CLASS IX (2019-20)
MATHEMATICS (041)
SAMPLE PAPER-8

Time : 3 Hours **Maximum Marks : 80**

General Instructions :

(i) All questions are compulsory.

(ii) The questions paper consists of 40 questions divided into 4 sections A, B, C and D.

(iii) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.

(iv) There is no overall choice. However, an internal choices have been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.

(v) Use of calculators is not permitted.

Section A

Q.1-Q.10 are multiple choice questions. Select the most appropriate answer from the given options.

1. Which of the following statement is not true? [1]

(a) Between two integers, there exist infinite number of rational numbers.

(b) Between two rational numbers, there exist infinite number of integers

(c) Between two rational numbers, there exist infinite number of rational numbers.

(d) Between two real numbers, there exists infinite number of real numbers.

Ans : (b) Between two rational numbers, there exist infinite number of integers

2. Find the value of $x+y+z$ if $x^2+y^2+z^2=18$ and $xy+yz+zx=9$ [1]

(a) 9 (b) 3

(c) 6 (d) 8

Ans : (c) 6

$$(x+y+z)^2 = x^2+y^2+z^2+2xy+2yz+2zx$$
$$= 18+2(9) = 36$$
$$\Rightarrow \quad x+y+z = 6$$

3. Abscissa of $(2,3)$ is [1]

(a) -2 (b) 3

(c) 2 (d) none of these

Ans : (c) 2

In the ordered pair (x,y), x is the abscissa and y is the ordinate.

In $(2,3)$, abscissa is 2.

4. $8y=9$ when written as an equation in two variables, is [1]

(a) $x+8y=9$ (b) $0\cdot x+8y+9=0$

(c) $0\cdot x+8y-9=0$ (d) $0\cdot x+8y=0$

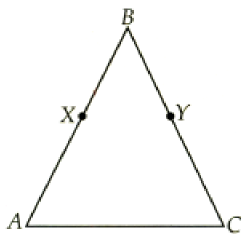
Ans : (c) $0\cdot x+8y-9=0$

$$8y = 9$$

can be written as in two variables as

$$0\cdot x+8y-9 = 0$$
$$0\cdot x+8\cdot y-9 = 0$$

5. In the given figure, if $AB=BC$ and $BX=BY$, then [1]



(a) $AX=CY$ (b) $AC=XY$

(c) $AY=CX$ (d) none of these

Ans : (a) $AX=CY$

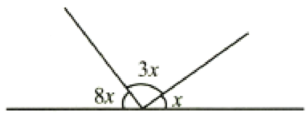
Given that, $AB = BC$ and $BX=BY$

By using Euclid's axiom 3, if equal are subtracted from equals, then the remainders are equal.

We have, $AB-BX = BC-BY$

$$AX = CY$$

6. Calculate the value of x. [1]



(a) 270° (b) 70°

(c) 15° (d) 45°

Ans : (c) 15°

$$8x+3x+x = 180° \quad \text{[Angles on straight line]}$$
$$12x = 180°$$
$$x = 15°$$

7. In ΔABC, if $\angle C > \angle B$, then [1]

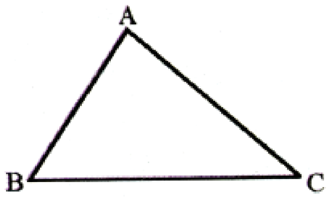
(a) $BC > AC$ (b) $AB > AC$

(c) $AB < AC$ (d) $BC < AC$

Ans : (b) $AB > AC$

In ΔABC

Given, $\angle C > \angle B$



We know that in a triangle the greater angle has the longer side opposite to it.
Thus, $AB > AC$

8. In a parallelogram $ABCD$, $\angle A = 115°$. The measure of $\angle D$ is equal to [1]

(a) $115°$ (b) $65°$
(c) $135°$ (d) $165°$

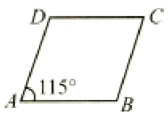
Ans : (b) $65°$

Since, $ABCD$ is a parallelogram.

So, $AB \parallel CD$
and AD is a transversal.

$$\angle A + \angle D = 180° \quad \text{[Co-interior angles]}$$

$$\angle D = 180° - 115° = 65°$$



9. Area of an isosceles triangle, the measure of one of its equal side being 5 cm and the third side 4 cm is [1]

(a) $2\sqrt{21}$ cm^2 (b) $21\sqrt{2}$ cm^2
(c) $22\sqrt{3}$ cm^2 (d) $23\sqrt{3}$ cm^2

Ans : (a) $2\sqrt{21}$ cm^2

Let, $a = 5\,\text{cm},\ b = 4\,\text{cm}$

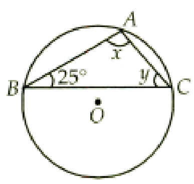
Therefore area of an isosceles triangle

$$= \frac{b}{4} \times \sqrt{4a^2 - b^2}$$

$$= \frac{4}{4}\sqrt{4 \times 25 - 16}\ \text{sq. cm}$$

$$= \sqrt{84}\ \text{cm} = 2\sqrt{21}\ \text{sq. cm}$$

10. In the given figure, O is the centre of the circle. For what values of x and y, chord BC will pass through the centre of circle where points A, B and C are on the circle? [1]



(a) $x = 90°, y = 60°$ (b) $x = 75°, y = 30°$
(c) $x = 65°, y = 90°$ (d) $x = 90°, y = 65°$

Ans : (d) $x = 90°, y = 65°$

When chord BC passes through centre,

then, $x = 90°$.

Now, $x + y + 25° = 180°$

$$90° + y + 25° = 180°$$

$$y = 65°$$

(Q.11-Q.15) Fill in the blanks :

11. If the lengths of two sides of an isosceles triangle are 4 cm and 10 cm, then the length of the third side is .... cm. [1]

Ans : 10 cm

As triangle is isosceles, thus two of its sides must be equal. If the length of third side is taken to be 4 cm, then sum of two sides that is $(4 + 4 = 8)$ will be less than third side which is not possible. Thus, third side must be 10 cm.

12. An isosceles right-angled triangle has an area 8 cm^2. The value of perimeter of triangle is .... cm. [1]

Ans : $4(2 + \sqrt{2})$ cm

Let each equal sides of isosceles right angled triangle be a cm.

$$\frac{1}{2}a^2 = 8$$

$$a^2 = 16$$

$$a = 4$$

$$\text{Hypotenuse} = \sqrt{2a} = 4\sqrt{2}\ \text{cm}.$$

$$\text{Perimeter} = a + b + c = 4 + 4 + 4\sqrt{2}$$

$$= 8 + 4\sqrt{2} = 4(2 + \sqrt{2})\,\text{cm}$$

or

If height of a triangle is halved then its area will become .... of original area.

Ans : half

13. The solid bounded by two concentric spherical surfaces is called a .... [1]

Ans : Spherical shell

14. The .... is the difference between the greatest and the least value of the variate. [1]

Ans : range

15. An .... for an experiment is the collection of some outcomes of the experiment. [1]

Ans : Event

(Q.16-Q.20) Answer the following :

16. Find the zero of a polynomial $2x + 4$. [1]

SOLUTION :

Given polynomial is $p(x) = 2x + 4$

On putting $p(x) = 0$

We get, $2x + 4 = 0$

$$2x = -4$$

$$x = \frac{-4}{2} = -2$$

Hence, $x = -2$

is the zero of the polynomial $2x + 4$

17. Are there any points which do not lie in any of the quadrants? If yes, where do they lie? [1]

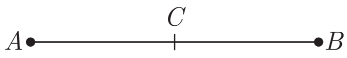
SOLUTION :

Yes, these points are lies on axes.

18. If a point C lies between two points A and B such that $AC = BC$, then prove that $AC = AB/2$, explaining by drawing the figure. [1]

SOLUTION :

Given, a point C lies between two points A and B such that $AC = BC$



On adding AC to both sides, we get

$$AC + AC = BC + AC$$
$$2AC = AB$$
$$AC = \frac{1}{2}AB$$

19. If the sides of an equilateral triangle are tripled, then find its new area. [1]

SOLUTION :

Consider, side of an equilateral triangle = a units.

Then, its area $= \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4}a^2$

When side $= 3a$

Its area will be $= \frac{\sqrt{3}}{4}(3a)^2 = 9 \times \frac{\sqrt{3}}{4}a^2$

Thus, when side of an equilateral triangle are tripled, its area becomes nine times.

20. Give an example of data that you collect from your day-to-day life. [1]

SOLUTION :

An example of data is election results obtained from television or newspaper.

Section B

21. Simplify : $\frac{6}{3\sqrt{2} - 2\sqrt{3}}$. [2]

SOLUTION :

Let,

$$I \ \frac{6}{3\sqrt{2} - 2\sqrt{3}}$$
$$= \frac{6}{3\sqrt{2} - 2\sqrt{3}} \times \frac{3\sqrt{2} + 2\sqrt{3}}{3\sqrt{2} + 2\sqrt{3}}$$
$$= \frac{6(3\sqrt{2} + 2\sqrt{3})}{(3\sqrt{2})^2 - (2\sqrt{3})^2} = \frac{6(3\sqrt{2} + 2\sqrt{3})}{18 - 12}$$
$$= \frac{6(3\sqrt{2} + 2\sqrt{3})}{6} = 3\sqrt{2} + 2\sqrt{3}$$

or

If $\frac{\sqrt{3} - 1}{\sqrt{3} + 1} = a + b\sqrt{3}$, find the value of a and b.

SOLUTION :

$$\frac{\sqrt{3} - 1}{\sqrt{3} + 1} \times \frac{\sqrt{3} - 1}{\sqrt{3} - 1} = a + b\sqrt{3}$$
$$\Rightarrow \quad \frac{3 + 1 - 2\sqrt{3}}{3 - 1} = a + b\sqrt{3}$$
$$\frac{4 - 2\sqrt{3}}{3 - 1} = a + b\sqrt{3}$$
$$\frac{2(2 - \sqrt{3})}{2} = a + b\sqrt{3}$$
$$\Rightarrow \quad 2 - \sqrt{3} = a + b\sqrt{3}$$

Therefore, $a = 2$, $b = -1$.

22. If one angle is equal to four times of its complement. Find the angle. [2]

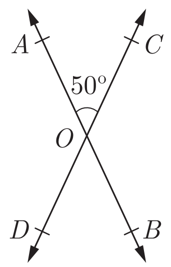
SOLUTION :

Let the angle be x. Then,

$$x = 4(90^\circ - x)$$
$$\Rightarrow \quad x = 360^\circ - 4x$$
$$x + 4x = 360^\circ$$
$$5x = 360^\circ$$
$$\Rightarrow \quad x = \frac{360^\circ}{5} = 72^\circ$$

or

In the given figure, if $\angle AOC = 50^\circ$, then find $(\angle AOD + \angle COB)$.



SOLUTION :

$$\angle AOD + \angle AOC = 180^\circ \quad \text{[Linear pair]}$$
$$\Rightarrow \quad \angle AOD = 180^\circ - 50^\circ = 130^\circ$$
$$\text{Now,} \quad \angle AOD = \angle COB \quad \text{[Vertically opp. angles]}$$
$$\therefore \ \angle AOD + \angle COB = 130^\circ + 130^\circ = 260^\circ$$

23. Express y in terms of x, given that $2x - 5y = 7$. Check whether the point (–3, –2) is one the given line. [2]

SOLUTION :

Given linear equation can be written as

$$5y = 2x - 7$$
$$\Rightarrow \quad y = \frac{2x - 7}{5}$$

On putting $x = -3$, in the above equation, we get

$$y = \frac{2(-3) - 7}{5}$$
$$= \frac{-6 - 7}{5} = \frac{-13}{5} \neq -2$$

So, the point (–3, –2) is not on the given line.

24. Find the coordinates of the point : [2]

(i) Which lies on x and y axes both.

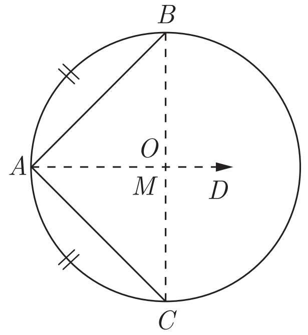
(ii) Whose abscissa is 2 and which lies on the x-axis.

SOLUTION :

(i) The coordinates of the points which lies on the x and y-axes both are (0, 0).

(ii) Since the point lies on the x-axis therefore, its ordinate $= 0$. So, the coordinates of the given point are (2, 0).

25. AB and AC are two equal chords of a circle. Prove that the bisector of the $\angle BAC$ passes through the centre of the circle. [2]



SOLUTION :

Given : AB and AC are two equal chords whose centre is O.
To prove : Centre O lies on the bisector of $\angle BAC$.
Construction : Join BC and draw bisector AD of $\angle BAC$.
Proof : In ΔBAM and ΔCAM

$AB = AC$ [Given]

$\angle BAM = \angle CAM$ [Construction]

and $AM = AM$ [Common sides]

$\therefore \Delta BAM \cong \Delta CAM$ [By SAS congruence rule]

$\Rightarrow BM = CM$ [By CPCT]

and $\angle BMA = \angle CMA$ [By CPCT]

So, $BM = CM$ and $\angle BMA = \angle CMA = 90^\circ$
$\therefore$ AM is the perpendicular bisector of chord BC.
Hence, bisector of $\angle BAC$, i.e., AM passes through the centre O.

26. The areas of three adjacent faces of a cuboid are x, y and z. If its volume is V, then find its volume. [2]

SOLUTION :

Let the dimensions of cuboid be l, b and h.
Given, area of three adjacent faces of a cuboid are x, y and z.

$\therefore \quad x = lb,\ y = bh \text{ and } z = hl \quad ...(1)$

and volume of cuboid $= V$

$\therefore \quad V = lbh$

On squaring both sides, we get

$$V^2 = l^2 b^2 h^2$$
$$= (lb)(bh)(hl)$$
$$V^2 = xyz$$
$$\Rightarrow \quad V = \sqrt{xyz}$$

[On taking positive square root]

or

The curved surface area of a right circular cylinder of height 14 cm is $88\,\text{cm}^2$. Find the diameter of the base of the cylinder.

SOLUTION :

Here, $h = 14\,\text{cm}$

Curved surface area $= 88\,\text{cm}^2$

$r = ?$

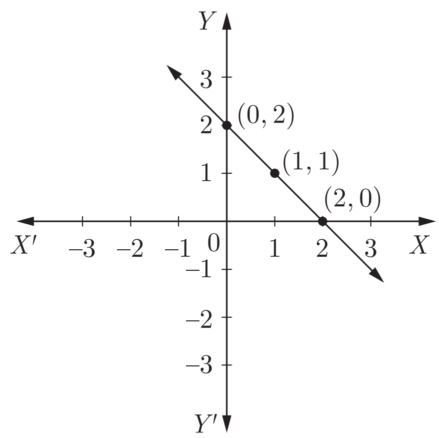
Curved surface area of the cylinder $= 2\pi rh$

$$\Rightarrow \quad 88 = 2 \times \frac{22}{7} \times r \times 14$$
$$88 = 44 \times 2 \times r$$
$$r = \frac{88}{44 \times 2} = 1$$

Hence, base diameter of the cylinder $= 1 \times 2\,\text{cm} = 2\,\text{cm}$.

Section C

27. From the choices given below, choose the equation whose graph is shown in the figure. [3]
(i) $x + y = 2$
(ii) $x - y = 2$
(iii) $2x + 2y = 6$



SOLUTION :

Given points on the graph are (0, 2), (1, 1) and (2, 0). So, these points will satisfy the equation of line.

Now, at (0, 2), $x + y = 0 + 2 = 2$

at (1, 1), $x + y = 1 + 1 = 2$

at (2, 0), $x + y = 2 + 0 = 2$

Thus, the points satisfy the equation $x + y = 2$
Hence, the given graph is a graph of the equation $x + y = 2$.

or

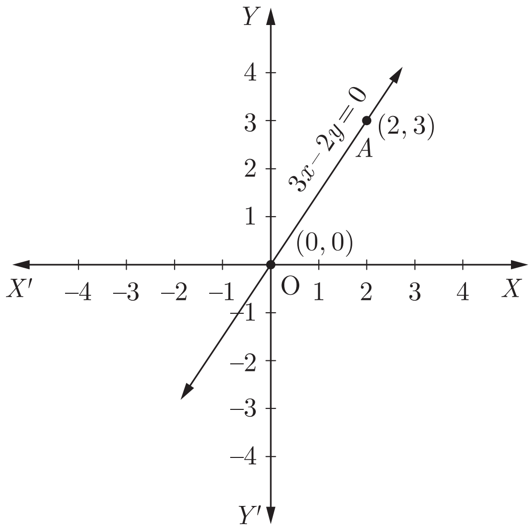
Draw the graph of $3x - 2y = 0$.

SOLUTION :

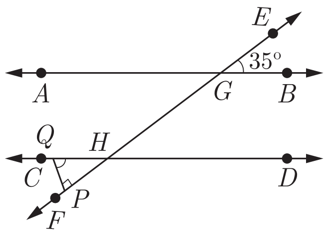
The given equation is $3x - 2y = 0$. To draw the graph of this equation, we need at least two points lying on the graph. From the equation, we have $3x = 2y$.

$$\Rightarrow \quad y = \frac{3}{2}x$$

For $x = 0$, $y = 0$, we plot the point $O(0,0)$
For $x = 2$, $y = 3$, we plot the point $A(2,3)$
Now, we join points O and A to obtain the graph of $3x - 2y = 0$.



28. In the given figure, $AB||CD$ and EF is a transversal, which intersects them at G and H, respectively. If $\angle EGB = 35^\circ$ and $QP \perp EF$, then find $\angle PQH$. [3]



SOLUTION :

Given $AB||CD$ and EF is a transversal.

$$\angle GHD = \angle EGB = 35^\circ$$

[By corresponding angles axioms]

$$\angle PHQ = \angle GHD = 35^\circ$$

[Vertically opposite angles]

and $\angle QPH = 90^\circ$ [$\because$ $QP \perp EF$]

Now, in ΔPQH, we have

$$\angle PQH + \angle PHQ + \angle QPH = 180^\circ$$

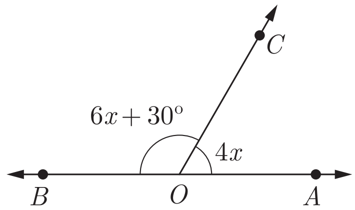
[Angle sum property of a triangle]

$\Rightarrow$ $\angle PQH + 35^\circ + 90^\circ = 180^\circ$

$\therefore$ $\angle PQH = 180^\circ - 125^\circ = 55^\circ$

or

What value of x would make AOB a line in figure, if $\angle AOC = 4x$ and $\angle BOC = 6x + 30^\circ$?



SOLUTION :

If AOB is a line, then

$$\angle AOB = 180^\circ$$

[$\because$ A straight angle $= 180^\circ$]

$\Rightarrow \angle AOC + \angle BOC = 180^\circ$

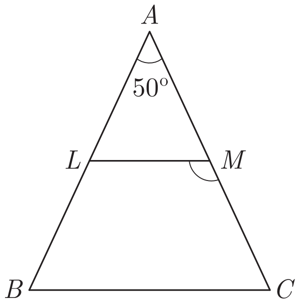
$$4x + (6x + 30^\circ) = 180^\circ$$

$$10x + 30^\circ = 180^\circ$$

$$10x = 180^\circ - 30^\circ = 150^\circ$$

$\Rightarrow$ $x = \frac{150^\circ}{10} = 15^\circ$

29. In the given figure, ΔABC is an isosceles triangle in which $AB = AC$ and LM is parallel to BC. If $\angle A = 50^\circ$, find $\angle LMC$. [3]



SOLUTION :

Given, ΔABC is an isosceles triangle having $AB = AC$.

$\therefore$ $\angle ACB = \angle ABC$ ...(1)

[$\because$ angles opposite to equal sides of a triangle are equal]

By using angle sum property of a triangle

$$\angle ABC + \angle ACB + \angle CAB = 180^\circ$$

$\Rightarrow$ $\angle ACB + \angle ACB + 50^\circ = 180^\circ$ [$\because$ from eq(1)]

$$2\angle ACB = 130^\circ$$

$\Rightarrow$ $\angle ACB = 65^\circ$

Since, lines $LM || BC$

$\therefore$ $\angle LMC + \angle BCM = 180^\circ$

[$\because$ Co-interior angles]

$$\angle LMC + 65^\circ = 180^\circ$$

[$\because \angle BCM = \angle ACB$]

$\Rightarrow$ $\angle LMC = 180^\circ - 65^\circ = 115^\circ$

30. Show that if two sides of a triangle are of lengths 5 cm and 1.5 cm, then the length of third side of the triangle cannot be 3.4 cm. [3]

SOLUTION :

Given, the length of two sides of a triangle are 5 cm and 1.5 cm respectively.

Let sides of a ΔABC be 5 cm and $CA = 1.5$ cm

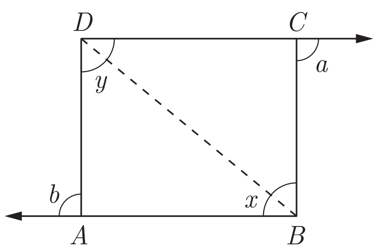
We know that, difference of two sides < third side and sum of two sides > third side

$\therefore$ $5 - 1.5 < BC$ and $5 + 1.5 > BC$

$\Rightarrow$ $3.5 < BC$ and $6.5 > BC$

So, BC cannot be 3.4 cm.

31. The sides BA and DC of a quadrilateral $ABCD$ are produced as shown in figure. [3]



Prove that $a+b=x+y$.

SOLUTION :

In ΔABD, we have

$$\angle ABD+\angle ADB = b \qquad ...(1)$$

[Exterior angle of a triangle]

In ΔCBD, we have

$$\angle CBD+\angle CDB = a \qquad ...(2)$$

[Exterior angle of a triangle]

On adding eq. (1) and (2), we get

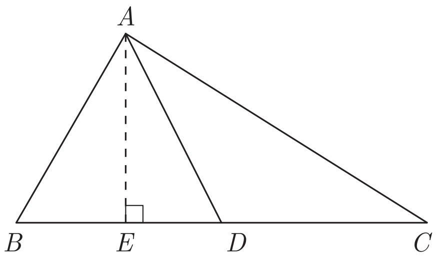
$$(\angle ABD+\angle CBD)+(\angle ADB+\angle CDB) = a+b$$

$$x+y = a+b$$

32. Show that a median of a triangle divides it into two triangles of equal areas. [3]

SOLUTION :

In ΔABC, AD is the median.



Hence, $BD = DC$

Draw $AE\perp BC$

$$\text{Area of } \Delta ABD = \frac{1}{2}\times BD\times AE$$

$$= \frac{1}{2}\times DC\times AE \; [\because BD=DC]$$

$$= \text{Area of } \Delta ADC$$

Thus, median of a triangle divides it into two triangles of equal area.

33. The sides of a triangle are x, $x+1$, $2x-1$ and its area is $x\sqrt{10}$. Find the value of x. [3]

SOLUTION :

Let the sides of triangle are

$$a = x,\; b = x+1 \text{ and } c = 2x-1$$

Then, semi-perimeter,

$$s = \frac{a+b+c}{2} = \frac{x+x+1+2x-1}{2}$$

$$= \frac{4x}{2} = 2x$$

Now, area of triangle $=\sqrt{s(s-a)(s-b)(s-c)}$

But given, area of triangle $=x\sqrt{10}$

$$\therefore \quad x\sqrt{10} = \sqrt{2x(2x-x)\{2x-(x+1)\}\{2x-(2x-1)\}}$$

$$= \sqrt{2x\times x\times(x-1)\times 1}$$

$$= \sqrt{2x^2(x-1)}$$

On squaring both sides, we get

$$(x\sqrt{10})^2 = \left[\sqrt{2x^2(x-1)}\right]^2$$

$$\Rightarrow \quad 10x^2 = 2x^2(x-1)$$

$$10 = 2(x-1)$$

[Dividing both sides by x^2 as $x\neq 0$]

$$(x-1) = \frac{10}{2} = 5$$

$$\Rightarrow \quad x = 5+1 = 6$$

Hence, the value of x is 6.

or

The diameters of two cones are equal. If their slant heights are in the ratio 5 : 4, then find the ratio of their curved surface areas.

SOLUTION :

Given, diameters of two cones are equal. So, radii of these cones are also equal. Let r be the radius of each cone and slant height be $5x$ and $4x$.

We know that,

Curved surface area of a cone $=\pi rl$

Then,

Curved surface area of first cone $=\pi r\times 5x$

Curved surface area of second cone $=\pi r\times 4x$

$$\therefore \quad \text{Required ratio} = \frac{\pi r\times 5x}{\pi r\times 4x} = 5:4$$

34. Here is an extract from a mortality table. [3]

Age (in years)	Number of persons surviving out of a sample of one million
60	16090
61	11490
62	8012
63	5448
64	3607
65	2320

(i) Based on this information, what is the probability of a person 'aged 60' of dying within a year ?

(ii) What is the probability that a person 'aged 61' will live for 4 years ?

SOLUTION :

(i) We see that 16090 persons aged 60, (16090-11490), i.e., 4600 died before reaching their 61^{st} birthday. Therefore, P (a person aged 60 die within a year)

$$= \frac{4600}{16090} = \frac{460}{1609}$$

(ii) Number of persons aged 61 years = 11490

Number of persons surviving for 4 years = 2320

P (a person aged 61 will live for 4 years)

$$= \frac{2320}{11490} = \frac{232}{1149}$$

Section D

35. Rationalise : $\dfrac{1}{\sqrt{7}+\sqrt{3}-\sqrt{2}}$. [4]

SOLUTION :

Let,

$$I \; \frac{1}{\sqrt{7}+\sqrt{3}-\sqrt{2}}\times\frac{(\sqrt{7}+\sqrt{3})+\sqrt{2}}{(\sqrt{7}+\sqrt{3})+\sqrt{2}}$$

$$= \frac{\sqrt{7}+\sqrt{3}+\sqrt{2}}{\left[(\sqrt{7}+\sqrt{3})^2-(\sqrt{2})^2\right]}$$

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

$$= \frac{\sqrt{7}+\sqrt{3}+\sqrt{2}}{7+3+2\sqrt{21}-2}$$

$$= \frac{\sqrt{7}+\sqrt{3}+\sqrt{2}}{8+2\sqrt{21}}$$

$$= \frac{\sqrt{7}+\sqrt{3}+\sqrt{2}}{2(4+\sqrt{21})}$$

$$= \frac{(\sqrt{7}+\sqrt{3}+\sqrt{2})(4-\sqrt{21})}{2(4+\sqrt{21})(4-\sqrt{21})}$$

[By rationalising]

$$= \frac{4\sqrt{7}+4\sqrt{3}+4\sqrt{2}-7\sqrt{3}-3\sqrt{7}-\sqrt{42}}{2(16-21)}$$

$$= \frac{\sqrt{7}-3\sqrt{3}+4\sqrt{2}-\sqrt{42}}{-10}$$

$$= \frac{3\sqrt{3}-4\sqrt{2}+\sqrt{42}-\sqrt{7}}{10}$$

36. Factorise : $x^2+\frac{1}{x^2}+2-2x-\frac{2}{x}$. [4]

SOLUTION :

Let, $I\ x^2+\frac{1}{x^2}+2-2x-\frac{2}{x}$

$$=(x)^2+\frac{1}{(x)^2}+2\times x\times\frac{1}{x}-2\left(x+\frac{1}{x}\right)$$

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

$[\because\ a^2+b^2+2ab=(a+b)^2]$

$$=\left(x+\frac{1}{x}\right)\left(x+\frac{1}{x}-2\right)$$

$$=\left(x+\frac{1}{x}\right)\left[(\sqrt{x})^2+\left(\frac{1}{\sqrt{x}}\right)^2-2\sqrt{x}\times\frac{1}{\sqrt{x}}\right]$$

$$=\left(x+\frac{1}{x}\right)\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$$

$$=\left(x+\frac{1}{x}\right)\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)$$

37. A part of monthly expenses of a family on milk is fixed which is ₹ 500 and the remaining varies with the quantity of milk taken extra at the rate of ₹ 20 per litre. Taking the quantity of milk required extra x litre and the total expenditure on milk is ₹ y, write a linear equation for this information and draw its graph. [4]

SOLUTION :

Let the quantity of milk required extra be $x\,l$ and total expenditure on milk be ₹ y.

$\therefore$ Required equation is $y=500+20x$ ...(1)

When $x=0$, then $y=500+20\times 0=500$

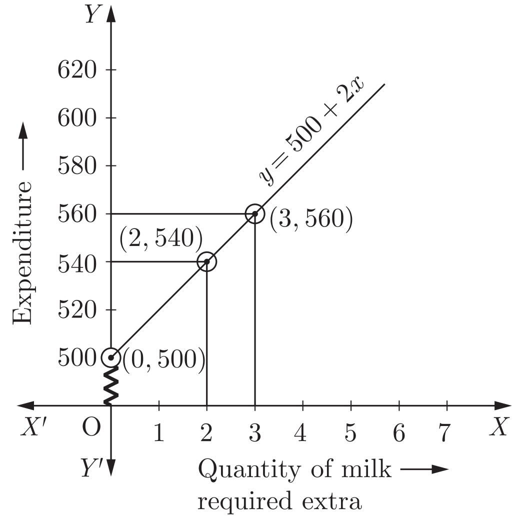
When $x=2$, then $y=500+20\times 2$
$=500+40=540$

When $x=3$, then $y=500+20\times 3$
$=500+60=560$

Thus, we have the following table

x	0	2	3
y	500	540	560

Now, plot the points (0, 500), (2, 540) and (3, 560) on a graph and join them by a line to get required graph.



38. Construct ΔABC in which $BC=6.8$ cm, $\angle B=45°$ and $\angle C=45°$. Construct angle bisector of $\angle B$ and $\angle C$ and let them intersect at point O. Measure $\angle BOC$. [4]

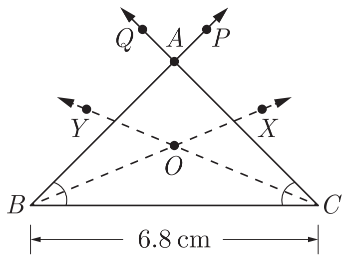
SOLUTION :

Steps of Construction :

(i) Draw a line segment $BC=6.8$ cm.

(ii) Draw $\angle PBC=45°$ at point B and draw $\angle QCB=45°$ at point C.

(iii) Mark the point of intersection of ray BP and ray CQ at A.



(iv) Now, draw the angle bisectors of $\angle ABC$ and $\angle ACB$, let them to intersect each other at point O. On measuring the $\angle BOC$, we get the value $135°$.

39. The diameter of the Moon is approximately one-fourth of the diameter of the Earth. Find the ratio of their surface areas. [4]

SOLUTION :

Let the diameter of Earth $=d_1$

Then, diameter of the Moon $=\frac{1}{4}d_1$

$\therefore$ Radius of the Earth $(r_1)=\frac{d_1}{2}$

and radius of the Moon $(r_2)=\frac{d_1}{2\times 4}=\frac{d_1}{8}$

Surface area of the Earth $(S_1)=4\pi r_1^2$

$$S_1=4\pi\left(\frac{d_1}{2}\right)^2=\pi d_1^2$$

Surface area of the Moon

$$S_2=4\pi\left(\frac{d_1}{8}\right)^2=4\pi\frac{d_1^2}{64}=\frac{\pi d_1^2}{16}$$

$\therefore$ Required ratio $S_1 : S_2 = \frac{\pi d_1^2}{1} : \frac{\pi d_1^2}{16} = 16:1$

or

The total cost of making a spherical ball is ₹ 33,957 at the rate of ₹ 7 per cubic metre. What will be the radius of this ball ?

SOLUTION :

Let radius of the ball be r meter.

$\therefore$ Volume of spherical ball $= \frac{4}{3}\pi r^3$

Total cost of making a spherical ball at the rate of ₹ 7 per m^3 = ₹ 33957

$\therefore$ Volume of spherical ball $= \frac{33957}{7} = 4851\,\text{m}^3$

Now, $\frac{4}{3}\pi r^3 = 4851$

$$\Rightarrow \quad r^3 = \frac{4851 \times 7 \times 3}{4 \times 22} = \left(\frac{21}{2}\right)^3$$

$$r = \frac{21}{2} = 10.5$$

$\therefore$ Radius of spherical ball $= 10.5$ m

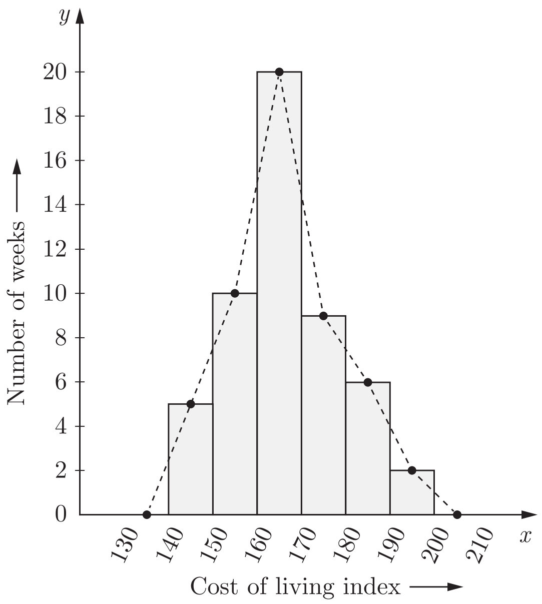
40. A study on cost of living index for a particular year in a city, the following weekly observations were made.

Cost of living index (₹)	Number of weeks
140-150	5
150-160	10
160-170	20
170-180	9
180-190	6
190-200	2

Draw a histogram and a frequency polygon on the same scale. [4]

SOLUTION :

We represent the class intervals along the horizontal line on a suitable scale and the corresponding frequencies along the vertical line on a suitable scale. We construct rectangles with class intervals as the bases and the respective frequencies as the heights. Thus, we obtain the histogram as shown below



Now, we join the mid-points of the tops of adjacent rectangles by line segments.

Also, we take the imagined classes 130-140 and 200-210, each with frequency 0. We join A with the mid-point of the top of the first rectangle and join B with the mid-point of the top of the last rectangle.

Thus, we obtain a complete frequency polygon.

or

Following are the runs scored by two teams A and B in a 10 over match. Represent the data graphically on the same graph.

Over	Team A	Team B
1	2	5
2	1	6
3	8	2
4	9	10
5	4	5
6	5	6
7	6	3
8	10	4
9	6	8
10	2	10

SOLUTION :