SSLC Examination March 2023
Mathematics – English Version.
Detailed Solutions with Questions.

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Question. 1

7, 13, 19, ... is an arithmetic sequence.

(a) What is its common difference ?

(b) Find its 11^{th} term.

Solution.

Sequence = 7, 13, 19, ...

a) Common difference = $x_2 - x_1$

= 13 – 7 = 6..

b) 11^{th} term = f + 10 d

= 7 + 10 x 6 = 67.

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Question. 2.

Weights of 11 players of a football team are given in kilograms :

55, 65, 56, 70, 62, 54, 64, 58, 68, 65, 60

Find the median of the weights of players.

Solution.

Arrange the weight in ascending order54,55,56,38,60,62,64,65,65 ,66,70.

The given data br odd numbers

$$\therefore \text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{ term .}$$

$$= \left(\frac{11+1}{2}\right)^{th} \text{ term} = \left(\frac{12}{2}\right)^{th} \text{ term}$$

6^{th} tern = 62.

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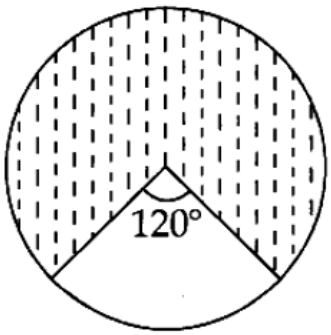
Question. 3.

A dot is put inside the circle without looking it.



(a) What is the probability that the dot to be within the unshaded part ?

(b) What is the probability that the dot to be within the shaded part ?

Solution.

a) $\frac{120}{360} = \frac{1}{3}$.

b) $1 - \frac{1}{3} = \frac{2}{3}$.

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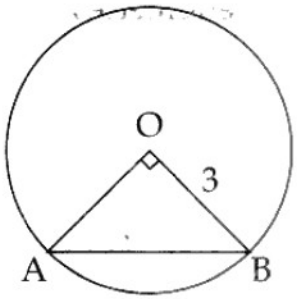
Question. 4.



AB is a chord of a circle of radius 3 centimetres. Chord AB makes a rightangle at the centre. What is the length of AB ?

Solution.

Given OB = 3.(radius)

In rt.ΔAOB ,angles are 45,45,90.ie., 1 : 1: √2 .

ie., 3: 3: 3√2.

Hence AB = 3√2.

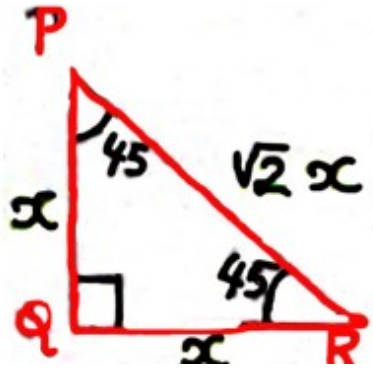
Note.

Having the angles 45° , 45° ,

Angles : 45° , 45° , 90°.

Sides : 1 : 1 : √2 .

x x √2x .



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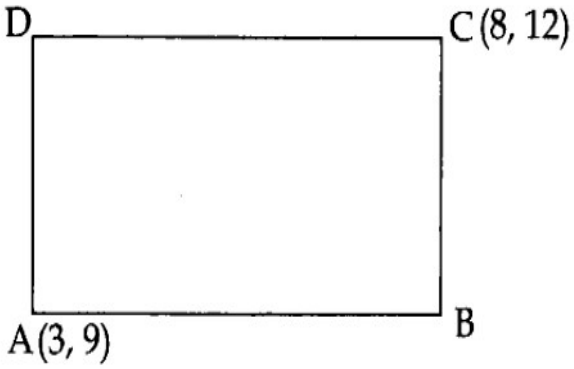
Question. 5.



A(3, 9), C(8, 12) are the coordinates of two opposite vertices of a rectangle whose sides are parallel to the coordinate axes.

(a) Find the coordinates of other two vertices of the rectangle.

(b) Find the lengths of the sides of the rectangle.

Solution.

Given two vertice

A(3,9) ; C(8,12).

a) Other two vertices of the rectangle be B(8,9) ; D(3,12).

b) Length of AB = | 8 - 3 | = 5 .

Length of BC = | 12 - 9 | = 3.

Length of DC = 5

[opposide of the rectangle]

Length of AD = 3

[opposide of the rectangle] .

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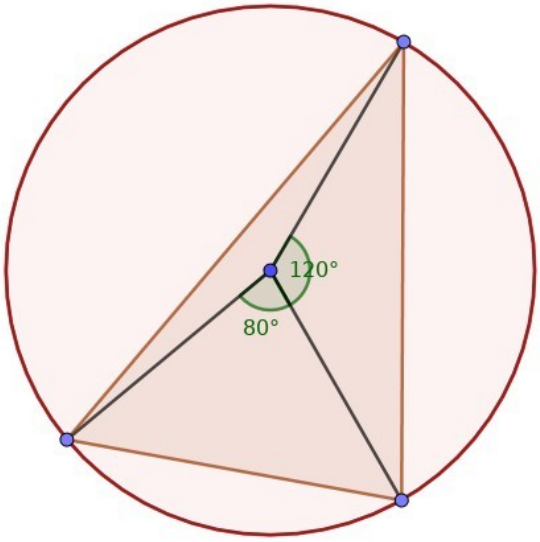
Question. 6.

Draw a circle of radius 4 centimetres.

Draw a triangle whose vertices are on this circle and two of the angles 40° and 60°.

Solution.



Construction

Draw a circle with radius 4cm. Draw any radius and make an angle 80^0($2 \times 40 = 80^0$) and then make an angle 120^0 .($2 \times 60 = 120^0$).and join all vertices.

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Question. 7.

Find the lengths of the sides of the rectangle whose perimeter is 80 centimetres and area 351 square centimetres.

Solution.

Given perimeter = 80cm.

Area = $351cm^2$.

ie., $2(l+b) = 80$

$l+b = 40$

Let length be x .

$b = 40-x$

Given Area =351

ie., $x(40-x)=351$

$x^2-40x = -351$

$x^2-40x+20^2 = -351+20^2$.[Using square completion method]

$(x-20)^2=49$

$x-20=7$

$x=27$

Hence the lebgth =27cm ,

Breadth =13 cm.

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Question. 8.

(4, 5) and (8, 11) are coordinates of two points on a line.

(a) Find the slope of the line.

(b) Find the equation of the line.

Solution.

Given two points are

(4,5) and (8, 11) .

a) Slope = $\frac{y_2-y_1}{x_2-x_1} = \frac{11-5}{8-4}$

$= \frac{6}{4} = \frac{3}{2}$.

b) Equation of the line

$= y - y_1 = m(x - x_1)$

$= y - 5 = \frac{3}{2}(x - 4)$

$2y - 10 = 3x - 12.$

$3x - 2y - 12 + 10 = 0.$

$3x - 2y - 2 = 0.$

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Question. 9.

6^{th} term of an arithmetic sequence is 46. Its common difference is 8.

(a) What is its 16^{th} term ?

(b) Find its 21^{st} term.

Solution.

Given 6th term = 46 ; d = 8.

ie.m f + 5d = 46

f = 46 – 5d

f = 46 – 5 x 8

= 46 – 40 = 6 .

a) 16^{th} term = f + 15d

= 6 + 15 x 8

= 6 + 120 = 126.

OR , $x_{16} = x_6 + 10g$

= 46 + 10 x 8

= 46 + 80 = 126.

b) 21dt term = f + 20d

= 6 + 20 x 8

$$= 6 + 160 = 166.$$

OR, $x_{21} = x_{16} + 5d$

$$= 126 + 5 \times 8$$

$$= 126 + 40 = 166.$$

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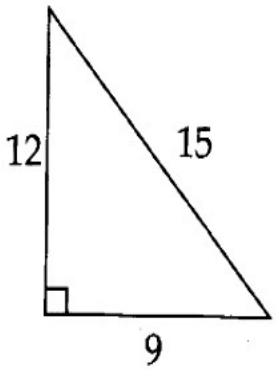
Question. 10.

The sides of a right triangle are 9 centimetres, 12 centimetres and 15 centimetres.



(a) Find the area of the triangle.

(b) Calculate the in radius of the triangle.

Solution.

Given sides are 9cm, 12cm and 15cm.

a) Aera $= \frac{1}{2} \times bh = \frac{1}{2} \times 9 \times 12$

$= 54cm^2$.

b) Radius $= \frac{A}{S} = \frac{54}{\frac{9+12+15}{2}}$

$= \frac{94}{18}$ $= 3cm.$

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Question. 11.

$P(x) = x^2 - 4x + 4$

(a) What is P(1) ?

(b) Write a first degree factor of $P(x) - P(1)$

(c) Write the polynomial $P(x) - P(1)$ as the product of two first degree polynomials.

Solution.

Given, $P(x) = x^2 - 4x + 4$.

a) $P(1) = 1^2 - 4 \times 1 + 4$.

$= 1 - 4 + 4 = 1$.

b) $P(x) - P(1)$.

$x^2 - 4x + 4 - 1$

$= x^2 - 4x + 3$.

c) $x^2 - 4x + 3$.

$= (x - 3)(x - 1)$.

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Question. 12.

A cone is made by rolling up a semicircle of radius 20 centimetres.

(a) What is the slant height of the cone ?

(b) Find the radius of the cone.

(c) Calculate the curved surface area of the cone.

Solution.

Givebm radius of the semi circle

= 20cm.

a) We know that Slant height of the cone = Radius of the sector = 20 cm .

b) Radius of the cone =

$$l \times \frac{x}{360} = 20 \times \frac{180}{360}$$

= 10cm.

c) CSA = πrl = π x 10 x 20

= 200π cm^2 .

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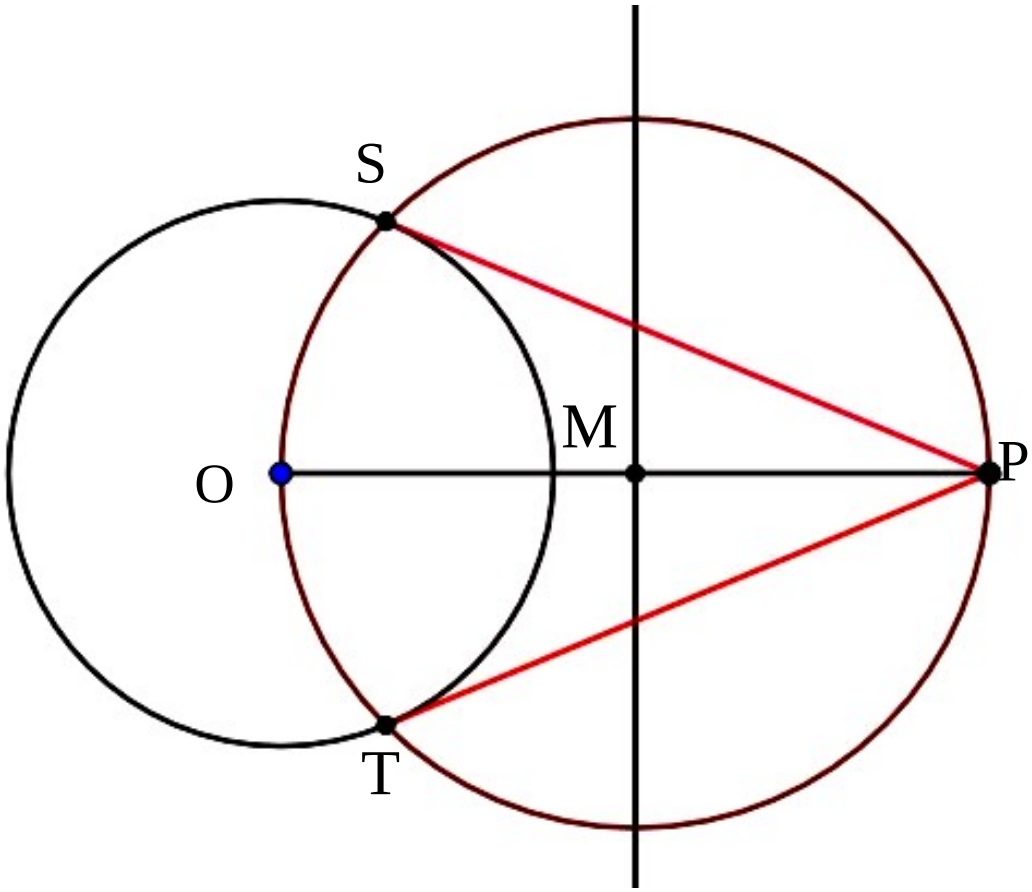
Question. 13.

Draw a circle of radius 2.5 centimetres. Mark a point 6.5 centimetres away from the centre.

Draw the tangents to the circle from this point.

Measure and write the lengths of the tangents.

Solution.



Construction

Draw a circle with given radius 2.5cm O as the center. Draw OP as 6.5cm.away from the center. Draw a perpendicular to OP and cut at M. Draw a circle OM as radius abd cut at S and

T respectively. Join PS and PT as the tangents.

The length of thr tangent

PS = PT = 6cm.

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Question. 14.

Sum of first 7 terms of an arithmetic sequence is 140.

Sum of first 11 terms of the same arithmetic sequence is 440.

(a) What is the 4^{th} term of this arithmetic sequence ?

(b) Find its 6^{th} term.

(c) What is the common difference ?

(d) Find the first term of this sequence.

Solution.

Sum of the first 7 term = 140.

Sum of the first 11 term

= 440.

a) 4^{th} term $(x_4) = \frac{S_7}{7} = \frac{140}{7}$

$= 20.$

b) 6^{th} term $(x_6) = \frac{S_{11}}{11} = \frac{440}{11}$

$= 40.$

c) Common difference (d)

$= \frac{x_6 - x_4}{6-4} = \frac{40-20}{2} = \frac{20}{2}$

$= 10.$

d) First term od the sequence

$(x_1) = x_4 - 43d$

$= 20 - 3 \times 10$

$= 20 - 30 = -10.$

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Question. 15.

A box contains 4 slips numbered 1, 2, 3, 4 and another contains 5 slips numbered 1, 2, 3, 4, 5. One slip is taken from each box without looking it.

(a) In how many different ways we can choose the slips ?

(b) What is the probability of both numbers being odd ?

(c) What is the probability of both numbers being the same ?

Solution.

Box - 1. → 1, 2, 3, 4 .

Box - 2. → 1, 2, 3, 4, 5 .

a) Total ways = m x n

= 4 x 5 = 20.

b) Both numbers being odd

= n(F) / n(N)

n(f) = 2 x 3 = 6 , n(N) = 20

∴ Probability both numbers being odd = n(F) / n(N) = $\frac{6}{20} = \frac{3}{10}$.

c) Probability both numbers being same = n(F) / n(N)

n(f) = 4., n(N) = 20.

∴ Probability both numbers being same = n(F) / n(N) = $\frac{4}{20} = \frac{1}{5}$.

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Question. 16.

In a right triangle, one of the perpendicular sides is 2 centimetres more than that of the other.

Area of the triangle is 24 square centimetres.

Find the lengths of the perpendicular sides of the right triangle.

Solution.

Let one side be x

Aere = 24 cm^2 .

By question

ie., $\frac{1}{2}$ x bh = 24

$\frac{1}{2}$ x x(x +2) = 24

$x^2 + 2x = 48$.

.[Using square completion method]

$x^2 + 2x + 1 = 48 + 1$

$(x + 1)^2 = 49$.

$x + 1 = 7$; $x = 7 - 1 = 6$.

∴ Sides are 6 cm. and 8 cm.

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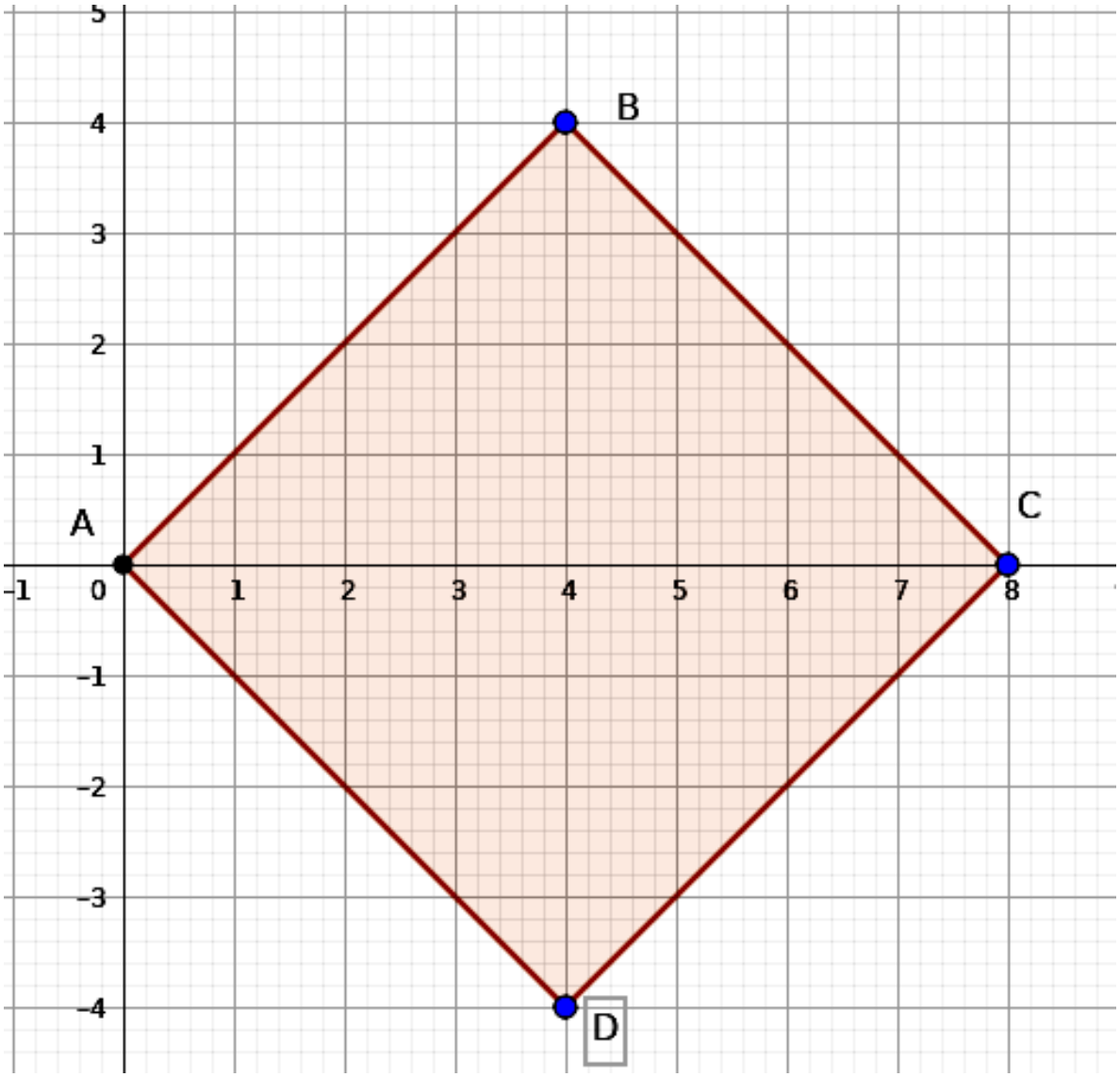
Question. 17.

Draw the co-ordinate axes and mark the points A(0, 0), B(4, 4), C(8, 0) and D(4, −4).

(a) Write the suitable name of the quadrilateral ABCD.

(b) Find the length of the diagonal BD.

Solution.



a) ABCD be a square.

b) Length of the diagonal

BD = 8.

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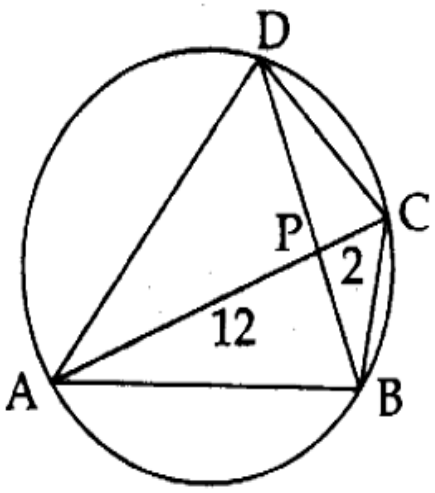
Question. 18.



Diagonals AC and BD of the cyclic quadrilateral ABCD cuts at P.

PA = 12 centimetres; PC = 2 centimetres; BD = 11 centimetres.

(a) If PB = x, then write PD in terms of x.

(b) Find the lengths of PB and PD.

Solution.

Given, PA = 12cm, PC = 2cm.,

BD = 11cm.

a) PB = x

Fromthe figure we can see that

PD = 11 – x .

b) We know that

PA x PC=PB x PD

ie., 12 x 2 =x x (11-x)

$\Rightarrow$ 24 = 11x – x^2 .

$\Rightarrow$ x^2 – 11x + 24 = 0 .

(x – 8) (x – 3) = 0

either x – 8 = 0 , or x – 3 = 0.

if x – 8 = 0 ; x – 3 = 0

x = 8 ; x = 3

Here when PB = 8cm.

then PD = 3cm.

When PB = 3cm then PD = 8cm.

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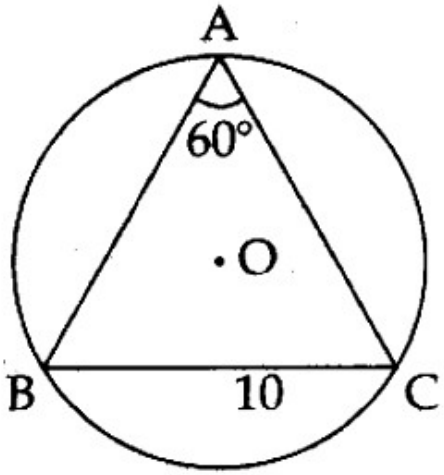
Question. 19.



BC is a chord of the circle centred at O.

BC = 10 centimetres $\angle A = 60°$. Find the radius of the circle.

Solution.

Givn, BC = 10cm be a chord.(C)

$\angle A = 60^0$.

$C = 2r \sin A$; $\Rightarrow 10 = 2r \sin 60$.

$$\Rightarrow 2r = \frac{10}{\sin 60} \; ; \Rightarrow 2r = \frac{10}{\frac{\sqrt{3}}{2}}.$$

$$\therefore r = \frac{10}{\sqrt{3}} \text{ .cm.}$$

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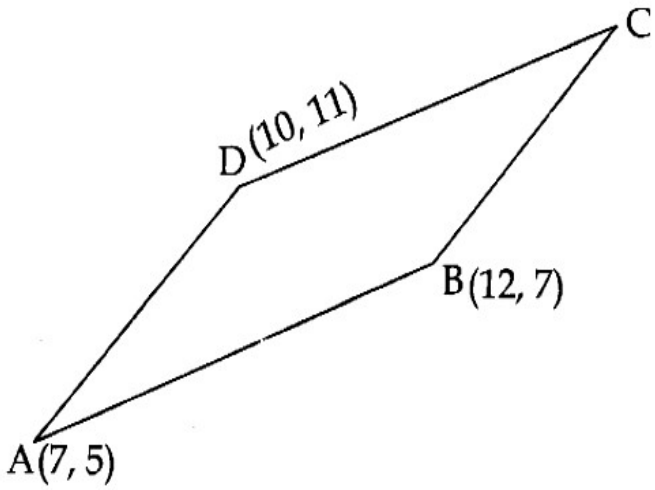
Question. 20.



In the figure, co-ordinates of 3 vertices of the parallelogram ABCD are given.

(a) Write the co-ordinates of C.

(b) Calculate the length of the diagonal AC.

(c) Find the co-ordinates of the point of intersection of the diagonals.

Solution.

The co-ordinates of A,B,C and D are given.

a) C (12 + 10 – 7 , 11 + 7 – 5)

C (15, 13) .

b) Length of diagomal AC

[Use distance formula] .

ie., $AC = \sqrt{(15-7)^2+(13-5)^2}$

$= \sqrt{8^2+8^2} = \sqrt{128}$

$= 8\sqrt{2}$.

c) [Use mid point formula] .

ie., $\left(\frac{12+10}{2}, \frac{7+11}{2}\right) = (11, 9)$.

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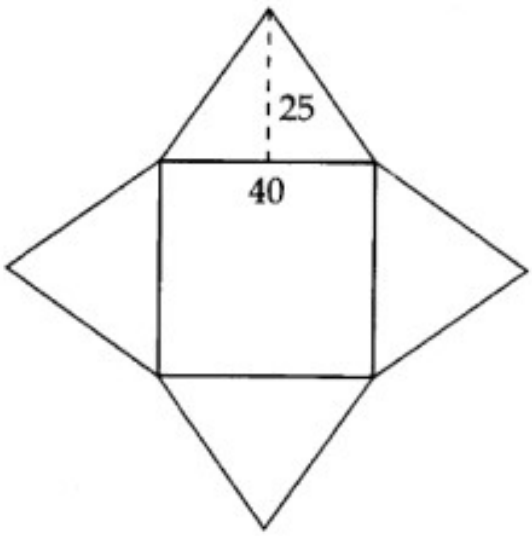
Question. 21.



A square pyramid is made by cutting out a paper as in the figure. Side of the square is 40 centimetres. Height of the triangle is 25 centimetres.

(a) What is the slant height of the square pyramid ?

(b) Find the height of the pyramid.

(c) Calculate the volume of the pyramid.

Solution.

Given, side = 40cm.

l = 25bm.

a) Slant heigh of the pyramid

= 25cm .

b) Height of thr pyramid

$$= \sqrt{l^2 - \left(\frac{a}{2}\right)^2} = \sqrt{25^2 - \left(\frac{40}{2}\right)^2}$$

$$= \sqrt{625 - 400} = \sqrt{225} = 15\text{cm}.$$

c) Volume of the pyramid

$= \frac{1}{3} a^2 h = \frac{1}{3} \times 40^2 \times 15.$

$= 8000 \text{ cm}^3$.

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Question. 22.

The daily wages of 99 workers in a factory is shown in the table.

Daily wages	Number of Workers
500-600	8
600-700	13
700-800	20
800-900	25
900-1000	19
1000-1100	14

(a) If the workers are arranged on the basis of their daily wages, at what position does the median wage fall ?

(b) What is the median class ?

(c) Find the median of the wages.

Solution.

Daily Wages	Number of workers	Daily Wages	cf
500-600	8	Up to 600	8
600-700	13	Up to 700	21
700-800	20	Up to800	41
800-900	25	Up to900	66
900-1000	19	Up to1000	85
1000-1100	14	Up to 1100	99
Total	99		

N = 99

a) Median $\left(\frac{n+1}{2}\right)^{th}$ **workers wage**

$= \left(\frac{99+1}{2}\right)$th workers wage

$= 50^{th}$ workers wage.

$\therefore$ Median position = 50.

b) Median class = 800 – 900.

c) Since d = 900 – 800 /25

= 100/25 = 4

SO, $X_{42} = 800 + \frac{d}{2} = 800 + \frac{4}{2}$

= 900 + 2 = 802.

$\therefore$ Median = x_{50} .

= x_{42} + 8d

= 802 + 8 x 4

Wages = Rs.834/-.

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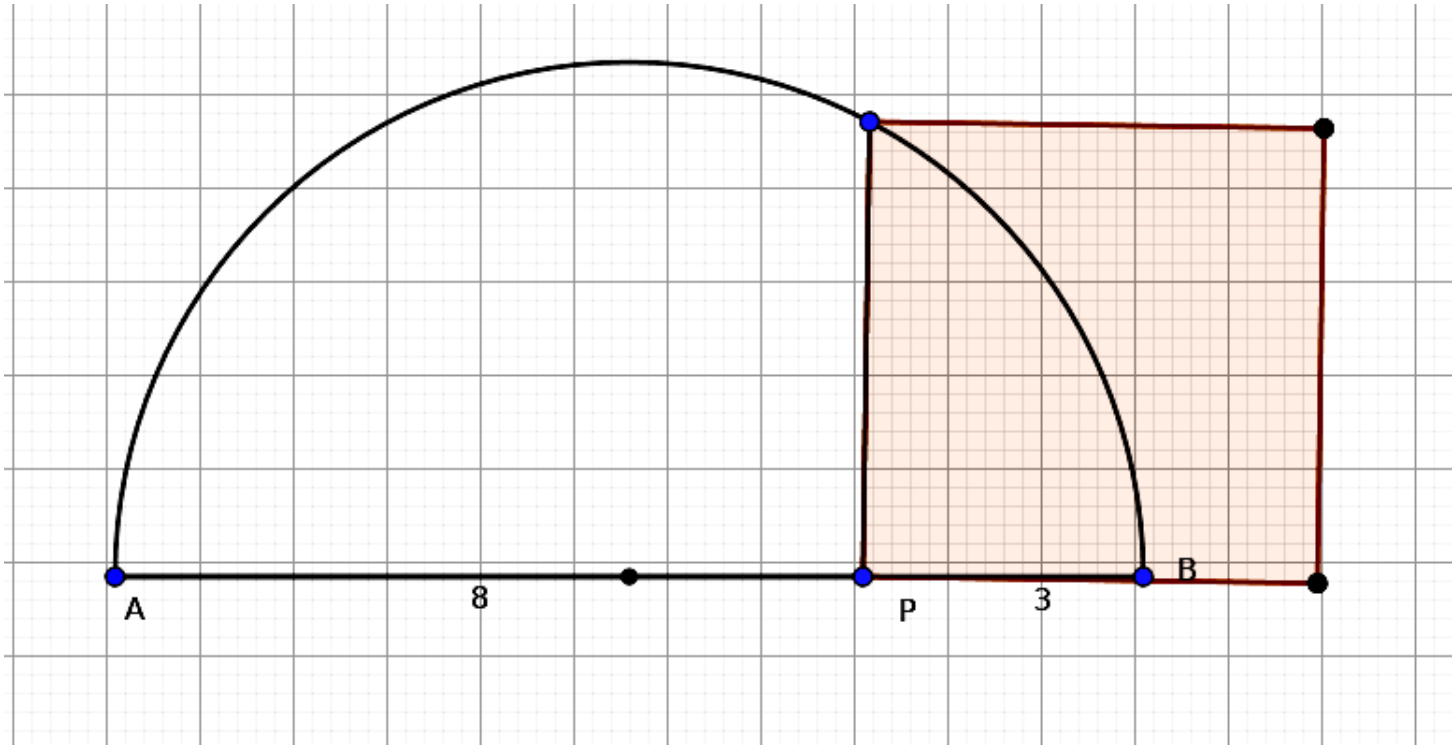
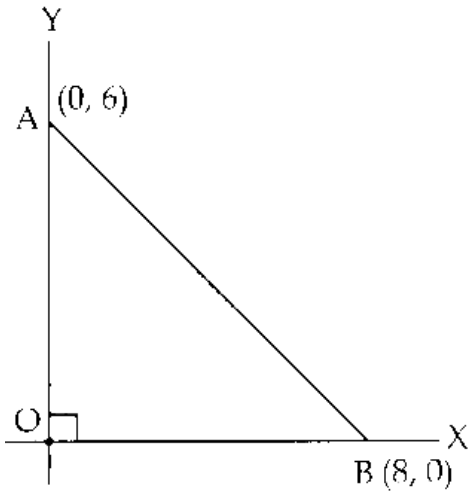
Question. 23.

Draw a rectangle of area 24 square centimetres. Draw a square of area equal to the area of this rectangle.

Solution.



Question. 24.



In the figure, (0, 6) and (8, 0) are coordinates of the points A and B. A circle of diameter AB is to be drawn.

(a) Find the coordinates of the centre of the circle.

(b) Find the radius of the circle.

(c) What is the equation of the circle ?

Solution.

Given A = (0, 6) ; B = (8, 0)

a) Centre of the circle

[find the mid point]

ie., $\left(\frac{x_1+y_1}{2}, \frac{x_2+y_2}{2}\right)$

$\Rightarrow \left(\frac{0+8}{2}, \frac{6+0}{2}\right)$ = (4, 3).

b) Given, AB diameter

AB = $\sqrt{8^2+6^2}$. ; $\sqrt{64+36}$ =10.

[Using distance formula]

$\therefore$ **Radius** $= \frac{10}{2} = 5.$

c) Equation of the circle

$$(x-a)^2 + (y-b)^2 = r^2 .$$

$$\Rightarrow (x-4)^2 + (y-3)^2 = 5^2 .$$

$$\Rightarrow x^2 - 8x + 16 + y^2 - 6y + 9 = 25.$$

$$\Rightarrow x^2 + y^2 - 8x - 6y = 0.$$

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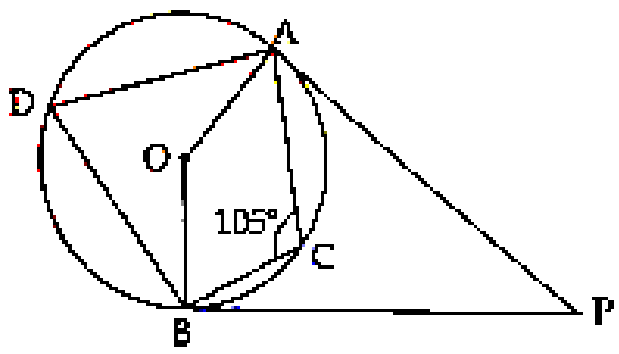
Question. 25.

5.



PA and PB are two tangents to the circle centred at O.
$\angle ACB = 105°$. Find the angles given below.

(a) $\angle ADB$ = _____

(b) $\angle AOB$ = _____

(c) $\angle APB$ = _____

(d) $\angle ABP$ = _____

(e) $\angle ABO$ = _____

Solution.

a) $\angle ADB = 180 - 105 = 75^0$.

b) $\angle AOB = 2 \times 75 = 150^0$.

c) $\angle APB = 180 - 150 = 30^0$.

d) $\angle ABP = \angle D = 75^0$.

e) $\angle ABO = \frac{180-150}{2} = \frac{30}{2}$

$= 15^0$.

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Question. 26.

There are two cylindrical wooden blocks with diameter 60 centimetres and height 60 centimetres.

A largest cone is carved out from one block and a largest sphere from the other.

(a) What is the volume of the cylinder ?

(b) Find the volume of the cone.

(c) Find the radius of the sphere.

(d) Calculate the volume of the sphere.

(e) Find the ratio of the volumes of the cone and the sphere.

Solution.

Given, heighr of the cylindrical block = 60cm.

Diametre = 60cm.; r = 30cm.

a) Volume of the cylinder

$= \pi r^2 h = \pi \times 30^2 \times 60$

$= 54000\pi \text{ cm}^3.$

b) Volume of the cone

$= \frac{1}{3} \times \pi r^2 h = \frac{1}{3} \times 54000\pi$

$= 18000\pi \text{ cm}^3$.

c) Radius of the sphere

Here diameter of yje cylinder be equak to the diameter of the sphere

∴Radius = 30 cm.

d) Vloume of rhe sphere

$$= \frac{4}{3} \times \pi r^3 \ . \Rightarrow \frac{4}{3} \times \pi \times 30^3 \ .$$

$$= 36000\ \pi\ cm^3 \ .$$

e) Ratio of the volumes of the cone and sphere

ie., = 18000π : 36000 π

= 1 : 2.

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Question. 27.

(a) Find the sum of first 20 natural numbers.

(b) Write the algebraic expression of the arithmetic sequence 5, 9, 13, _____

(c) Find the sum of first 20 terms of the arithmetic sequence 5, 9, 13, _____

Solution.

Given first 20 natural numbers.

a) $S_{20} = \frac{n(n+1)}{2} = \frac{20(20+1)}{2}$

$= 10 \times 21 = 210.$

b) Given sequence

$= 5, 9, 13, \ldots.$

$f = 5 ; \quad d = 9 - 5 = 4.$

Algibraic expression

$x_n = dn + (f - d)$

$= 4n + (5 - 4)$.

$= 4n + 1.$

c) Given sequence

$= 5, 9, 13, \ldots.$

$n =$, $f = 5$, $d = 9 - 5 = 4.$

$S_{20} = \frac{n}{2} [2 + (n - 1) d]$

$$= \frac{20}{2} [2 \times 5 + (20 - 1)\, 4\,]$$

$$= 10\,[\,10 + 19 \times 4\,]$$

$$= 10 \times 86 = 860.$$

OR

Do it yourself by this formula.

$$\frac{d}{2} n^2 + \left(f - \frac{d}{2}\right) n$$

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Question. 28.

A child sees the top of a telephone tower at an elevation of 80°. Stepping 20 metres back, he sees it at an elevation of 40°.

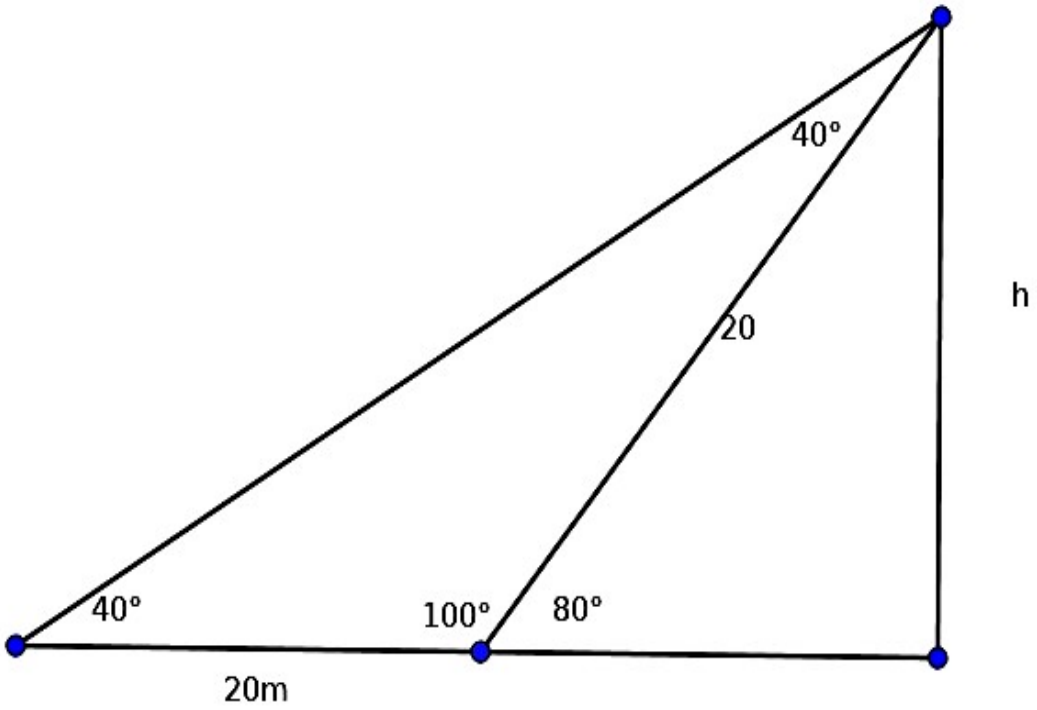
(a) Draw a rough figure.

(b) Calculate the height of the tower.

[sin 40° = 0.64 ; cos 40° = 0.77 ; tan 40° = 0.84
sin 80° = 0.98 ; cos 80° = 0.17 ; tan 80° = 5.7]

Solution.

a)



b) $\sin 80 = \frac{h}{20}$

$h = \sin 80 \times 20. \Rightarrow 0.98 \times 20$

Height of the tower = 19.6..

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Question. 29.

Score

Diagonals of a quadrilateral are the lines joining its opposite vertices.

What about the diagonals of a polygon ?

The lines from one vertex to the adjacent two vertices are not diagonals. They are the sides of the polygon. Lines to all other vertices are diagonals.

In a quadrilateral, only one diagonal can be drawn from one vertex. If we draw from all 4 vertices, we get 4 diagonals. But 2 among them are the same. In a pentagon, from one vertex, 2 diagonals can be drawn.

Therefore total number of lines is $5 \times 2 = 10$.

But 5 among them are the same.

So number of diagonals in a pentagon $= \frac{5 \times 2}{2} = 5$.

Now complete the table given below :

Polygon	Number of sides	Number of diagonals from one vertex	Total number of diagonals
Quadrilateral	4	1	$\frac{4\times1}{2} = 2$
Pentagon	5	2	$\frac{5\times2}{2} = 5$
Hexagon	6	3	$\frac{6\times3}{2} = 9$
Heptagon	7	.....	.....
Decagon	10	.....	.....
n sided polygon	n	$n-3$	.....

Solution.

Heptagon	7	4	$\frac{7\times4}{2}=14$
Decagon	10	7	$\frac{10\times7}{2}=35$
N side polygon	n	n - 3	$\frac{n(n-3)}{2}$

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Detailed Solutions with Questions.

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