MATHS SAMPLE PAPER

PART-A

Section-I

Section I has 16 questions of 1 mark each.

1. Convert $2\frac{5}{12}$ in decimal form.

2. Express $\sqrt[4]{1250}$ in its simplest form.

3. If $x+\frac{1}{x}=2$, then $x^3+\frac{1}{x^3}=$___________.

4. $(x-y)(x+y)(x^2+y^2)(x^4+y^4)$ is equal to ___________.

5. Abscissa of all points on the x – axis is ____________.

6. A point whose ordinate is 4 and lies on the y – axis is ________.

7. The point of the form (a, a), where $a \neq 0$ lies on the line $y = x$ (True/False).

8. Any point on the y – axis is of the form (y, 0). (True/False).

9. In ΔPQR, if ∠R >∠Q, then what is the relation between sides PQ and PR?

10. If $\angle A$ = 36°27′46″and $\angle B$ =28°43′39″, find $\angle A + \angle B$.

11. A diagonal of a rectangle is inclined to one side of the rectangle at 25°. The acute angle between the diagonals is ________.

12. 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 find the radius of the circle.

13. Find the area of an equilateral triangle with side $2\sqrt{3}$ cm.

14. The radii of two cylinders are in the ratio of 2 : 3 and their heights are in the ratio of 5 : 3. Find the ratio of their volumes.

15. In a survey of 200 ladies, it was found that 142 like coffee, while 58 dislike it.

Find the probability that a lady chosen at random
(i) likes coffee, (ii) dislikes coffee.

16. In 50 tosses of a coin, tail appears 32 times. If a coin is tossed at random, what is the probability of getting a head?

Section II

Case-study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

17. Case study based-1: Two classmates Salma and Anil simplified Two different expressions during the revision hour and explained to each other their simplifications. Salma explains simplification of $\frac{\sqrt{2}}{\sqrt{5}+\sqrt{3}}$ by rationalising the denominator and Anil explains simplifications of $(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})$ by using the identity (a + b)(a − b). Answer the following question.

(a) what is the conjugate of $\sqrt{5} + \sqrt{3}$?

(i) $\sqrt{5} + \sqrt{3}$

(ii) $\sqrt{5} - \sqrt{3}$

(iii) $\sqrt{5} \times \sqrt{3}$

(iv) None of these

(b) By rationalising the denominator of $\frac{\sqrt{2}}{\sqrt{5}+\sqrt{3}}$, Salma got the answer

(i) $\frac{\sqrt{2}}{\sqrt{5}+\sqrt{3}}$

(ii) $\frac{\sqrt{2}(\sqrt{5}-\sqrt{3})}{2}$

(iii) $\sqrt{5} - \sqrt{3}$

(iv) $\frac{\sqrt{2}(\sqrt{5}+\sqrt{3})}{2}$

(c) Anil applied __________ identity to solve $(\sqrt{5} + \sqrt{7})(\sqrt{5} - \sqrt{7})$

(i) (a + b)(a − b)

(ii) (a + b)(a + b)

(iii) (a − b)(a − b)

(iv) (x + a)(x + b)

(d) $(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})$ equals

(i) -1

(ii) 5

(iii) -5

(iv) 1

(e) Addition of two irrational numbers is equal to

(i) Rational

(ii) Irrational

(iii) Integers

(iv) Whole Number

18. Case study based – 2: Four friends Ram, Raju, Ravi, Ritu are standing in reference to a well situated at the origin with the following respective coordinates (2, 4), (−2, 4), (−2, −4) and (2, −4).

(a) By plotting these points on a single graph paper, the figure obtained is rectangle. find the perimeter of the rectangle.

(i) 12cm

(ii) 24cm

(iii) 48cm

(iv) 8cm

(b) Find the distance between Ram and Raju

(i) 2 cm

(ii) 3 cm

(iii) 4 cm

(iv) 5 cm

(c) Raju stands in which quadrant.

(i) Quadrant I

(ii) Quadrant II

(iii)Quadrant III

(iv) Quadrant IV

(d) Ordinate of (2, −4)

(i) −4

(ii) −2

(iii) 4

(iv) 2

(e) Abscissa of (−2, −4)

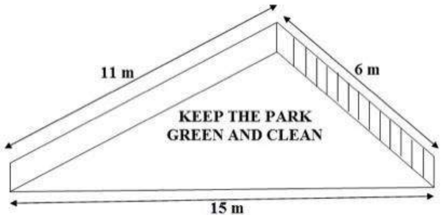
(i) −4

(ii) -2

(iii) 4

(iv) 2

19. Case study based -3: There is a slide in a park. One of its side walls has been painted in some colour with a message "Keep the park clean and green". The sides of the wall are 11m, 15m and 6m.



(a) The semi perimeter of the triangle is

(i) 30m

(ii) 16m

(iii) 32m

(iv) 15m

(b) Formula to find perimeter of the triangle is

(i) (a + b + c)/2

(ii) $a + b + c$

(iii) 3a

(iv) 2 $(a + b + c)$

(c) Area of the triangle is

(i) $15m^2$

(ii) $30m^2$

(iii) $20\sqrt{2}m^2$

(iv) $20\sqrt{3}m^2$

(d) Formula to find area of the sidewall with the given dimensions only is

(i) ½ × b × h

(ii) $\frac{\sqrt{3}}{4}a^2$

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

(iv) a + b + c

(e) Perimeter of the triangle is

(i) 16m

(ii) 32m

(iii) 30m

(iv) 20m

20. Case study based – 4: The daily cost of milk supplied to 25 houses in a locality are given below

Cost	Number of Houses
40 - 50	4
50 - 60	5
60 - 70	3
70 - 80	5
80 - 90	2
90 - 100	6

If one house is chosen at random, find

(a) Probability (The milk bill of the house lies in ₹ 60 - ₹80) is

(i) 3/25

(ii) 8/25

(iii) 5/25

(iv) 25/8

(b) Probability (House is paying less than ₹ 70 for the milk bill) is

(i) 5/25

(ii) 8/25

(iii) 12/25

(iv) 4/25

(c) Probability (The milk bill of the house is below ₹ 50)

(i) 5/25

(ii) 8/25

(iii) 12/25

(iv) 4/25

(d) Probability (The milk bill of the house is above ₹ 100)

(i) 0

(ii) 1

(iii) 12/25

(iv) 4/25

(e) Probability (The milk bill of the house lies between ₹40 - ₹100)

(i) 0

(ii) 1

(iii) 12/25

(iv) 4/25

PART–B

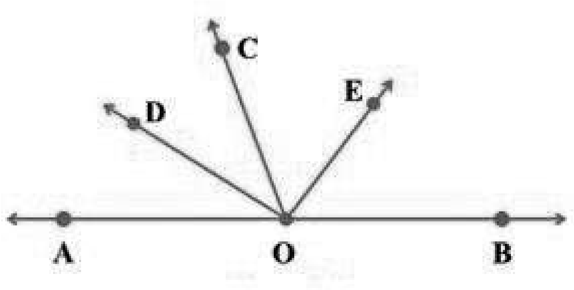
Section III

21. Rationalise the denominator of each of $\frac{1}{(5+3\sqrt{2})}$.

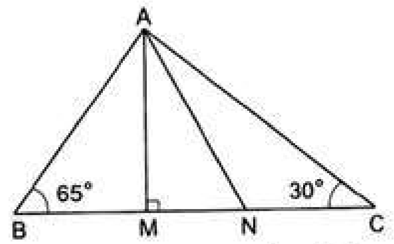
22. The polynomials (ax^3+3x^2-3) and $(2x^3-5x+a)$ when divided by (x-4) leave the same remainder. Find the value of a.

23. Draw the graph of the equation y = 3x.

24. In Figure, OD is the bisector of ∠AOC, OE is the bisector of ∠BOC and $OD \perp OE$. Show that the points A, O and B are collinear.



25. In the given figure, AM $\perp$ BC and AN is the bisector of $\angle A$. Find the measure of $\angle MAN$.

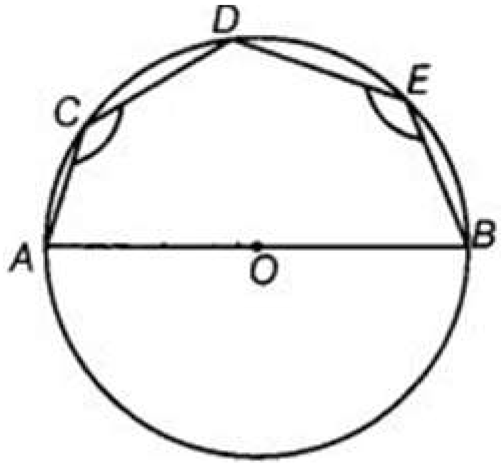


26. Show that if the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.

Section IV

27. A triangle ABC is right angled at A. L is a point on BC such that AL ⊥ BC. Prove that ∠BAL = ∠ACB.

28. In Figure, AOB is a diameter of the circle and C, D, E are any three points on the semi-circle. Find the value of ∠ACD + ∠BED.



29. Construct a triangle ABC in which BC = 7cm, ∠B = 75° and AB + AC = 13 cm.

30. From a point in the interior of an equilateral triangle, perpendiculars are drawn on the three sides. The lengths of the perpendiculars are 14 cm, 10 cm and 6 cm. Find the area of the triangle.

31. A school provides milk to the students daily in a cylindrical glasses of diameter 7 cm. If the glass is filled with milk upto an height of 12 cm, find how many litres of milk is needed to serve 1600 students.

32. The value of π up to 50 decimal places is given below:

3.14159265358979323846264338327950288419716939937510
(i) Make a frequency distribution of the digits from 0 to 9 after the decimal point.
(ii) What are the most and the least frequently occurring digits?

33. An organisation selected 2400 families at random and surveyed them to determine a relationship between income level and the number of vehicles in a family. The information gathered is listed in the table below:

Monthly income (in Rs)	Vehicles per family			
	0	1	2	Above 2
Less than 7000	10	160	25	0
7000 – 10000	0	305	27	2
10000 – 13000	1	535	29	1
13000 – 16000	2	469	59	25
16000 or more	1	579	82	88

Suppose a family is chosen. Find the probability that the family chosen is
(i) Earning Rs 10000 – 13000 per month and owning exactly 2 vehicles.
(ii) Earning Rs 16000 or more per month and owning exactly 1 vehicle.
(iii) Earning less than Rs 7000 per month and does not own any vehicle.

Section V

34. Factorise: $2x^3 - 3x^2 - 17x + 30$

35. In the given figure, $ABCD$ is a quadrilateral whose diagonals intersect at right angles. Show that the quadrilateral formed by joining the midpoints of the pairs of adjacent sides is a rectangle.

36. A right triangle with sides 6 cm, 8 cm and 10 cm is revolved about the side 8 cm. Find the volume and the curved surface of the solid so formed.

HINTS & SOLUTIONS

Maths Sample paper

1. 29/12 → $2.41\bar{6}$

2. $5\sqrt[4]{2}$

3. 2

4. $x^8 - y^8$

5. Any integer

6. (0, 4)

7. True

8. False

9. PQ < PR

10. 65°11′25″

11. 50°

12. 17 cm

13. $3\sqrt{3}$ cm^2

14. 20/27

15. (i) 71/100 (ii) 29/100

16. 9/25

17. (a) (ii) $\sqrt{5} - \sqrt{3}$

(b) (ii) $\frac{\sqrt{2}(\sqrt{5}-\sqrt{3})}{2}$

(c) (i) (a + b)(a – b)

(d) (i) -1

(e) Bonus. Either rational OR irrational

18. (a) (ii) 24 cm

(b) (iii) 4 cm

(c) (ii) II quadrant

(d) (i) -4

(e) (ii) -2

19. (a) (ii) 16 m

(b) (ii) a + b + c

(c) (iii) $20\sqrt{2}$ m^2

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

(e) (ii) 32 m

20. (a) (ii) 8/25

(b) (iii) 12/25

(c) (iv) 4/25

(d) (i) 0

(e) (ii) 1

21. $\frac{1}{5+3\sqrt{2}} \times \frac{5-3\sqrt{2}}{5-3\sqrt{2}} = \frac{5-3\sqrt{2}}{7}$

22. Given, f(x) = ax^3+3x^2-3

$g(x) = 2x^3 - 5x + a$

$If\ f(x)\ is\ divided\ by\ (x-4)$
$then\ it\ leaves\ a\ remainder\ f(4)$

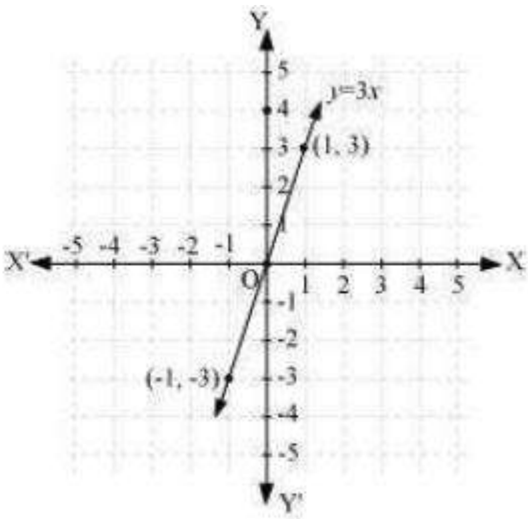
$f(4) = a \times 4^3 + 3(4^2) - 3$
$= a \times 64 + 48 - 3$
$= 64a + 45$

$If\ g(x)\ is\ divided\ by\ (x-4)$
$then\ it\ leaves\ a\ remainder\ g(4)$

Therefore a = 1.

23. y = 3x

It can be observed that $x = -1$, $y = -3$ and $x = 1$, $y = 3$ are solutions of the above equation. The graph of the above equation is constructed as follows.

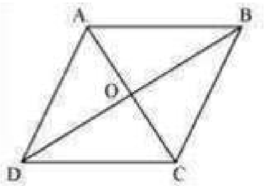


24. Given In the figure, OD ⊥ OE, OD and OE are the bisectors of ∠AOC and ∠BOC.
To show Points A, O and B are collinear i.e., AOB is a straight line.
Proof Since, OD and OE bisect angles ∠AOC and ∠BOC, respectively.
∠AOC =2 ∠DOC ...(i)
and ∠COB = 2 ∠COE ...(ii)
On adding Eqs. (i) and (ii), we get
∠AOC + ∠COB = 2 ∠DOC +2 ∠COE ⇒ ∠AOC +∠COB = 2(∠DOC +∠COE)
⇒ ∠AOC + ∠COB= 2 ∠DOE
⇒ ∠AOC+ ∠COB = 2 x 90° [∴ OD ⊥ OE]
⇒ ∠AOC + ∠COB = 180°
∴ ∠AOB = 180°
So, ∠AOC and ∠COB are forming linear pair.
Also, AOB is a straight line.
Hence, points A, O and B are collinear.

25. From a pre-existing result,

∠MAN = ½ (∠B − ∠C) = ½(65 – 30) = (35/2)°

26. To Prove: If diagonals of a quadrilateral bisect at 90º, it is a rhombus.

Figure: 

Definition of Rhombus: A parallelogram whose all sides are equal.
Given: Let ABCD be a quadrilateral whose diagonals bisect at 90º

In ΔAOD and ΔCOD,

OA = OC (Diagonals bisect each other)

∠AOD = ∠COD (Given)

OD = OD (Common)

ΔAOD ≅ ΔCOD (By SAS congruence rule)

AD = CD ....(1)

Similarly,

AD = AB and CD = BC ....(2)

From equations (1) and (2),

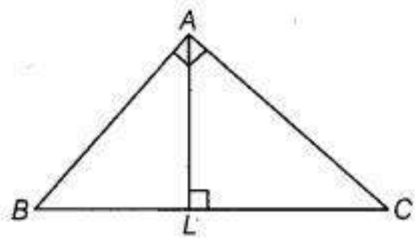
AB = BC = CD = AD

Since opposite sides of quadrilateral ABCD are equal, it can be said that ABCD is a parallelogram. Since all sides of a parallelogram ABCD are equal, it can be said that

ABCD is a rhombus

Hence, Proved.

27. Given In ΔABC, ∠A = 90° and AL ⊥ BC
To prove ∠BAL = ∠ACB
Proof In ΔABC and ΔLAC, ∠BAC = ∠ALC [each 90°] ...(i)
and ∠ABC = ∠ABL [common angle] ...(ii)



On adding Eqs. (i) and (ii), we get
∠BAC + ∠ABC = ∠ALC + ∠ABL ...(iii)

Again, in ΔABC,

$\angle BAC + \angle ACB + \angle ABC = 180°$

[sum of all angles of a triangle is 180°] $\Rightarrow \angle BAC + \angle ABC = 1\ 80° - \angle ACB$ ...(iv)

In ΔABL,

$\angle ABL + \angle ALB + \angle BAL = 180°$

[sum of all angles of a triangle is 180°] $\Rightarrow \angle ABL + \angle ALC = 180° - \angle BAL$ [$\therefore \angle ALC = \angle ALB = 90°$] ...(v)

On substituting the value from Eqs. (iv) and (v) in Eq. (iii), we get $180° - \angle ACS = 180° - \angle SAL$

$\Rightarrow \angle ACB = \angle BAL$

Hence proved.

28. Join AE,

Since, ACDE is a cyclic quadrilateral .

$\therefore \angle ACD + \angle AED = 180°$ ---- i)

Also, $\angle AEB = 90°$ ---- ii) [angle in semi circle]

On adding Eqs. (i) and (ii) , we get

$\angle ACD + \angle AED + \angle AEB = 180° + 90°$

$\Rightarrow \angle ACD + \angle BED = 270°$

Hence , the value of ($\angle ACD + \angle BED$) is 270

29. Given base BC = 7 cm

$\angle B = 75°$

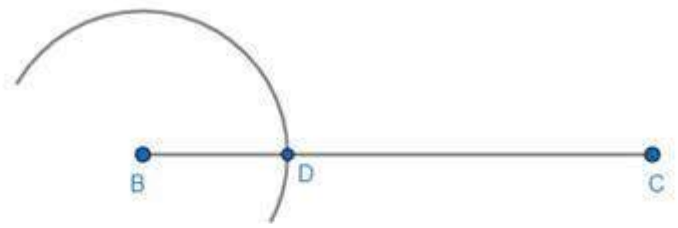
And AB + BC = 13 cms.

Steps of construction:

i. Draw a base line BC of 7 cms.

ii. Construct $\angle B = 75°$.

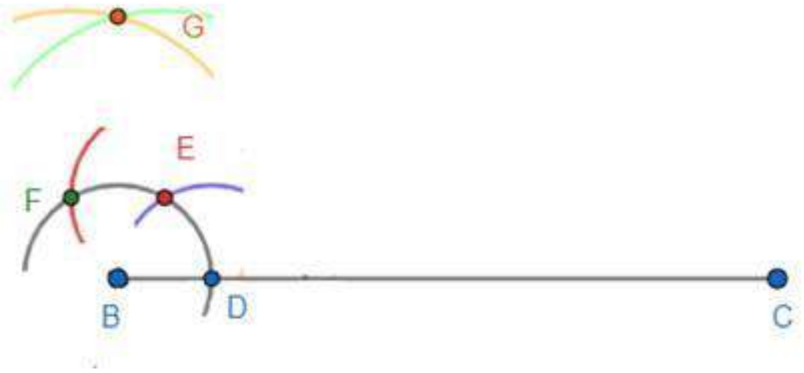
a. With B as centre and with any radius, draw another arc cutting the line BC.



b. With D as centre and with the same radius, draw an arc cutting the first arc (drawn in step b) at point E.

c. With E as centre and with the same radius, draw another arc cutting the first arc (drawn in step b) at point F.

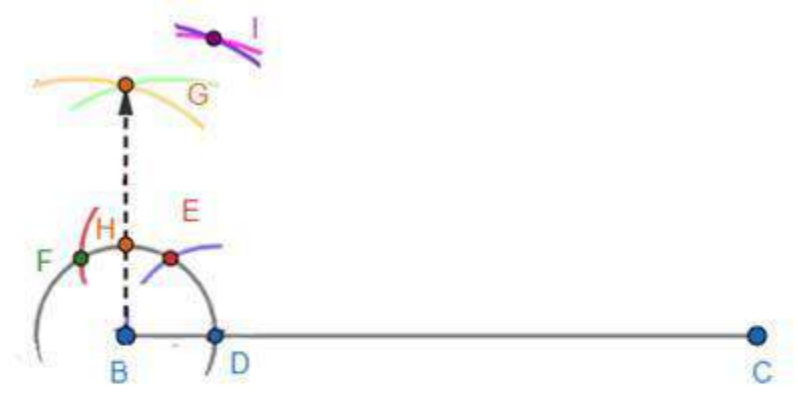
d. With E and F as centers, and with a radius more than half the length of EF, draw two arcs intersecting at point G.



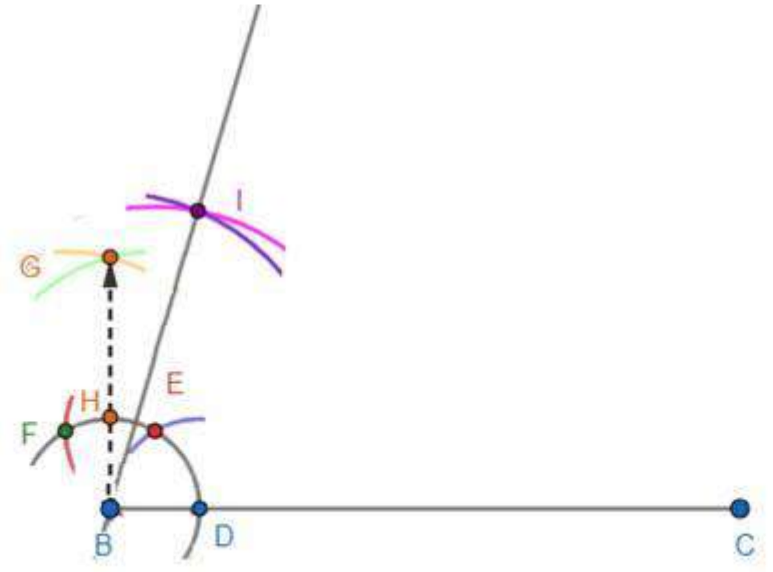
e. Join points B and G. The angle formed by GBC is 90°. i.e.

$\angle$ GBC = 90°.

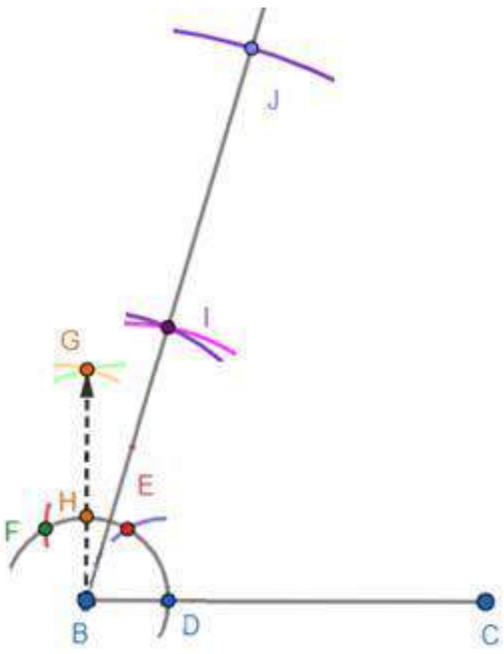
f. Now the point H will be the point of intersection of the ray BG and the first arc (from step b). With points H & E as centers, with any radius more than half the length of HE, draw two arcs such that they meet at point I.



g. By joining point I and B, we get the ray BI which forms 75° with ray BD.

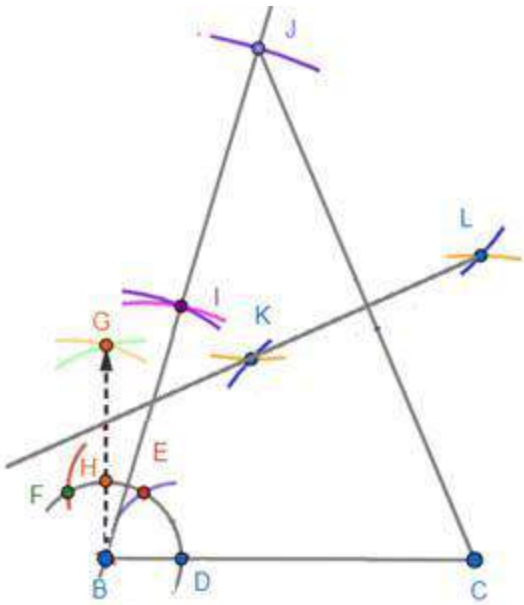


iii. With B as centre draw an arc with length 13 cms (= AB + BC given), such that it intersects ray BI at J.

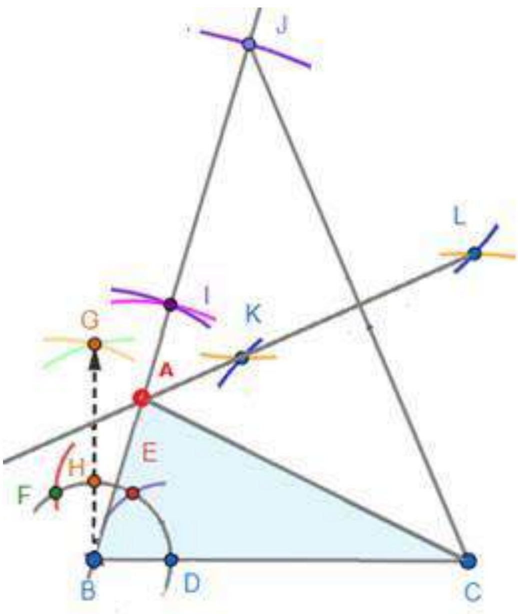


iv. Join CJ and we draw a perpendicular bisector for CJ.

a. By drawing arcs on both sides of the line CJ, with C and J as centers and with same lengths. These arcs intersect at K and L on either side of line CJ.



v. The perpendicular bisector for CJ will intersect the ray BJ at point A. Join AC.



Thus, the formed triangle ABC is the required triangle.

30. ΔABC is an equilateral triangle.
Let ABC be equilateral triangle of side '*a'* cm.

Let P be a point in the interior of the ΔABC. so PQ⊥BC, PR⊥CA and PS⊥AB

So, PS = 14 cm, PQ = 10 cm and PR = 6 cm

Area of ΔABC = Area of ΔAPB + Area of ΔBPC + Area of ΔCPA

$$\frac{\sqrt{3}}{4}a^2 = \frac{1}{2}[PS \times AB + PQ \times BC + PR \times AC]$$

$$\Rightarrow \frac{\sqrt{3}}{4}a^2 = \frac{1}{2} \times a \times [14 + 10 + 6]$$

$$\Rightarrow \frac{\sqrt{3}}{4}a^2 = \frac{1}{2} \times a \times 30$$

$$\Rightarrow \frac{\sqrt{3}}{4}a^2 = 15a$$

$$\Rightarrow a = \frac{15 \times 4}{\sqrt{3}} = \frac{60}{\sqrt{3}}\ cm$$

$$Area\ of\ triangle\ = \frac{\sqrt{3}}{4} \times \frac{60}{\sqrt{3}} \times \frac{60}{\sqrt{3}} = 300\sqrt{3}\ sq.cm$$

31. Diameter d = 7 cm

Radius r = 7 / 2 cm and h = 12 cm

∴ V = $\pi r^2 h$ = 22 / 7 × 7 / 2 × 7 / 2 × 12 = 462

Total milk for 1600 students = 462 × 1600

= 739200 cm^3

= 739200 / 1000 litres = 739.2 litres.

32. (i)

Digits	*Tally marks*	*Frequency*
0	||	2
1	~~||||~~	5
2	~~||||~~	5
3	~~||||~~ |||	8
4	||||	4
5	~~||||~~	5
6	||||	4
7	||||	4
8	~~||||~~	5
9	~~||||~~ |||	8
Total		50

(ii) Most frequently occurring is 3 and 9 and least is 0

33. (i) 29/2400

(ii) 579/2400

(iii) 1/240

34. x = 2 is a zero of the polynomial.

$2(2)^3 - 3(2)^2 - 17(2) + 30$

$2 \times 8 - 3 \times 4 - 34 + 34$

$16 - 12 - 4 = 0$

Then the polynomial is divisible by(x-2)

We get,

$2x^3 - 3x^2 - 17x + 30 \div (x - 2)$

$= 2x^2 + 1x - 15$

Therefore,

$2x^3 - 3x^2 - 17x + 30 =$
$(x-2)(2x^2 + x - 15)$
So,
$(x-2)(2x^2 + x - 15)$
$= (x-2)(x+3)(2x-5)$

35. Given: A quadrilateral ABCD whose diagonals AC and BD are perpendicular to each other at O. P,Q,R and S are mid points of side AB, BC, CD and DA respectively are joined are formed quadrilateral PQRS.

To Prove : PQRS is a rectangle.

Proof : In △ABC, P and Q are mid - points of AB and BC respectively.

∴ PQ || AC and PQ = 1 / 2 AC ---- (i) [mid point theorem]

Further, in △ACD, R and S are mid points of CD and DA respectively.

∴ SR || AC and SR = 1 / 2 AC --- (ii) [mid point theorem]

From (i) and (ii) , we have PQ || SR and PQ = SR

Thus , one pair of opposite sides of quadrilateral PQRS are parallel and equal .

∴ PQRS is a parallelogram .

Since PQ || AC ⇒ PM || NO

In △ABD, P and S are mid points of AB and AD respectively .

∴ PS || BD [mid point theorem]

⇒ PN || MO

∴ Opposite sides of quadrilateral PMON parallel .

∴ PMON is a parallelogram .

∴ ∠MPN = ∠MON [opposite angles of || gm are equal]

But ∠MON = 90° [give]

∴ ∠MPN = 90° ⇒ ∠QPS = 90°

Thus, PQRS is a parallelogram whose one angle is 90°.

∴ PQRS is a rectangle.

36. Since, the given right angled triangle is revolved about the side 8 cm, it will form a Cone of radius 6cm and height 8cm.

Volume of a cone = $1/3\pi r^2h$ = $1/3\times3.14\times6\times6\times8$ = 301.44 cm^3

Curved Surface area of a cone = πrl .... (i)

We know that,

$l^2 = r^2 + h^2 = 6^2 + 8^2 = 36 + 64 = 100$

l = 10 cm

Substitute the value of l in (i), we get

Curved Surface area of a cone = $3.14 \times 6 \times 10$ = 188.4 cm^2

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