MATHS SAMPLE PAPER

PART-A

Section-I

Section I has 16 questions of 1 mark each.

1. How many irrational numbers lie between two numbers?

2. Rationalise the denominator of $\frac{3-2\sqrt{2}}{3+2\sqrt{2}}$

3. If f(x) = 1/x, g(x)=1/(1-x) and h(x)=x^2, then find f(g(h(2))).

4. If x^{51} + 51 is divided by x + 1, the remainder is _____.

5. The difference between the graph of the equation x = -3 and x = 5 is k. Find the value of k.

6. The point on the graph of the linear equation 2x + 5y = 19 whose ordinate is $1\frac{1}{2}$ times its abscissa is _____.

7. If x > 0 and y < 0, then the point (x, y) lies in which quadrant?

8. If $x < 0$ and $y > 0$, then the point (x, y) lies in which quadrant?

9. When three points lie on the same line they are termed as _____ points.

10. Two supplementary angles are in the ratio 4 : 5. Find the angles.

11. ABCD is a rectangle with $\angle ABD = 40°$. Determine $\angle DBC$.

12. The angles of a quadrilateral are 75°, 90° and 75°. The fourth angle is _____.

13. The area of equilateral triangle with each side as 6 cm is _____

14. The perimeter of an equilateral triangle is 90 m. Find its area.

15. State True/False: E is an event with probability 1.5

16. The probability of guessing the correct answer to a certain question is x/2. If the probability of not guessing the correct answer to the question is 2/3, then find the value of x

Section II

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

17. You must be having a geometry box which contains the following: (i) A graduated scale, on one side of which centimetres and millimetres are marked off and on the other side inches and their parts are marked off. (ii) A pair of set - squares, one with angles 90°, 60° and 30° and other with angles 90°, 45° and 45°. (iii) A pair of dividers (or a divider) with adjustments. (iv) A pair of compasses (or a compass) with provision of fitting a pencil at one end. (v) A protractor. Normally, all these instruments are needed in drawing a geometrical figure, such as a triangle, a circle, a quadrilateral, a polygon, etc. with given measurements. But a geometrical construction is the process of drawing a geometrical figure using only two instruments – an ungraduated ruler, also called a straight edge and a compass. In construction where measurements are also required, you may use a graduated scale and protractor also.

1.Which of the following set of lengths can be the sides of a triangle?

A. 2 cm, 4 cm, 1.9 cm
B. 1.6 cm, 3.7 cm. 5.3 cm
C. 5.5 cm, 6.5 cm, 8.9 cm
D. None of the above

2.To construct an angle of 60 degrees, we need to draw first:

A. A ray
B. An arc
C. Two rays
D. A straight line

3.Which of the following is the possible third side of a triangle whose other two sides are 10 cm and 13 cm?

A. 2 cm
B. 24 cm
C. 20 cm
D. 3 cm

4.Two legs of an isosceles triangle have length 12 and 27 respectively. What is the perimeter of the triangle?

A. 66
B. 78
C. 51
D. 72

5.Which of the following can be the angles of a triangle (in degrees)?

A. 60, 100, 30
B. 80, 50, 90
C. 90, 45, 45
D. 120, 30, 40

18. You all must have seen the ice tray in your refrigerator. Observe that the moulds for making ice are all congruent. The cast used for moulding in the tray also has congruent depressions (may be all are rectangular or all circular or all triangular). So, whenever identical objects have to be produced, the concept of congruence is used in making the cast.

Sometimes, you may find it difficult to replace the refill in your pen by a new one and this is so when the new refill is not of the same size as the one you want to remove. Obviously, if the two refills are identical or congruent, the new refill fits. So, you can find numerous examples where congruence of objects is applied in daily life situations.

1.If Δ ABC ≅ Δ LKM, then side of Δ LKM equal to side AC of Δ ABC is

A. LK

B. KM

C. LM

D. None of these

2.In triangle ABC and PQR three equality relations between some parts are as follows:

AB = QP, ∠B = ∠P and BC = PR
State which of the congruence conditions applies:

A. SAS

B. ASA

C. SSS

D. RHS

3.In triangles ABC and PQR, if ∠A=∠R, ∠B=∠P and AB=RP, then which one of the following congruence conditions applies:

A. SAS

B. ASA

C. SSS

D. RHS

4.In Δ PQR ≅ Δ EFD then ED =

A. PQ

B. QR

C. PR

D. None of these

5.If ABC and DEF are two triangles such that Δ ABC≅ Δ FDE and AB =5 cm, ∠B = 40° and ∠A =80°, Then, which of the following is true?

A. DF = 5 cm, ∠F= 60°

B. DE = 5 cm, ∠E= 60°

C. DF = 5 cm, ∠E= 60°

D. DE = 5 cm, ∠D= 40°

19. Take a compass and fix a pencil in it. Put its pointed leg on a point on a sheet of a paper. Open the other leg to some distance. Keeping the pointed leg on the same point, rotate the other leg through one revolution. What is the closed figure traced by the pencil on paper? As you know, it is a circle. How did you get a circle? You kept one point fixed and drew all the points that were at a fixed distance from A. This gives us the following definition: The collection of all the points in a plane, which are at a fixed distance from a fixed point in the plane, is called a circle. The fixed point is called the centre of the circle and the fixed distance is called the radius of the circle.

1.In a cyclic quadrilateral ABCD, if m ∠A = 3(m∠C). Find m ∠A.

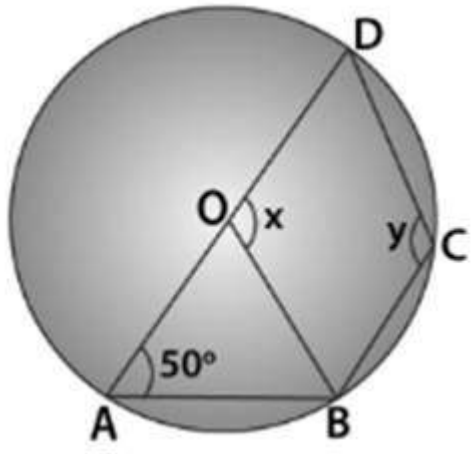
A. 150°

B. 125°

C. 135°

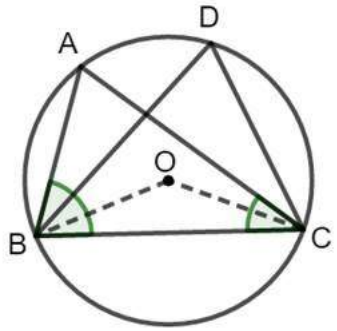
D. 145°

2.In figure, O is the centre of the circle ∠DAB = 50°. Calculate the value of y.



A. 100°
B. 140°
C. 130°
D. 150°

3.In the figure, If ∠ABC = 69° and ∠ACB = 31° then measure of ∠BOC is

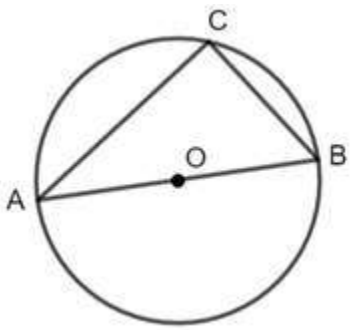


A. 100°
B. 40°
C. 160°
D. 80°

4.The largest chord in a circle is

A. radius
B. diameter
C. secant
D. tangent

5.In the following figure, if AC = 8 cm and BC = 6 cm then radius of circle is



A. 10 cm
B. 5 cm
C. 4 cm
D. 3 cm

20. Mary wants to decorate her Christmas tree. She wants to place the tree on a wooden block covered with coloured paper with picture of Santa Claus on it. She must know the exact quantity of paper to buy for this purpose. If the box has length, breadth and height as l cm, b cm and h cm respectively and square sheets of paper are of side a cm, then would she require

$$number\ of\ square\ sheets\ required = \frac{l \times b \times h}{a \times a}$$

1.The edge of a cube is 20 cm. The number of small cubes each of 5 cm edge that can be formed from this cube will be

A. 4
B. 32
C. 64
D. 100

2.solid cube of side 12 cm is cut into eight cubes of equal volume. What will be the side of the new cube?

A. 4cm
B. 6cm
C. 8cm
D. 10cm

3.If the side of a cube is 'l' units, then the lateral surface area of cube is

A. $2l^2$
B. $4l^2$
C. $6l^2$
D. $8l^2$

4.If the dimensions of a cuboid are 2 cm × 3 cm × 6 cm, then the length of the longest rod that can be put into that cuboid is

A. 6 cm
B. 8 cm
C. 7 cm
D. None of these

5.If the sum of all the edges of a cube is 36 cm, then what will be the volume of that cube?

A. 216 cm^3
B. 27 cm^3
C. 64 cm^3
D. 125 cm^3

PART–B

Section III

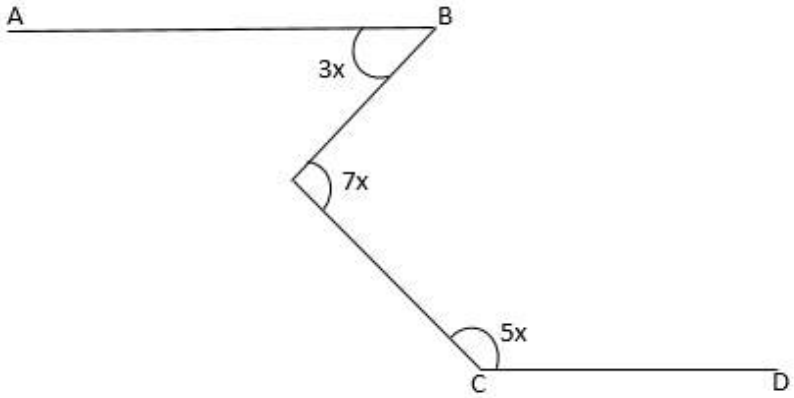
21. What is the value of x in $5^{-2x}. 5^2 = 125$?

22. Find the value of $\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}$.

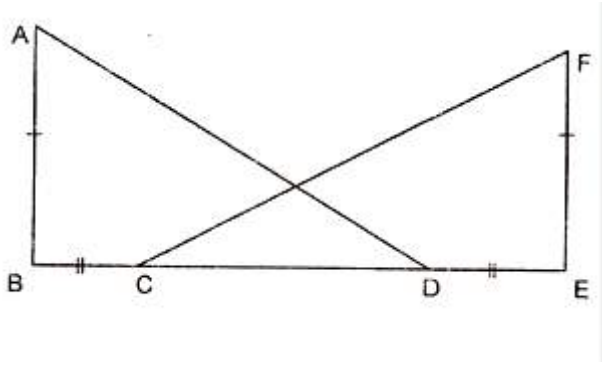
23. For what value of k does the point (-1,-4) satisfies the equation 3x – yk = 4?

24. Reflection of a point A (x, y) with respect to origin is B and reflection of B in y-axis is C (3, 4). What are the co-ordinates of point A?

25. In the given figure, If AB||CD, then find the complementary angle of x.



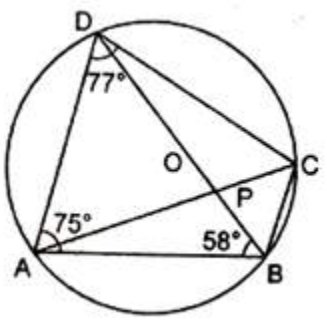
26. In Figure, *AB* ⊥ *BE* and *FE* ⊥ *BE.* If *BC=DE* and *AB=EF*, then prove that Δ *ABD* is congruent to Δ *FEC.*



Section IV

27. ABCD is a trapezium in which AB||DC. M and N are the mid-points of AD and BC respectively, If AB = 12cm, MN = 14 cm, then CD =

28. In Figure, *ABCD* is a cyclic quadrilateral in which ∠*BAD*=75°, ∠*ABD*=58° and ∠*ADC*=77°, *AC* and *BD* intersect at *P.* Then, find ∠*DPC*.



29. Find the area of an isosceles triangle having the base *x* cm and one equal side *y* cm.

30. A cone is 18 m deep and its diameter is 5 m. What is its capacity in kilo liters?

31. The average age of Bhavesh and Bharti was 27 years when their child was born. The average age of Bhavesh, Bharti and the child is 21 years now. The present age of the child is:

32. Given below is the frequency distribution table regarding the concentration of sulphur dioxide in the air in parts per million of a certain city for 30 days.

Conc. Of SO_2	0.00-0.04	0.04-0.08	0.08-0.12	0.12-0.16	0.16-0.20	0.20-0.24
No. of days	4	8	9	2	4	3

Find the probability of concentration of sulphur dioxide in the interval

(i) 0.12-0.16

(ii) 0.16 – 0.24

(iii) 0.04 – 0.16

33. Construct a right triangle when one side is 3.5 cm and sum of other side and the hypotenuse is 5.5 cm.

Section V

34. If (x – 1) and (x + 2) be the factors of $x^3 + (a - 1)x^2 - (b + 2)x - 6$, then find the values of a and b.

35. A well with 10 m inside diameter is dug 14m deep. Earth taken out of it is spread all around it to make an embankment of height $4\frac{2}{3}$. Find the width of the embankment

36. The following table gives the life times of 400 neon lamps:

Life time (in hours)	Number of lamps
300 - 400	14
400 - 500	56
500 - 600	60
600 - 700	86
700 – 800	74
800 – 900	62
900 - 1000	48

(i) Represent the given information with the help of a histogram.
(ii) How many lamps have a life time of more than 700 hours?

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HINTS & SOLUTIONS

Maths Sample paper

1. There are infinitely many irrrational numbers between two numbers.

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

By rationalization the denominator, we get,

$$= \frac{(3-2\sqrt{2})}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}} = \frac{(3-2\sqrt{2})^2}{3^2-(2\sqrt{2})^2} = \frac{9+8-12\sqrt{2}}{9-8} = \frac{17-12\sqrt{2}}{1} = 17-12\sqrt{2}.$$

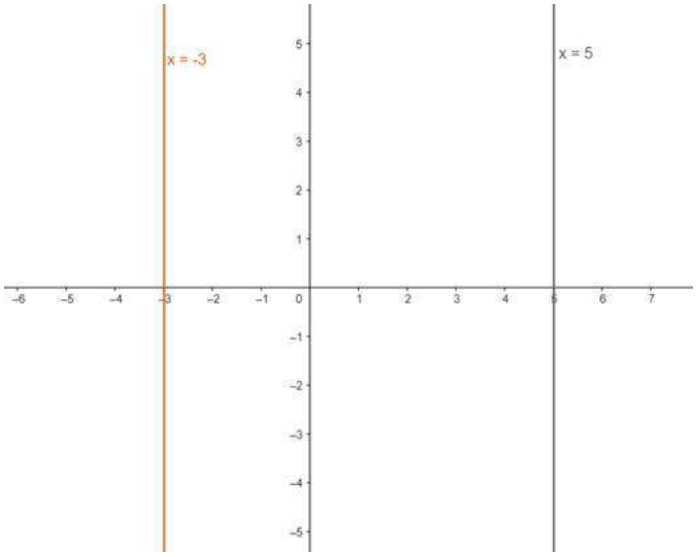
3. First of all, open the innermost bracket that is h (2).

Since, h (2) $=2^2=4$, we get

f(g(h(2)))=f(g(4))=f(-1/3)=-3

4. 50

5.



The distance between the graphs = (5 – (-3)) = 8

6. (2, 3)

7. We have, x > 0 and y < 0

∴x is positive and y is negative

= point (x, -y) lies in 4^{th} quadrant

8. According to question, we have

x < 0 and y > 0 then these points will lie in second quadrant

As, points of the type (-, +) lie on the second quadrant

9. If three or more points lie on the same line, they are called collinear points or if on joining the points (three points in this case), a straight line is obtained, then those points are termed as collinear points.

10. Supplementary angles are in the ratio 4: 5

Let the angles be 4x and 5x.

It is given that they are supplementary angles

Therefore,

$4x + 5x = 180^o$

$x = 20^o$

Hence, $4x = 80^o$

$5x = 100^o$

Therefore, angles are 80^o and 100^o.

11. Given:

ABCD is a rectangle

$\angle ABD = 40^\circ$

$\angle ABD + \angle DBC = 90^\circ$ (angles of rectangle)

$\angle DBC = 90^\circ - 40^\circ = 50^\circ$

12. Let the fourth angle be x.

We know that,

Sum of angles of a quadrilateral = 360°

75° + 90° + 75° + x = 360°

x + 240° = 360°

x = 120°

13. $9\sqrt{3}$ cm^2

14. $225\sqrt{3}$ m^2

15. False

For any event 'E', we know that

0 ≤ P(E) ≤ 1

In option A, P(E) = 1.5 > 1

16.

$$\text{Probability} = \frac{\text{number of favourable outcomes}}{\text{Total possible outcomes}}$$

The probability of not happening of an event = 1 – the probability of an event

Given: P (correct answer) = x/2

P (not correct answer) $= \left(1 - \frac{x}{2}\right) = \frac{2-x}{2}$

$$P(not\ correct\ answer) = \frac{2}{3}$$

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

6 – 3x = 4

3x = 2

$\boldsymbol{x = \frac{2}{3}}$.

17. 1. Ans. C.

2. Ans. A.

3. Ans. C.

Concept: The sum of length of two sides in a triangle is always greater than the length of third side.

Let the third side be ‘x’, therefore we have three sides as 10 cm, 13 cm and ‘x’ cm

$\Rightarrow x + 10 > 13$

$\Rightarrow x > 3$

& $x + 13 > 10$ [true by default]

& $13 + 10 > x$

$\Rightarrow x < 23$

$\Rightarrow 3 < x < 23$

Only possible answer is 20 cm.

Hence, Option C is correct.

4. Ans. A.

In an isosceles triangle, two sides are equal.

Given two sides are 12 and 27.

Let 12 be the side that is equal,

Then, the sides of the triangle are 12, 12, and 27

Theorem: The sum of two sides is always greater than the third side.

$12 + 12 < 27$

Therefore, 12 cannot be the side that is equal.

When, 27 is the side that is equal,

Then, the sides of the triangle are 12, 27, and 27

12 + 27 > 27 [Possible]

Perimeter = 12 + 27 + 27 = 66

Hence, A is the correct answer.

5. Ans. C.

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

Only option c satisfies this property.

Hence, c is the correct answer.

18. 1. Ans. C.

2. Ans. A.

3. Ans. B.

4. Ans. C.

5. Ans. C.

19. 1. Ans. C.

2. Ans. C.

3. Ans. C.

In ΔABC, By angle sum property of triangle

⇒ ∠ABC + ∠ACB + ∠BAC = 180°

⇒ 69 + 31 + ∠BAC = 180

⇒ ∠BAC = 80°

∵ angle made by an arc at the center is double the angle made by it at remaining part of the circle.

⇒ ∠BOC = 2∠BDC = 160°

Hence, Option C is correct.

4. Ans. B.

The largest chord in a circle is diameter which passes through the center.

Hence, Option B is correct.

5. Ans. B.

We know, angle in a semicircle is a right angle

⇒ ΔACB is a right triangle right-angled at C.

By Pythagoras's theorem

⇒ $AC^2 + BC^2 = AB^2$

⇒ $8^2 + 6^2 = AB^2$

⇒ $64 + 36 = AB^2$

⇒ $AB^2 = 100$

⇒ AB = 10 cm

Now, AB = 10 cm [Diameter]

⇒ radius = ½ × 10 = 5 cm

Hence, Option B is correct

20. 1. Ans. C.

Volume of large cube = Volume of small cubes

⇒ $20^3 = n\ 5^3$

$$n = \frac{20^3}{5^3} = 4^3 = 64.$$

2. Ans. B.

Volume of solid cube = $(side)^3 = (12)^3 = 1728\ cm^3$

Accordign to question, volume of each new cube = 1/8 (Volume of original cube)

= 1/8 × 1728 = 216 cm^3

∴ side of new cube = $\sqrt[3]{216} = 6\ cm$

3. Ans. B.

Lateral Surface Area = Total Surface Area – (Area of base and top)

= $6(side)^2 - 2(side)^2$

= $6l^2 - 2l^2$

= $4l^2$

Hence, B is the correct answer.

4. Ans. C.

The length of longest rod that can be put in a cuboid will be equal to the length of diagonal of cuboid.

Length of diagonal $= \sqrt{l^2 + b^2 + h^2}$

Putting values, we get

$= \sqrt{2^2 + 3^2 + 6^2}$

$= \sqrt{4 + 9 + 36} = \sqrt{49}$

= 7 cm

Hence, Option C is correct.

5. Ans. B.

Concept Used:

Each side of a cube is equal.

The volume of Cube = a^3

Given: Sum of edges of a cube = 36 cm

Assumption: Let the edge of the cube be ‘a’ cm.

Explanation:

Sum of all the edges of cube = 36 cm

As there are 12 sides of the cube, Sum of edges = 12 a

Therefore, 12a = 36

$\Rightarrow a = \frac{36}{12}$

$\Rightarrow a = 3$ cm

Now, we know that, Volume of a cube = a^3

Putting the value of "a" we get,

The volume of the cube = $(3 \text{ cm})^3$

$= 27 \text{ cm}^3$

$\therefore$ The Volume of the cube is 27 cm^3.

Hence, Option B is correct

21. We know, $x^a . x^b = x^{a+b}$

$5^{-2x} . 5^2 = 125$

$\Rightarrow 5^{-2x+2} = 5^3$

As $x^a = x^b$, then a = b.

So,

-2x + 2 = 3

-2x = 1

X = - ½

22.

$$\left(\frac{X^a}{X^b}\right)^{a+b}\left(\frac{X^b}{X^c}\right)^{b+c}\left(\frac{X^c}{X^a}\right)^{c+a} = \left(X^{a-b}\right)^{a+b}\left(X^{b-c}\right)^{b+c}\left(X^{c-a}\right)^{c+a}$$

Applying the formula: $(a^2 - b^2) = (a + b)(a - b)$

$$= X^{(a^2-b^2)}X^{(b^2-c^2)}X^{(c^2-a^2)}$$

$$= X^{(a^2-b^2+b^2-c^2+c^2-a^2)}$$

$= x^0$

$= 1$

23.

As (-1,-4) satisfies the equation 3x – yk = 4,

Put these values in the given equation.

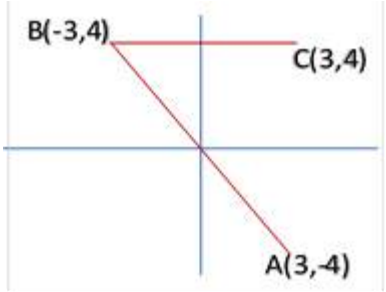
3(-1) – (-4)k = 4

⇒ -3 + 4k = 4

⇒ 4k = 7

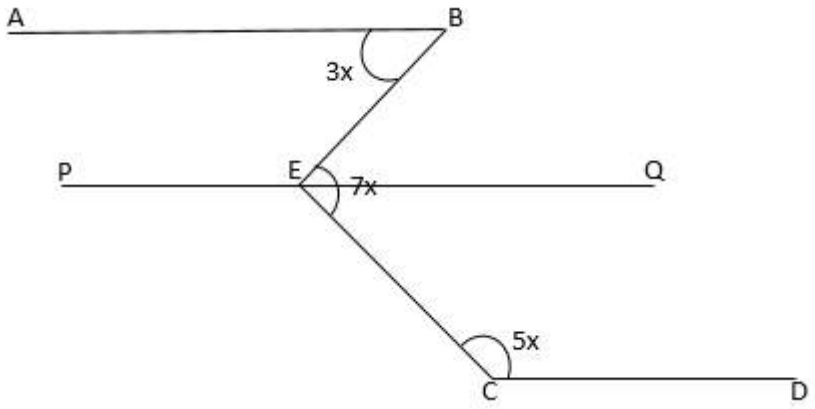
$\Rightarrow k = \frac{7}{4}$

24.



Since, C (3, 4) is a reflection of point B in y-axis, point B is also the reflection of point C (3, 4) in y-axis. Therefore, co-ordinate of B is (-3, 4). Now A (x, y) must be the reflection of B (-3, 4) with respect to origin. Therefore, co-ordinates of A (x, y) are (3, -4).

25.



A line PQ parallel to AB and CD is drawn through point E.

So, ∠ABE = ∠BEQ = 3x (Alternate angle)

Given,

∠BEC = 7x

⇒∠BEQ + ∠QEC = 7x

⇒∠QEC = 7x – 3x = 4x

Now,

∠ECD + ∠QEC = 180° (Internal angle)

⇒ 5x + 4x = 180°

⇒ x = 20°

Therefore, complementary angle of x = 90° - 20° = 70°

26. In ΔABD and ΔFEC,

AB= FE (Given)

∠B = ∠E (Each 90°)

BC = DE (Given)

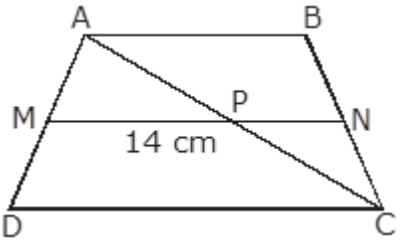
Add CD both sides, we get

BD = EC

Therefore, by S.A.S. theorem,

$\Delta_{ABD} \cong \Delta_{FEC}$

27. Given:



ABCD is a trapezium

AB||DC

M, N are mid points of AD & BC

AB = 12cm, MN = 14 cm

∵ AB||MN||CD [M, N are mid points of AD &BC]

By mid-point theorem,

MP = ½ CD and NP = ½ AB

∴MN = ½ (AB + CD)

14 = ½ (12 + CD)

CD = 28 – 12 = 16 cm

28. ∠DBA = ∠DCA = 58° (Angles on the same segment)

In triangle DCA, By angle sum property

∠DCA + ∠CDA + ∠DAC = 180°

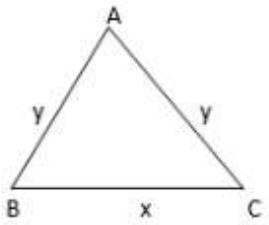
58° + 77° + ∠DAC = 180°

∠DAC = 45°

∠DPC = 180° - 58° - 30°

= 92°

29.



In ΔABC, AB = y $BC = x, AC = y$ .....Given

Since y x and y are the sides of an isosceles triangle and s is

the semi-perimeter, then its area is given by:

A = $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$ [Heron's Formula]

$s = \frac{x+y+y}{2} = \frac{x+2y}{2}$

A= $\sqrt{\frac{x+2y}{2}\left(\frac{x+2y}{2}-x\right)\left(\frac{x+2y}{2}-y\right)\left(\frac{x+2y}{2}-y\right)}$

A = $\sqrt{\frac{x+2y}{2}\left(\frac{2y-x}{2}\right)\left(\frac{x}{2}\right)\left(\frac{x}{2}\right)} = \frac{x}{2}\sqrt{y^2-\frac{x^2}{4}}$ cm^2

30. Given,

Height of a cone, h = 18 m

Diameter of cone, d = 5 m

Radius, $r = \frac{1}{2}d = \frac{5}{2}\ m$

Volume of a cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times \frac{5}{2} \times \frac{5}{2} \times 18$

⇒ Volume = 117.85 m^3

Required answer is option a as $1m^3$ = 1 kl

31. Given the average age of Bhavesh, Bharti and their child is 21 years now

We know that, Sum of observations = Average × total observations

Sum of age of Bhavesh, Bharti and their child now = 21 ×3 = 63 years

Also, average age of Bhavesh and Bharti was 27 years when the child was born

Sum of age of Bhavesh and Bharti when the child was born = 27×2= 54 years

Sum of ages of Bhavesh, Bharti and their child from the birth of child till now = 63 – 54 = 9 years

Hence 9 years divide among husband, wife and child equally.

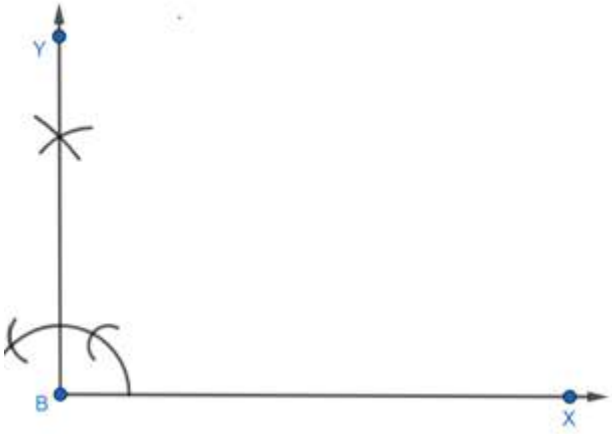
Age of child = 3 years.

32. The frequency distribution table regarding the concentration of sulphur dioxide in the air in parts per million of a certain city for 30 days

Total number of days = 30

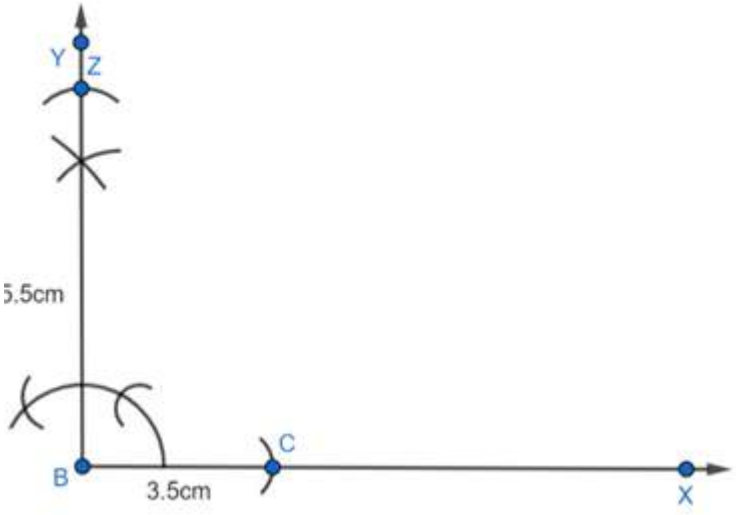
The probability of concentration of SO_2 in the interval of 0.12 – 0.16 $= \frac{2}{30} = 0.06$.

33. Step 1:
Draw ∠YBX = 90°.



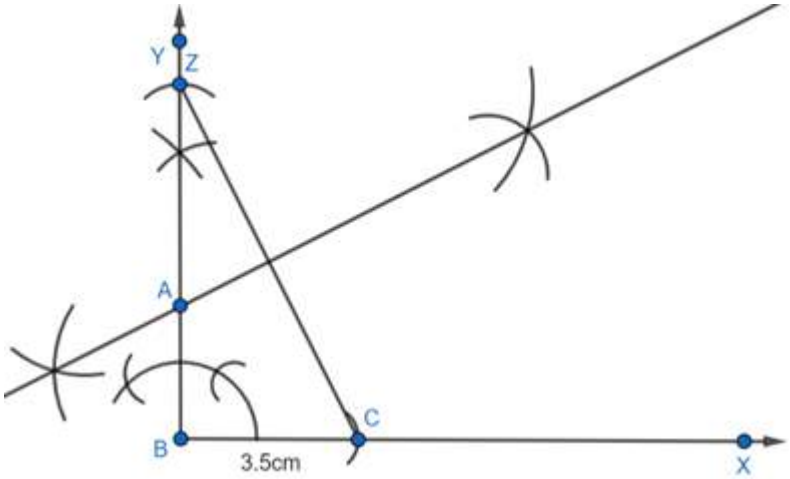
Step 2:

With B as center and radius 3.5cm and 5.5cm respectively cut arcs intersecting BX at C and BY at Z.

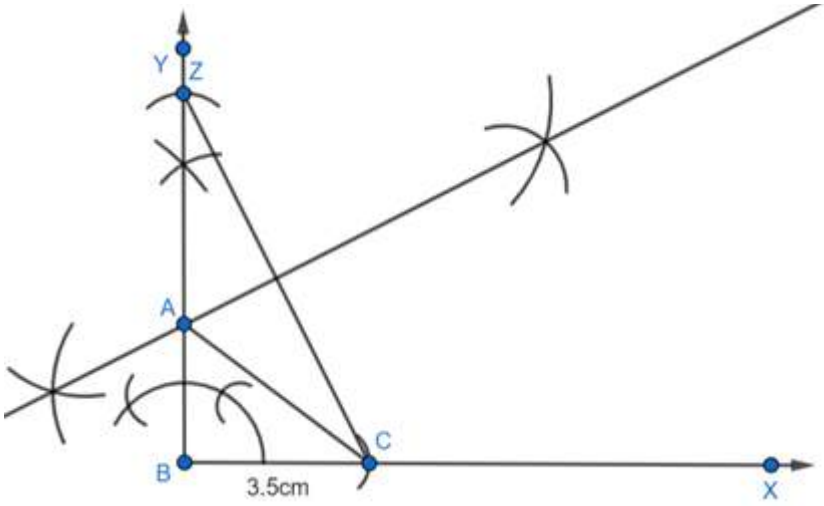


Step 3:

Join ZC and construct its perpendicular bisector intersecting BY at A.



Step 4:
Join AC.



ABC is the required triangle.

Justification

Here ∠ABC=90° , BC=3.5cm by construction.

As A is the point of intersection of the perpendicular bisector and CZ,

So, AZ=AC which means AB+AZ=5.5cm

And at the same time AB+AC=5.5cm

Hence the triangle Construction is justified.

34. $if\ (x-a), is\ a\ factor\ of\ polynomial\ function\ f(x), then$

$f(a) = 0$

$\therefore\ on\ putting\ x = 1\ in$

$x^3 + (a-1)x^2 - (b+2)x - 6$

$\Rightarrow 1 + a - 1 - b - 2 - 6$

$\Rightarrow a - b = 8\ -(i)$

$similarly,$

$(-2)^3 + (a-1)(-2)^2 - (b+2) \times (-2) - 6$

$\Rightarrow -8 + 4a - 4 + 2b + 4 - 6$

$\Rightarrow 4a + 2b = 14$

$\Rightarrow 2a + b = 7\ -(ii)$

$By\ eq.(i) + (ii),$

$3a = 15$

$\Rightarrow a = 5$

$From\ eq.(i).b = 5 - 8 = -3$

35. Let the width of the embankment be x

According to the question,

The volume of the embankment = volume of the earth dug out = volume of the well.

$\pi \times ((5+x)^2 - 5^2) \times \frac{14}{3} = \pi \times 5^2 \times 14$

Solving we get,

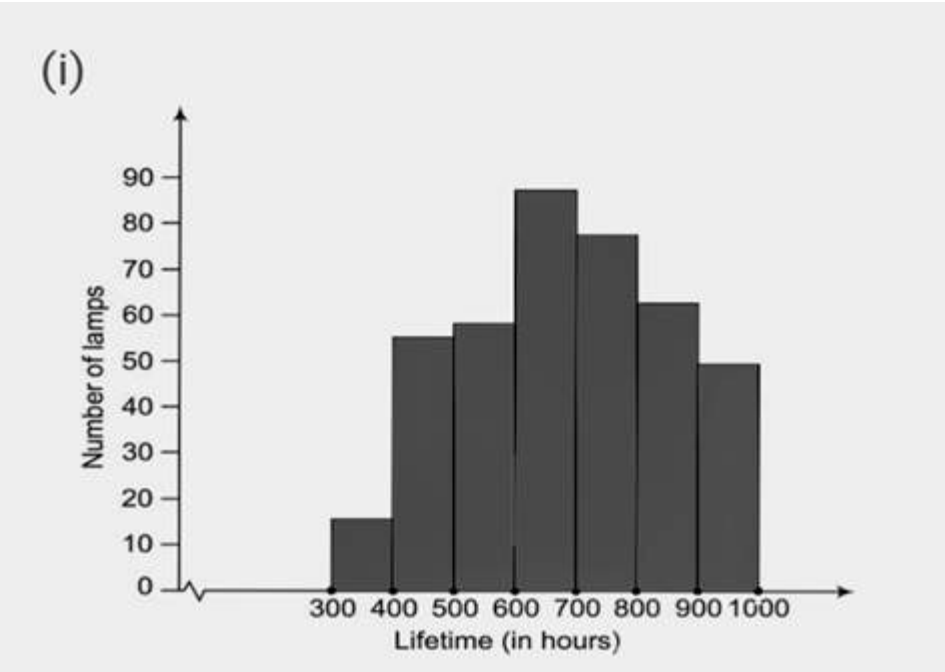
$x^2 + 10x - 75 = 0$

$x = 5, -15$

Since the width cannot be negative, hence x = 5 m is the correct answer.

36. The parts of the questions are solved below:

(i) The above given information is represented with the help of histogram below:



(ii) 74 + 62 + 48 = 184

Hence, 184 lamps have a life time of more than 700 hours.

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