transversal

$\therefore \angle AEF = \angle EFD$ .....(i) (Pair of alternate interior angles)

EP is the bisectors of ∠AEF, (Given)

$\therefore \angle AEP = \angle FEP = \frac{1}{2}\angle AEF$

$\Rightarrow \angle AEF = 2\angle FEP$ .....(ii)

Also, FQ is the bisectors of ∠EFD

$\therefore \angle EFQ = \angle QFD = \frac{1}{2}\angle EFD$

$\Rightarrow \angle EFD = 2\angle EFQ$ .....(iii)

From equations (i), (ii) and (iii)

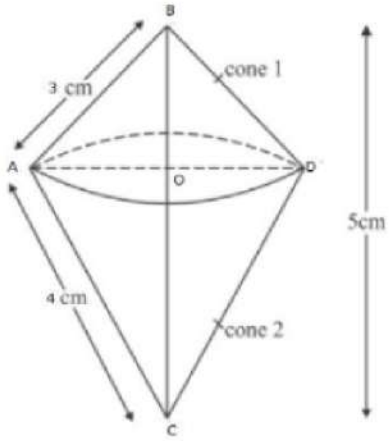
$2\angle FEP = 2\angle EFQ$

$\Rightarrow \angle FEP = \angle EFQ$

Thus, the lines EP and FQ are intersected by a transversal EF such that the pair of alternate interior angles formed are equal.

$\therefore EP \| FQ$ (If a transversal intersects two lines such that a pair of alternate interior angles are equal, then the two lines are parallel)

33.



AB = 3 cm, AC = 4 cm

In $\triangle$BAC, by pythagoras theorem

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

$\Rightarrow BC^2 = 3^2 + 4^2$

$\Rightarrow BC^2 = 25$

$\Rightarrow BC = \sqrt{25} = 5$ cm

In $\triangle$AOB and $\triangle$CAB

$\angle ABO = \angle ABC$ [common]

$\angle AOB = \angle BAC$ [each 90^o]

Then, $\triangle AOB \sim \triangle CAB$ [by AA similarity]

$\therefore \frac{AO}{CA} = \frac{OB}{AB} = \frac{AB}{CB}$ [c.p.s.t]

$\Rightarrow \frac{AO}{4} = \frac{OB}{3} = \frac{3}{5}$

Then, AO = $\frac{4\times3}{5}$ and OB = $\frac{3\times3}{5}$

$\Rightarrow$ AO = $\frac{12}{5}$ cm and OB = $\frac{9}{5}$ cm

$\therefore$OC = 5 - $\frac{9}{5}$ = $\frac{16}{5}$cm

$\therefore$ Volume of double cone thus generated = volume of first cone + volume of second cone

$= \frac{1}{3}\pi(AO)^2 \times BO + \frac{1}{3}\pi(AO)^2 \times OC$

$= \frac{1}{3} \times \frac{22}{7} \times \left(\frac{12}{5}\right)^2 \times \frac{9}{5} + \frac{1}{3} \times \frac{22}{7} \times \left(\frac{12}{5}\right)^2 \times \frac{16}{5}$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{12}{5} \times \frac{12}{5}\left[\frac{9}{5} + \frac{16}{5}\right]$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{12}{5} \times \frac{12}{5} \times 5$

$=\frac{1056}{35} = 30\frac{6}{35}\text{cm}^3$.

34. Let a = 18 cm, b = 24 cm and c = 30 cm

$\Rightarrow$ half perimeter = s = $\frac{a+b+c}{2} = \frac{18+24+30}{2} = 36\text{cm}$

By Heron's formula, we have:

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

$= \sqrt{36(36-18)(36-24)(36-30)}$

$= \sqrt{36 \times 18 \times 12 \times 6}$

$= \sqrt{12 \times 3 \times 6 \times 3 \times 12 \times 6}$

$= 12 \times 3 \times 6$

= 216 cm^2

We know that the smallest side is 18 cm.

Thus, we can find out the altitude of the triangle corresponding to 18 cm.

We have:

Area of triangle = 216 cm^2

$\Rightarrow \frac{1}{2} \times$ Base $\times$ Height = 216 $\Rightarrow \frac{1}{2} \times (18)$(Height) = 216

$\Rightarrow$ Height $= \frac{216 \times 2}{18} = 24cm$

OR

Let a, b, c be the sides of the given triangle and s be its semi-perimeter.

Then, $s = \frac{a+b+c}{2}$ ...(i)

$\therefore$ Area of the given triangle$= \sqrt{s(s-a)(s-b)(s-c)} = \Delta$ say

As per given condition, the sides of the new triangle will be 2a, 2b, and 2c.

So, the semi-perimeter of the new triangle =

$s' = \frac{2a+2b+2c}{2} = a + b + c$ ...(ii)

From (i) and (ii), we get

s' = 2s

Area of new triangle $= \sqrt{s'(s'-2a)(s'-2b)(s'-2c)}$

$= \sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$

$= \sqrt{16s(s-a)(s-b)(s-c)}$

$= 4\sqrt{s(s-a)(s-b)(s-c)} = 4\Delta$

The required ratio = $4\Delta : \Delta$ = 4:1

Therefore the ratio of area of new triangle thus formed and the given triangle is 4 : 1.

35. Given that $f(x) = 2x^3 + x^2 - 7x - 6$

f(x) is a cubic polynomial with an integer coefficient . If the rational root in the form of $\frac{p}{q}$, the values of p are limited to factors of 6 which are $\pm 1, \pm 2, \pm 3, \pm 6$

and the values of q are limited to the highest degree coefficient i.e 2 which are $\pm 1, \pm 2$

here, the possible rational roots are $\pm$ 1, $\pm$ 2, $\pm$ 3, $\pm$ 6, $\pm\frac{1}{2}, \pm\frac{3}{2}$

Let, x = -1

$f(-1) = 2(-1)^3 + (-1)^2 - 7(-1) - 6$

= - 2 + 1 + 7 - 6

= - 8 + 8

= 0

Let, x = 2

$f(-2) = 2(2)^3 + (2)^2 - 7(2) - 6$

$= (2 \times 8) + 4 - 14 - 6$

= 16 + 4 -14 - 6

= 20 - 20

= 0

Let, x = $-\frac{3}{2}$

$f(-\frac{3}{2}) = 2(-\frac{3}{2})^3 + (-\frac{3}{2})^2 - 7(-\frac{3}{2}) - 6$

$= 2(-\frac{27}{8}) + \frac{9}{4} - 7(-\frac{3}{2}) - 6$

$= (-\frac{27}{4}) + \frac{9}{4} - (-\frac{21}{2}) - 6$

= – 6.75 + 2.25 + 10.5 - 6

= 12.75 - 12.75

= 0

But from all the factors only -1, 2 and $-\frac{3}{2}$ gives the result as zero.Further,since f(x) is of degree 3, therefore it has almost 3 rooots.

So, the rational roots of $2x^3 + x^2 - 7x - 6$ are -1, 2 and $-\frac{3}{2}$

Section E

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

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon.

Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).

Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total was found 120.

Reeta just entered in the class, she did not know any number.

The teacher said Reeta to form the 1st equation with two variables x and y.

Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.

Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

(i) x - y = 10

2x + 3y = 120

(ii) 2x + 3y = 120

(iii) x - y = 10 ...(1)

2x + 3y = 120 ...(2)

Multiply equation (1) by 3 and to equation (2)

3x - 3y + 2x + 3y = 30 + 120

$\Rightarrow$ 5x = 150

$\Rightarrow$ x = 30

Hence the number thought by Prateek is 30.

OR

We know that x - y = 10 ...(i) and 2x + 3y = 120 ...(ii)

Put x = 30 in equation (i)

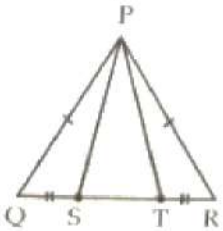
30 - y = 10

$\Rightarrow$ y = 40

Hence number thought by Kevin = 40

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

A children's park is in the shape of isosceles triangle said PQR with PQ = PR, S and T are points on QR such that QT = RS.



(i) In $\triangle$PQS and $\triangle$PRT

PQ = PR (Given)

QS = TR (Given)

$\angle$PQR = $\angle$ PRQ (corresponding angles of an isosceles $\triangle$)

By SAS commence

$\triangle$PQS $\cong$ $\triangle$PRT

(ii) $\triangle PQS \cong \triangle PRT$

$\Rightarrow$ PS = PT (CPCT)

So in $\triangle$PST

PS = PT

It is an isosceles triangle.

OR

Let $\angle$Q = $\angle$R = x and $\angle$P = 80^o

In $\triangle$PQR, $\angle$P + $\angle$Q + $\angle$R = 180^o (Angle sum property of $\triangle$)

80^o + x + x = 180^o

2x = 180^o - 80

2x = 100^o

x = $\frac{100^\circ}{2}$

= 50^o

(iii)Perimeter = sum of all 3 sides

PQ = PR = 6 cm

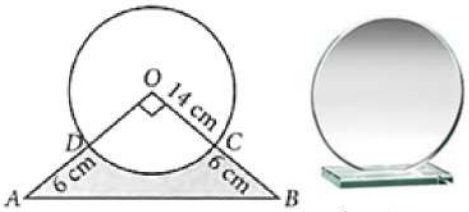
QR = 7 cm

So, P = (6 + 6 + 7) cm

= 19 cm

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

Director of a company selected a round glass trophy for awarding their employees an annual function. The design of each trophy is made as shown in the figure, where its base ABCD is golden plated from the front side at the rate of ₹6 per cm^2.



(i) Area of sector ODCO = $\frac{1}{4}\pi r^2$

= $\frac{1}{4} \times \frac{22}{7} \times 14 \times 14 = 154$ cm^2

(ii) Area of $\triangle$AOB = $\frac{1}{2} \times OA \times OB = \frac{1}{2}(20 \times 20)$

= 200 cm^2

OR

Area of major sector = area of circle - area of minor sector

= $\pi r^2 - \frac{1}{4}\pi r^2 = \frac{3\pi r^2}{4} = \frac{3}{4} \times \frac{22}{7} \times 14 \times 14$ = 462 cm^2

(iii)Area of region which is golden plated = area of $\triangle$OAB - area of sector ODCO.

= 200 - 154 = 46 cm^2

$\therefore$ Total cost of golden plating = ₹(6 $\times$ 46) = ₹276