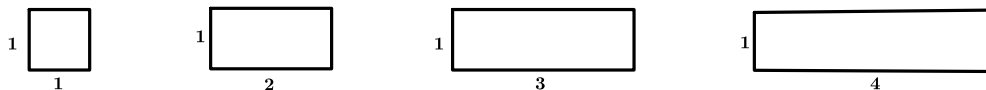*Concepts :- Number Patterns,Algebra of sequences*

1. Look at these pictures



   - Write as sequences, the perimeters, areas and the length of diagonals of these rectangles.
   - Continuing this pattern, find the perimeter, area and the length of diagonal of the $10^{th}$ rectangle.
   - Write the algebraic expressions of these three sequences.

2. Write as sequences, the perimeters and the areas of the equilateral triangles with sides $1cm, 2cm, 3cm, ....$

3. In the picture, the circles are divided as equal sectors.
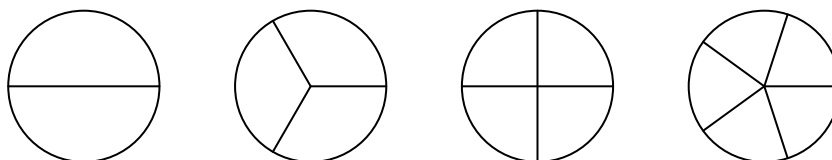


   Write down the measures of the central angle of the single sectors of each circle,as a sequence.
   Find the central angle of the single sector of the $8^{th}$ circle.
   If the radii are $1cm$, write down the sequence of areas of the single sectors.
   Write the algebraic expressions of these two sequences.

4. Write as sequence, the digits of the decimal form of the fraction $\frac{1}{7}$.

5. Write down the sequence of powers of 2. Write as sequence, the digits of unit place of each power.
   In this sequence of powers of 2, find the unit digit of $20^{th}$ term.

6. We can draw a chord by joining 2 points on a circle. If there are 3 points, then we can draw 3 chords.How many chords can be drawn by joining 4 points in pairs? What about 5 points?
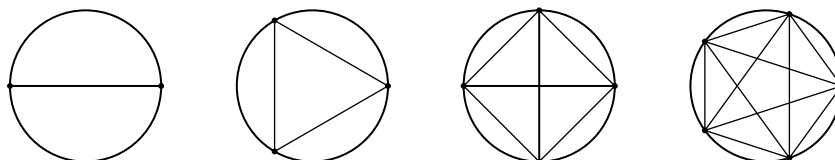


   Write as sequence, the number of chords obtainined by continuing this process.
   Write down the algebraic expression of the sequence.

7. For the sequence of polygons starting with a quadrilateral, write the total number of diagonals as a sequence. Also write the algebraic expression.

## *Concepts:-Arithmetic sequences, Position and term*

8. Check whether the sequences given below are arithmetic sequences; give reason. If they are in arithmetic sequences find the common difference.

   1) 1, 2, 3, 4, ........    5) 5, 12, 19, 26, ....    9) 11, 111, 1111, 11111, ....

   2) 1, 2, 4, 8, ........    6) 3, 5, 7, 11, ....    10) 31, 51, 81, 101, ....

   3) 15, 12, 9, 6, ......    7) 0, -2, -4, -6, ....    11) 1.5, 2.6, 3.7, 4.8, ....

   4) 11, 2, -7, -16, ....    8) $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}$, ....    12) $1, \frac{5}{4}, \frac{3}{2}, \frac{7}{4}$, ....

9. In each of the following, form an arithmetic sequence.

   1) First term 5, Common difference 3    6) Second term 15, Common difference 10
   2) First term 8, Common difference 11    7) First term 8, third term 20
   3) First term 4, Common difference -2    8) First term 1, fourth term 13
   4) First term -3, Second term 3    9) Second term -5, fourth term 11
   5) First term 2.35, Second term 3.55    10) First term $\frac{1}{3}$, Common difference $\frac{1}{2}$

10. Two terms of the arithmetic sequences are given. Find term difference and position difference. Calculate the common difference. Find the other terms of the sequences.

| $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $x_6$ | $x_7$ | $x_8$ | term difference $x_m - x_n$ | position difference $m - n$ | common difference $\frac{x_m - x_n}{m - n}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 |  |  |  |  |  | 25 |  |  |  |  |
|  | 4 |  |  |  | 28 |  |  |  |  |  |
|  |  | 10 |  |  |  |  | 30 |  |  |  |
| 5 |  |  | 29 |  |  |  |  |  |  |  |
| 0 |  |  |  |  |  |  | 35 |  |  |  |
| 4 |  | 10 |  |  |  |  |  |  |  |  |
| 12 |  |  |  | 96 |  |  |  |  |  |  |
|  | 15 | 22 |  |  |  |  |  |  |  |  |
| 100 |  |  |  |  |  | 52 |  |  |  |  |
| -3 |  |  |  |  |  |  | 25 |  |  |  |

11. Find the number of terms in each of the given sequence.

| sequence | term difference | common difference | number of terms |
|---|---|---|---|
| $1, 5, 9, .......85$ | | | |
| $7, 13, 19, .......241$ | | | |
| $2, 9, 16, .......100$ | | | |
| $105, 110, 115, .......295$ | | | |
| $91, 88, 85, .......1$ | | | |

12. The $3^{rd}$ term of an arithmetic sequence is 25 and $5^{th}$ term is 15. What is its first term? Find the common difference. What is its $6^{th}$ term?

13. The $2^{nd}$ term of an arithmetic sequence is 64 and $6^{th}$ term is 100. What is the common difference? What is its first term?

14. What is the $10^{th}$ term of the sequence $5, 12, 19, 26, ....$? What is the $20^{th}$ term ?

15. What is the $5^{th}$ term of the sequence $23, 18, 13, ....$ ?What is the $6^{th}$ term ?

16. What is the common difference of the sequence $4, 7, 10, ....$? Which term be get by adding 30 to the $3^{rd}$ term? Is 50 a term of this sequence?

17. What is the common difference of the sequence $7, 12, 17, .........82$ ?
Is the difference between 82 and 7 a multiple of Common difference? How many terms are there in this sequence ?

18. How many terms are there in the sequence $85, 78, 71, .........1$ ?

19. In an arithmetic sequence,the first term is 4 and the common difference is 5.
At which position does the number 94 occur in this sequence?

20. In an arithmetic sequence,the first term is 3 and the common difference is 7.
Is 100 a term of this sequence? What about 101?

21. Write the smallest twodigit number which is a multiple of 3? Howmany such numbers are there?

22. Write the smallest three digit number which leave a remainder 1 on division by 5. Howmany such numbers are there between 100 and 200 ?

23. Consider the arithmetic sequence $\frac{1}{2}, 1\frac{1}{4}, 2, 2\frac{3}{4}, ........$
Is 5 a term of this sequence? What about 10?

24. Is 0 a term of the arithmetic sequence $-87, -84, -81, .......$?
Which is the first positive number in this sequence?

25. In the arithmetic sequence $215, 240, 265, .......$ is the difference between any two terms equal to 100?

## *Concept :-Algebra of arithmetic sequence*

26. The first term of an arithmetic sequence is 15 and the sum of the first three terms is 60. Find the first three terms.

27. Write down the arithmetic sequence with first term 40 and the sum of the first 5 terms is 500.

28. The second term of an arithmetic sequence is 8. Find the sum of first three terms. Write three such sequences.

29. The sum of second and third term of an arithmetic sequence is 15. Find the sum of first four terms. Write three such sequences.

30. Write four arithmetic sequences with 100 as the sum of the first six terms.

31. The sum of first four terms of an arithmetic sequence is 50. $5^{th}$ term is 15. Write first 5 terms.

32. Write down the first 6 terms of an arithmetic sequence with $6^{th}$ term is 25 and the sum of the first 5 terms is 80.

33. If we take $n = 1, 2, 3, ...$, write down the values of $3n + 2$. Is this an arithmetic sequence ?
    What is the relation between the common difference and the coefficient of $n$; Similarly the sum of coefficients and first term ?
    The algebraic form of an arithmetic sequence is $x_n = 2n + 3$. Write the sequence.

34. The algebraic forms of some arithmetic sequences are given. Write the sequences; find their first term and common difference.

| algebraic form $x_n$ | sequence | first term | common difference |
|---|---|---|---|
| $x_n = 5n + 3$ | | | |
| $x_n = 5n - 3$ | | | |
| $x_n = 3n + 5$ | | | |
| $x_n = 2n + 5$ | | | |
| $x_n = 5 - 3n$ | | | |
| $x_n = 5 - 2n$ | | | |
| $x_n = 3 - 5n$ | | | |

35. Write down the algebraic form of the following arithmetic sequences.
    1)$5, 8, 11, ......$
    2)$3, 10, 17, ......$
    3)$11, 21, 31, ......$
    4)$1, 1\frac{1}{2}, 2, .......$
    5)$8, 13, 18, ......$
    6)$1, 11, 21, ......$
    7)$10, 7, 4, ......$
    8)$1\frac{1}{4}, 1\frac{1}{2}, 1\frac{3}{4}, .......$
    9)$7, 11, 15, ......$
    10)$65, 60, 55, ......$
    11)$-2, 0, 2, ......$
    12)$\frac{1}{2}, 1\frac{1}{4}, 2, .......$

36. The algebraic form of an arithmetic sequence is $x_n = 4n + 3$. What is the $1^{st}$ term? What is the $2^{nd}$ term? Write down the first 5 terms.

37. The algebraic form of an arithmetic sequence is $x_n = 7n + 2$. What is the common difference? Find the $25^{th}$ term. Is 100 a term of this sequence?

38. The algebraic form of an arithmetic sequence is $x_n = 4n + 3$. What is the $1^{st}$ term? What is the $2^{nd}$ term? Write down the first 5 terms.

39. The algebraic form of an arithmetic sequence is $x_n = 7n + 2$. What is the common difference? Find the $25^{th}$ term. Is 100 a term of this sequence?

40. The algebraic form of an arithmetic sequence is $x_n = 5n - 2$. At which position does the number 68 occur in this sequence?

41. The $3^{rd}$ term of an arithmetic sequence is 10 and $5^{th}$ term is 16. What is its $4^{th}$ term? Write down the algebraic expression of the sequence.

42. The $2^{nd}$ term of an arithmetic sequence is 25 and $8^{th}$ term is 55. What is its $n^{th}$ term?

## *Concept :-Sum of arithmetic sequence*

43. How much more is the sum of the natural numbers from 11 to 20 than the sum of the natural numbers from 1 to 10?

44. Find the sum of first 50 natural numbers. Find the sum of first 50 even numbers also. Compare them.

45. How much more is the sum of first 50 even numbers than the sum of first 50 odd numbers ?

46. Calculate the difference between the sum of the first 10 terms of the arithmetic sequence $4, 7, 10, ......$ and the first 10 multiples of 3. What is the difference of first 100 terms?

47. Find the sum of the first 10 terms of each of the following sequences.
    1) 5, 8, 11, ......
    2) 11, 21, 31, ......
    3) $1, 1\frac{1}{2}, 2, .......$
    4) 8, 13, 18, ......
    5) 10, 7, 4, ......
    6) $1\frac{1}{4}, 1\frac{1}{2}, 1\frac{3}{4}, .......$
    7) 7, 11, 15, ......
    8) -2, 0, 2, ......
    9) $\frac{1}{2}, 1\frac{1}{4}, 2, .......$

48. Howmany two digit numbers are there,which are multiples of 5 ? Find their sum.

49. Find the sum of all numbers between 100 and 200 which are divisible by 3.

50. What is the sum of first 50 natural numbers which leave a remainder 1 on division by 7.

51. The $1^{st}$ term of an arithmetic sequence is 5 and the common difference is 2. Find the sum of its first 20 terms.

52. The algebraic form of an arithmetic sequence is $x_n = 2n + 3$. Find the sum of its first 100 terms.

53. How many terms are there in the sequence $5, 11, 17, ......95$ ? Also find their sum.

54. The $8^{th}$ term of an arithmetic sequence is 20 . Find the sum of its first 15 terms.

55. The sum of first 25 terms of an arithmetic sequence is 1000.The $8^{th}$ term is 25.
    What is the $13^{th}$ term of the sequence? What is the common difference?
    Find the sum of its first 15 terms.

56. The sum of first $n$ terms of an arithmetic sequence is $5n^2 + 2n$.
    What is the first term?
    What is the sum of first 2 terms? Find the second term
    What is the sum of first 3 terms? Find the third term
    Write the first 5 terms of the sequence.

*Concepts :- Right angle and circles*

1. In the following figures when we draw a circle with diameter $AB$, check whether the vertex $C$ is inside or outside or on the circle.
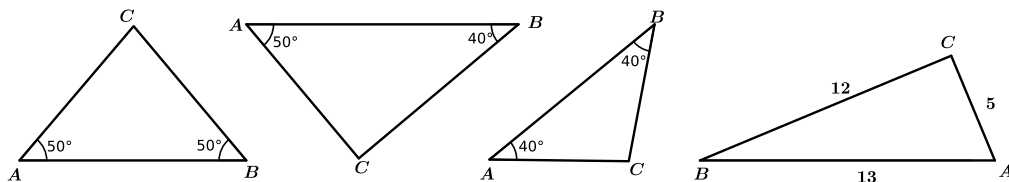


2. In the quadrilateral, if we draw the circle with $AC$ as diameter, check whether the vertices $B$ and $D$ are inside or outside the circle.

   When we draw a circle with diameter $BD$, what about the positions of $A$ and $C$ ?
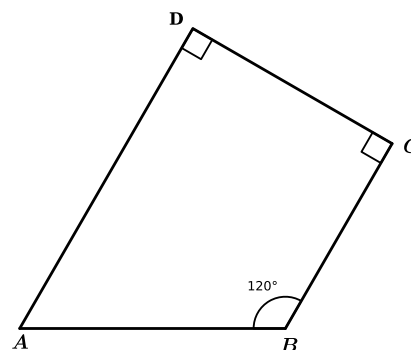


3. In quadrilateral $ABCD$, $\angle A = 100°, \angle B = 90°, \angle C = 80°$.

   • When we draw a circle with diameter $AC$, check whether the vertices $B$ and $D$ are inside or outside the circle

   • When we draw a circle with diameter $BD$, what about the positions of $A$ and $C$ ?

4. In the figure, check whether the semicircle passes through the corner $A$ with $BC$ as diameter.
   If circles are drawn with each sides $AB$ and $AC$ as diameters, where would be they cross the side $BC$?
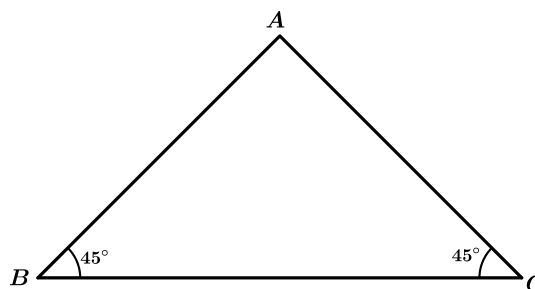


5. If a circle is drawn with $AB$ as diameter, which of the points $C, D, E$ would be on it? Explain.
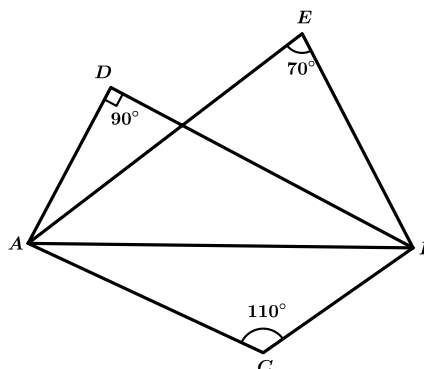
*Concepts :- Chord, angle and arc*

6. Find $\angle P$ in each figures.
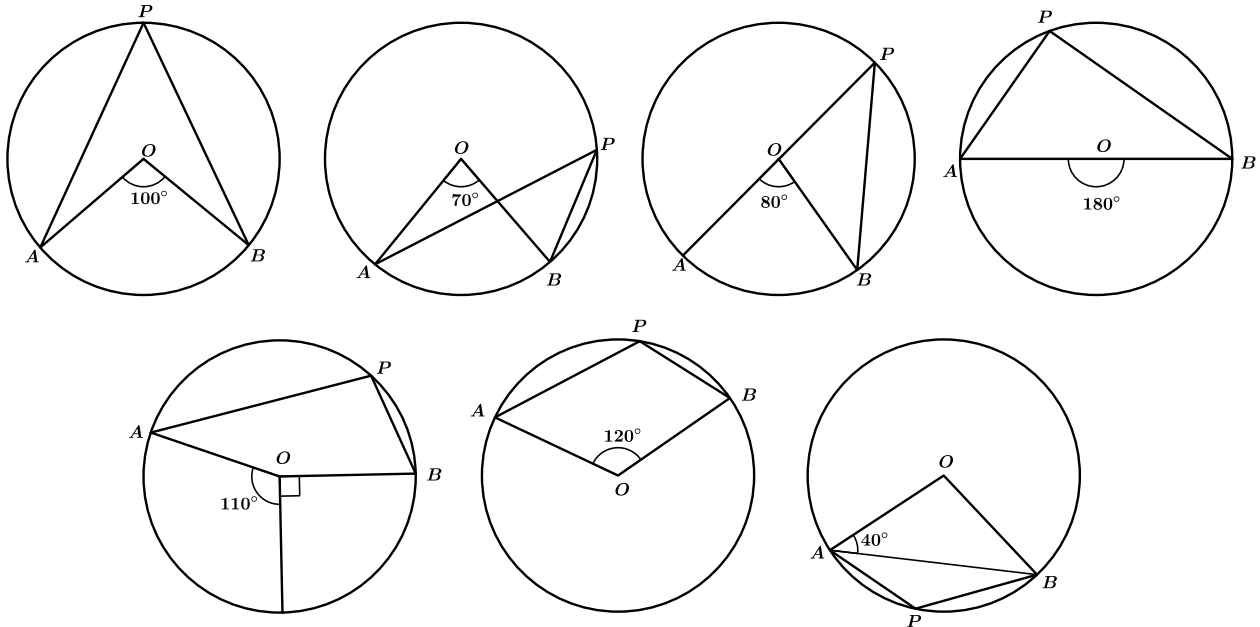


7. In each figures, compute the angles of $\triangle ABC, \triangle OAB$.
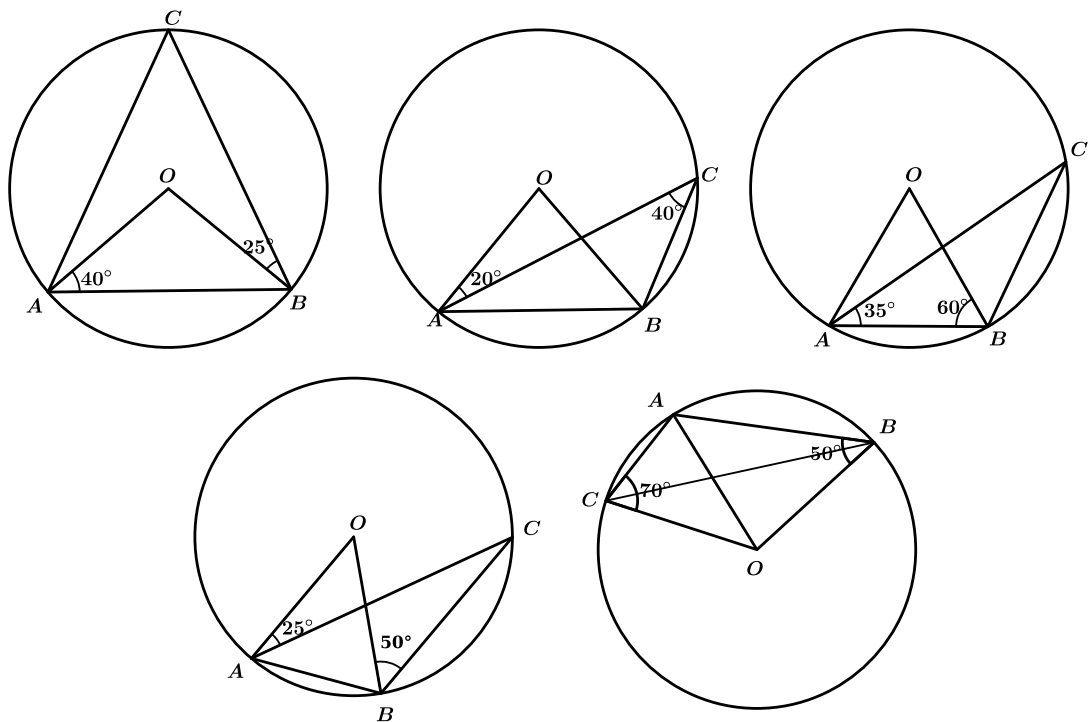
8. A chord of a circle divides it into two parts. Then,

   - If all angles on one part, three times the angles on the other, calculate the angles.

   - If all angles on one part, four times the angles on the other, calculate the angles.

   - If all angles on one part, 50° more than the angles on the other, calculate the angles.

9. In the figure, $O$ is the centre. If $\angle OBC = 40°$
   find $\angle BOC$ and $\angle A$
   If $\angle OBC = 35°$ find $\angle A$
   If $\angle OBC = x°$ find $\angle A$
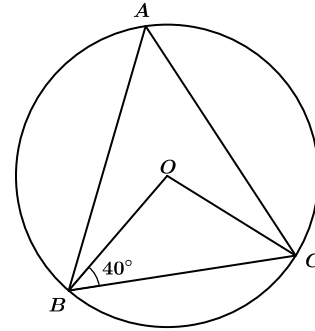


10. How do we draw angles $27\frac{1}{2}°$ and $62\frac{1}{2}°$ without drawing angle bisector ?

11. The circumradius of a triangle is $3cm$ and two angles are $50°, 60°$ each. Constuct the triangle.

12. The circumradius of a triangle is 3.5 and two angles are $35°, 65°$ each. Constuct the triangle.

13. The circumradius of a triangle is $2.5cm$ and two angles are $37\frac{1}{2}°, 60°$ each. Constuct the triangle.

14. The circumradius of a triangle is $3cm$ and two angles are $25\frac{1}{2}°, 56\frac{1}{2}°$ each. Constuct the triangle.

15. In the given figure, arclength of $APC$ and $BQC$ are equal. If length of arc $ARB$ is half of arc $APC$,

   - What fraction of the circumference of the circle is the length of the arc $ARB$ ?

   - How much is the central angle of arc$ARB$ ?

   - Find the central angle of arc $BQC$.

   - Compute the angles of $\triangle ABC$.

   - If $P$ and $Q$ are the midpoints of arc$APC$ and arc$BQC$, what are the angles of polygon $ABQCP$?
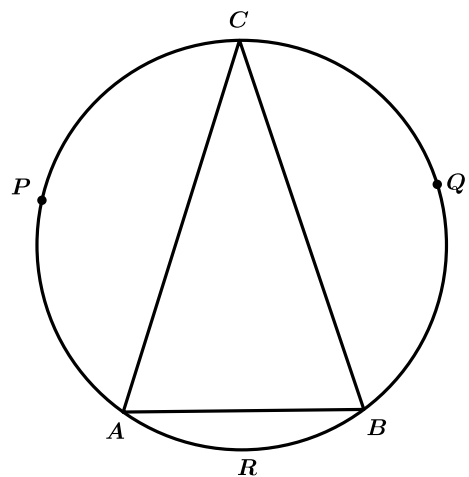
*Concepts :- circle and quadrilateral*

16. In quadrilateral $ABCD$, $\angle A = x°, \angle B = 2x°, \angle C = 4x°, \angle D = 3x°$.

    • Find the value of $x$

    • Prove that quadrilateral $ABCD$ is cyclic.
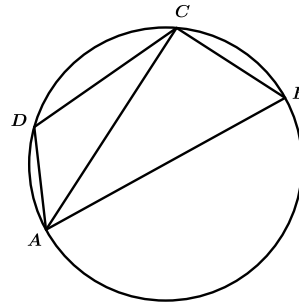
17. In the figure $AB$ is diameter and $\angle ABC = 60°$.
    Find $\angle ADC, \angle ACB$ and $\angle BAC$



18. In the quadrilateral $ABCD$, $\angle A = 75°, \angle B = 110°, \angle C = 85°$.

    • Where would be the vertex $D$ with respect to the circle through the vertices $A, B$ and $C$?
      Justify

    • Where would be the vertex $C$ with respect to the circle through the vertices $A, B$ and $D$?
      Justify

    • Where would be the vertex $B$ with respect to the circle through the vertices $A, C$ and $D$?
      Justify

19. Find the measurements of given angles in each figures.
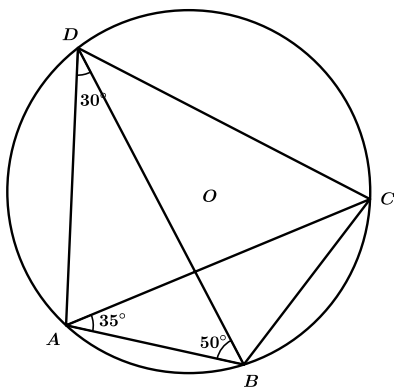


$\angle ACB =$
$\angle ACD =$
$\angle BDC =$
$\angle ADC =$
$\angle ABC =$
$\angle DAC =$
$\angle ABC =$
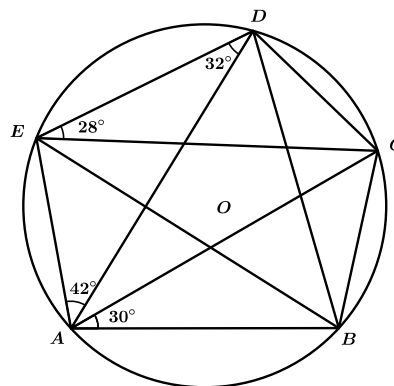
$\angle ACE =$
$\angle CAD =$
$\angle ACB =$
$\angle DCE =$
$\angle BDC =$
$\angle DBC =$
$\angle ADC =$
$\angle ABD =$

20. Find out the cyclic quadrilaterals among the following classes of quadrilaterals.

    * Rectangles        * Squares        * Parallelograms        * Rhombuses

    * Trapeziums        * Isosceles trapeziums

## *Concepts :- Two chords*

21. Find the value of $x$ in each figures.
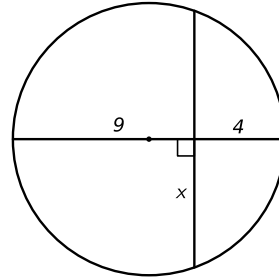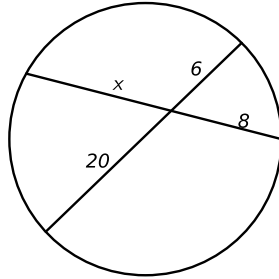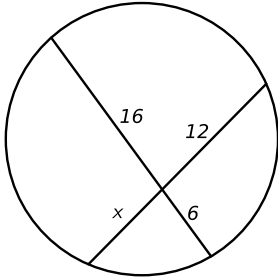


22. In the figure, the chords $AB$ and $CD$ intersect at $P$.
$APQR$ and $CPMN$ are the rectangles formed by the parts of the chords $AB$ and $CD$.

    Compare the areas of the two rectangles

    What is the length of the other side of the rectangle $APQR$?
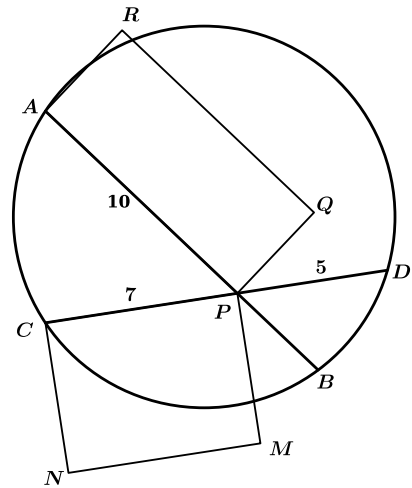


23. Draw a rectangle of width 6*centimetres* and height 4*centimetres*. Draw a rectangle of the same area with width 7*centimetres*.

24. Draw a rectangle of width 7*centimetres* and height 3*centimetres*. Draw a rectangle of the same area with width 5*centimetres*.

25. Find the length of the perpendicular to the diameter in each semicircles given.
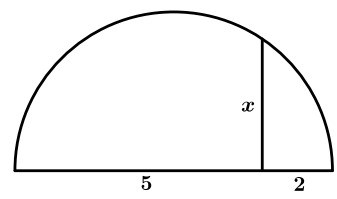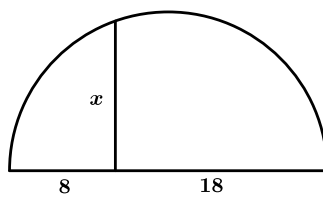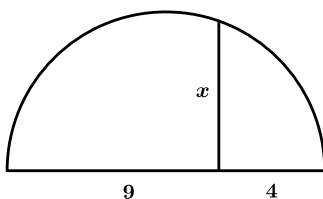


26. Draw a rectangle of sides 6 centimetres and 4 centimetres and draw a square of the same area.

27. Draw a square of area 10 square centimetres in two different ways.

28. Draw a triangle of sides 5, 6, 7 centimetres and draw a square of the same area.

29. Draw a right triangle of perpendicular sides 8, 6 centimetres and draw a square of the same area.

30. Draw an equilateral triangle with side $\sqrt{10}$ *centimetres*.

31. Draw a right triangle of hypotenuse 10 centimetres with maximum area. Find the area of this triangle. In this figure draw another right triangle of hypotenuse 10 centimetres with area 20 square centimetres.

32. Find the value of $x$ in each figures.
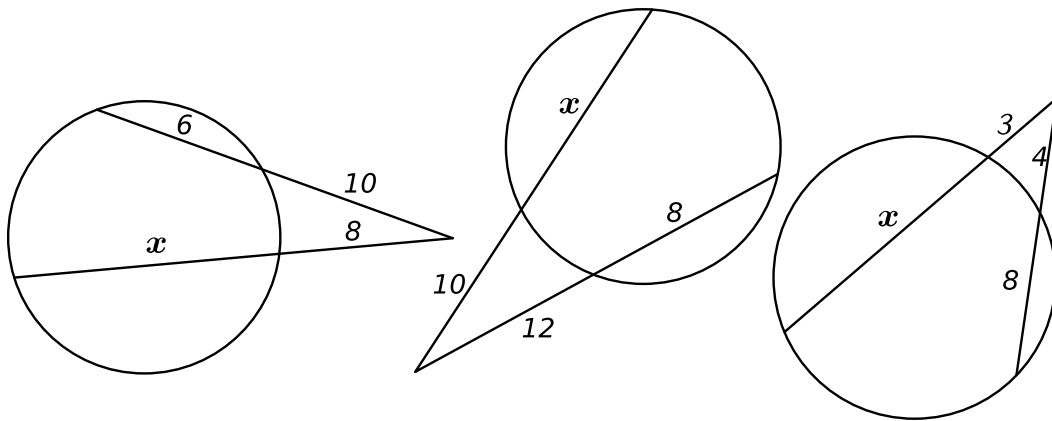


33. In the figure, $AD = 10cm, BD = 6cm, CD = 2cm$.
    Find $CP, CQ, PQ$.
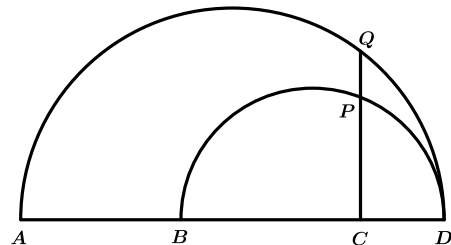


34. In the figure, what is the relation between the central angle of small arc $CD$ and $\angle A$.
    Calculate $\angle A + \angle B + \angle C + \angle D + \angle E$



6
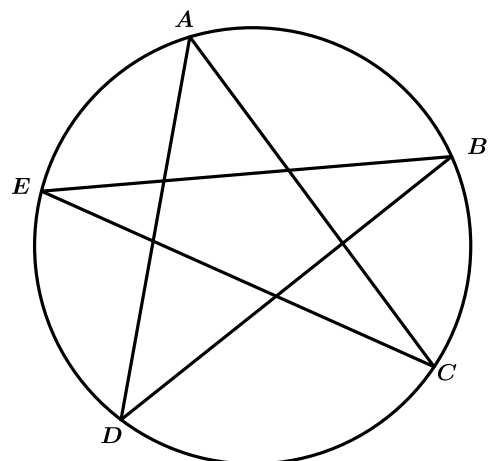
## *Concepts :- Possibilities as numbers*

1. A box contains 5 black beads and 7 white beads.If one bead is taken,

   - What is the probability of getting a black bead? What is the probability of drawing a white bead?
   - In another box there are 4 black beads and 6 white beads.If one bead is taken,
   - What is the probability of getting a black bead? What is the probability of getting a white bead?
   - From which box is it more probable to draw a black bead?
   - From which box is it more probable to draw a white bead?

2. A box contains paper slips with numbers 1 to 25 written on them. If one slip is drawn from the box,

   - which number is more probable to be drawn? even? or odd?
   - What is the probability that the number is a prime?
   - What is the probability that the number being a multiple of 3? What about being not a multiple of 3

3. Howmany two digt numbers are there ?

   - Howmany pairs are possible with both the digits are same ?
   - If one says a two digit number, what is the probability of two digits being the same?
   - Out of these, howmany of them are odd ? Howmany of them are even ?
   - What is the probability of an odd number ?
   - What is the probability of an even number ?

   ## *Concepts :- Geometrical probability*

4. In the picture, the diameter of the smaller circle is half of the larger circle. Calculate the probability of a dot put without looking to be within the smaller circle.
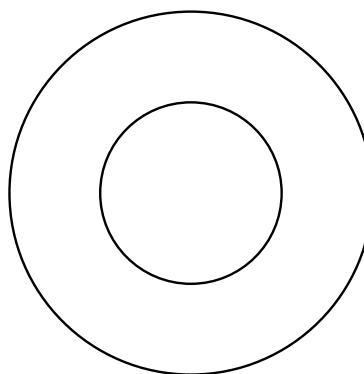


5. $ABCD$ is a square. Calculate the probability of a dot put without looking, to be within the $\triangle APB$. What is the probability that it would be within the $\triangle APQ$? What is the probability that it would be within the $\triangle BPC$?
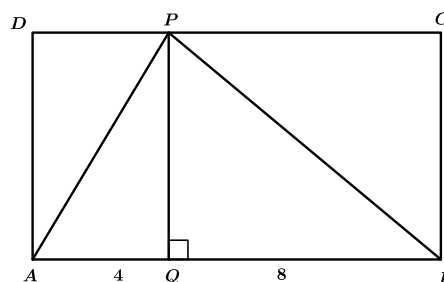
## *Concepts :- Pairs, more pairs*

6. In a box there are 6 blue balls and 4 yellow balls and in another box, there are 2 blue balls and 8 yellow balls. If one ball is taken from each box,

   - In how many different ways can we take two balls, one from each box ?
   - How many pairs are possible with both blue ?
   - what is the probability of both being blue ?
   - How many pairs are possible with both yellow ?
   - what is the probability of both being yellow ?
   - How many pairs are possible with one blue and the other yellow ? What is the probability of that case ?
   - What is the relation between at least one of them being blue and both being yellow ?
   - Then, what is the probability of at least one of them being blue? what is the probability of at least one of them being yellow?

7. When two dice(numbered 1 to 6) are rolled together,

   - How many number pairs are possible ?
   - what is the probability of both being odd ? what is the probability of at least one of them being even ?
   - what is the probability of both being primes ? what is the probability of at least one of them being not prime ?

8. Two boxes contain paper slips with numbers written on them. One box with numbers 1 to 10 and the other with numbers 11 to 25. If one slip is drawn from each box,

   - what is the probability of both being odd? what is the probability of both being even?
   - What is the probability of one being an odd and the other an even?

9. Prime numbers less than 10 are written in paper slips and put in a box. All natural numbers upto 5 are written in another set of paper slips and put in a second box

   - How many slips are there in the first box?
   - How many slips in the second box have prime numbers on them?
   - If one slip is drawn from each box, what is the probability of both being primes?
   - What is the probability of both being odd? What is the probability of both being even?

10. There are 12 beads in a box, some white and some black. The probability of drawing a white bead from it is $\frac{1}{3}$

    - How many white beads are there in the box? How many black?
    - If we take away 2 black beads from the box, what is the probability of drawing a white bead?
    - Is the the probability of drawing a black bead increases?

## *Concepts :- square problems*

1. Area of a square ground is 225 square metres.What is the length of a side?

2. When each side of a square was increased by 7 centimetres,its area became 144 square centimetres.What was the length of a side of the original square?

3. When each side of a square was reduced by 1 metres, the area became 100 square metres. What was the length of a side of the original square?

4. There is a path 5 metres wide runs around a square ground.The area of the ground without the path is 400 square metres. What is the total area of the ground and the path?

5. A square ground has 3 metre wide path all around it. The total area of the ground and the path is 400 square metres. What is the area of the ground alone?

6. After three years, the square of the age of Ramu will be 324. What is his present age?

7. The square of a term in the arithmetic sequence $8, 12, 16, ...$ is 1600. What is its position?

## *Concepts :-Square completion*

8. 1 added to the product of two consecutive odd numbers gives 100. What are the numbers?

9. 25 added to the product of two consecutive multiples of 10 gives 1225. What are the numbers?

10. The length of a rectangle ground is 2 metre more than its breadth; and its area is 360 square metres. What are the length and breadth ?

11. The difference between the square of a number and $4 times$ the number is 45.What are the numbers?

12. The hypotenuse of a right angled triangle is one more than twice the length of the shortest side. The third side is one less than twice the length of the shortest side. Compute the length ofs of all three sides.

13. In a right angled triangle,one of the perpendicular sides is $4cm$ longer than the other and its area is 96 square centimetres. what are the lengths of its sides?

14. The perimeter of a rectangle is 40 metres. What is the sum of its length and breadth? If the area of the rectangle is 84 square metres, what are the lengths of its sides?

15. A $60cm$ long wire is to be bent into a right angled triangle.If the hypotenuse is $26cm$ what are the other sides ?

16. How many tems of the arithmetic sequence $3, 5, 7, ...$ must be added to get 255?

17. If the price of a pen is reduced by $Rs.2$ a person can buy 3 more pens for $Rs.120$. Find the original price of the pen.

18. The average speed of an Express train is 20 klometres more than of a Passenger train per hour.For covering a distance of 240 kilometres, the Passenger train would take $2 hours$ more than of the Express train. What are the average speed of the trains per hour ?

## *Concepts :- Two answers*

19. There is a path of equal width runs around a rectangular ground.The sides of the ground with the path, are 24 metres, 20 metres. If the area of the ground without the path is 320 square metres, What is the width of the path?

20. The difference between $6 times$ a number and the square of the number is 8. What is the number?

21. A box is to be made by cutting off small squares from the corner of a thick paper with sides $60cm, 40cm$. If the base area of the box is 800 square centimetres, find length,breadth and height of the box?

22. The sum of square of a number and twice the number is 15. What is the number?

23. The product of a number and 4 more than the number is 165. What are the numbers?

24. How many tems of the arithmetic sequence $19, 17, 15, ...$ must be added to get 75?

25. The product of two consecutive numbers is 156. What are the numbers?

## *Concepts :- Equations and polynomials*

26. What number should be taken as $x$ to get $p(x) = 0$ from $p(x) = x^2 - 5x + 6$ ?

27. What number should be taken as $x$ to get $q(x) = 0$ from $q(x) = 2x^2 + 9x - 5$ ?

28. The sum of square of a number and $3 times$ the number is 10. What is the number?

29. The perimeter of a rectangle is $34cm$ and its diagonal is $13cm$. what are the lengths of its sides?

30. The sum of first $n$ natuaral numbers is 120. Find $n$?

31. How many tems of the arithmetic sequence $1, 5, 9, ....$ must be added to get 190 ?

32. The sum of $4 times$ of a number and the reciprocal of the number is 5. What is the number?

33. To complete a job Rasheed takes 5 more hours than Gopal.When both of them did the job together, it was completed in 6 hours.

    - If Gopal takes $x$ hours for completing the job alone, what about the time for Rasheed ?
    - How much work would be done by Gopal in 1 hour ? What about Rasheed ?
    - How much work would be done by them together in 1 hour ?
    - How many hours would each of them needed to do the job alone ?

34. The length of a rectangle ground is 4 metres more than $3 times$ of its breadth; and the distance between two opposite vertices is 25 metres. Find the perimeter of the ground. Find the cost of fencing four sides at $Rs.400$ per metre.

## Concepts :- Angles and sides

1. What is the ratio of the sides of a $30°$, $60°$, $90°$ triangle ? If the length of the side opposite to $30°$ angle is 10 centimetres, how much are the other sides ?

2. What is the ratio of the sides of a $45°$, $45°$, $90°$ triangle ? If the length of the side opposite to $45°$ angle is 6 centimetres, find the lengths of the other sides.

3. If the height of an equilateral triangle is 12 centimetres, how much is its side ?

4. The diagonal of a square is 10 centimetres. What is the length of a side ? Find the area of the square.

5. The angle between the ground and the stay wire from the top of an electric post is $30°$. If the distance between the foot of the post and the bottom of the wire is 6 metres, draw a rough figure. Find the height of the post and the length of the stay wire.

6. In the following triangles,find the other two sides.
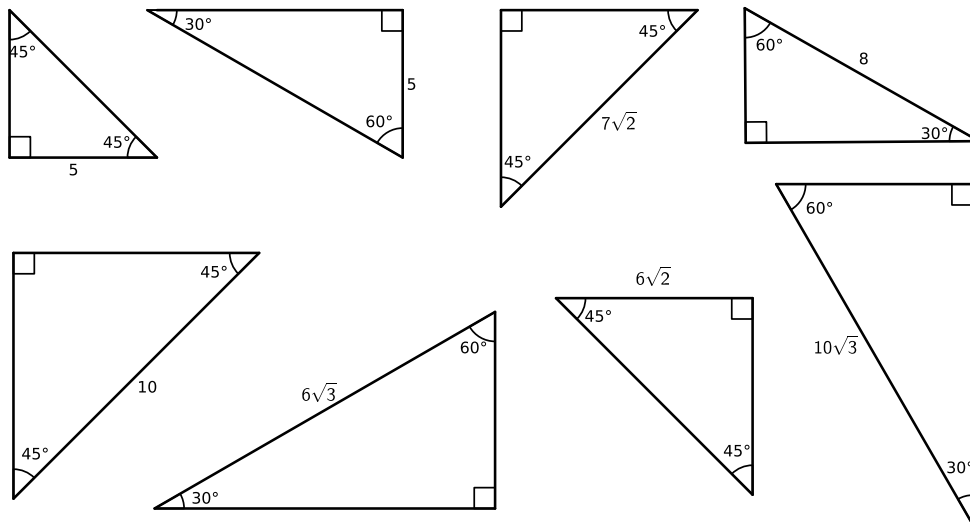


7. Find the perimeter of the following figures.
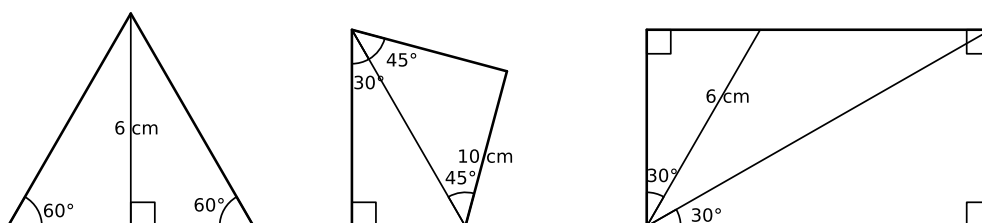


8. In a parallelogram the two sides are 8 centimetres, 5 centimetres each and one of the included angle is $60°$. Calculate the area of the parallelogram.

9. Find the area of the following figures.
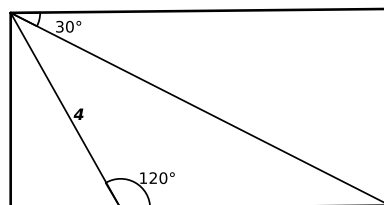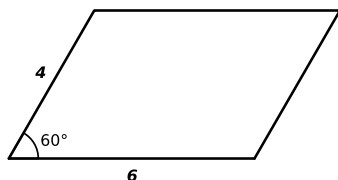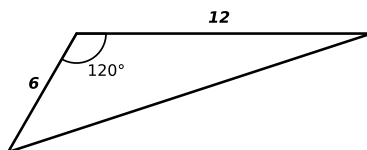


10. The sides of a rhombus are 4 centimetres each. One of the angle between two adjacent sides is $135°$. Calculate the area.

11. In the figure, $AB = AC = 4cm$. How much is the height from $A$ to $BC$. Find the length of $BC$.
    What is the ratio of the sides of a triangle with angle measures $30°$, $30°$, $120°$?
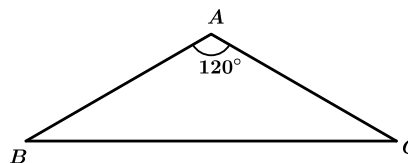


12. In the figure, $DC = 1cm$ How much is $BD$?
    What is the ratio of the sides of a triangle with angle measures $45°$, $60°$, $75°$?
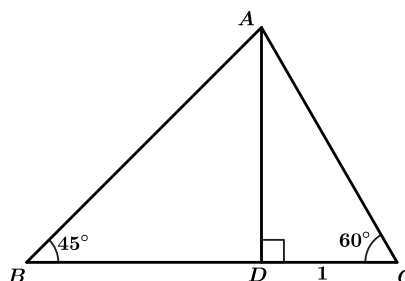


13. In the figure, how much is $\angle BAD$? Calculate the lengths $AD, DC$ and $AC$.
    What is the ratio of the sides of a triangle with angle measures $15°$, $45°$, $120°$?



2
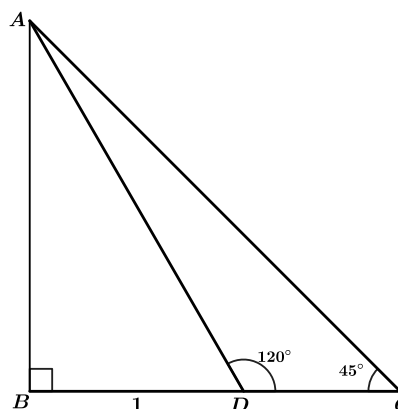
14. In the figure, $BD = 10cm$. Calculate $\angle BAD$ and $\angle BAC$
    Calculate the sides of $\triangle ADC$.
    Find the area of $\triangle ADC$.
    What is the ratio of the sides of a triangle with angle measures $15°$, $30°$, $135°$?
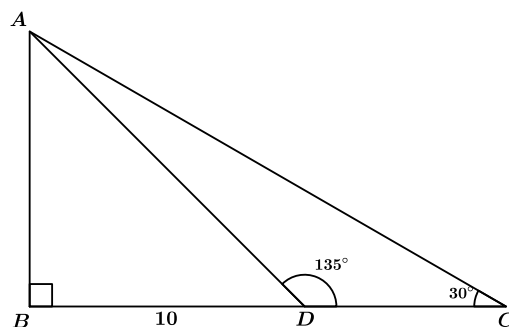


## *Concepts :- New measure of angles*

15. In the following triangles,find the other two sides.
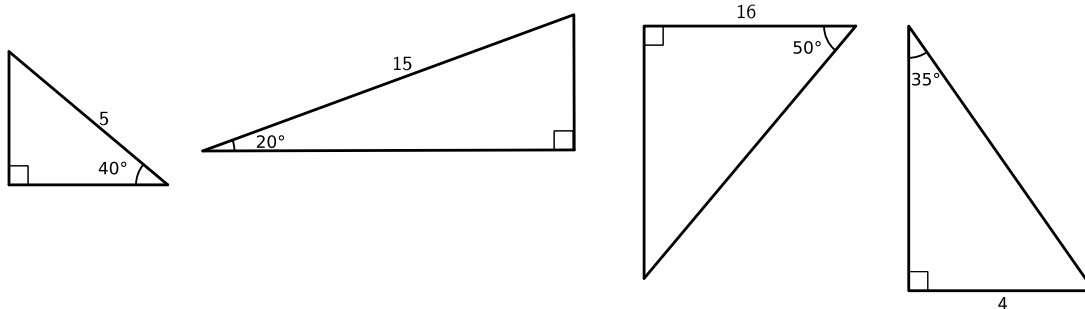


16. In a right angled triangle, the longest side is of 18 cm. The angle between this side with another side is $24°$. Find the area of the triangle.

17. In $\triangle ABC$, $\angle B = 65°$ , $AB = 10cm$, $BC = 12cm$. Find the altitude from $A$ to $BC$.
    Find the area of the triangle.

18. Find the area of the following triangles.
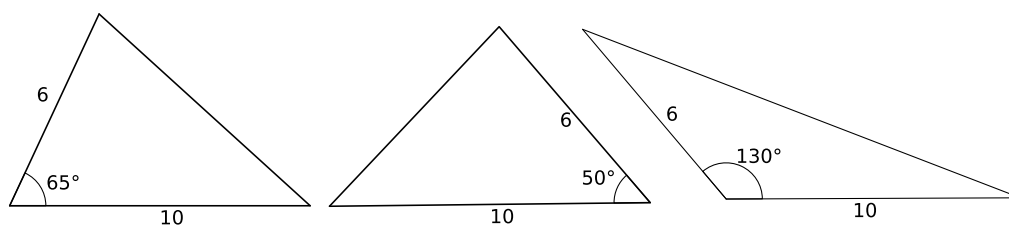


19. The sides of a rhombus are 5 cm each. One of the angle between two adjacent sides is $70°$. Calculate the area.

20. Equal sides of an isoceless triangle are 10 cm each. If angle opposite to one of them is $40°$, find the area of the triangle.

3

21. The sides of a parallelogram are $10cm, 15cm$ each. If angle between them is $80\,^\circ$, find the area of the parallelogram.

22. calculate the length of the third side of the following triangles.
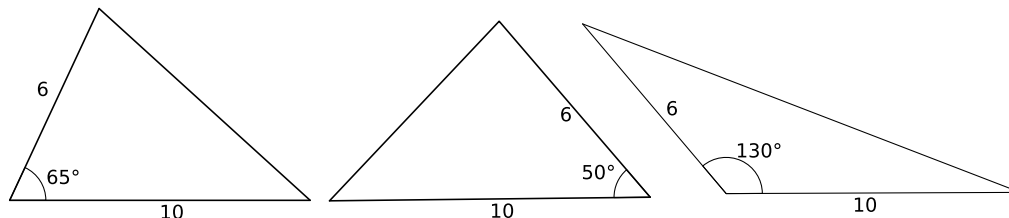


23. The sides of a parallelogram are $6cm, 10cm$ each. If angle between them is $55\,^\circ$, find the lengths of diagonals.

## *Concepts :- Triangle and circle*

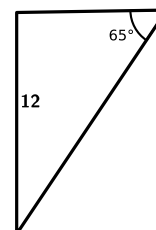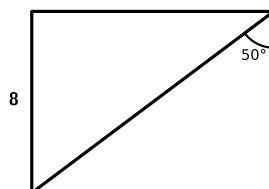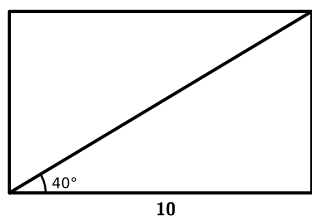24. Calculate the length of the chord in each of the following circles.
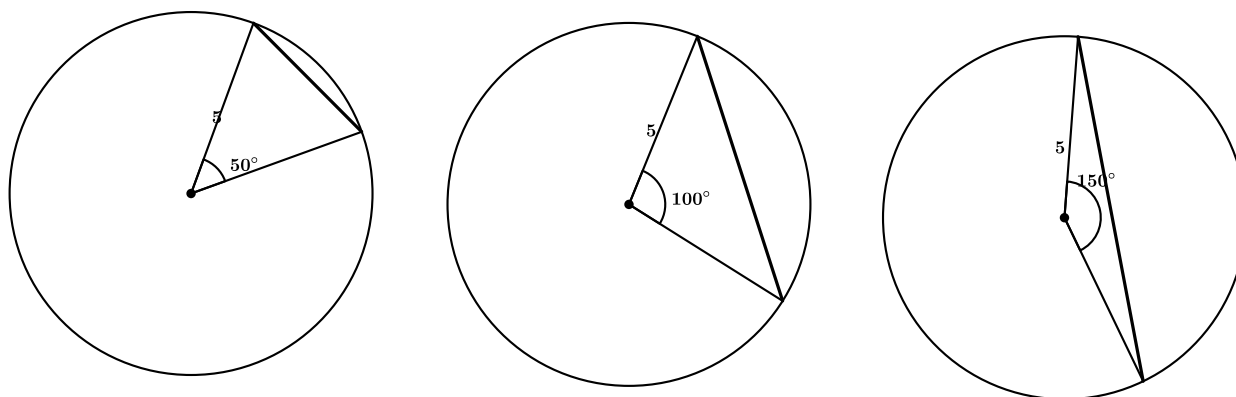


25. Find the diameters of each of the following circles. Find the other two sides of the triangles.



4
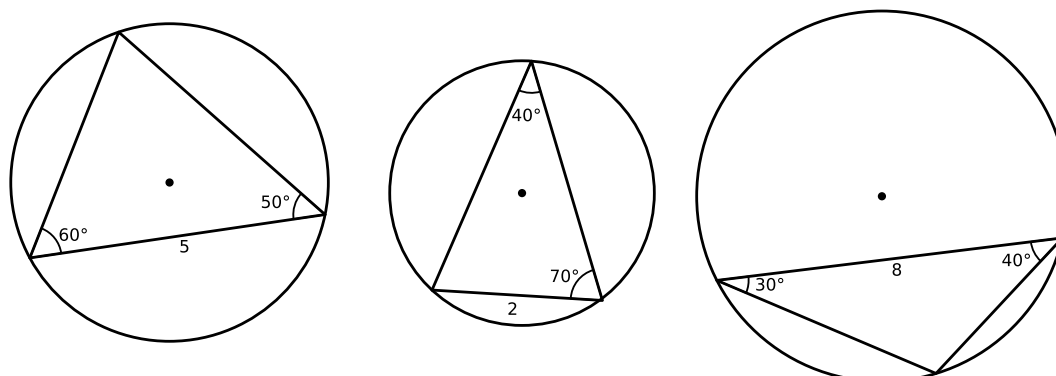
## *Concepts :- Another measure, Distances and heights*

26. Find the area of the following rectangles.



27. A ladder leans against a wall makes a 75° angle with the ground. If the foot of the ladder is 3*metres* away from the foot of the wall, how high is the top of the ladder from the ground?

28. In the figure, $ABCD$ is a rhombus. $\angle D = 70°$. If the length of diagonal $AC$ is 6 centimetres, find the length of the other diagonal $DB$. Calculate the area of the rhombus.
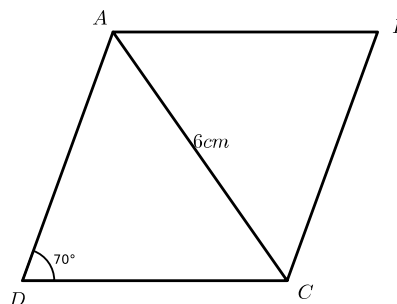


29. In the figure, $\angle B = 65°, \angle C = 35°, BC = 8cm$. Find the area of the triangle.
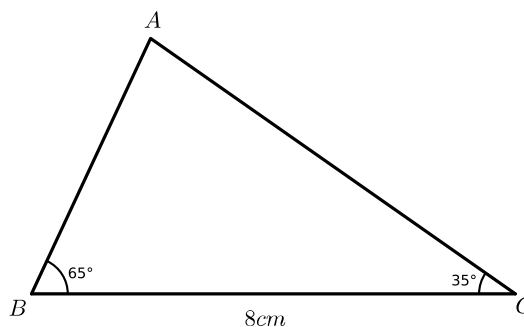


30. In the figure $O$ is the centre of the cicumcircle of the regular pentagon. Find $\angle AOB$ and $\angle AOM$. If the length of one side of the pentagon is 6 centimetres, how much is $OM$ ? Calculate the area of $\triangle AOB$ and pentagon.
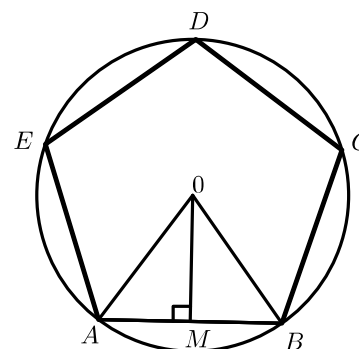
31. A man with height 1.6*metres*, standing on the ground sees the top of a tree 30 metres away, at an angle of elevation of 40°. Draw a rough sketch and compute the height of the tree.

32. A man on top of a building sees a car on the ground, at an angle of depression 20°.If the height of the building is 25 metres, calculate the distance between the building and the car.

33. When the sun is at an angle of elevation 55° , the length of the shadow of a tree is 15 metres. Calculate the height of the tree.

34. A man looks down from the top of a lighthouse 20 metres high and sees a ship at an angle of depression 10°. How far is the ship from the foot of the lighthouse?

35. A man 1.7*metres* tall stands 40*metres* away from the foot of a mobile tower; and sees the top of the tower at an angle of elevation 38°. How tall is the tower?

36. A boy 1.5*metres* tall stands on top of a building with 10*metres* height, sees the bulb at the top of a mobile tower at an angle of elevation 50°. If the building and the tower stand 40*metres* apart, calculate the height of the tower.

37. A boy standing on the ground sees the top of a tree at an angle of elevation of 45°. From the top of the house the boy sees the top of a tree at an angle of elevation of 30°. If the height of the house is 8 metres, calculate the height of the tree.

38. A man looking down from the top of a telephone tower, sees the top of a building at an angle of depression 35° and foot of the building at an angle of depression 55°. If the tower is 100 metres away from the building, what is the height of the tower? What is the height of the building?

39. In the figure a boy standing at $A$, on the ground sees the top of a tree $CD$ at an angle of elevation of 40°. After walking 50 metres towards the tree, from $B$, he sees it at an angle of elevation of 70°.
Find the height of the tree.
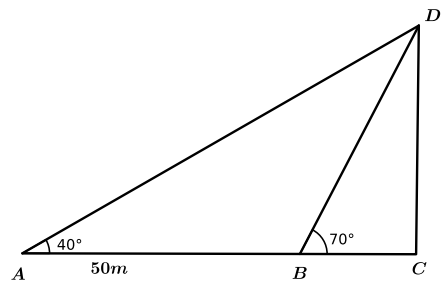


40. A man 1.75*metres* tall standing on the ground sees the top of a building at an angle of elevation of 50°. After walking 100 metres towards the building, he sees it at an angle of elevation of 75°. What is the height of the building?

41. Two buildings of different heights stand 16 metres apart. From the foot of the taller building the top of the shorter one is seen at an angle of elevation of 45° and from the foot of the shorter building, the top of the taller building is seen at an angle of elevation of 70°
Draw a rough sketch. What are the heights of the buildings?

42. A boy 1.6 metres tall, standing on the top of a building, sees the top of a tower at an angle of elevation of 50° and foot of the tower at an angle of depression of 20°. If the height of the building is 9.2 metres, What is the height of the tower? What is the distance between the tower and the building?

## *Concepts :- Positions and numbers*

1. Make a copy of the given pictures and specify the vertices with number pairs
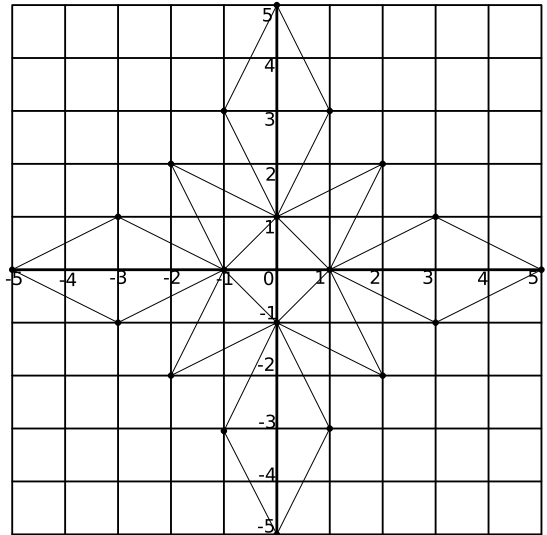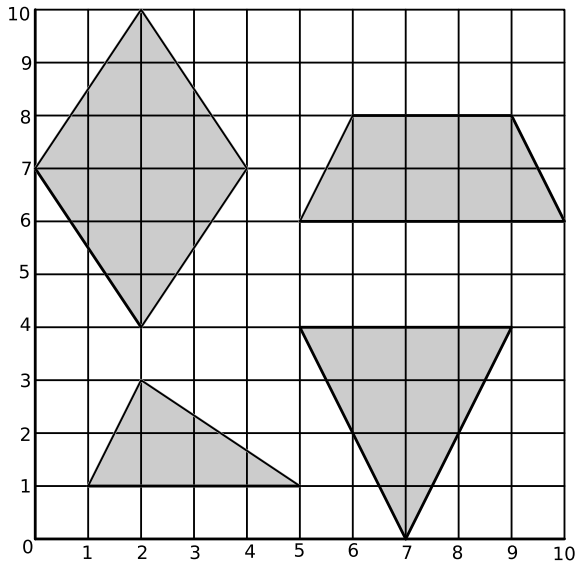


2. Draw $x - axis$ and $y - axis$; and mark the given points. Join the points.

   $A(5, 0), B(3, 2), C(4, 4), D(2, 3), E(0, 5), F(-2, 3), G(-4, 4), H(-3, 2), I(-5, 0),$
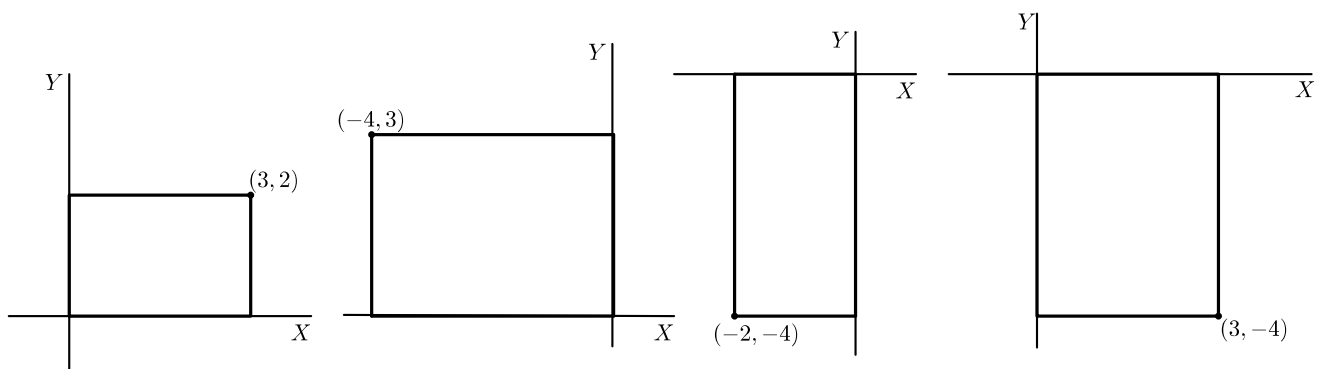   $J(-3, -2), K(-4, -4), L(-2, -3), M(0, -5), N(2, -3), P(4, -4), Q(3, -2)$

3. Sort the following points as on $x - axis$, on $y - axis$ and others

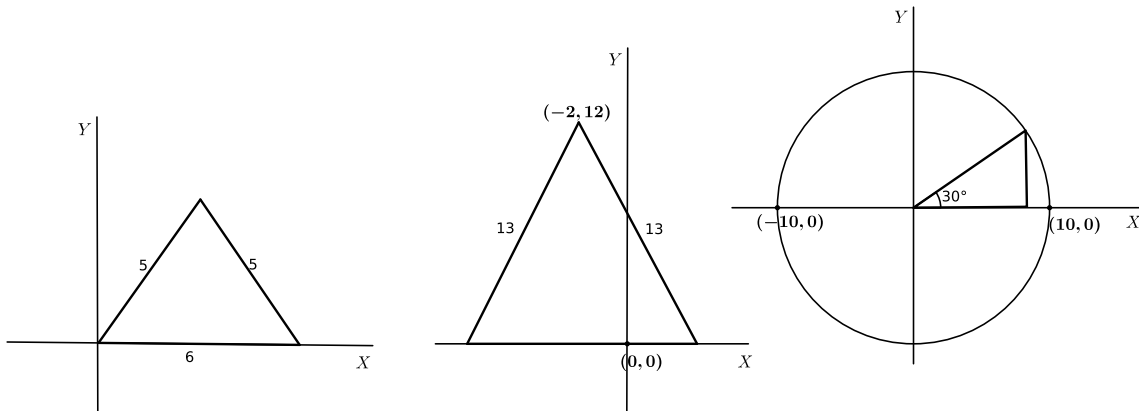   $A(0, 4); B(5, 0); C(3, 4); D(0, -2); E(-5, 4); F(-3, 0); G(0, -8); H(1, -1)$

4. From the points given below, find the pair which are on a line parallel to the $x - axis$ and the pair which are on a line parallel to the $y - axis$

   $P(5, 2); Q(2, 5); R(3, 1); S(1, -5); T(-3, 2); M(1, 4)$

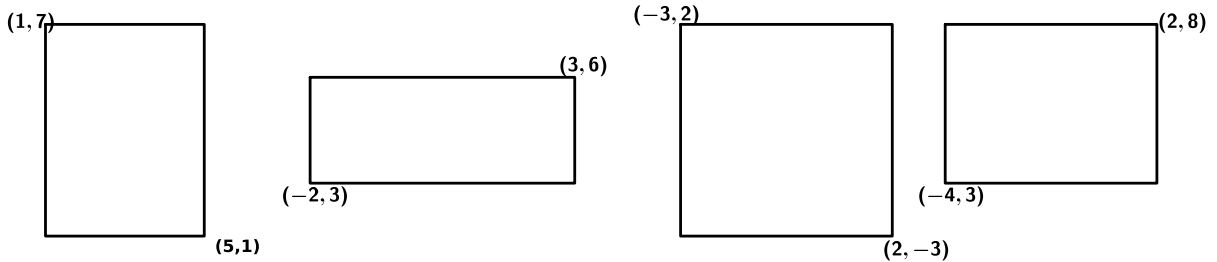5. What are the other coordinates of the following rectangles?



1

6. From the figure find the coordinates of the vertices of the triangles.



*Concepts :- Rectangles*

7. All rectangles below have sides parallel to axes. Find the coordinates of the remaining vertices of each.



8. Draw rough figures of the rectangles with sides parallel to axes and the given points as opposite vertices. Find the coordinates of the other vertices of each.

$(0, 0), (3, 5)$      $(6, 1), (2, 4)$      $(-2, 5), (4, -1)$      $(-2, -8), (-5, -1)$

*Concepts :- Distances*

9. Find the distance between each pairs of points.

$A(0, 0), B(3, 0)$     $C(0, 0), D(0, -5)$     $E(-3, 2), F(2, 2)$     $G(-2, -8), H(1, -8)$
$J(2, 4), K(2, 7)$     $L(1, 5), M(1, -3)$     $N(-1, 4), P(6, 4)$     $Q(0, -3), R(6, -3)$
$S(0, 3), T(0, 8)$     $U(5, 7), V(-2, 7)$     $W(7, -4), X(7, 1)$     $Y(0, 4), Z(0, -9)$

10. $(5, 3)$ is point on a line parallel to $x$-axis. What are the coordinates of the points at which it cuts the $y - axis$? What is the distance between these two points? What is the distance between this line and the $x - axis$?

11. The coordinates of a point on a line parallel to the $y-axis$ are $(-3, 4)$. What is the distance between this line and the $y-axis$? Find the coordinates of the point where this line meets the $x-axis$. What is the distance between these two points? Find the coordinates of two more points on this line, which are 5 units from the point $(-3, 4)$.

12. A circle is drawn with centre at $(3, 0)$ and radius 5 units in a coordinate system. What are the coordinates of the points at which it cuts the $X$-axis? And the points where it cuts the $Y$-axis?

13. A circle, drawn with centre at $(-2, 0)$ is passes through $(2, 0)$. Find the radius of the circle. What are the coordinates of the other point at which it cuts the $X$-axis? And the points where it cuts the $Y$-axis?

14. In the figure, $OABC$ is a parallelogram.
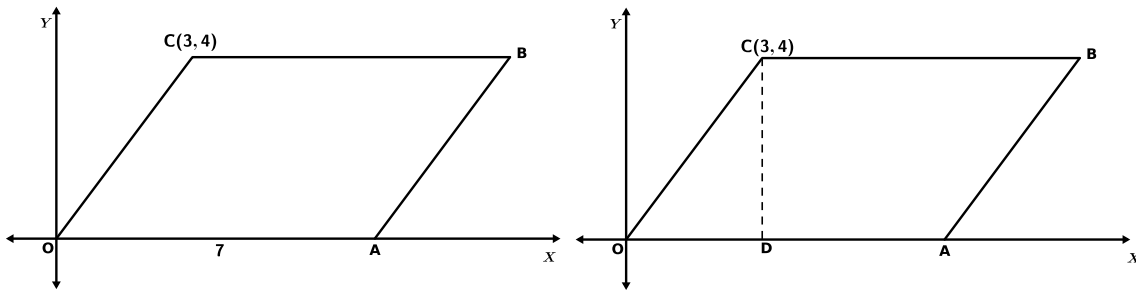


- What are the coordinates of $A$ ?
- What is the relation between the $y$-coordinate of $B$ and $y$-coordinate of $C$ ?
- What is the length of $BC$ ? Find the coordinates of $B$.
- If $CD$ is perpenticular to $X$-axis, find the lengths of $OD$ and $CD$.
- Find the length of $OC$

15. Find the coordinates of the other vertices of the following parallelograms.
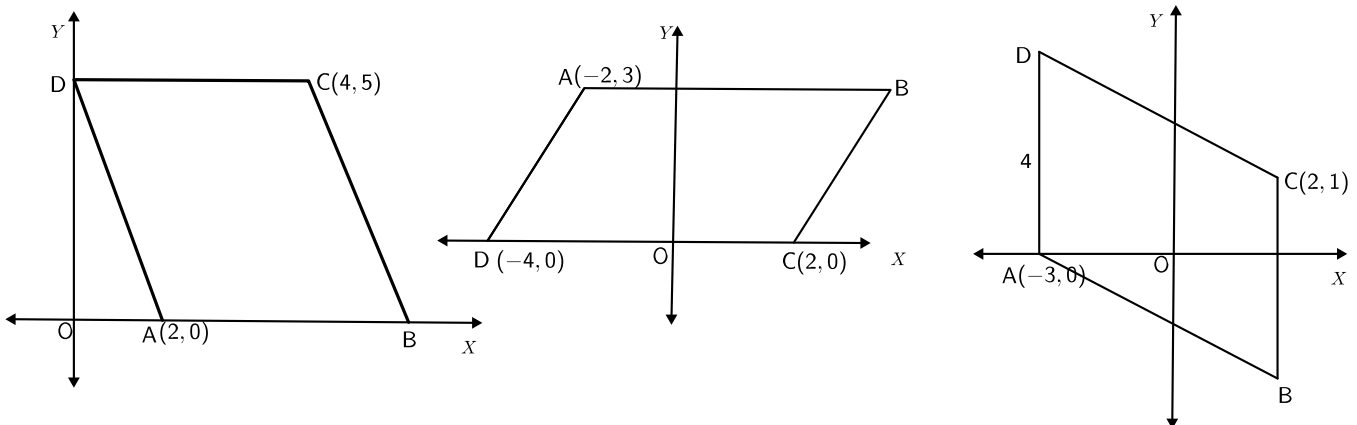
16. A circle drawn with centre $(5, 0)$ cuts the $X$-axis at $(-8, 0)$. Find its radius. Draw a rough figure and find other points of intersection of the circle with the *axes*

17. Find the perimeter of the given quadrilaterals.
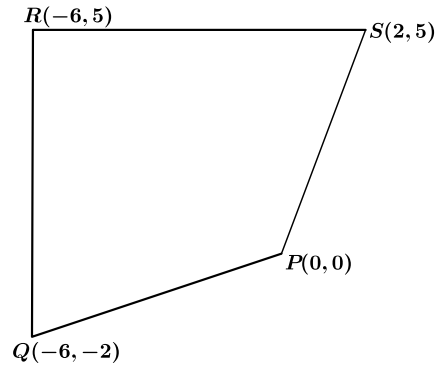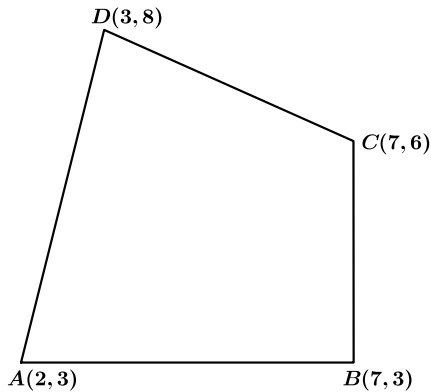


18. In the figure the centre of the circle is origin. Find its radius. What are the coordinates of the points at which it cuts the *axes*? Also find the coordinates of another two points on the circle.
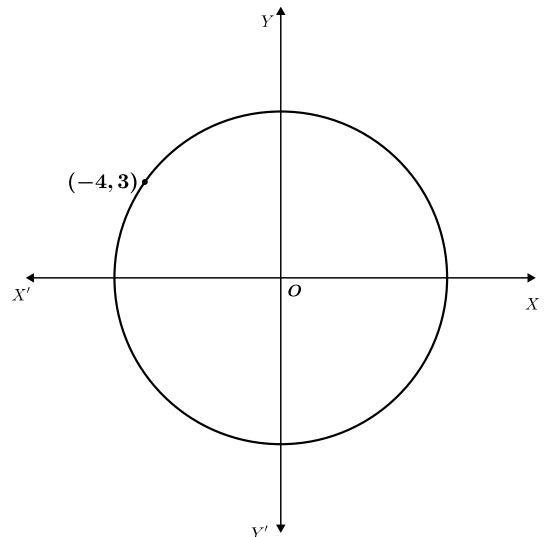


19. A circle drawn with centre $(5, 3)$ touches the $Y$-axis at $A$ and cuts the $X$-axis at $B$ and $C$. Draw a rough figure and find its radius . Find the coordinates of $A, B$ and $C$.

20. The coordinates of some points are given below. Find the points which are on a circle with centre origin and radius $3cm$.

$$(0, 3); (1, 2); (2, 1); (-3, 0); (1, -2); (-1, -\sqrt{2}); (0, -3); (\sqrt{2}, \sqrt{5}); (\sqrt{2}, \sqrt{7})$$

21. In $\triangle ABC$, $A(5, 9), B(5, 16), C(29, 9)$. Prove that $\triangle ABC$ is a right angled triangle.

22. In parallelogram $ABCD$, $A(2, 1), B(7, 2), C(9, 5)$ Find the coordinates of $D$.

23. Prove that $A(1, 0), B(7, 0), C(4, 4)$ are the vertices of an isosceles triangle.

24. $M$ is a point on $X$-axis, equidistant from the points $(-2, 3)$ and $(5, 4)$.
If $x$-coordinate of $M$ is $a$, what is its $y$-coordinate ?
Draw a rough figure and find the coordinates of $M$.

4

25. Draw $X-axis$ and $Y-axis$; and mark the points $(0,0); (3,1); (4,4)$ and $(1,3)$. Join the points and find the lengths of the sides and give a suitable name for the figure.

26. Can we draw a triangle with vertices $(1,5), (5,8), (13,14)$. Give reason.

27. Find the area of the triangle given.

$(6,7)$

$(2,3)$   $(8,3)$
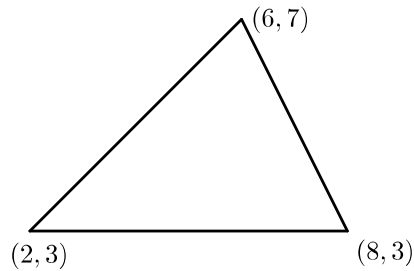
28. In the figure the centre of the circle is origin. $C(2,0)$ is a point on the circle.
If $AB$ is a diameter of the circle, find the coordinates of $A$ and $B$.

$Y$

$A$

$60°$

$O$   $C(2,0)$   $X$

$B$
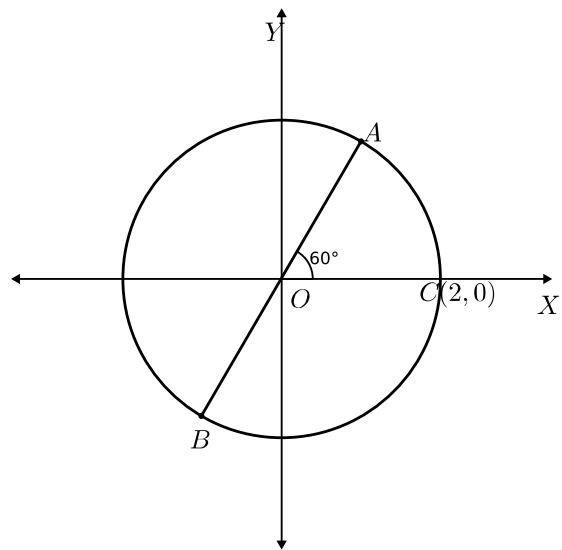
29. If the point $(0,2)$ is equidistant from $(3,a)$ and $(a,5)$, find $a$.

30. The vertices of a triangle are $(7,15); (7,-9)$ and $(-3,-9)$.
Prove that $(2,3)$ is the circumcentre of the triangle.
Find the radius of the circumcirle.

31. Prove that $(0,-2), (3,1), (0,4), (-3,1)$ are the vertices of a square.

32. Draw $X-axis$ and $Y-axis$; and mark the points $(2,0), (5,-5), (8,0)$ and $(5,5)$.
Join the points and find the area of the figure.

*Concepts :- Lines and circles*

1. Draw the figures with the given specifications.
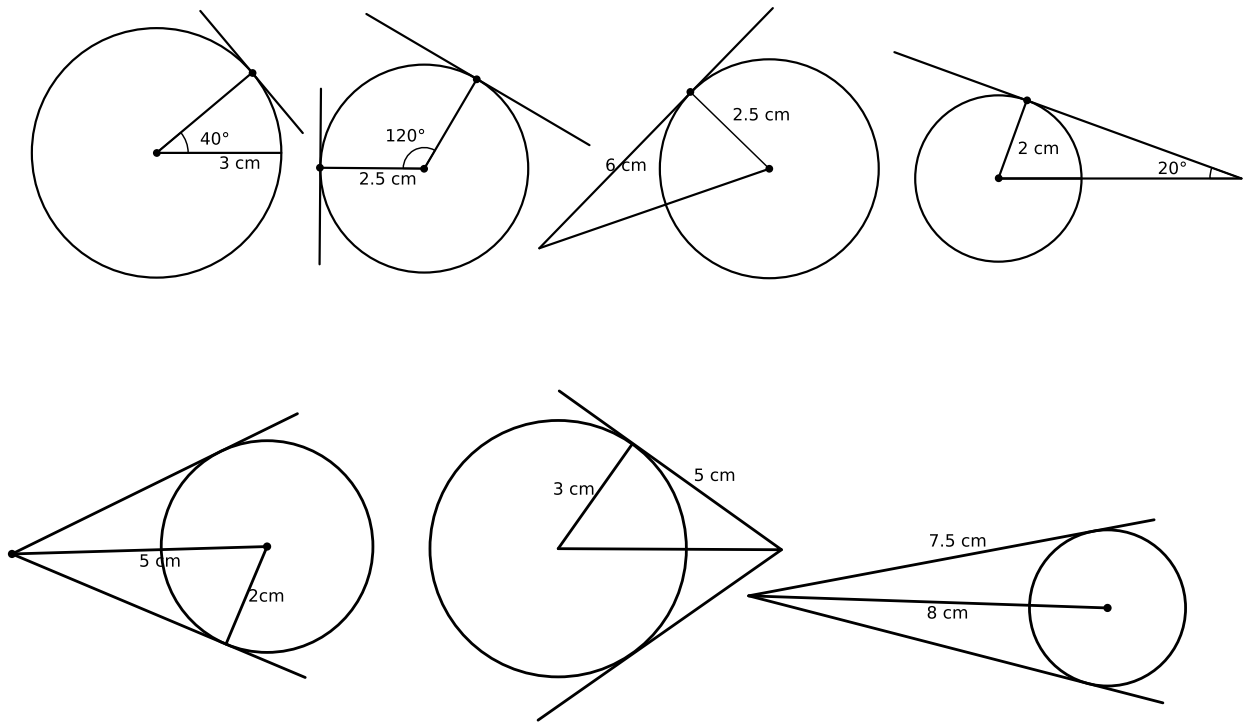


2. Draw a circle of radius 3.5 centimetres and draw the chord $AB$ of length 5 centimetres in it. Draw the tangents at $A$ and $B$.

*Concepts :- Tangents and angles*

3. Draw a circle of radius 3 centimetres and draw three radii with central angle 120$^\circ$. Draw an equilateral triangle with all three sides touching the circle.

4. In each of the following figures, find the angles of $\triangle ABC$. Also find the angles of triangle formed by the tangents at $A, B$ and $C$.
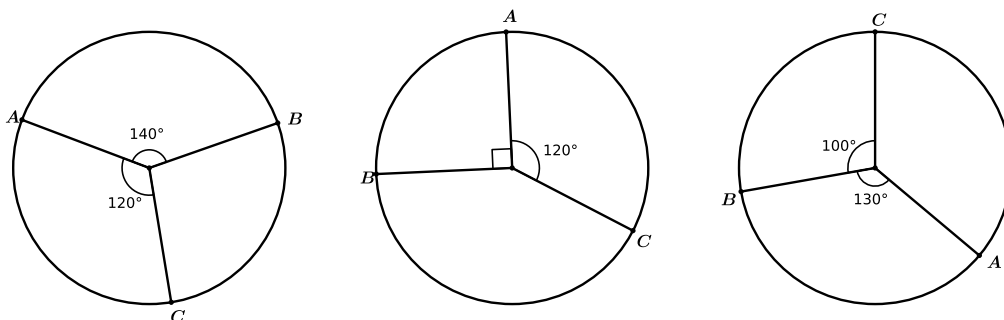
5. Draw a circle of radius 2.5 centimetres and draw a triangle with angles $50°, 60°, 70°$, and all three sides touching the circle.

6. Draw a circle of radius 4 centimetres and draw a square with all sides touching the circle.

7. Draw a circle of radius 3.5 centimetres and draw a rhombus with one angle $50°$, all four sides touching the circle.

8. Draw a circle of radius 4 centimetres and draw a regular hexagon with all sides touching the circle.
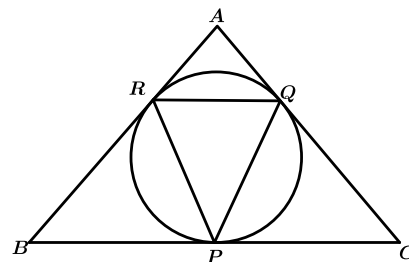
## *Concepts :- Chord and tangent*

9. In the figure, $PQ, ST$ are tangents. Find the angles of triangle and quadrilateral.
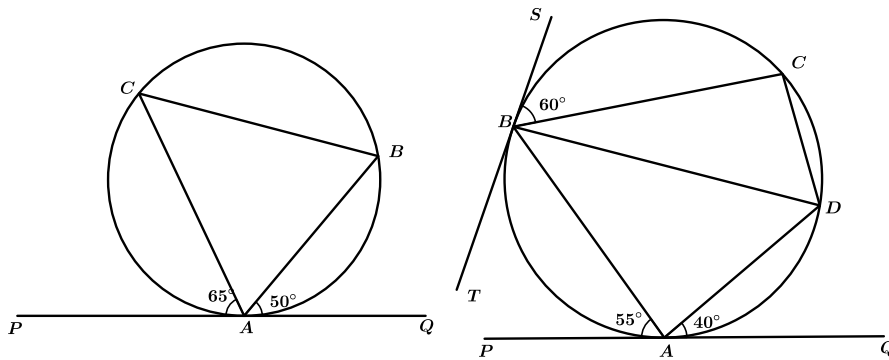


10. In the figure, $BT$ is a tangent. If $AC = BC$ and $\angle ABT = 80°$, then
    How much is $\angle ACB$ ? $\angle CBT$ and $\angle CBT$ ?
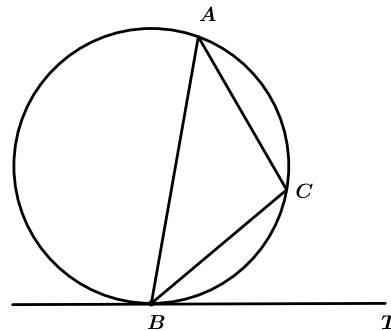


11. In the figure, $ABC$ is a triangle with $AB = AC, \angle A = 100°$. Its incircle touches the sides at $P, Q, R$. How much are $\angle B$ and $\angle C$?
    Calculate the angles of $\triangle PQR$



2

## *Concepts :- A tangent from outside*

12. Find the length of the tangent to a circle with radius 7 centimetres, from a point 25 centimetres away from the centre?

13. If the length of a tangent to a circle from a point 17 centimetres away from the centre is 15 centimetres, what is the radius of the circle?

14. In the figure $P$ is 37 centimetres away from the centre of the circle. If $PQ = 25cm$, then

    • What is the radius of the circle?

    • What are the lengths of the tangents $PA$ and $PB$?

    • What is the length of the tangent from a point 20 cm away from the centre of the circle?
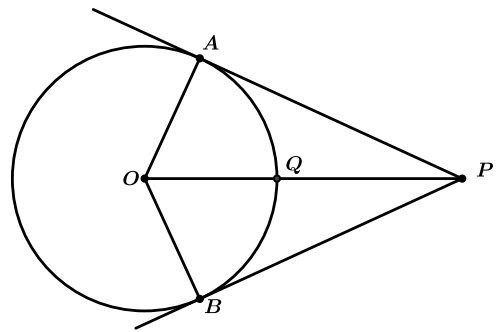


15. In the picture below, $AB, BC, CA$ are tangents to the circle at $P, Q$ and $R$
    If $AB = 20cm$ and $CQ = 5cm$, then
    $AP = AR$; Why? How much is $CR$?
    What is the relation between $BP$ and $BQ$?
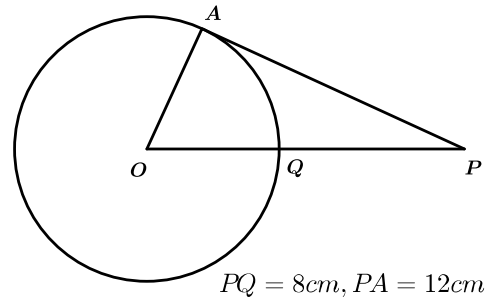    Find $AR + BQ$. Calculate the perimeter of $\triangle ABC$
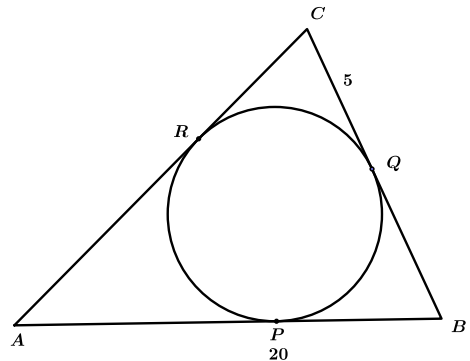


16. Find the perimeters of following triangles and quadrilateral.
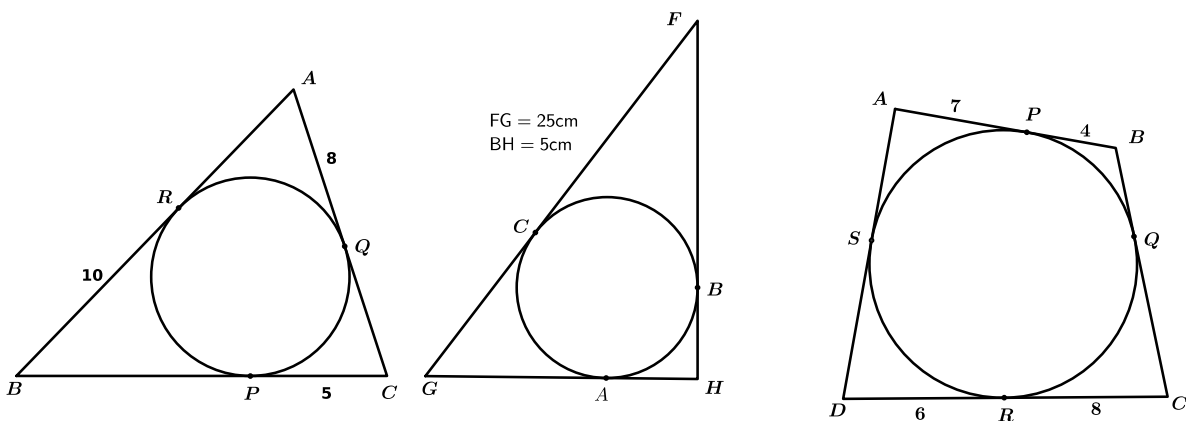


17. Draw a circle of radius 2.3 centimetres and mark a point P ,6 centimetres from its centre. Draw tangents from P to the circle and write down the measurements of their lengths.

18. Draw a circle of radius $3cm$ and mark a point, $5cm$ from its centre. Draw tangents from that point to the circle and write down the measurements of their lengths.

19. Draw a circle of radius $3cm$ and draw two diameters with one angle $60°$. Draw the tangents at the ends of these diameters. What is the specialty of the quadrilateral formed by these tangents?

20. In the figures, $PA$ and $PB$ are tangents. Find the radius.



$OQ = 2cm, PQ = 6cm$



$PQ = 8cm, PA = 12cm$
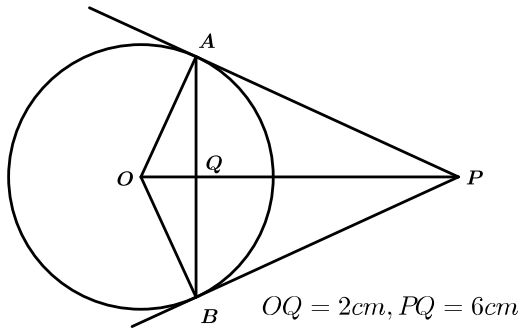
21. In the figure, $PA, PB$ and $QR$ are tangents.
    If $PA = 15$ , then prove that the perimeter of $\triangle PQR = 30cms$.
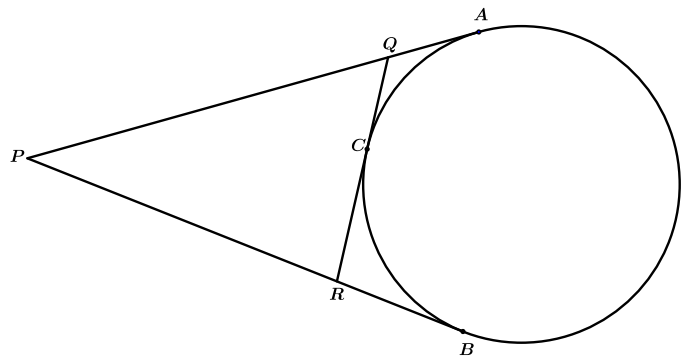


22. Calculate the values of $x$ in the following figures.

23. Draw a rectangle of one side 7 centimetres and area equal to that of a square of side 6 centimetres.
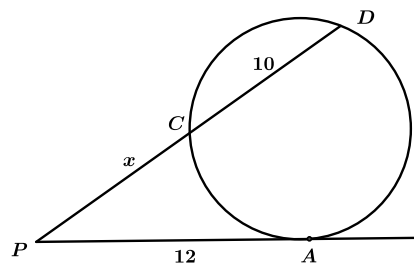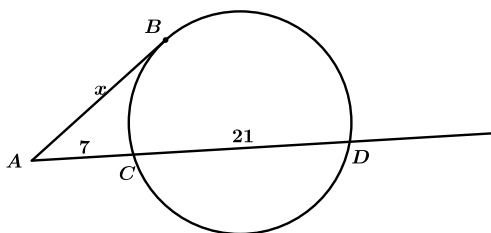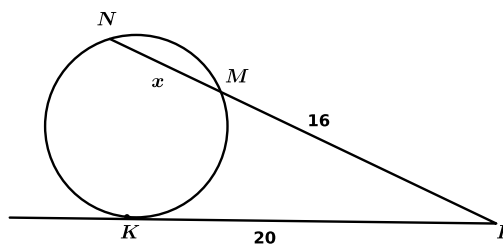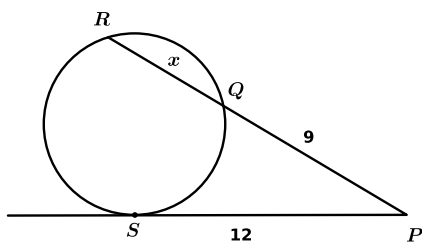
## Concepts :-circle touching a line

24. Draw a triangle of sides $6, 7, 8$ centimetres and draw its incircle. Measure the inradius and write it down.

25. Draw an equilateral triangle of side 4 centimetre. Draw its incircle and circumcircle.

26. Draw $\triangle ABC$ with $AB = 7cm, \angle A = 70°$ and $\angle B = 50°$ . Draw its incircle.

27. In a triangle two sides are 6 cm, 8 cm and the included angle is $90°$ Draw the triangle and the incircle.

28. Draw a square of side 5 centimetre. Draw its incircle and circumcircle.

29. The sides of a rhombus are 5 centimetres each. One of the angle between two adjacent sides is $70°$. Draw the rhombus and a circle touching the sides.

30. Draw a quadrilateral with any sides. Draw a circle touching any three sides.

In the figure, the incircle of $\triangle ABC$, touches the sides at $P, Q$ and $R$. If $AB = 10cm, BC = 12cm, AC = 16cm$, find half the perimeter of the triangle.
What is the relation between half the perimeter and the lengths $BC$ and $AP$?
Find $AP, BQ$ and $CR$
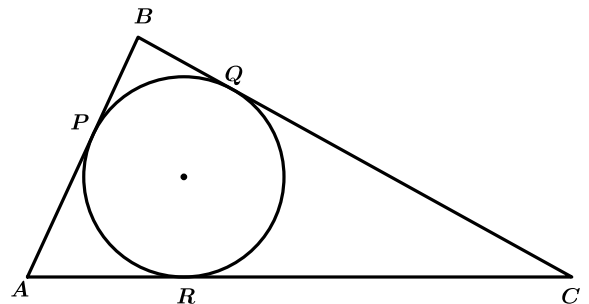
31. Find the area of the triangle with perimeter $32 centimetres$ and the radius of the incircle $1\frac{1}{2} centimetres$

32. The area of a triangle is 60 square centimetres. If the perimeter is $40 centimetres$, calculate the radius of the incircle.

33. Calculate the area of a triangle of sides $7 centimetres, 15 centimetres, 20 centimetres$.
Calculate the radius of the incircle.

34. In the figure, $\angle B = 90°, AC = 12cm$. If the radius of the incircle $3 centimetres$, find the area and perimeter of the triangle.
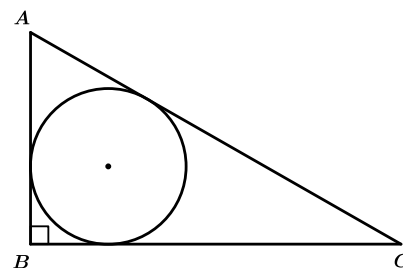
*Concepts :- Square pyramid, Area*

1. The given figure shows a net of a square pyramid.

   - What is the base area of the pyramid?

   - Find the slant height of the pyramid

   - What is the area of one triangle?

   - Find its lateral surface area and surface area.
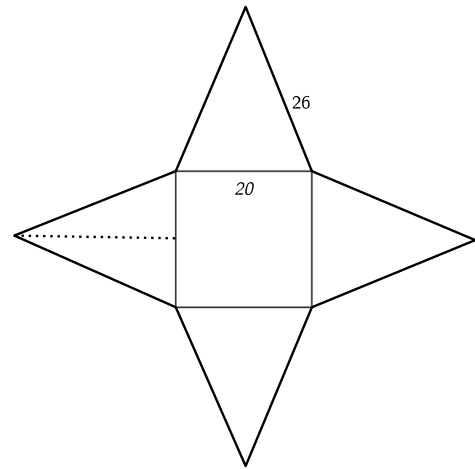
2. A toy is in the shape of a square pyramid of base perimeter 56*cm* slant height 24*cm*. What is the total cost of painting 1000 such toys, at 150 rupees per square metre? Find the area of colored paper needed to cover that solid.

3. Lateral faces of square pyramids are given. Find the surface area of each pyramid.
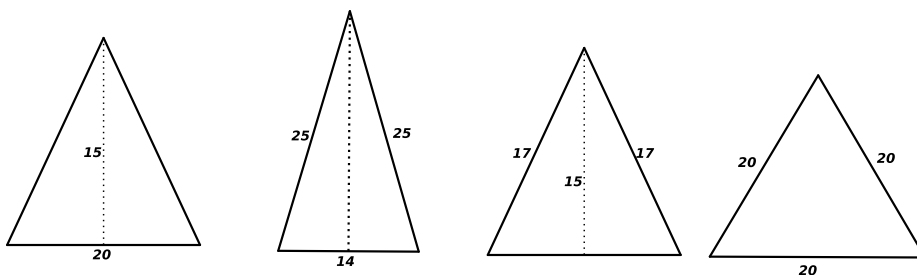
*Concepts :- Square pyramid, Height and slant height*

4. Find height of following square pyramids
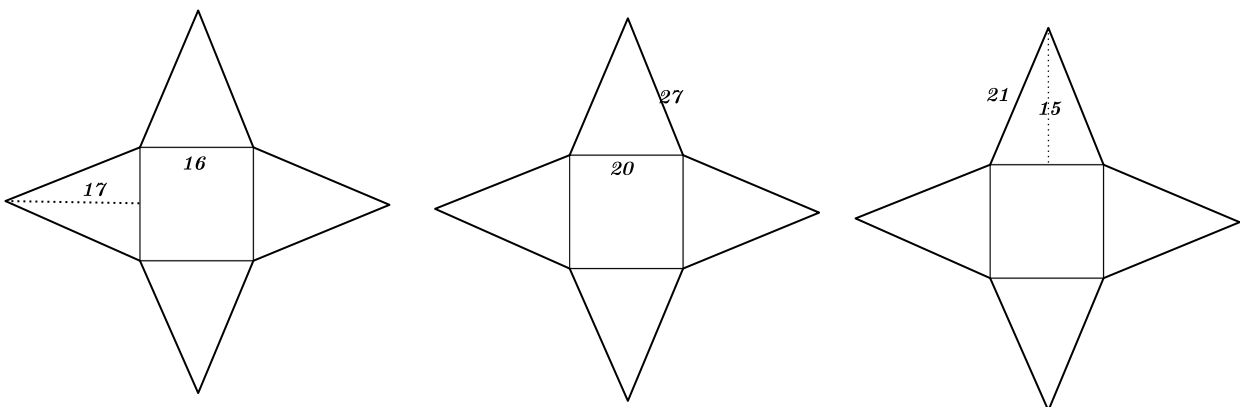
5. A tent in the shape of a square pyramid has base perimeter $96m$ and height $5m$. How much canvas would be needed for this?

6. Find the height of the square pyramid with base perimeter $88cm$ and slant height $61cm$.

7. To make a square pyramid of base 12 centimetres and height 17 centimetres, Rema cut out a square and four isosceles triangles. What are the lengths of the sides of one such triangle?

8. Can we make a square pyramid from a square with side $10cm$ and four triangles with sides $10cm, 7cm, 7cm$? Explain the reason

9. A square pyramid of base edge $20cm$ and height $5cm$ is to be made of paper. What should be the dimensions of the triangle?

10. Base area of a circus tent in the shape of a square pyramid is $1600m^2$, height is $37.5m$. How much canvas would be needed for this?

## *Concepts :- Square pyramid, Volume*

11. Base area of a square pyramid is $300cm^2$. Height is $15cm$. Find the volume of the square pyramid.

12. A square of side $8cm$ and four isosceles triangles with height $5cm$ are to be joined to make a square pyramid. then,

   - What is the slant height of the pyramid?
   - Find the height and volume of the pyramid

13. In a square pyramid all lateral faces are equilateral triangles. If total length of edges is $48cm$,

   - How long are the base edge ? How long are the slant edge ?
   - What is the slant height of the pyramid ?
   - Find the height and volume of the pyramid.

14. Volumes of two square pyramids are equal. If the base edges are in the ratio $2:1$, what is the ratio of their heights?

15. What is the volume of the largest square pyramid with same base, that can be carved out from a wooden cube with $30cm$ side?
   Find the surface area of the pyramid.

16. A metal square pyramid is melt and recast into small pyramids with half the base edge and half the height. Howmany such pyramids can be made?
   What is the ratio of their lateral surface area with the big one?

2

## *Concepts :- Cone, Curved surface area*

17. Compare the given slant heights and base-radii of the cones made by rolling up the following sectors. Find curved surface area of the cones.
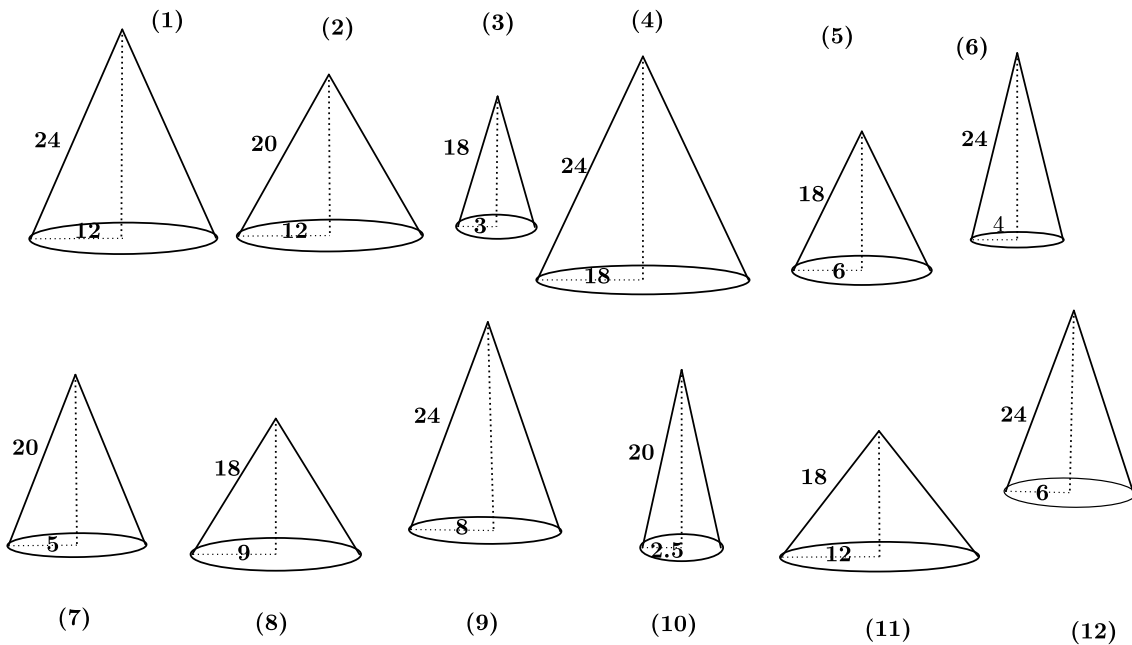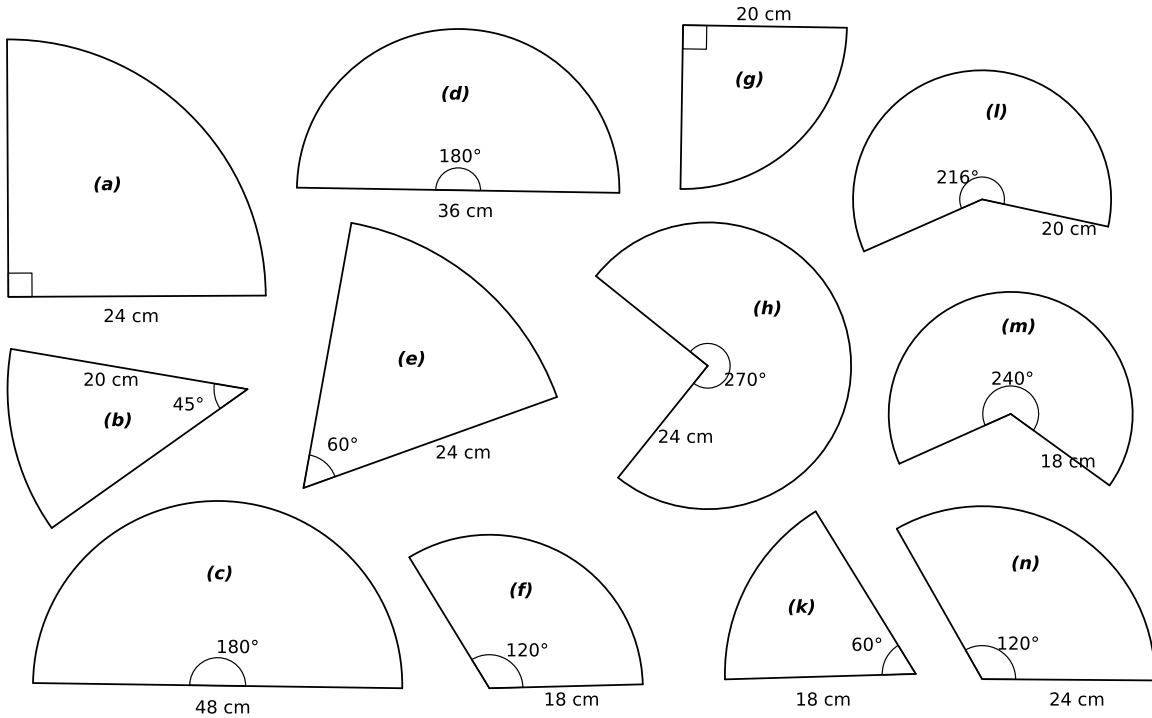
18. A circular metal sheet of radius 12 centimetres is cut into 4 equal sectors and bent into cones.

    • Howmany such cones can be made? What is the slant height of one such cone?

    • Calculate the base radius of one such cone.

    • Find curved surface area of one such cone.

19. A tent is in the shape of a cylinder and a cone with same radius upon it. The maximum height of the tent is $15m$ and the slant height of the conical part is $15m$. If the common diameter is $15m$,

    • What is the height of the conical part?

    • What is the height of the cylindrical part?

    • If the cost of canvas is 200 rupees per square metre, what would be the total cost for covering the tent?

## *Concepts :- Cone, Volume*

20. The base radius of a cone is 5 cm and its slant height is 13 cm. What is its height? Calculate its volume.

21. The base-radius of a cylindrical block of wood is $16cm$ and its height is $30cm$. What is the volume of the largest cone that can be carved out from this ?

22. Find the volume of a cone with base-diameter $24cm$ and height $9cm$ ? Calculate the total surface area also.

23. A sector of central angle $216°$ is cut out from a circle of radius $25cm$ and it is rolled up into a cone. What is its volume?

24. A metal cylinder of radius $15cm$ and height $24cm$ is melt and recast into a cone of height $18cm$. What is the base radius of the cone?

25. A tent is in a shape of a cone made by rolling up a semicircular canvas of diameter $40m$. What is its height ?

26. By bending the given sectors into cones, which one has more volume?
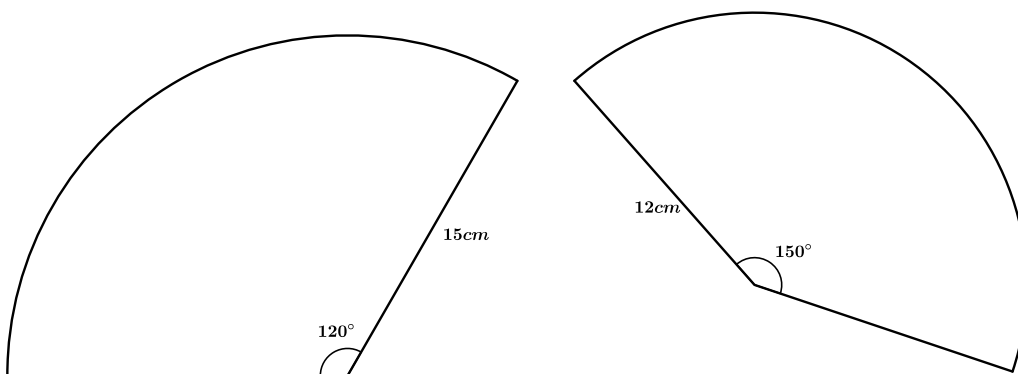
## *Concepts :- Sphere, Hemisphere*

27. A metal sphere of radius $4cm$ is melt and recast into spheres of radius $1cm$.

    - How many such spheres are got?
    - How many hemispheres are got with radius $1cm$. ?

28. The edges of a cube are 6 centimetres long. Find the volume of the largest sphere that can be cut from it.

29. A metal sphere of radius $12cm$ is melt and recast into spheres of radius $3cm$. Howmany such spheres are got?

30. The surface area of a hemisphere is $300\pi$ square centimetres. What is the surface area of the sphere with same radius?

31. The radii of two spheres are in the ratio 1 : 2. What is the ratio of their volume? What is the ratio of their surface area?

32. The base radius of a wooden cylinder is $30cm$ and its height is $16cm$. There are two more cylinders with same volume; one with base radius $20cm$ and the other with base radius $24cm$ From which cylinder we can carved out the largest sphere? What is the volume of that sphere?

33. What is the radius of the largest sphere that can be put into the given box? How many spheres with radius $2cm$ can be packed in this box?
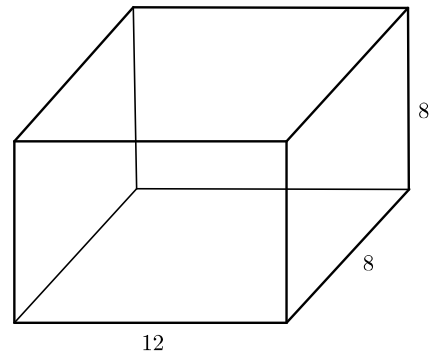


34. A solid with total length $7cm$ is made by joining a hemisphere and cone of the same radius $6cm$, as in the figure:

    - Find the height of the cone. What is the volume of the cone?

    - What is the volume of the hemisphere? Calculate the total volume?

    - What is the total surface area of the solid?



5
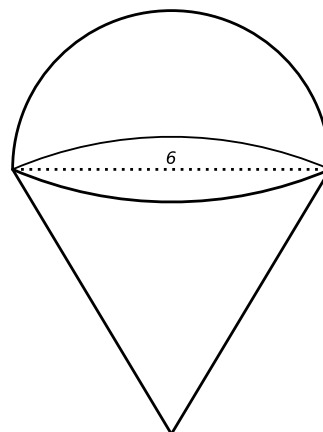
35. A petrol tank is in the shape of two hemispheres attached to the two ends of a cylinder. The common radius is $18cm$ and the total length of the tank is $80cm$. How many litres of petrol can it contain?

36. Find the ratio of the volumes of the given figures. Compare the total surface area.
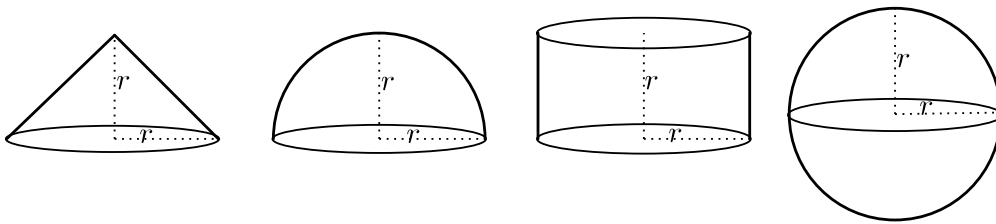


37. Calculate the volumes of the following shapes.
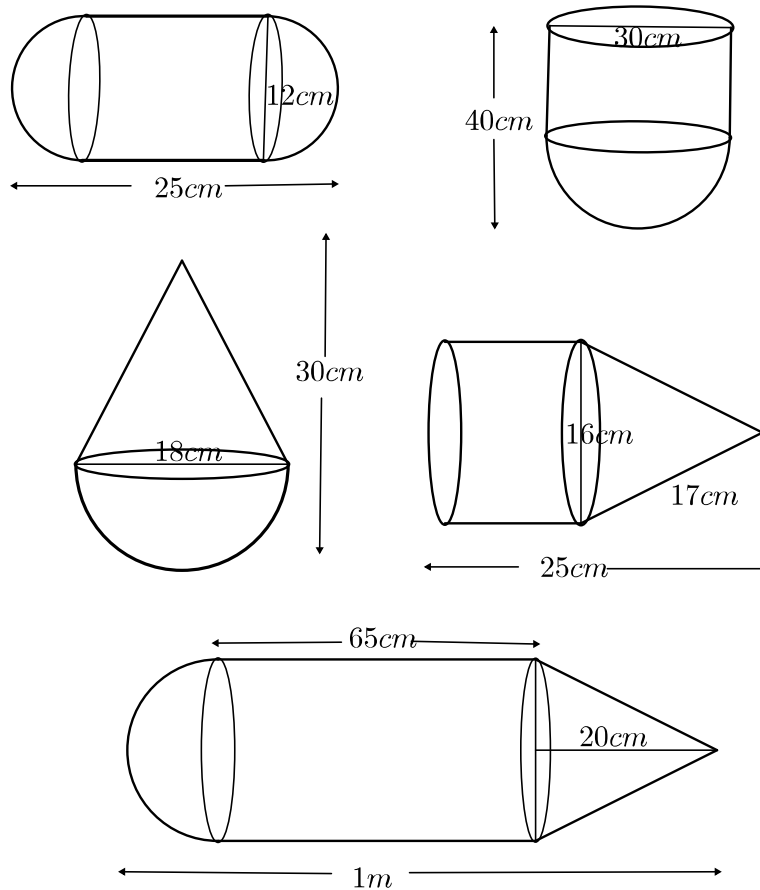
*Concept :- Triangles*

1. In $\triangle AMB$, how much are the perpendicular sides?
   What about perpendicular sides of $\triangle DNC$?
   What are the coordinates of $C$ in Parallelogram $ABCD$?
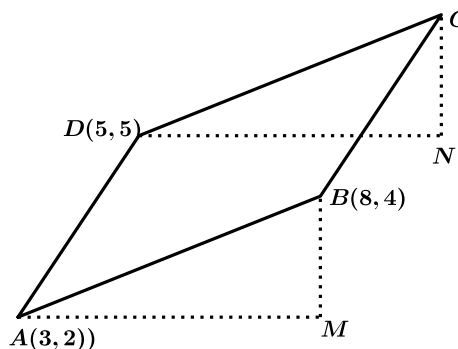


2. Find the coordinates of the other vertices of the following parallelograms.
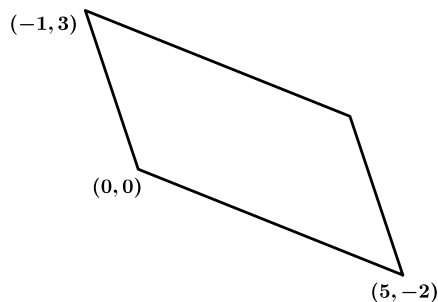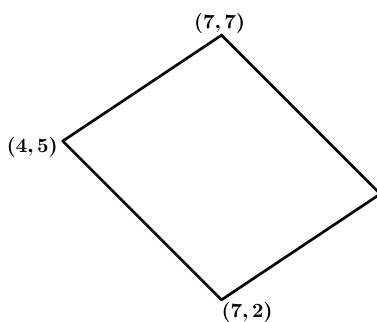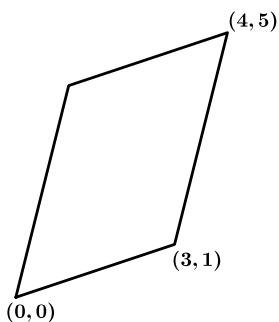


3. In this picture, the mid points of the sides of the larger triangle are joined to make the smaller triangle $PQR$. Calculate the coordinates of the vertices of the larger triangle.
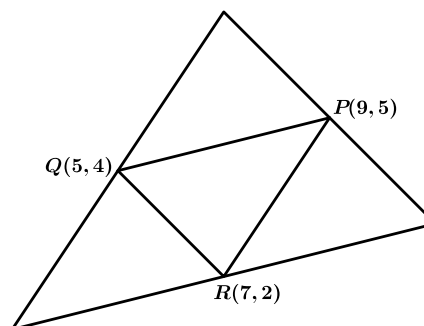


4. Find the coordinates of the fourth vertices of the following parallelograms.
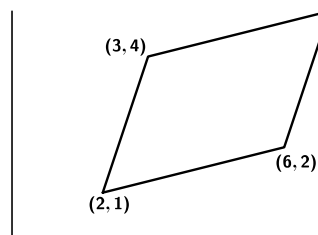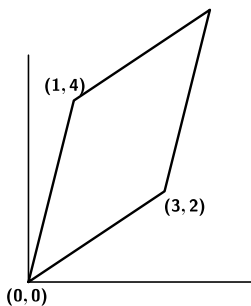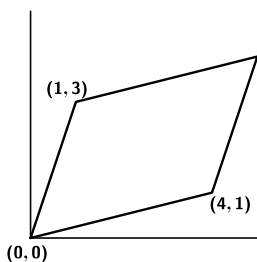
## *Concept :- Ratio*

5. In the picture, the perpendicular sides of $\triangle ABC$ are parallel to axes.
   What are the coordinates of $B$?
   How much are the perpendicular sides of $\triangle ABC$?
   If $M$ is the mid point of $AC$, what are the lengths of the vertical sides of $\triangle APM$?
   Then, find the coordinates of $M$.
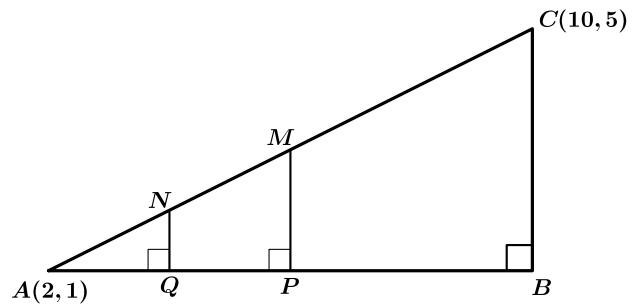
   

   If, $AN : NC = 1 : 3$, what are the lengths of the perpendicular sides of $\triangle AQN$? What are the coordinates of $N$?

6. In the picture, if $PB : BQ = 1 : 2$, find the coordinates of $B$.

   Find the coordinates of the mid point of $PQ$.
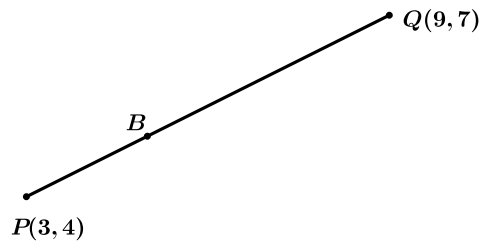
   

7. Find the coordinates of the mid point of the lines joining each of the given pairs of points.

   $A(0,0), B(4,6)$      $C(2,1), D(8,5)$      $E(1,7), F(5,2)$      $G(-2,0), H(6,6)$

   $J(2,1), K(-4,7)$      $L(-5,-2), M(5,2)$      $N(-1,4), P(5,-2)$      $Q(0,-3), R(4,5)$

8. The coordinates of $A$ and $B$ are $(0,0)$ and $(4,8)$.

   Calculate the coordinates of the point $P$ on $AB$ such that $AP : PB = 1 : 3$.
   Calculate the coordinates of the point $Q$ such that $AQ : QB = 3 : 1$.

9. The coordinates of $P$ and $Q$ are $(0,3)$ and $(10,8)$.

   Calculate the coordinates of the point $M$ on $PQ$ such that $PM : MQ = 3 : 2$.
   Calculate the coordinates of the point $N$ such that $PN : NQ = 1 : 4$.

10. In this picture, the mid points of the sides of the larger quadrilateral are joined to make the smaller quadrilateral.
    Calculate the coordinates of other vertices of the quadrilaterals.
    Calculate the lengths of the sides of the smaller quadrilateral.
    What is the speciality of this quadrilateral?

    

2
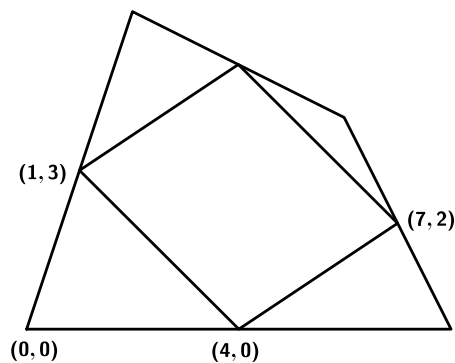
## *Concept :- Straight lines*

11. While moving along the line joining $(0, 1)$ and $(4, 3)$, what is the connection between the changes of $x$ and $y$ coordinates at every point?
    If so, Does this line pass through $(6, 4)$?
    Find the coordinates of another two points on this line.

12. Consider the line joining the points $(3, 6)$ and $(4, 8)$.
    What is the rate at which the $y$-coordinate changes with respect to the $x$-coordinate?
    Find two more points on this line. Does this line pass through origin?

13. Find the coordinates of two other points on the line joining $(5, 2)$ and $(8, 3)$.

14. Find the coordinates of two other points on the lines joining each of the given pairs of points.

    $J(0, 0), K(1, 2)$        $L(5, 2), M(1, -2)$        $N(-1, 4), P(1, 3)$        $Q(0, -3), R(2, 0)$

15. If the point of intersection of the line passing through $(1, 2)$ and $(7, 4)$ and the line passing through $(2, 5)$ and $(6, 1)$ is $(x, y)$, find the values of $x$ and $y$.

16. Find the point of intersection of the two lines passes through $(-3, 1), (5, 3)$ and $(4, 1), (-2, 3)$.

17. What are the points at which the line joining $(4, 2)$ and $(7, 3)$ cuts the $x - axis$?

18. What are the points at which the line joining $(-1, 5)$ and $(3, 1)$ cuts the $x - axis$?, and the $y - axis$?

## *Concept :- Figures and equations*

19. Find the coordinates of 3 more points on the line joining origin and $(3, 6)$.
    What is the relation between the $x$-coordinate and the $y$-coordinate of these points?
    If $(x, y)$ is a point on this line, write the equation of the line.

20. What is the slope of the line joining $(1, 2)$ and $(3, 5)$ ?
    If $(x, y)$ is a point on this line, write the equation of the line.

21. What is the equation of the line with slope $\frac{1}{2}$ and passes through the point $(2, 3)$ ?

22. What is the equation of the line with slope $2$ and passes through the point $(2, 3)$ ?

23. What is the equation of the line with slope $-\frac{1}{2}$ and passes through the point $(2, 3)$ ?

24. What is the equation of the line with slope $-2$ and passes through the point $(2, 3)$ ?

25. Write the equation of each straight lines passing through the given points.

    $A(2, 1), B(4, 2)$        $C(1, 2), D(2, 4)$        $E(1, 2), F(2, 0)$        $G(2, 1), H(0, 2)$

26. In the figure, what are the slopes of the lines $OA, OB$ and $OC$.
    Write the equations of the lines.
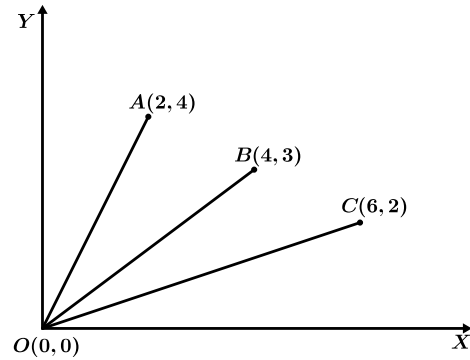
27. Find the equation of the circle with centre at the origin and radius 3 centimetres.

28. The circle with centre $(4, 3)$ passes through the origin.
    Write the equation of this circle.
    Find the coordinates of the points where this circle cut the axes.

29. Find the slope of the line $AB$.
    What is the equation of this line.
    Write the equation of the circle with diameter $AB$.
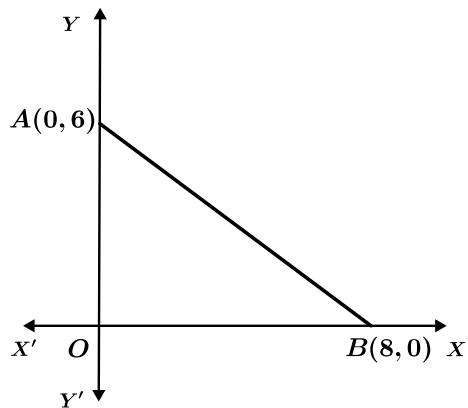
30. The equation of a line is $2x + 5y = 20$

    - Ckeck whether this line pass through the point $(5, 2)$.

    - Find the coordinates of the points where this line cut the axes.

    - Find one more point on this line.

31. In the picture, the circle touches the axes at $A$ and $B$.
    Find the coordinates of $B$.
    Find the radius of the circle.
    Find the coordinates of the centre of the circle.
    Write the equation of the circle.
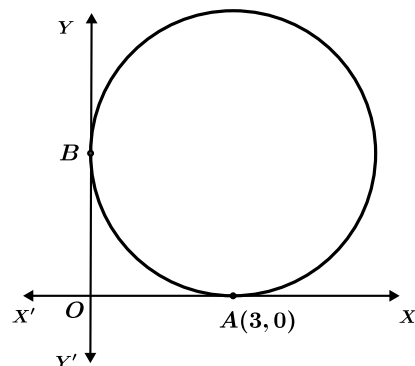
## *Concept :- Factors and solutions*

1. Write down each of the following polynomials as the product of two first degree polynomials
   Write also the solutions of the equation $p(x) = 0$ in each.

   1) $p(x) = x^2 - 5x - 24$    2) $p(x) = x^2 + 2x - 24$    3) $p(x) = x^2 - 8x + 24$

   4) $p(x) = x^2 - 5x + 4$    5) $p(x) = x^2 + 3x - 10$    6) $p(x) = x^2 - 10x + 25$

   7) $p(x) = 2x^2 - 5x + 2$    8) $p(x) = 2x^2 + x - 6$    9) $p(x) = 3x^2 - 11x + 6$

   10) $p(x) = 4x^2 - 4x + 1$   11) $p(x) = x^2 - 4x + 1$    12) $p(x) = x^2 - 2x - 1$

2. Find a second degree polinomial $p(x)$ such that $p(1) = 0$ and $p(3) = 0$

3. Find a second degree polinomial $p(x)$ such that $p(-2) = 0$ and $p(5) = 0$

4. Find a second degree polinomial $p(x)$ such that $p(\frac{1}{2}) = 0$ and $p(-2) = 0$

5. Find a second degree polinomial $p(x)$ such that $p(2 + \sqrt{3}) = 0$ and $p(2 - \sqrt{3}) = 0$

6. Find a third degree polinomial $p(x)$ such that $p(-1) = 0, p(2) = 0$ and $p(-3) = 0$

## *Concept :- Polynomial remainder*

7. Check whether $x - 1, x + 2, x - 2, x + 3$ are the factors of $x^3 - 2x^2 - 5x + 6$. If not, find the remainders

8. Check whether $2x - 1$ is a factor of $2x^2 + 5x - 4$.

9. Prove that $2x + 3$ is a factor of $2x^3 + 3x^2 - 8x - 12$.

10. Find the quotient and remainder on dividing $x^2 - 5x - 15$ by $x - 2$.

11. Find the quotient and remainder on dividing $x^2 + 11x + 15$ by $x + 2$.

12. Find the quotient and remainder on dividing $x^3 - 3x^2 - x + 8$ by $x + 1$.

13. Check whether $x - 1$ and $x + 1$ are the factors of $x^{50} - 1$.

14. Check whether $x - 1$ and $x + 1$ are the factors of $x^{51} + 1$.

15. If $n$ is any odd number, prove that $x + 2$ is a factor of $x^n + 2^n$.

16. By adding a number to $p(x) = x^3 - 4x^2 + 5x - 3$, a new polynomial $q(x)$ is to be formed.

    • What number should be added, so that $x - 1$ is a factor of $q(x)$?
    • What number should be added, so that $x - 2$ is a factor of $q(x)$?

17. The remainder on dividing the polynomial $x^3 + x^2 - 3x + k$ by $x - 1$ is 4. Find the value of $k$.

18. If $x + 2$ is a factor of $2x^3 + kx^2 - x - 6$, find the value of $k$.

*Concept :- Not a correct average, Another average*

1. The score of a batsman in 6 matches are given.

$$10, \quad 15, \quad 20, \quad 22, \quad 18, \quad 5$$

   - Find the mean of these scores.
   - Suppose he scored 130 runs in the $7^{th}$ match. Now what is the mean score ?
   - Is this mean score gives a clear indication of his performance?
   - Find the median of these scores.

2. The height of some children are given in centimetres. Find the mean and median height.

$$110, \quad 117, \quad 100, \quad 120, \quad 105, \quad 128, \quad 125$$

3. Find the mean and median of the following measures.

   - 35, 39, 32.5, 37, 40.5, 36, 33.5, 35.5, 31, 33

   - 2.350, 2.400, 3.150, 2.600, 2.550, 3.050, 2.450, 2.750, 3.000

   - 10, 14, 18, 22, 26, 30, 34, 38

*Concept :- Frequency and median*

4. The table below gives the rainfall during a day of July.
   Find the median rainfall in a day.

| Rainfall(mm) | Number of days |
|---|---|
| 5 | 2 |
| 10 | 3 |
| 15 | 6 |
| 20 | 8 |
| 25 | 5 |
| 30 | 4 |
| 35 | 2 |
| 40 | 1 |

5. Daily wages and number of workers working in a company are listed.
   Calculate the median daily wage.

| Daily wages(Rs) | Number of workers |
|---|---|
| 250 | 2 |
| 300 | 3 |
| 350 | 6 |
| 400 | 9 |
| 450 | 8 |
| 500 | 7 |
| 550 | 5 |

6. Calculate the median.

| Monthly income | 10000 | 9000 | 7000 | 12000 | 11000 | 13000 | 8000 |
|---|---|---|---|---|---|---|---|
| No.of families | 13 | 11 | 3 | 4 | 7 | 2 | 5 |

## *Concept :- Classes and median*

7. The table shows the students in a class sorted according to their marks.

| Mark | No.of students |
|------|----------------|
| 0-20 | 2 |
| 20-40 | 4 |
| 40-60 | 10 |
| 60-80 | 5 |
| 80-100 | 4 |

- At which position the median mark occur?
- Which is the median class? How many students are there in the median class?
- Write the subdivisions. If we write the middle values of the subdivisions as an arithmetic sequence, what is first term?, what is the common difference?
- Calculate the median mark.

8. Daily wages and number of workers working in a company are listed.

| Daily wages | Number of workers |
|-------------|-------------------|
| 200-300 | 5 |
| 300-400 | 10 |
| 400-500 | 25 |
| 500-600 | 6 |
| 600-700 | 4 |

- Find the positions of the middle values we need. Find the median class.
- How many workers are there in the median class?
- Write the daily wages as an arithmetic sequence and calculate the median wage.

9. Find the Median

| Age | No |
|------|----|
| 0-15 | 2 |
| 15-30 | 5 |
| 30-45 | 10 |
| 45-60 | 15 |
| 60-75 | 6 |
| 75-90 | 3 |

10. Find the Median

| Weight(kg) | No |
|------------|----|
| 20-26 | 3 |
| 26-32 | 5 |
| 32-38 | 12 |
| 38-44 | 6 |
| 44-50 | 2 |

11. Find the Median

| Monthly income | No.of families |
|----------------|----------------|
| 4000-5000 | 20 |
| 5000-6000 | 50 |
| 6000-7000 | 100 |
| 7000-8000 | 40 |
| 8000-9000 | 10 |
| 9000-10000 | 5 |

12. Find the Median

| Electricity bill (in Rupees) | Number of families |
|------------------------------|--------------------|
| 0-50 | 2 |
| 50-100 | 6 |
| 100-150 | 15 |
| 150-200 | 20 |
| 200-250 | 16 |
| 250-300 | 10 |
| 300-350 | 1 |

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