Grade 10 Kerala Mathematics 2021

For questions from 1 to 5, choose the correct answer from the brackets. Each question carries 1 score.

Q1. Arithmetic sequence with common difference 2 is:
[7,10,13, ….. ; 7,5,3, …
7,9,11, … ; 2,5,8, … …]

Solution:
7, 9, 11,…

Q2. Which is always a cyclic quadrilateral?
[Parallelogram ; Square
Trapezium ; Rhombus]

Solution:
Square

Q3. Which among the following is a point on the x axis?
[(2,0): (0,2): (1,1); (3,4)]

Solution:
(2,0)

Q4. Measure of the smallest angle of a right angled triangle is 30°. Length of its smallest side is 6 centimetres. What is the length of its largest side?
(6, 3, 18, 12)

Solution:
12 centimetres

Q5. What is the slope of the line passing through the points (2, 5) and (3, 7)?
(2, 3, 4,5)

Solution:
2

Questions from 6 to 10 carries 2 scores each.

Q6. Write the first term and common difference of the arithmetic sequence 3n + 2.

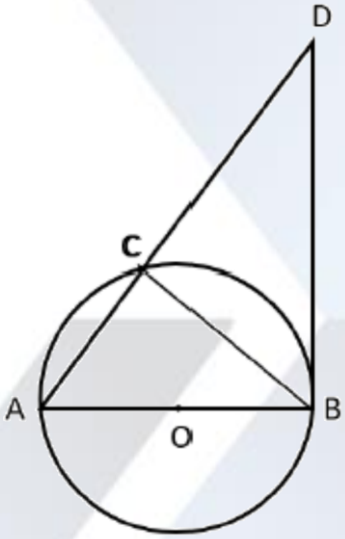
Solution:

First term = 3 + 2 = 5

Common difference = 3(2) + 2 - (3 + 2) = 6 + 2 - 5

Common difference = 3

Q7. In the figure AB is the diameter of the circle. C is a point on the circle. One of the angles ∠ACB and ∠ADB is twice the other.



Write the measures of angles ∠ACB and ∠ADB.

Solution:

Solution: ∠ACB = 90° (Angle subtended by the diameter)

∠ADB = 45° (Half of ∠ACB)

Q8. One is asked to say a natural number less than 10 .

(a) What is the probability of it being an odd number?

(b) What is the probability that it will not be an even number?

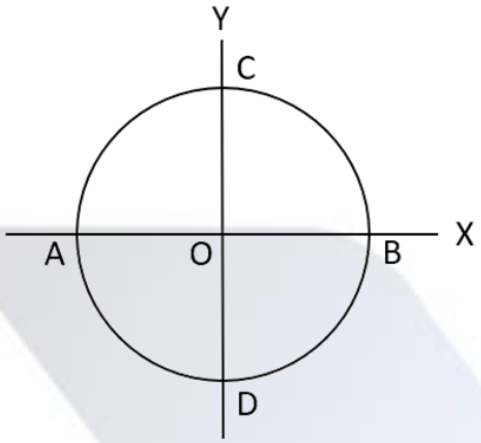
Solution:

(a) Odd numbers = 1,3,5,7,9

$P(\text{ Odd number }) = \frac{5}{9}$

(b) $P(\text{Not an even number }) = P(\text{ odd number }) = \frac{5}{9}$

Q9.



In the figure, AB and CD are diameters of the circle. Coordinates of B are (3,0). Write the coordinates of O and C.

Solution:

(a) Coordinates of O = (0,0) [As B lies on x-axis, centre will also lie on x-axis.]

(b) Coordinates of C = (0,3) [As C must be 3 units from O and on positive y-axis]

Q10. Write $x^2 - 1$ as the product of two first degree polynomials.

Solution:

$(x + 1)(x - 1)$

Questions from 11 to 20 carries 3 scores each.

Q11. (a) What is the tenth term of the arithmetic sequence $a + 1, a + 2, a + 3, \ldots$?

(b)What is its common difference ?

(c) Write the algebraic form of the above sequence.

Solution:

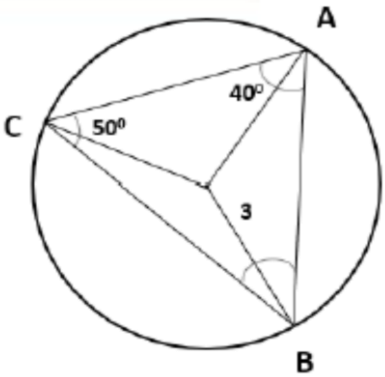
(a) Tenth term = $a + 1 + 9(1) = a + 10$

(b) Common difference = $a + 2 - (a + 1) = 1$

(c) Algebraic form = $a + n$

Q12. Draw a triangle of circumradius 3 centimetres and two of the angles 40° and 50°.

Solution:



Q13. (a) Write the sequence of even numbers.

(b) One added to the product of two consecutive even numbers gives 289. Form a second degree equation to solve this problem.

Solution:

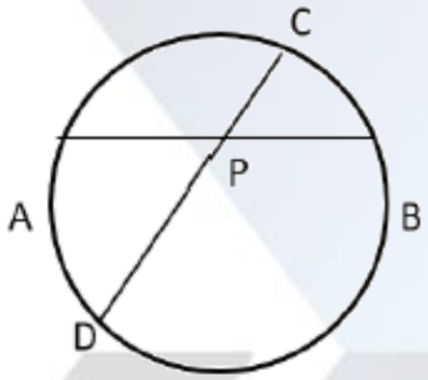
(a) Even numbers = Multiples of 2 $\Rightarrow$ 2,4,6, ...

(b) $x(x + 2) + 1 = 289$

$x^2 + 2x + 1 = 289$

$(x + 1)^2 = 289$

Q14. In the figure, chords AB and CD intersect at P. AB = 10 centimetres, PB = 4 centimetres and PC = 3 centimetres.



(a) What is the length of PA?

(b) Find the length of PD.

Solution:

(a) PA = AB − PB = 10 − 4 = 6 centimetres PA = 6 centimetres

(b) $3 \times PD = 6 \times 4$

$PD = \frac{6 \times 4}{3} = 8$ centimetres

Q15. P is at a distance of 13 centimetres from the centre of a circle of radius 5 centimetres.

(a) How many tangents can be drawn from the point P to the circle?

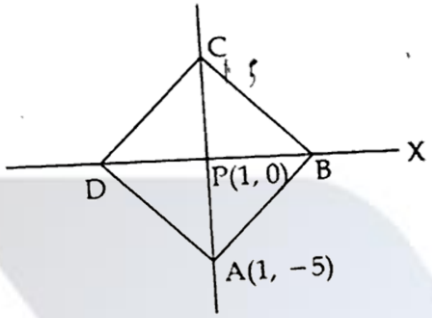
(b) Find the lengths of the tangents.

Solution:

(a)Since, P is outside the circle, only 2 tangents can be drawn.

(b) Length of tangents $= \sqrt{13^2 - 5^2} = \sqrt{169 - 25} = \sqrt{144} = 12$ cm

Q16. ABCD is a square, coordinates of A are (1, -5). Diagonals of the square intersect at P (1,0). Write the coordinates of B, C, and D.



Solution:

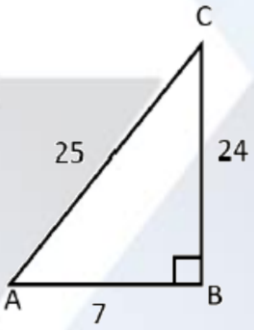
PA $= \sqrt{(1-1)^2 + (-5-0)^2} = 5$ units

Coordinates of B $= (1+5,0) = (6,0)$

Coordinates of C $= (1,5)$

Coordinates of D $= [(1-5),0] = (-4,0)$

Q17. In the figure $\angle B = 90°$, AB $= 7$ centimetres, BC $= 24$ centimetres, AC $= 25$ centimetres.



(a) sin A $= \frac{24}{K}$, what number is K ?

(b) Write cos C and sin C.

Solution:

(a) sin A $= \frac{24}{25}$

On comparison, K $= 25$

(b) cos C $= \frac{24}{25}$

sin C $= \frac{7}{25}$

Q18. A sector of central angle 120° and radius 12 centimetres is rolled up into a cone.

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

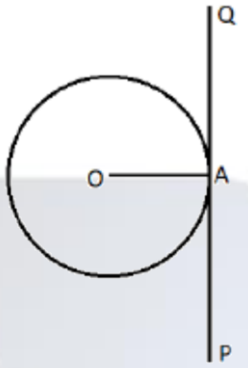
(b) Find the radius of the cone.

Solution:

(a) Slant height of the cone $= 12$ cm

(b) $\frac{120°}{360°} = \frac{r}{12} \Rightarrow r = \frac{12 \times 120°}{360°} = 4$ cm

Q19. (a) In the figure, OA is the radius of the circle. PQ is the tangent through A. What is the measure of $\angle OAP$?

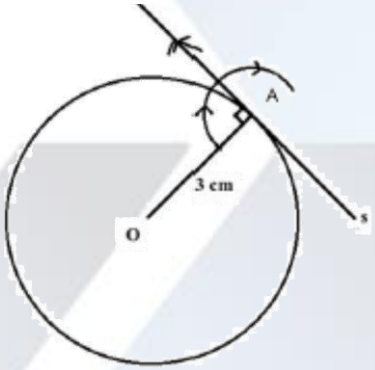


(b) Draw a circle of radius 3 centimetres and mark a point A on it. Draw the tangent through A.

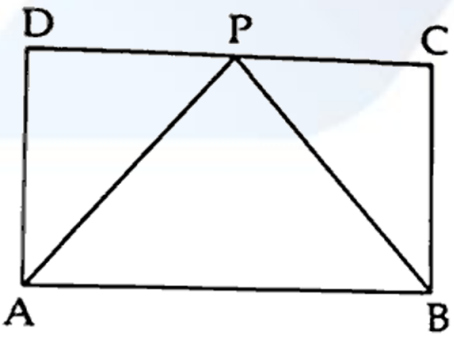
Solution:

(a) $\angle OAP = 90°$

(b)



Q20. ABCD is a rectangle. P is the midpoint of CD. If we put a dot in the figure without looking into it:



(a) What is the probability that it would be inside triangle APB?

(b) What is the probability that it would be inside triangle ADP?

Solution:

(a) $\frac{\text{Area of APB}}{\text{Area of the rectangle}} = \frac{1}{2}$

(b) Area of triangle ADP $= \frac{1}{4} \times$ Area of the rectangle

$\frac{\text{Area of the triangle ADP}}{\text{Area of the rectangle}} = \frac{1}{4}$

Questions from 21 to 30 carries 4 scores each

Q21. (a) Write the 20^{th} term of the arithmetic sequence 5,10,15, …

(b) Find the sum of the first 20 terms of the arithmetic sequence 5,10,15, ….

(c) What is the sum of the first 20 terms of the arithmetic sequence 4,9,14, … ?

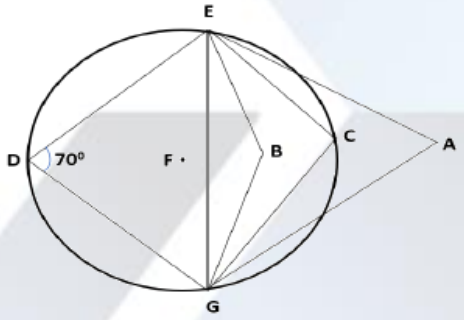
Solution:

(a) 20^{th} term $= 5 + 19 \times 5 = 100$

(b) $\frac{20}{2} \times (5 + 100) = \frac{20 \times 105}{2} = 1050$

(c) $1050 - 20 \times 1030$

Q22.



In the figure C, D, E, and G are points on the circle. $\angle D = 70°$. For the angles given in column I, choose suitable measures from column II.

Column I	Column II
∠ECG	120°
∠EBG	60°
∠EAG	110°
	180°

Solution:

$\angle ECG = 180 - \angle EDG = 180° - 70° = 110°$

$\angle EAG = 60°$ as $\angle ECG > \angle EAG$

$\angle EBG = 120°$ as $\angle ECG < \angle EBG$

Q23. Fill up the empty cells of the given square such that the numbers in each row, each column and both diagonals form arithmetic sequences.

3		13
7		

Solution:

In the first row, differences between 1st and 3rd term $= 10$,

Position difference $= 3 - 1 = 2$

Common difference $= \frac{10}{2} = 5$, Arithmetic sequence 3,8,13

3	8	13
7		

In the first column, differences between 1 st and 3 rd term $= 4$,

Position difference $= 3 - 1 = 2$

Common difference $= \frac{4}{2} = 2$, Arithmetic sequence 3,5,7

3	8	13
5		
7		

Diagonally, differences between 1st and 3rd term $= 6$,

Position difference $= 3 - 1 = 2$

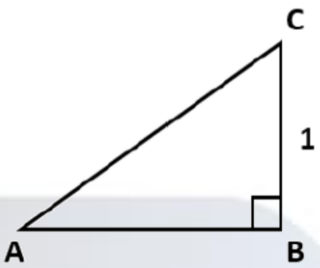
Common difference $= \frac{6}{2} = 3$, Arithmetic sequence 7,10, 13

3	8	13
5	10	
7		

Similarly, for second and third row, arithmetic sequence becomes 5,10,15 and 7,12,17, respectively.

3	8	13
5	10	15
7	12	17

Q24. In the figure $\angle B = 90°$. BC = 1 centimetre, sin A $= \frac{1}{2}$.



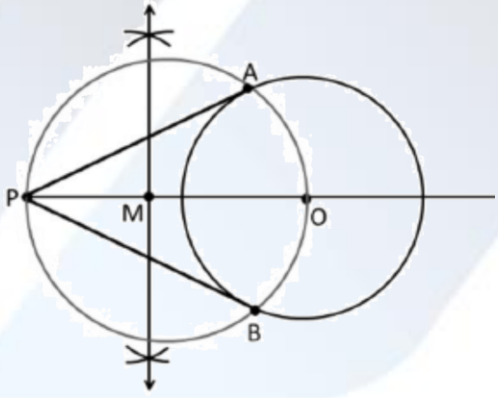
(a) What is the length of AC?
(b) Find the length of AB.
(c) What is the measures of $\angle A$?
(d) sin 60° = ____

Solution:

(a)sin A $= \frac{BC}{AC} = \frac{1}{2} \Rightarrow$ AC = 2 cm
(b) AB $= \sqrt{(4-1)} = \sqrt{3}$ cm
(c) 30°
(d) $\frac{\sqrt{3}}{2}$

Q25. Draw a circle of radius 3 centimetres. Mark a point P outside the circle at a distance 7 centimetres from the centre. Draw tangents from P to the circle. Measures the length of the tangents.

Solution:



Length of tangents: $PA^2 = OA^2 + OP^2$
$PA^2 = 3^2 + 7^2$
PA $= \sqrt{58}$ cm

Q26. Scores of 10 students are given below:
11,32,33,35,39,41,45,47,48,49
(a) Find the mean score.
(b) Find the median score.

Solution:

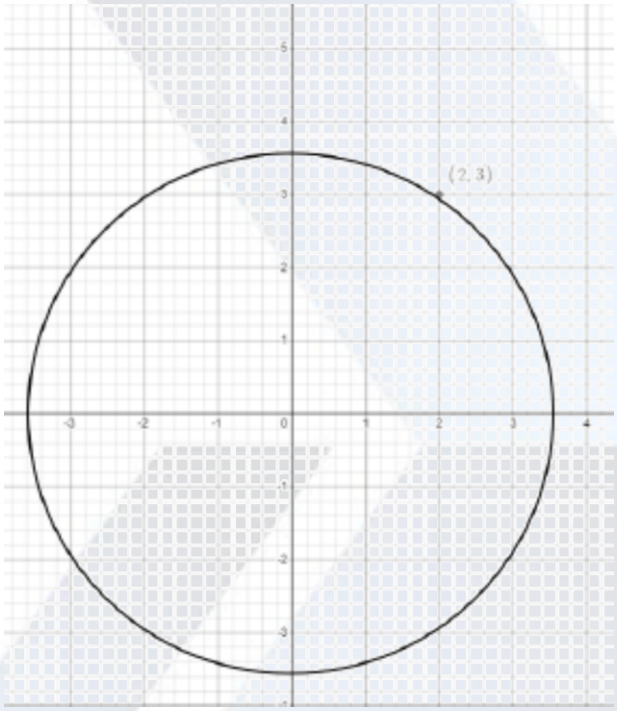
(a) Mean $= \frac{11+32+33+35+39+41+45+47+48+49}{10} = \frac{380}{10} = 38$

(b) 11,32,33,35,39,41,45,47,48,49

Median $= \frac{39+41}{2} = \frac{80}{2} = 40$

Q27. Draw the x and y axes. Mark the point (2,3). Draw a circle with origin as centre and passing through the point (2,3).

Solution:



Q28. (a) The perimeter of a rectangle is 40 centimetres. Length of its smaller side is 7 centimetres. What is the length of its larger side?

(a) Find the sides of a rectangle with perimeter 40 centimetres and area 96 square centimetres

Solution:

(a) Length of larger side $= \frac{\text{Perimeter}}{2} -$ Length of smaller side $= 20 - 7 = 13$ cm

(b) If length $= 10 + x$, then breadth $= 10 - x$

$(10 + x)(10 - x) = 96$

$100 - x^2 = 96$

$x = \sqrt{100 - 96} = \sqrt{4} = 2$

Length $= 10 + 2 = 12$ cm, breadth $= 10 - 2 = 8$ cm

Q29. One is asked to say a two-digit number,

(a) What is the probability of both digits being the same?

(b) What is the probability of the first digit being twice the second?

Solution:

(a) Total number of two-digit numbers $= 90$

Probability of both digits being the same $= \frac{9}{90}$

(b) Favourable results $= 21,42,63,84$

Probability of the first digit being twice the second $= \frac{4}{90}$

Q30. (a) $P(x) = x^2 - 5x + 9$, find $P(2)$ and $P(3)$.

(b)Write $P(x) - P(2)$ as the product of two first degree polynomials.

Solution:

(a) $P(2) = 2^2 - 5 \times 2 + 9 = 3$

$P(3) = 3^2 - 5 \times 3 + 9 = 3$

(b) $P(x) - P(2) = x^2 - 5x + 9 - 3 = x^2 - 5x + 6$

$P(x) - P(2) = (x - 2)(x - 3)$

Questions from 31 to 45 carries 5 scores each.

Q31. 1

2 3

4 5 6

7 8 9 10

……

(a) Write the fifth line of the pattern.

(b) How many numbers are there in the tenth line?

(c) How many numbers are there in the first ten lines altogether?

(d) What is the first number in the eleventh line?

Solution:

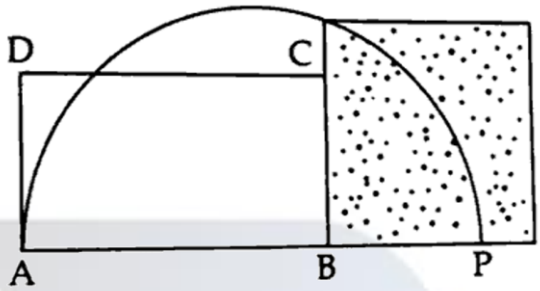
(a)11 12 13 14 15

(b) 10

(c) $1 + 2 + 3 + \cdots \ldots + 10 = \frac{10 \times 11}{2} = 55$

(d) $55 + 1 = 56$

Q32. (a) In the figure area of the rectangle ABCD is 8 square centimetres and BC = BP.



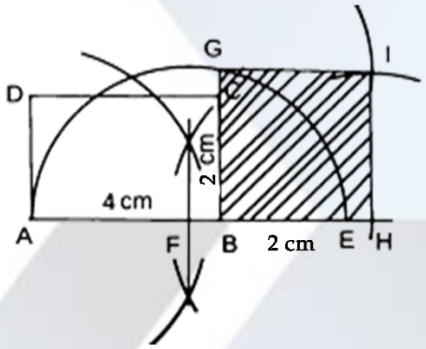
What is the area of the shaded square?

(b) Draw a rectangle of area 8 square centimetres. Draw a square having the same area of the rectangle.

Solution:

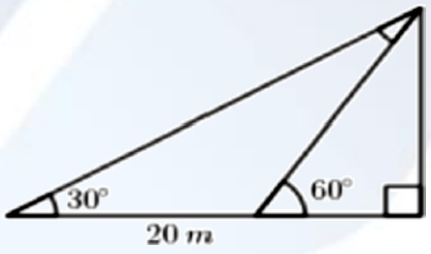
(a) 8 sq. cm as, Area of square = Area of Rectangle.

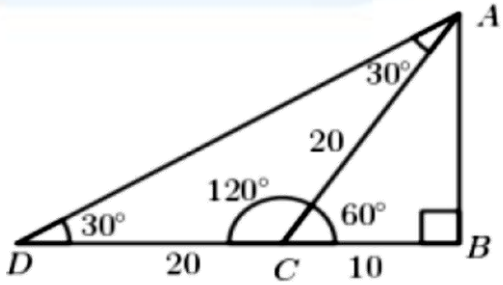
(b)



Q33. A man standing at the edge of a river sees the top of a tree at an elevation of 60°. Stepping 20 metre back he sees it at an elevation of 30°. Draw a rough figure and find the width of the river.

Solution:





$\angle ACD = 120°$
$\angle D = \angle CAD = 30°$
$CD = AC = 20$ m

Now, $\cos 30° = \frac{BC}{AC} \Rightarrow BC = \frac{\sqrt{3}}{2} \times AC$

$BC = 10\sqrt{3}$ m

Q34. The sides of a rectangle are parallel to the axes. One pair of its opposite vertices are A(2,4) and C(6,12)

(a) Write the coordinates of the other two vertices.

(b) Write the coordinates of the midpoint of AC.

(c) x coordinate of a point on AC is ' a '. What is its y coordinate?

Solution:

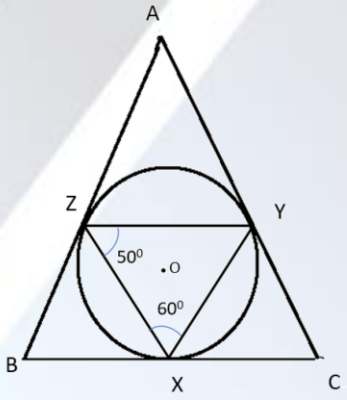
a) Coordinate of $B = (6,4)$

Coordinate of $D = (2,12)$

(b) $\left(\frac{2+6}{2}, \frac{4+12}{2}\right) = (4,8)$

(c) 2a

Q35. In the figure AB, BC, and AC touches the circle at the points Z, X and Y. $\angle ZXY = 60°$ and $\angle XZY = 50°$. Find the measures of $\angle A$, $\angle B$ and $\angle C$.



Solution:

$\angle AZY = \angle ZXY = 60°$

$\angle A = 180° - (60 + 60) = 60°$

$\angle CXY = \angle XZY = 50°$

$\angle C = 180° - (50° + 50°) = 80°$

$\angle B = 180° - (60° + 80°) = 40°$

Q36. (a) Radius of a solid metal cone is 5 centimetres, its slant height is 13 centimetres. Find its height.

(b) Find the volume of the cone.

(c) It is melted and recast into small cones of radius 1 centimetre and height one centimetre. How many cones will we get?

Solution:

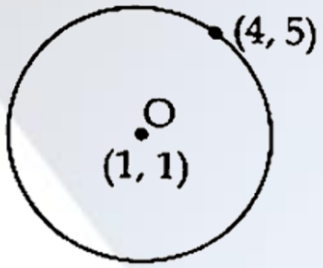
(a) $h = \sqrt{13^2 - 5^2} = \sqrt{169 - 25} = \sqrt{144} = 12$ cm

(b) Volume of the cone $= \frac{1}{3} \times \pi \times 5^2 \times 12 = 100\pi$ cm^3

(c) Volume of the small cone $= \frac{1}{3} \times \pi \times 1^2 \times 1 = \frac{\pi}{3}$ cm^3

Number of cones $= 100\pi \div \frac{\pi}{3} = 300$

Q37. A circle is drawn with (1,1) as centre. (4,5) is a point on the circle.



(a) Find the radius of the circle.

(b) Write the equation of the circle.

(c) The x coordinate of a point on the circle is 6. What is the y coordinate of that point?

Solution:

(a) Radius $= \sqrt{(4-1)^2 + (5-1)^2} = 5$ units

(b) $(x-1)^2 + (y-1)^2 = 5^2$

(c) $(6-1)^2 + (y-1)^2 = 5^2 \Rightarrow y = 1$

Q38. The diameters of two spheres are in the ratio 1 : 2.

(a) What is the ratio of their radii?

(b) Find the ratio of their surface areas.

(c) If the surface area of the sphere is 10π square centimetres, what is the surface area of the second sphere?

Solution:

(a) 1: 2

(b) $r_1 = 1r, r_2 = 2r$

Ratio of the surface areas $= 4\pi r^2 : 4\pi(2r)^2$

$= 1 : 4$

c) $4 \times 10\pi = 40\pi$sq. cm

Q39. (a) What is the remainder on dividing the difference in terms of the arithmetic sequence 100,109,118, ... by 9 ?

(b) Write the sequence of three digit numbers, which are multiples of 9 .

(c) What is the position of 999 in the arithmetic sequence of three digit numbers which are multiples of 9 ?

Solution:

(a) 1

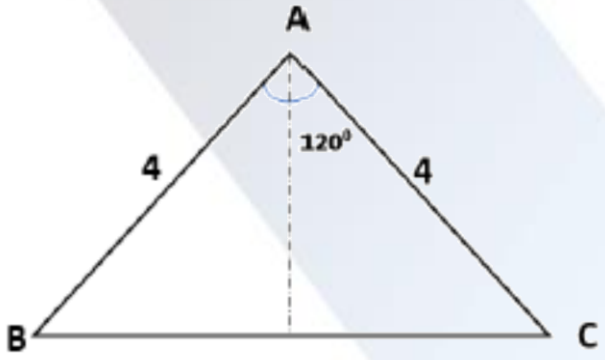
(b) 108,117,126, ...

(c) Algebraic form $= 9n + 108 - 9 = 9n + 99$

$9n + 99 = 999$

$n = 100$

Q40.



In the figure, AB = AC = 4 centimetres, $\angle A = 120°$.

(a) $\angle B =$

(b) Find the perpendicular distance from A to BC .

(c) Find the area of the triangle.

Solution:

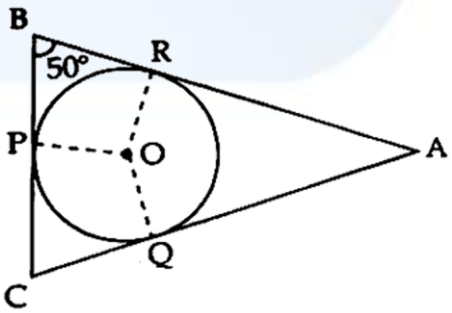
(a) 30°

(b) 2 cm

(c) $BC = 4\sqrt{3}$ cm

Area of the triangle $= \frac{1}{2} \times 4\sqrt{3} \times 2 = 4\sqrt{3}$ cm^2

Q41. (a) In the figure, the circle with centre O touches the sides of the triangles ABC at the points P, Q, and R. If $\angle B = 50°$, what is $\angle POR$?

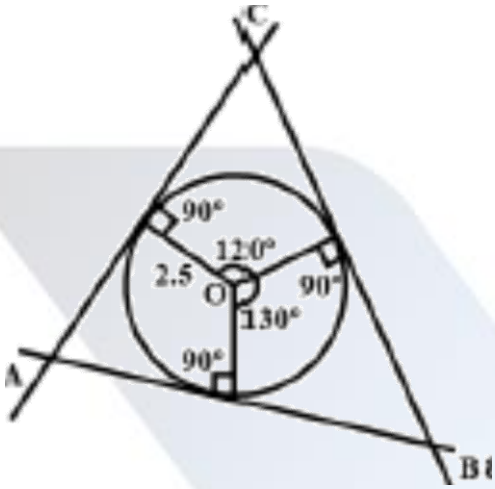


(b) Draw a circle of radius 2.5 centimetres. Draw a triangle of angles 50°, 60°, 70° with all its sides touching the circle.

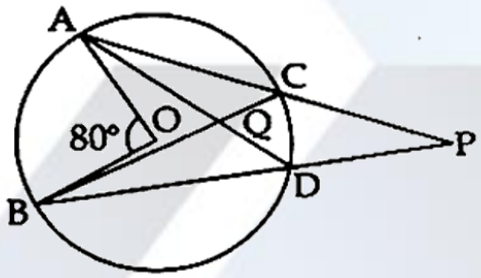
Solution:

(a) $\angle POR = 180° - 50° = 130°$

(b)



Q42. In the figure, O is the centre of the circle. A, B, C and D are points on the circle. $\angle AOB = 80°$.



(a) Write the measures of $\angle ACB$, $\angle ADB$, and $\angle ADP$.

(b) Find $\angle CQD + \angle P$.

Solution:

(a) $\angle ACB = 40°$

$\angle ADB = 40°$

$\angle ADP = 140°$

(b) $\angle BCP = 140°$

$\angle CQD + \angle P = 360° - 280° = 80°$

Q43. A box is to be made by cutting off small squares from each corner of a square of thick paper, and bending upwards. The height of the box is to be 10 centimetres and volume 1 litre.

(a) What should be the length of a side of the square cut-off?

(b) What should be the length of a side of the square, thick paper sheet?

Solution:

(a) 10 cm

(b) If the base edge of the box is taken as x,

$x^2 \times 10 = 1000$

$x^2 = \frac{1000}{10} = 10$

$x = \sqrt{100} = 10$

Length of the side of the square thick paper $= 10 + 20 = 30$ cm

Q44. The table below shows children of a class sorted according to their scores in an examination.

Scores	Number of children
$0 - 10$	5
$10 - 20$	8
$20 - 30$	10
$30 - 40$	13
$40 - 50$	9
Total	45

(a) If the children are arranged in the ascending order of their scores, then what will be the assumed score of the 14^d child?

(b) Compute the median score.

Solution:

Score	Number of children
Below 10	5
Below 20	13
Below 30	23
Below 40	36
Below 50	45

Median = Score of the 23^{rd} child $= x_{23}$

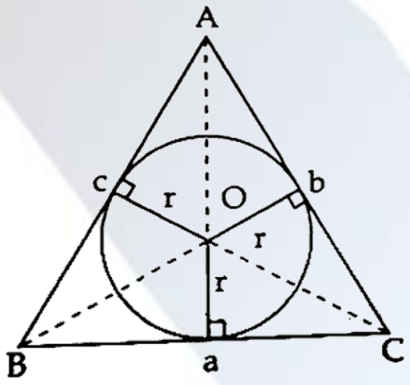
Median comes between 20 and 30 .

(a) $x_{14} = \frac{20+21}{2} = 20.5$

(b) Median $= x_{23} = 20.5 + 9 \times 1 = 29.5$

Q45. Read the following passage. Understand the mathematical concept in it and answer the questions that follow.

Circle passing through all the three vertices of a triangle is its circumcircle. Like this, the circle touching all the three sides of a triangle is its incircle. The point of intersection of the angle bisectors is the incentre.



Distance from the centre of the circle to the touching point is radius.

Area of triangle ABC is the sum of the area of the triangles OBC, OAC and OAB . If the radius of the incircle is taken as r and the sides of the triangle as a, b and c.

Then area of triangle ABC $= \frac{1}{2}ar + \frac{1}{2}br + \frac{1}{2}Cr$

$= \frac{1}{2}r(a + b + c)$

$= r\frac{(a+b+c)}{2}$

$= r \times s$

Here $s = a+b+c$ (half of perimeter)

(a) Circle touching all the three sides of a triangles is:
[circumcircle, incircle, semicircle, ellipse]

(b) Circle passing through all the three vertices of a triangle is:
[circumcircle, incircle, semicircle, ellipse]

(c) If the radius of the incircle is taken as r and the half of the perimeter as s then area of the triangle is :
$\left(r + s, \frac{r}{s}, r \times s, r^2 \times s\right)$

(d) The perimeter of a triangle is 20 centimetres and radius of its incircle is 2 centimetres. What is the area of the triangle? (in square centimetres)
(40, 20, 10, 5)

(e) Area of a triangle is 24 square centimetres and its perimeter is 24 centimetres. Radius of the incircle is ___ centimetres.
(1, 2, 1.5, 2.5)

Solution:

(a) Incircle

(b) Circumcircle

(c) $r \times s$

(d) 20
(e) Area of triangle $= r \times s$
Here, s = Half of perimeter = 12 centimetres
$24 = r \times 12$
r = 2 centimetres