INTERBELL MATH
VERSION - 22

INTERBELL STUDENT SUPPORT MATERIAL
SSLC Mathematics - 2022

Workshop participants

Rajesh M, Kalladi HSS Kumaramputhur

Thomson Kumaranelloor, GHSS Aanakkara

Manoj Kumar, KTMHSS

Jayakrishnan K. A, DBHSS Thachampara

Suresh K. C, DBHSS Thachampara

Prasad P. S, DBHSS Thachampara

Sudha, Mundoor HSS

Anitha, Pathiripala GHSS

Bindu N, P K HSS Mannapra

Gopikrishnan, Mudappallur GHSS

Shameer M, GHS Nagalassery

Coordination: Dr. M. Shaheed Ali, Senior Lecturer DIET Palakkad

Index

Preface

Mathematics is one of the most support needed subjects for students writing SSLC exams. The main reason is, that children do not understand in the right sense, right meaning and application of ideas. It is hoped that this will reduce some of the learning gaps in the online period of teaching by providing real-time support. INTERBELL MATH version 22 prepared by the Interbell team members of the district under the guidance of Palakkad Diet will give enough strength for that ..

Congratulations

1 **ARITHMETIC SEQUENCES**

CONCEPTS

> ➢ A sequence got by starting with any number and adding a fixed number repeatedly is called an arithmetic sequence. That fixed number is called common difference

- Find the common difference of the sequence 10,14,18,...

    answer : 14-10 = 18-14 = 4

1. write the sequence with first term 5 and common difference 3   (1)
2. Find the tenth term of the sequence a+1,a+2,a+3,...

           (1)
3. Write the common difference of the arithmetic sequence 13,23,33,...   (1)
4. Write the arithmetic sequence with second term 6 and common difference 4   (1)

    ## **CONCEPTS**

5. The difference between any two terms of an arithmetic sequence is the product of the

    difference of positions and the common difference.

6. The algebraic form of any arithmetic sequence is of the form $x_n = dn + x_1 - d$

    ✗ The algebraic form of an arithmetic sequence is 7n + 3 what is its common difference? answer : 7

    ✗ The first term of an arithmetic sequence is 3, its common difference is 5, write its algebraic form. What is its 10th term **?**
        (4)

$$x_n = dn + x_1 - d$$
$$= 5n+(3-5)$$
$$= 5n-2$$
$$10^{th}\, term = 5 \times 10 - 2$$
$$= 50 - 2 = 48$$

If we add 9 times common difference to the first term, we will get ^{10th} term

3+9x5 = 3+45 = 48

5. Find the first term of an arithmetic sequence with algebraic form 2n+3   (1)
6. Find the common difference of an arithmetic sequence with

    algebraic form 5n+1   (1)
7. Write the algebraic form of the sequence 4, 8, 12, 16, ...   (2)

8. Find the first and 20th term of the sequence 3n+2   (2)

9. What is the common difference of the sequence 15, 20, 25, ...? Find the difference between 10th and 20th terms   (2)

10.   What is the common difference of the sequence 10,20,30,... Which is the first three digit number in this sequence?   (2)

11.   What is the remainder when the terms of the sequence 5n+2 divided by 5? Is 102 a term in this sequence?   (2)

12.   Find the 25th term of the arithmetic sequence with 5th term 17 and common difference 5   (2)

13.   Write the sequence of numbers between 100 and 200 which leaves remainder 3 on division by 5. Mention its last term   (2)

14.   Find the 30th term of the sequence with algebraic form 3n+1. Also find the sum of its first 30 terms. Is 302 a term in this sequence ?   (4)

15.   The sum of first and tenth term of a sequence with 10 terms is 50. What is the sum of second and ninth terms? If its fifth term is 24,then what is its sixth term? Find the first term and common difference   (4)

16.   If in a sequence the 10th term is 40 and 18th term is 88 then what is its common difference ? Is 168 a term in this sequence?
            Write its algebraic form.   (4)

17.   What is the remainder when the terms of the sequence 100, 109, 118, ... are divided by 9? write the three digit number sequence of multiples of 9. What is the position of 999 in this sequence?   (4)

CONCEPTS

➢ In an arithmetic sequence, if the sums of positions of two pairs of terms are equal, then the sums of the pairs of the terms are also equal.

➢ If the number of terms n is even, then there will be $\dfrac{n}{2}$ such pairs. Then

    Sum = number of pairs x sum of a pair

➢ If n is odd , then Sum = middle term x number of terms

- ➢ Sum to n terms of an arithmetic sequence, $S_n = \dfrac{n}{2}(first\ term + last\ term)$

- ➢ Algebraic form of an arithmetic sequence is $s_n = \dfrac{d}{2}n^2 + \left(f - \dfrac{d}{2}\right)n$

- • The sum of first n terms of an arithmetic sequence is $2n^2 + 3n$, what is its first term?

  (2, 3, 4, 5)   answer : 5

18. The sum of first n terms of the sequence is n^2 , What is its first term?   (1)

19. The sum of first n terms of the sequence is $2n^2 + 3n$, what is its common difference? (1)

20. What is the remainder when the terms of the sequence 99, 108, 117, ... are divided by 9?   (1)

21. Find the common difference of the sequence 15,13,11,9,...   (1)

22. The first term of an arithmetic sequence is 8, its 21st term is 108. Find the sum of first 21 terms.   (2)

23. The sum of first 9 terms of an arithmetic sequence is 45,

    write the sequence.   (2)

24. What is the second term of the sequence with sum of first n-terms

    is $3n^2 + 4n$ (2)

25. Find the 20th term of the sequence 10, 20, 30... What is the sum of its first 20 terms? Also find the sum first 20 terms of 9, 19, 29, ...   (4)

26. Find the sum of first 20 terms of the arithmetic sequence 19,39,59,...   (4)

27. The sum of first 9 terms of a sequence is 45, sum of first 18 terms is 171. what is the sum of 10th term to 18th term? Find its 5th and 14th term. Find the sum of 5th to 14th terms?   (4)

28. The sum of first 20 term of an arithmetic sequence is 80 more than the sum of first 19 terms. What is its 20th term? What is its common difference if the 10th term is 20 ? Will the difference between any two terms be 2022?   (4)

29.   The first term of a sequence is 10 and is common difference is 6, what is its 11th term? Find the sum of first 21 terms. Write an arithmetic sequence having sum first 21 terms is 1491   (4)

30. Find the sum of numbers between 100 and 300 which leaves remainder 2 when divided by 3.   (4)

31. The sum of first 4 terms of an arithmetic sequence and the sum of its first 9 terms are equal and is equal to 72. What is its 5th term? Find the sum of its first 5 terms. Write the sequence.   (4)

32. The sum of 1st and 21st terms of an arithmetic sequence is 140. What is its 11th term? If the first term is 10, what is its common difference? Write the sequence. Find the sum of its first 11 terms. Also find the sum of first 11 terms of 20, 25, 30, …
                                                                                    (6)

33. The sum of first n-terms of an arithmetic sequence is n^2+2n, find the first term and common difference. Write the sequence. Find the sum of its first 20 terms.
                                                                                    (6)

34. Prove that 1 added to the sum of first n-terms of an arithmetic sequence 3,5,7,… gives a perfect square.   (6)

35. In an arithmetic sequence if the 5th term is 38 and the 8th term is 62, what is its common difference? Will the difference between any two terms be 100? Write the sequence. Find the algebraic form of sum of first n-terms   (6)

36. The algebraic form of an arithmetic sequence is 2n+3, find its first term and common difference. What is the sum of its first n-terms? What about sum of its first 10 terms? Prove that 4 added to the sum of its first n-terms gives a perfect square
                                                                                    (6)

37. a) If the nth term of a sequence is 2n-1, what is its 5th term? Find the sum of first five terms. Also find the sum of first n terms

b) Find the sum of first n-terms of $\dfrac{1}{n}, \dfrac{3}{n}, \dfrac{5}{n}, …$

c) Find the sum of first 2022 terms of $\dfrac{1}{2022}, \dfrac{3}{2022}, \dfrac{5}{2022}, …$ (6)

38.   Consider the following pattern

1

2   3   4

5   6   7   8   9

a)Write the next two lines

b) Find the sequence of last numbers in this pattern

c) What is the last number in the 9th line ?

d) What are the first and last numbers in the 10th line?   (6)

39.   The sum of first 31 terms of an arithmetic sequence is 620. What is its 16th term? Find the sum of 15th and 17th terms. What about the sum of 1st and 31st terms? Write the sequence.   (6)

40.   Find the sum of the following

a) 1+2+3+...+10

b) 2+4+6+...+20

c) 3+6+9+...+30

d) 6+12+18+...+60   (6)

41.   The nth term of an arithmetic sequence is 3n-2, What are its first term and common difference? Write the sequence. Find the sum of first 11 terms. Write algebraic form of sum to n-terms.

(6)

42.   Find the sum of numbers between 200 and 500 which leaves remainder 4 on division by 7. What is the first 4-digit number which leaves remainder 4 when divided by 7?   (6)

43.   If the nth term of an arithmetic sequence is 5n-2, find the sum of first n-terms. How many numbers are there in this sequence less than 500?What is the position of 998 in this sequence? Can the difference between any two terms be 56?   (8)

44.   a) Find the sum of numbers between 100 and 500 which leaves remainder 3 on division by 6.

b) Find the sum of numbers between 100 and 500 which leaves remainder 3 on division by 5.

c) Write the algebraic form of above mentioned sequences   (8)

45.   a) The sum of 7th and 17th term of an arithmetic sequence is 94 and the sum of 4th and 14th term is 70. Find the first term and common difference.

b) in an arithmetic sequence with common difference 4, the sum of first 8 terms is equal

to the sum of next 7 terms. What is the difference between first and ninth terms? Find the difference between seventh and fifteenth terms? Find the eighth term   (8)

ANSWERS

1. 5,8,11,14,...
2. a+10
3. 10
4. 2,6,10,14,...
5. 2x1 + 3 = 5
6. 5
7. x_n = dn +f-d = 4n +4-4 = 4n
8. x_1= 3x1+2 =5, x_{20}= 3x20 +2 = 62
9. d = 5, x_{20} -x_{10}=(20-10)x5 = 50
10.   d= 10,   first 3 digit number = 100
11.   remainder = 2.   102 is term in this sequence
12. x_{25} =x_5+20d = 17+20x5 = 117
13.   103,108,111,...,198\
14. x_{30} = 3x30+1 = 91, x_1= 4, S_{30}= $\frac{30}{2}$ (4+91) = 1425,   302 is not a term
15. x_2+x_9 = 50 x_5+x_6 = 50 x_6 = 50-24 = 26 d=26-24= 2 x_1=x_5-4d = 24 - 8 = 16

16. $\dfrac{x_{18}-x_{10}}{18-10}$ = d   d = $\dfrac{88-40}{8}$ = 6   168 is not a term in this sequence

x_1 = x_{10}-9d =40-54 = -14 x_n = 6n +(-14-6) = 6n -20

17.   remainder = 1   sequence: 108,117,126,... x_n= 9n+99

9n+99=999   n = 100   999 is 100th term

18. 1^2= 1

19.   2x2 = 4

20.   0

21.   -2

22. S_{21} = $\dfrac{21}{2}$ (8+108) = 21x58 = 1218

23.   middle term = $\dfrac{45}{9}$ = 5   sequence : 1,2,3,4,5,6,7,8,9

24. x_1=3+4=7, x_1+x_2 = $3x2^2$+4x2 = 20 x_2 =20-7=13

25. x_{20}=10+19x10 =200 S_{20}= $\dfrac{20}{2}$ (10+200)= 2100

S_{20}=2100-20 = 2080

26. S_{20}= 2100+2080 = 4180

27.   Sum of 10th to 18th terms = 171-45 =126

x_5 = $\dfrac{45}{9}$ = 5 x_{14} = $\dfrac{126}{9}$ = 14

Sum of 5th to 14th terms = $\dfrac{10}{2}$ (5+14)= 95

28. x_{20}= S_{20}-S_{19} = 80

d= $\dfrac{x_{20}-x_{10}}{20-10}$ = 6   2022 will be a term difference

29. x_{11}=10+10x6 = 70 x_{21}=10+20x6 = 130 S_{21}= $\dfrac{21}{2}$ (10+130) = 1470

sequence with sum 1470 is 10,16,22,...   sequence with sum 1491 is 11,17,33,...

30.   101,104,107,....299   number of terms = $\dfrac{299-101}{3}$ +1=67

S_{67}= 13400

11

31. $x_5 = \dfrac{72}{9} = 8$ $S_5 = S_4 + x_5 = 72 + 8 = 80$ $x_3 = \dfrac{80}{5} = 16$

   $x_5 = x_3 + 2d$ $8 = 16 + 2d$ $d = -4$ sequence ; 24,20,16,12,...

32. $x_{11} = \dfrac{140}{2} = 70$ $d = \dfrac{x_{11} - x_1}{11 - 1} = \dfrac{60}{10} = 6$ 10,16,22,...

   $S_{11} = \dfrac{11}{2}(10 + 70) = 440$ $x_{11} = 20 + 10 \times 5 = 70$, $S_{11} = \dfrac{11}{2}(20 + 70) = $

   495

33. $x_1 = S_1 = 1^2 + 2 \times 1 = 3$ $x_2 = S_2 - S_1 = 8 - 3 = 5$ sequence;

   3,5,7,...

   $S_{20} = \dfrac{20}{2}(3 + 41) = 440$

34. $S_n = n^2 + 2n$ $S_n + 1 = n^2 + 2n + 1 = (n+1)^2$ which is a perfect square

35. $d = \dfrac{x_8 - x_5}{8 - 5} = \dfrac{24}{3} = 8$ 100 cannot be a term difference

      $x_1 = x_5 - 4d = 38 - 32 = 6$ sequence : 6,14,22,...

   $s_n = \dfrac{d}{2}n^2 + (f - \dfrac{d}{2})n = 4n^2 + 2n$

36. $x_1 = 2 \times 1 + 3 = 5$, $d = 2$ $S_n = \dfrac{n}{2}(5 + 2n + 3) = n(4 + n) = n^2 + 4n$,

   $S_{10} = 10^2 + 4 \times 10 = 140$ $S_n + 4 = n^2 + 4n + 4 = (n+2)^2$ is a perfect square

37. $x_5 = 9$, $S_5 = 25$ $S_n = n^2$ c) $S_n = \dfrac{n^2}{n} = n$ d)

   $S_{2022} = 2022$

38.   a) 10 11 12 1314 15 16, 17 18 19 20 21 22 23 24 25   b)

   1,4,9,16,25,...

   c) $9^2 = 81$ d) first term = 82, last term = 100

39. $x_{16} = \dfrac{620}{31} = 20$ $x_{15} + x_{17} = 2x_{16} = 40$ $x_1 + x_{31} = 40$

   $x_{15} = 18$, $x_{17} = 22$. $x_1 = x_{15} - 14d = 18 - 4 \times 2 = -10$ sequence : -10,-8,-6,...

40.   a) $\dfrac{10 \times 11}{2} = 55$ b) $10 \times 11 = 110$ c) $110 + 55 = 165$ d)

   $55 + 110 + 165 = 330$

41. $d = 3$ $x_6 = 3 \times 6 - 2 = 16$ $x_1 = 1$, $x_{11} = 31$ $S_{11} = 176$ $s_n = \dfrac{3n^2 - n}{2}$

   1,4,7,...

42. $x_1 = 207$ $x_n = 494$ number of terms $= 42$ $S_{42} = 14721$

43. $d = 5$, $x_1 = 5-2 = 3$

$$s_n = \frac{d}{2}n^2 + \left(f - \frac{d}{2}\right)n \qquad\qquad s_n = \frac{5}{2}n^2 + \left(3 - \frac{5}{2}\right)n$$

$$s_n = \frac{n + 5n^2}{2}$$

   first term = 3, last term = 498   number of terms = 100

       $5n-2 = 998$ $5n = 1000$ $n = 200$ 998 is the 200th term

   term difference cannot be 56

44.   a) first term = 105,   last term = 495,   d = 6

   number of terms $= \dfrac{495 - 105}{6} + 1 = 65 + 1 = 66$

   sum $= \dfrac{66}{2}(105 + 495) = 33 \, x \, 600 = 19800$

   b) first term = 103,   last term = 498,   d = 5

   number of terms $= \dfrac{498 - 103}{5} + 1 = 79 + 1 = 80$

   sum $= \dfrac{80}{2}(103 + 498) = 40 \, x \, 601 = 24040$

   c) for first sequence $x_n = 6n+3$

   for the second sequence $x_n = 5n+3$

45.   a) $x_1 + 6d + x_1 + 16d = 94$ $2x_1 + 22d = 94$

             $x_1 + 3d + x_1 + 13d = 70$ $2x_1 + 16d = 70$ $6d = 24$, $d = 4$

             $2x_1 + 16x4 = 70$ $x_1 = 3$

        b) $x_9 - x_1 = (9-1)x4 = 32$ $x_{15} - x_7 = (15-7)x4 = 32$

        sum of first 8 terms = sum of next 7 terms

        $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 = x_9 + x_{10} + x_{11} + x_{12} + x_{13} + x_{14} + x_{15}$

        $x_8 = (x_9 - x_1) + (x_{10} - x_2) + (x_{11} - x_3) + (x_{12} - x_4) + (x_{13} - x_5) + (x_{14} - x_6) + (x_{15} - x_7)$

                                $x_8 = 7x32 = 224$

2 CIRCLES

Concepts

"Angle in a semicircle is right.

If we join the ends of a diameter of a cicle to a point inside the circle the angle formed will be more than 90°.....if it is outside....less than 90°"
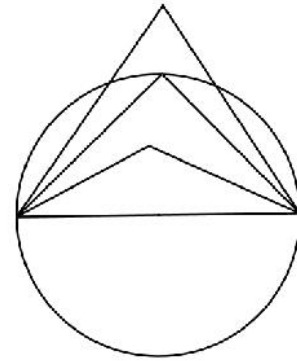
1) PQ is the diameter of the circle and R is a point on the circle.

i) $\angle PRQ$= ....

(1)

ii) S is out side the circle, T is inside the circle. Write your assumption about the measures of $\angle PSQ$, $\angle PTQ$

(1)

iii) In quadrilateral ABCD , $\angle$ A= 60° ,$\angle$ B= 90°, $\angle$ C= 100°, $\angle$ D= 110° If we draw a circle with AC as diameter where will be the positions of B, D out side the circle, inside or on the circle?

(2)
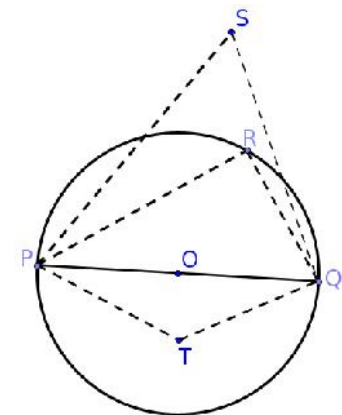
Content

The angle made by any arc of a circle on the alternate arc is half the angle made at the centre.

All angles made by an arc on the alternate arc are equal,and a pair of angles on an arc and its alternate are supplementary.

If all the four vertices of a quadrilateral are on a circle, then its opposite angles are supplementary.

2) Find the value of x in each figure given below.   (4)
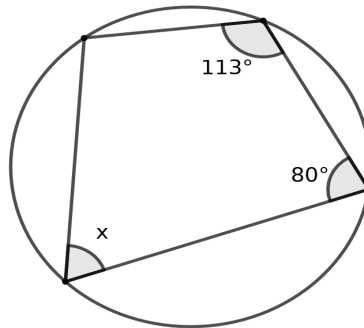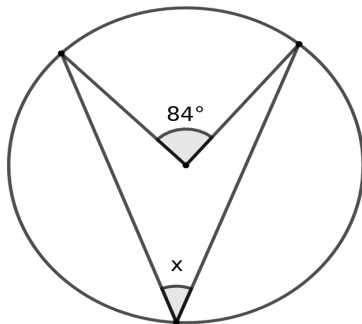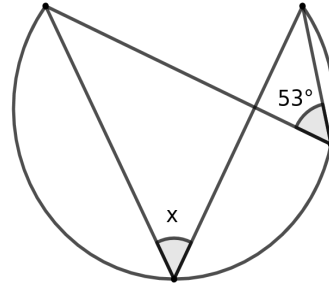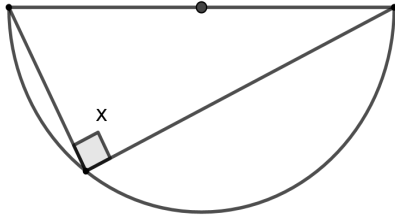
3) O is the circum centre of triangle ABC.

i) If ∠C= 40° then ∠AOB= ....   (1)

ii) If ∠ A= 60° then ∠ BOC= ....   (1)

iii) Two angles of a triangle whose circum radius 2.5 are 30° , 80° . Draw the triangle and measure the smallest side. (4)
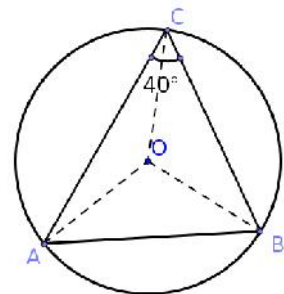
"If all the four vertices of a quadrilateral are on a circle, it is known as cyclic quadrilateral, then its opposite angles are supplementary."
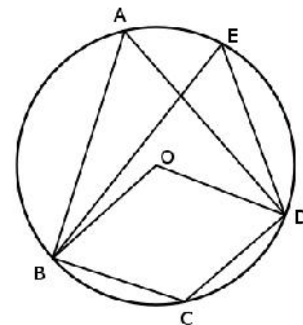
4) Draw a square whose vertices are on the circle with radius 3 cm   (4)

5) In the figure ∠ APB = 50° ,

 a) Find ∠AQB ?

 b) Find ∠AOB ?

 c) Find ∠OAB ?   (4)
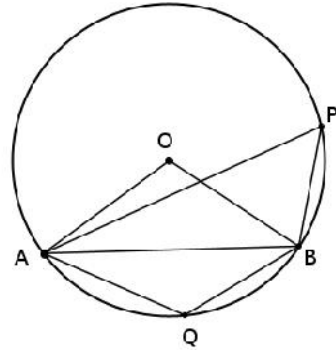
6) All the vertices of PQRS are on the circle.

i) What is the name of the quadrilateral ?
                 (1)

ii) If ∠ POR = 140° then ∠ PSR=........
                 (1)

iii) ∠ PQR=........
                 (1)

iv) If ∠ P= 100° then   ∠ R = ...
                 (1)
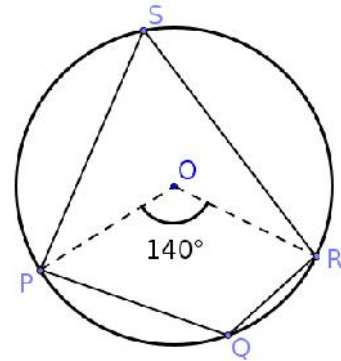
Chords...

"If two chords of a circle intersect within the circle,then the products of the parts of the two chords are equal."

"The product of the parts into which a diameter of a circle is cut by a perpendicular chord, is equal to the square of half the chord."

PA x PB = PC x PD

PA x PB = PC²

16
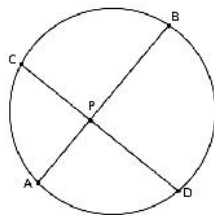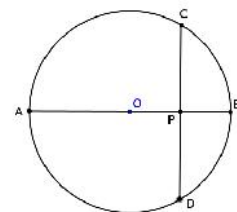
7) Chords AB ,CD intersects at P outside the circle. PB = 3 cm, AB = 13 cm, PD = 4 cm, Find CD .....?(1)

(24, 12, 6, 8)
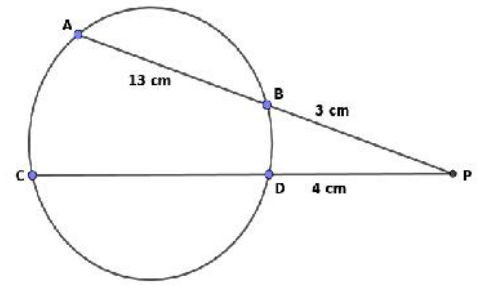
8) In the figure PA = PC ആണ്.
i) PA x PB = ... (1)

ii) Prove that AB = CD
(3)
iii) Whether PB, PD are equi distant from the centr of the circle...? Why ? (2)
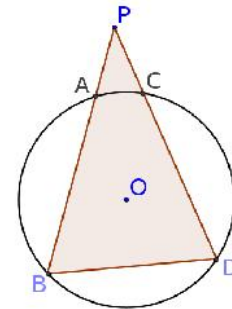
9) Two chords AB,CD intersects at P.
i) Write the relation between PA, PB, PC, PD
(1)
ii) PA= 8 cm ,PB = 3 cm , PC= 6 cm then find the length of PD? (1)
iii) If we draw a rectangle with PA, PB as sides and another rectangle with PC,PD as sides what will be the relation between the areas of that two rectangles ? (2)
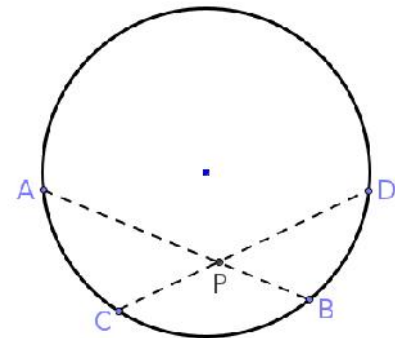
10)AB is the diameter of the circle. CD is perpendicular to AB.
i) PD= 4 then find PC . Find the length of the chord? (1)
ii) PA= 8 cm then find PB ? (1)
iii) What is the area of the rectangle with PA, PB as sides ? What is the area of the square with PC as side ? What is the relation between these two areas ? (2)
iv) Draw a rectangle with sides 5 cm, 3 cm then draw a square having same area. (4)
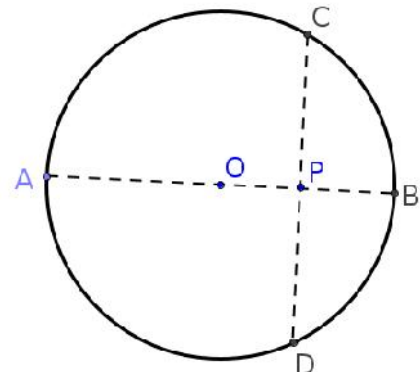
Circles:- Answers

1) i)∠ PRQ= 90 °
   ii) ∠ PSQ ∠ 90°, ∠ PTQ > 90°
   iii) B is on the cicle ,∠ B= 90°
   D is inside the circle, ∠ D> 90°
2) 90°,53°,42°,67°
3) i) ∠ AOB= 80°
   ii) ∠ BOC= 120°
iii) Draw a circle of radius 2.5 cm . Then mark
60°, 160° at the centre of the circle then join the
three points to form a triangle.
4) draw the figure.
5)a) ∠AQB = 180° - ∠APB
        = 180° - 50° = 130° (Angles in the
opposite segments)
b) ∠AOB = 2 x ∠APB = 2 x 50° = 100°
 (Angle in the centre)
c) OA = OB (radius of the same circle)
∴ ∠OAB =∠OBA
= 180° - 100° = 40°
    2

6) i) Cyclic quadrilateral
     ii) ∠ PSR= 70°
     iii) ∠ PQR=110°
     iv) 80°
7) 8 cm
8)8) i) PAx PB = PC x PD
   ii) PA= PC ആയതിനാൽ
      PB = PD
      അതു കൊണ്ട്
      PB - PA = PD - PC
      AB = CD
   iii) At same distance.
      Equal chords are at equal distance from
the centre.
9) i) PA x PB = PC x PD
    ii) PD= 24/6= 4
   iii) Areas are equal.

10) i) PC = 4 cm ,CD=8 cm
   ii) PB = 2 cm
   iii) Area of the rectangle = 8 x 2 = 16 cm^2
  Area of the square = 16 cm^2, Areas are equal.
   iv) Draw the rectangle first. Then extends its breadth into the right-hand side then

draw the perpendicular bisector of the total length and draw a semicircle with half of
that total length. Draw a perpendicular from where the first side of the rectangle
ends to the semicircle. Then take this length as one side of the square and complete
that square.
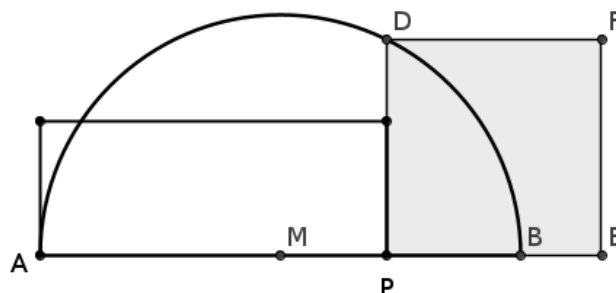
<mark>3</mark> MATHEMATICS OF CHANCE

Probability as a number

If there are 5 black pearls and 7 white pearls in a box, what is the probability of getting one white pearl out of it? So the probability of getting a white pearl is to calculate how much of the white pearl is in total. Then the answer is 7/12

1)If 8 black balls and 6 white balls are taken out of a box, what is the probability that it will turn black?

2)A child is asked to say a two-digit number. What is the probability that the two digits are equal ?

3)Asking someone to say a two digit number What is the probability that it is an perfect square?

4) There are 4 red balls and 6 green balls in a bag. 3 red balls and 7 green balls in another bag.
   a) If one participant from the first bag, what is the probability that it will turn red?
   b) What if you take it out of the second bag?
   c) If the balls in both the bags are put in one bag and a ball is taken out of it, what is the probability that it will turn red?

5) 10 A has 22 boys and 18 girls. If a child is selected to participate in a math fair
   a) What is the probability that the child will be a boy?
   b) What is the probability that the child will be a girl?

6) The numbers from 1 to 30 are written on different paper slips and put in a box. If a slip is chosen without looking,

   a) What is the probability of becoming an even number?
   b) What is the probability of becoming a prime number?

7) There are 6 black balls, 5 red balls and 9 yellow balls in a bowl. If you take a ball without looking at the bowl, then
   a) What is the probability of getting a black ball?
   b) What is the probability of getting the yellow ball?

8) The total number of children in a class is 40. If a child is selected from this, the probability of it being a boy is 3/8. If so

      a) What is the number of boys in the class?
      b) What is the number of girls?
      c) How many boys should be added to get the probability of getting boys become 1/2

9) Someone is asked to say a two digit number
      a) What is the probability of being a multiple of ten?
      b) What is the probability that the two digits of the said number are the same number?
      c) What is the probability that the said number is an perfect square ?

10) A box contains a total of 60 pearls, including black and white pearls. If a pearl is taken from it, the chance of it becoming white is 2/5. If so
      a) What is the number of white pearls?
      b) What is the number of black pearls?
      c) How many white pearls should be added to get the probability become 1/2

11) There are 7 white pearls and 13 black pearls in a box.
      a) If you take a pearl without looking at the box, it will turn white
      How likely is it?
      b) Put 2 more black pearls in the box and take one pearl
      what is the probability it to be black?

12) What is the probability of getting 5 Sundays in December in the calendar year?

Geometrical probability

Most of the problems with using geometric images mean that it is possible to estimate the area of the shaded part over the total area of the image. In many pictures the total area and the shaded area can be easily divided into same geometric shapes and the answer can be easily seen.

For example, if a dot is made in the image below, what is the probability that it will be on the shaded area?
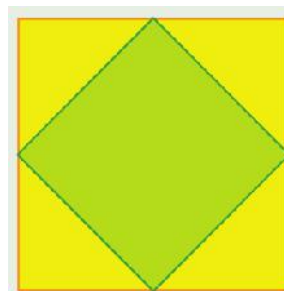
Look at the way this image is divided into identical geometric shapes
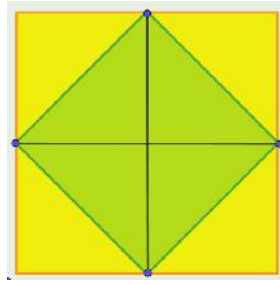
13) What is the probability that a dot in the image below will occur on the shaded area?
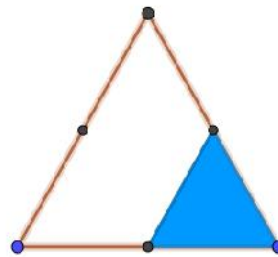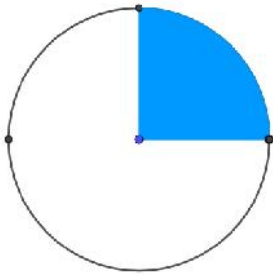
Possibility when coming in pairs

Some questions may need to be considered in pairs, when considering the total number. The probability of seeing how many of the pairs we need, out of the total number of pairs in such problems means that, for example, in one box there are three slips of 1, 2, 3, and in another box there are two slips of 1, 2 and if we take one slip from each box, what is the probability that the sum will be 4?

In this, if you take one slip from each box, you will get a pair of slips. First calculate how many such pairs there are. It is possible to calculate how many pairs of sum is 4 we need in it.

14) A bag contains 5 black balls, 7 white balls and 8 red balls. Another bag contains 6 black balls, 4 white balls and 5 red balls. If a child picks up a ball from each of the two bags without looking at the bag

    a) What is the probability that both are white balls?
    b) What is the probability of getting the same colour?
    c) What is the probability of getting different colour?
    d) What is the probability of getting at least one white ball?

15) Put 5 pieces of paper 1, 2, 3, 4, 5 in one box and 4 pieces of paper 2, 3, 6, 8 in another box. Each piece of paper is taken out of each box without looking at the box. Then on the pieces of paper taken.

    a) What is the probability that the two are even numbers?
    b) What is the probability that both are even numbers?
    c) What is the probability that the first number is an even number?
    d) What is the probability that at least one is an even number?

16) There are 60 children in a class. 30 of them are boys. Another class has 50 children, 25 of whom are boys. If only one child is selected from each class

    a) What is the probability that it is both girls?
    b) What is the probability that there will be at least one girl in it?

Answers

1) probability = 8/14 = 4/7
2) probability   = 9/90   =   1 / 10
3) probability   = 6/90   =   1 / 15
4. a) 4/10
   b) 3/10
   c) 7/20
5. a) 22/40
   b) 18/40
6 a) 15/30
   b) 10/30
7 a) 6/20
   b) 9/20
8 a) 40 x 3/8 = 15
   b) 40-15 = 25
   c) $\dfrac{15+x}{40+x}=\dfrac{1}{2}$
     x = 10
9 a) 9/ 90
  b) 9/90
  c) 6/90

10 a) 2/5 X 60 = 24
   b) 60 – 24 = 36
   c) 12
11 a) 7/20

   b)5/22

12 There are 31 days in December

   4 full weeks and 3 days

The probable three days are

1)	Sunday	Monday	Tuesday
2)	Monday	Tuesday	Wednesday
3)	Tuesday	Wednesday	Thursday
4)	Wednesday	Thursday	Friday
5)	Thursday	Friday	Saturday
6)	Friday	Saturday	Sunday
7)	Saturday	Sunday	Monday

Total possibilities = 7

having Sunday = 3

required probability = 3/7

4 SECOND DEGREE EQUATION

Main points to remember
*Square completion
*Quadratic equation

$$a x^2 + b x + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

4.1 – (one mark each)

1. If square of a number is 225, which is the number?
2. Area of a rectangle is 40cm². If length is "x", what is the breadth?
3. Which number is to be added to x^2+10x, to get a perfect square?
Answers

1. $x^2 = 225$, x =15
2. length + breadth   = 40/2 = 20
    l = x, b = 20-x
3. $(10/2)^2 = 5^2 = 25$

4.2 – (2 marks each)

1. When 4 times a number is subtracted from its square, got 221. Which is the number?

2. The product of a number and 6 less than it is 135. which is the number?

3. Product of two consecutive terms of an arithmetic sequence with common difference 6 is 160
a) Find the numbers
b) Find their sum

4. The product of 2 consecutive multiples of 8 is 384.
a) Form second degree equation
b) Find the numbers

5. a) Which number is to be added to x^2+12x to get a perfect square?
   b)$x^2+12x = 64$, x=?

Answers

1. $x^2 - 4x = 221$
    $x^2 - 4x + 4 = 221 + 4$
    $(x-2)^2 = 225 = 15^2$
     $x-2 = 15$
     $x = 17$

2. $x(x-6) = 135$
     $x^2 - 6x = 135$
     $x^2 - 6x + 9 = 135 + 9$
      $(x-3)^2 = 144 = 12^2$
       $x-3 = 12,\ x = 15$

3. a) $x, x+6$
       $x(x+6) = 160$
       $x^2 + 6x = 160$
       $x^2 + 6x + 9 = 160 + 9$
$(x+3)^2 = 169 = 13^2$
$x+3 = 13,\ x = 10$
Numbers = 10, 16
   b) Sum = 10 + 16 = 26

4. a) $x,\ x+8$
      $x(x+8) = 384$
      $x^2 + 8x = 384$
    b) $x^2 + 8x + 16 = 384 + 16 = 400$
     $(x+4)^2 = 20^2$
     $x+4 = 20,\ x = 16$

5. a) $(12/2)^2 = 6^2 = 36$
    b) $x^2 + 12x = 64$
      $x^2 + 12x + 36 = 64 + 36 = 100$
      $(x+6)^2 = 10^2,\ x+6 = 10,\ x = 4$

4.3 – (4 marks each)

1. Product of 2 consecutive even numbers is 528
a) If one is x, which is the other number?
b) Form second degree equation
c) Find the numbers

2. Perimeter of a rectangle is 44cm and area is 120 sq.cm
a) length +breadth = ?
b) If length is x, what is breadth?
c) Find length and breadth

3. Fill in the blanks
a) $x^2 + 4x = 140$
b) $x^2 + 4x + \text{-----} = 140 + \text{------}$
c) $(x + \text{-----})^2 = \text{------}$
d) $x + 2 = \text{-----}$
e) $x = \text{------}, \text{------}$

4. What will be the length and breadth of a rectangle whose perimeter is 36 cm, and area is 32 sq.cm?

5. Rectangular shaped play ground has perimeter 60m.
a) if breadth is x, what is length?
b) If the area is 176sq. c.m, find length and breadth

Answers

1. a) x , x+2
b) $x(x+2) = 528$
   $x^2 + 2x = 528$
   $x^2 + 2x + 1 = 528 + 1 = 529$
   $(x+1)^2 = 23^2$
   $x + 1 = 23, x = 22$
c) 22, 24

2. a) length + breadth = 22
   b) l = x, b = 22-x
c) $x(22-x) = 120$
$22x - x^2 = 120$
$x^2 - 22x = -120$
$x^2 - 22x + 121 = -120 + 121 = 1$
$(x-11)^2 = 1, x-11 = 1, x = 12$
l = 12, b = 10

3. a) $x^2 + 4x = 140$
b) $x^2 + 4x + 4 = 140 + 4$
c) $(x + 2)^2 = 12^2$
d) $x + 2 = \pm 12$
e) $x = 12-2, x = -12 -2$
   $x = 10, -14$

4. 2(length + breadth) = 36
 l = x, b = 18-x
$x(18-x) = 32$
$18x - x^2 = 32$
  $x^2 - 18x = -32$
  $x^2 - 18x + 81 = -32 + 81 = 49$
  $(x - 9)^2 = 7^2$
  $x - 9 = 7, x = 16$
length and breadth- 16,2

5. a) 30-x
 b) x(30-x) = 176
   30x – x² = 176
    x²-30x = -176
    x²-30x +225= -176 +225 = 49
    (x – 15)² = 7²
     x   = 22
if breadth is 22cm, length = 8cm

4.4 – (6 marks each)

1. There is a play ground in the shape of a square. A garden with 4m width is set in one side. The area of play ground excluding this is 437 sq.m.
a) What is the shape of play ground now?
b) What is its length?
c) What is the length of sides of square play ground?
d) What is the area of entire play ground?

2. The biggest side of a rectangle is 8cm more than its smallest side. Its area is 180cm².
a) smallest side x, then biggest side?
b) form second degree equation
c) Find length and breadth of the rectangle

3. If x is a counting number
a) What should be added to x^2+16x to get a perfect square?
b) $x^2+ax +16$ is a perfect square, what is the value of a?
c) ax^2+bx+c is a perfect square. Then prove that, $a^2 = 4b$
d) x^2+8x+k is a perfect square, then what will be the value of k?

Answers
1. a)Rectangle   b) x-4
c) x(x-4) = 437
  x² – 4x = 437
   x² – 4x +4 = 437 +4 = 441
   (x – 2)² = 21²,   x -2 = 21, x = 23
d) 23² = 529 sq. c.m
2.a) x, x+8
   b) x(x+8) = 180
    x² +8x =180
     x² +8x +16=180+16 = 196
   (x+4)² = 14²,   x+4 = 14, x = 10
c) 10, 18
3. a) x²+16x+64
  b) a= 8
c) (a/2)² = b, a²/4 = b, a² = 4b
  d) k= 16

5 Trigonometry

If a perpendicular is drawn from one vertex of an equilateral triangle to the opposite side, it becomes two identical right triangles. Its angles are 30°, 60° and 90° each, of which the length of the opposite side of the 90° angle is twice the length of the opposite side of the 30° angle. The length of the opposite side of the 60° angle is equal to $\sqrt{3}$ times of the length of the opposite side of the 30° angle.
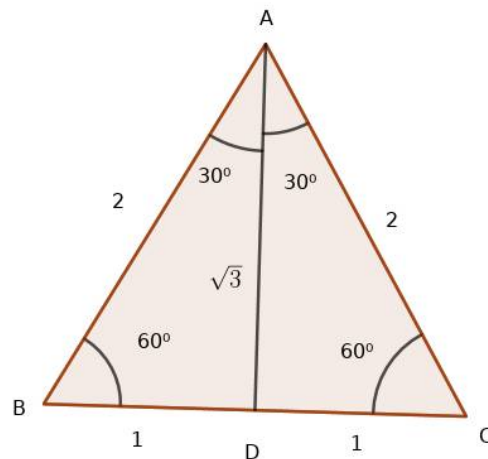
If we draw the diagonal of a square, it becomes two isosceles right triangles. Then its angles will be 45°, 45° and 90° each. The opposite sides of the 45° angles will be of equal length. The length of the opposite side of the 90° angle is $\sqrt{2}$ times of their equal sides.
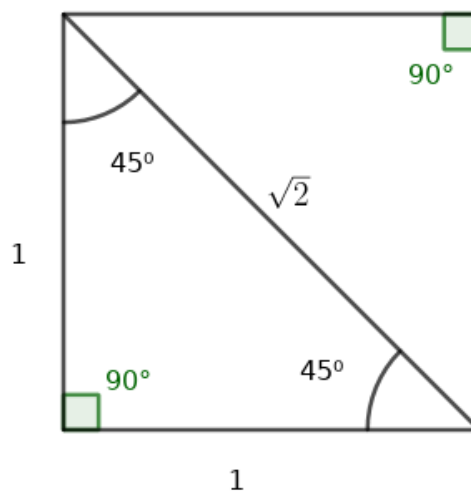
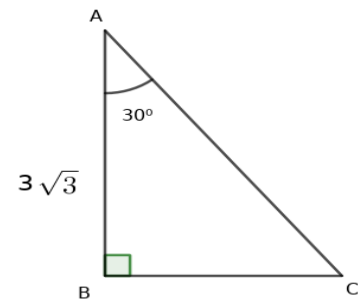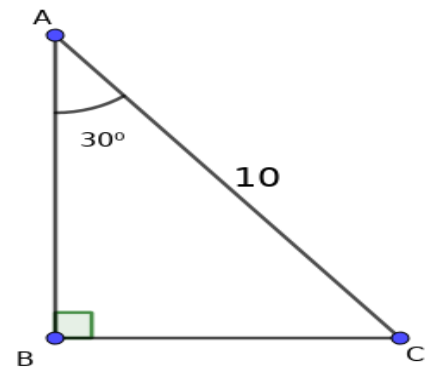|	
1. In right triangle ABC , let ∠C = 30° AC = 6 cm then, (i) What is the length of AB? (ii) What is the length of BC? (2)	
2. In right triangle ABC , let AB = $3\sqrt{3}$ cm (i) What is the length of AC? (ii) What is the length of BC? (iii) What is the perimeter of the triangle? (4)	
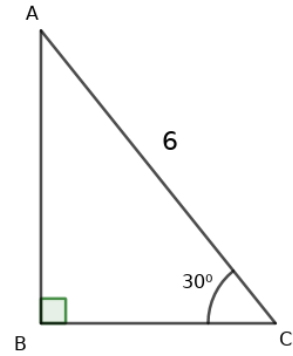
3. In right triangle ABC, let AC = 10 cm
 	
  (I) What is the length of AB ?
 	
  (ii) What is the length of BC?
 	
  (iii) Find the area of triangle ABC.
 	
                             (4)	

4. In right triangle PQR, let PQ = 3 cm (i) What is the length of PR ? (ii) What is the perimeter of square PRST? (iii) Find the area of square PRST? (4)	
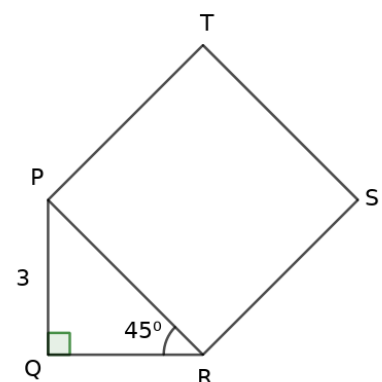
5) If two people standing on either side of a 10 meter high tower viewed the top edge at an angle of elevation of 30° and 60° respectively.

(1) Draw an approximate figure showing these ideas.

(2) What is the distance between those people?

(6)

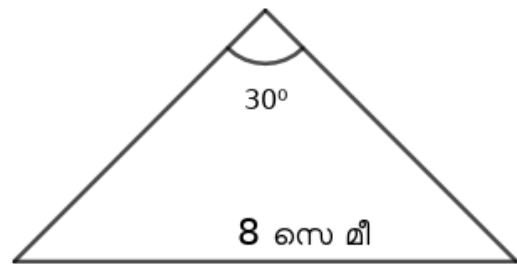6) The angle of the triangle in the figure is 30° and the length of the opposite side is 8 cm.

(a) What centre angle does that side form at its circumcircle ?

(b) If r is the radius of circumcircle, what is the relation between the radius of circumcircle and that side ?

(c) Find the diameter of circumcircle.

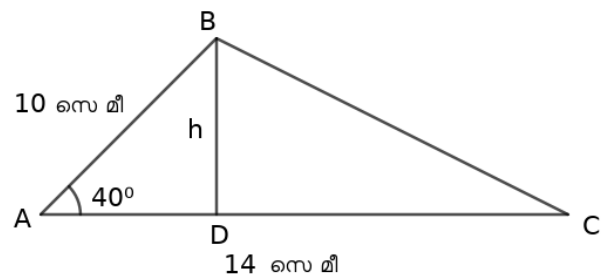(d) Find the circumference of the circle?

(6)

7) In the triangle ABC, 'h' is the perpendicular distance from the vertex B to the side AC. If AC = 14 cm, then

(a) Find the length of h.

(b) What is the area of Δ ABC.

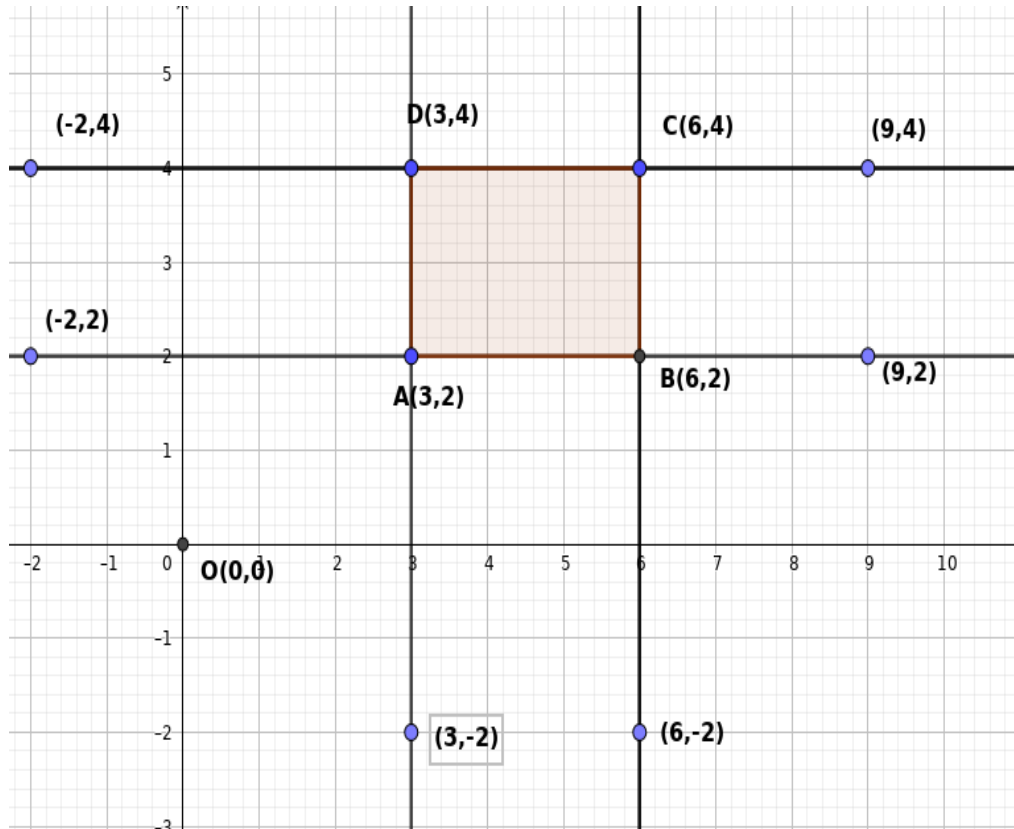[sin(40°)= 0.6428]

(6)

6 CO ORDINATES

9 GEOMETRY AND ALGEBRA

See the picture and try to learn the ideas

Olrigin is O(0,0) .

The y - co-ordinates of the points on the line parallel to the x axis are equal .
eg: (3,2), (6,2), (9,2)

The x - co-ordinates of the points on the line parallel to the y axis are equal
 eg: (3,4),(3,2),(3,-2) .

The y co-ordinates of points on the x axis is 0.
eg: (1,0), (2,0), (4,0), (-1, 0)

The x co-ordinates of points on the y axis is 0
eg: (0,1),(0,2)(0,4),(0,-1)

In rectangle ABCD ,

a) Since the side AD is parallel to the y axis, the x co ordinates of A and D are 3
A(3,2), D(3,4).

b) Since the side BC is parallel to the y axis, the x co ordinates of B and C are 6
 B(6,2), C(6,4).

c) Since the side AB is parallel to the x axis, the y co ordinates of A and B are 2
 A(3,2), B(6,2).

d) Since the side CD is parallel to the x axis, the y co ordinates of C and D are 4.
C(6,4), D(3,4).

1)Classify the points given below as,
     a) Points on x axis
     b) Points on y axis
     c) Points on the line parallel to the x axis
     d) Points on the line parallel to the y axis
     e) Non axis points
     f) Origin

    (0,5),(2,3),(-2,0),(7,3),(2,-4),(-1,3),(0,1),(4,0),(0,0)   (6)

- The y - co-ordinates of the points on the line parallel to the x axis are equal . (x_1, y) (x_2, y)
- The x co ordinates of the points on the line parallel to the y axis are equal . (x, y_1) (x, y_2)

2) Write the co-ordinates of the corners of the square ABCD?
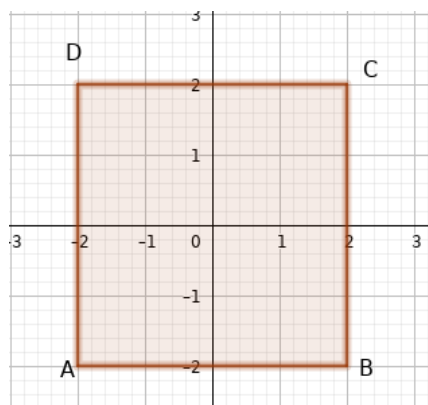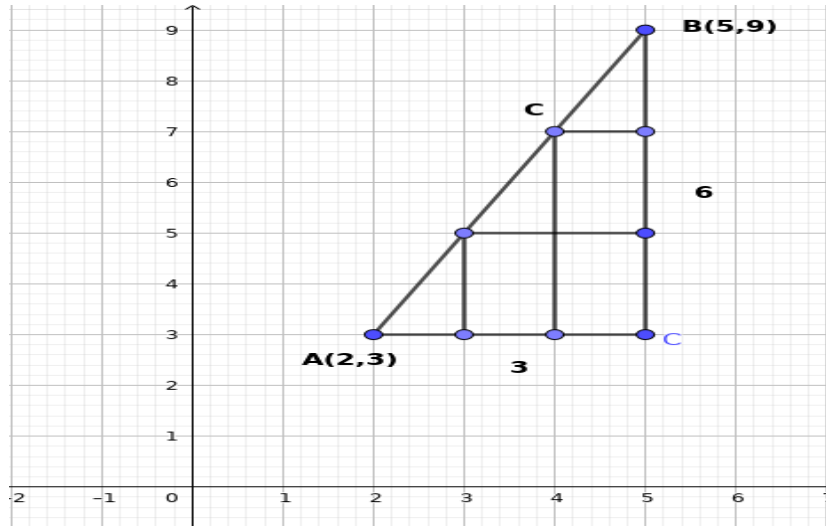
See the picture and try to learn the ideas

B is 3 right and 6 above A

Slope of AB $= \dfrac{6}{3}$

Length of AB $= \sqrt{3^2 + 6^2}$

Midpoint AB $= (\dfrac{2+5}{2}, \dfrac{3+9}{2})$

C(4,7) divides the line AB in the ratio 2 : 1

3) Without drawing co ordinate axes, Mark each pair of points below with right-left, top-bottom position correct.

A(3,2), B(4,-3), C(-1,4), D(-4,-5)   (2)

The distance between the points (0,0) (x, y) is $\sqrt{x^2 + y^2}$

4) Find the distance between origin and the point (3,4) ?   (2)

The midpoint of the line joining the points (x_1, y_1) and (x_2, y_2) is $(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2})$

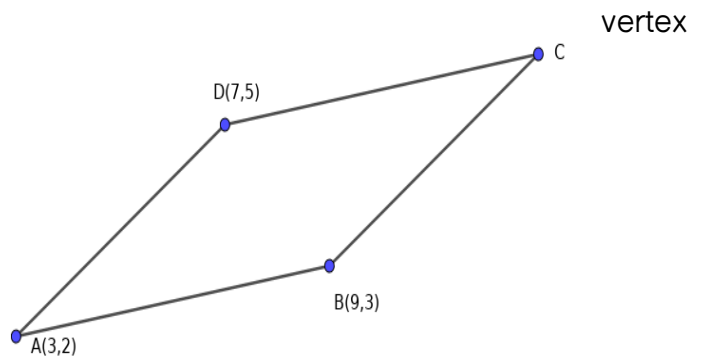5) Find the co ordinates of the midpoint of the line joining the points (2,3) and (6,7)   (2)

6)

a)Mark the points A (1,4), B (4,10)
b)Find the co ordinates of the midpoint of the line AB
c) What are the co ordinates of the point which divides the line AB in the ratio 2:1?

(4)

If a pair of opposite vertices of a parallelogram are (x_1, y_1) and (x_2, y_2) and the other pair of opposite vertices are (x_3, y_3) ,(x_4, y_4) then x_1+ x_2 = x_3 + x_4 , y_1+y_2= y_3+ y_4.

---

7) What are the co ordinates of the fourth   vertex
of the parallelogram ABCD?

In any line not parallel to either axis ,the change in y is proportional to the change in x.

8) Find the value of k , If the points (5,4), B (8,7) C(k,16) are on the same line ?   (2)

The y co ordinates of the points on the line parallel to the x axis are equal. (x1, y) (x2, y)

The x co ordinates of the points on the line parallel to the y axis are equal. (x, y1) (x, y2)

The distance between the points with co ordinates (x_1, y) (x_2, y) is |x_1 - x_2|
The distance between the points with co ordinates (x, y_1) (x, y_2) is |y_1 - y_2|
Area of a rectangle=Length x Breadth

9) The rectangle below has sides parallel to the axes
      (a) Find the co ordinates of the points B,D
      (b) Find the length and breadth of the rectangle ?
      (c) What is the area of ABCD?

D

C(6,7)

B

A(2,5)
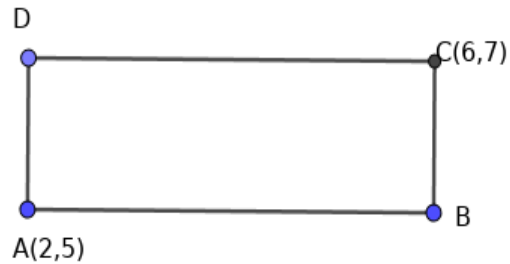
- For any two points on the line joining (x_1, y_1) and (x_2, y_2) Slope= $\dfrac{y2 - y1}{x2 - x1}$
- In any line not parallel to either axis, the change in y is proportional to the change in x.

10) If A (3,5) and B (7,9) are the two points on a line then
     a) What is the slope of the line AB?
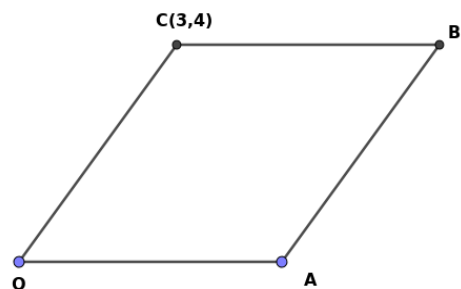   b) Write the co ordinates of any two points on this line?

(2+2)

In a point (x,y)
- The x coordinate denotes the distance of the point from the y axis
- The y coordinate denotes the distance of the point from the x axis
- The distance between (0,0) and (x,y) is $\sqrt{x^2 + y^2}$
- Area of a parallelogram = b × h

11) In rhombus OABC , O is the origin and A is (5,0),
then
 (a)What is the perpendicular distance from the point
    C to OA?
 (b)What is the length of OC?
 (c) What is the area of the rhombus OABC ?

C(3,4)

B

O

A

(2+1+1)

- Area of a triangle = $\frac{1}{2}$b×h
- The distance between the points $(x_1\ 0))\ (x_2, 0)$ on the x axis is $|x_1 - x_2|$
- The distance between the points $(0,\ y_1))\ (0, y_2)$ on y axis is $|y_1 - y_2|$
- The x coordinate of a point on y axis is 0

12) In the figure O is the origin and area of the triangle is 12 cm².

a) Write the length of AB?
b) Write the length of OC?
c) write the co ordinates of the point C?

(1+2+1)
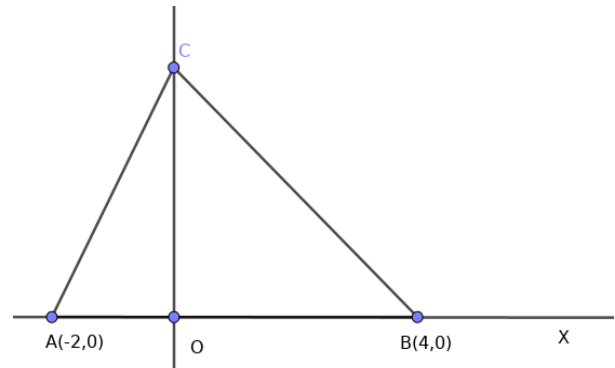
**In (x,y) The x co ordinate denotes , the distance of the point from the y axis
The y co ordinate denotes ,the distance of the point from the x axis**

The angles of an isosceles right triangle are 45°,45°,90°

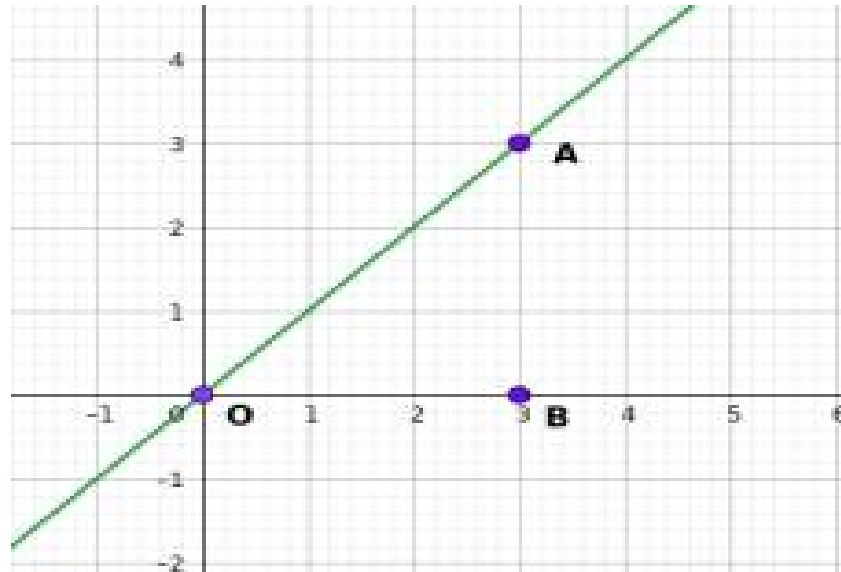**The distance between (0,0) and (x, y) is $\sqrt{x^2 + y^2}$**

Area of a triangle is $\frac{1}{2}$ b×h

In any line not parallel to either axis ,the change in y is proportional to the change in x.

**The equation of a line joining the points (x₁, y₁) (x₂ ,y₂)
is $\dfrac{y - y_1}{x - x_1} = \dfrac{y_2 - y_1}{x_2 - x_1}$**

The general form of a line is ax+by+c=0

13) See the figure,

     (a) What are the co ordinates of A?

     (b) What is ∠AOB ?

     (c) What is the length of OA ?

     (d) What is the area of the triangle AOB ?

     (e) Write the co ordinates of any two points on the line OA?

     (f) Write the equation of the line?

(6)

- **If (x,y) is a point on a circle with origin as its centre, then $r = \sqrt{(x^2+y^2)}$**
- **If we draw a circle with origin as its centre and radius r ,**
- **it cuts the x axis at (r,0) and (- r,0)**
- **If we draw a circle with origin as its centre and radius r ,**
- **it cuts the y axis at (0, r) and (0, -r).**
- **If (x,y) is a point on a circle with origin as its centre then**
- **(-x,y), (-x,-y), (x,-y) are also points on it.**
- **The equation of the circle with origin as its centre is $x^2+y^2 = r^2$**

A(3,4)

O

X

14) A circle is drawn with origin as its centre.

(a)What is the radius of the circle?

(b)Find the co ordinates of the points, where the circle cuts the axes?

(c)Find 8 other points on the circle also write the equation of the circle?
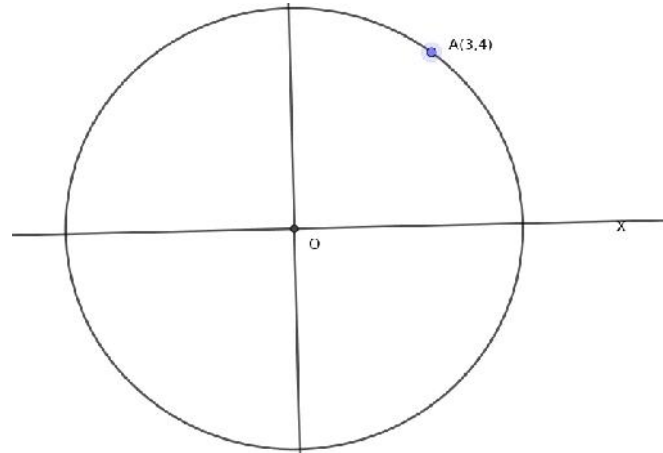
(2+2+4)

- **Area of a triangle = $\frac{1}{2}$ b×h**
- **The y – co-ordinates of the points on the line parallel to the x-axis are equal . (x1, y) (x2, y)**

- **The areas of the triangles between two parallel lines with the same base are equal**

15)
a) Mark the points A (-3,1) B(5,1) C(1,5) by drawing the axes and join them to form a triangle .
b)What is the area of the triangle ?
c) Draw a line through the opposite vertex of the triangle parallel to the base and mark two points on it? Draw another triangle of equal area ?

(3+3+2)

- **Tangent at point on a circle is perpendicular to the radius through that point**
- **The ratio of the sides of a triangle with angles 45° 45° 90° is 1 :1: √2**
- **The y co ordinates of the points on x axis is 0: $(x_1 , 0))$ $(x_2, 0)$**
- **The x co ordinates of the points on y axis is 0: $(0, y_1)$ $(0, y_2)$**
- **The length of the line joining the points (x_1, y_1) (x_2, y_2) is √ $[(x_1-x_2)^2 + (y_1-y_2)^2]$**

16)   a) Draw the co ordinate axes and draw a circle of radius 4 cm with centre as its origin.
b) Draw a radius OP at an angle of 45° with the x-axis and draw a tangent through P .

37

c) If the tangent cuts the axes at the points A, B ,then write the co ordinates of the points and also find the length of AB?

 ANSWERS

1)a) (-2,0) (4,0)(0,0)
b)(0,5)(0,1)(0,0)
c)(2,3)(7,3)
d)(2,3)(2,-4)
e)(2,3)(7,3)(2,-4)(-1,-3)
f)(0,0)

2) A(-2,-2) B(2,-2) C(2,2) D(-2,2)

3)
A(3,2):3 right- 2 up
B(4,-3):4 right 3 down
C(-1,4):1 left- 4 down
D(-4,-5):4 left- 5 down

4)5

5)(4,5)

6)

a) (2 $\frac{1}{2}$,7)

b) (3,8)

7) (13,6)

8) k=17

9)
a) B(6,5) D(2,7)
b) length=4, breadth=2
c) Area=8 cm²

10)
a) Slope=4/4=1
b)(8,10)(9,11)

11)
 a)4
b)5
c) b×h =4×5=20

12)
a)6
b)4
c)(0,4)

13)
a) (3,3)
b)45°
c)3√2
d)9/2
e)(4,4)(5,5)
f)y=x

14)
a)Darw circle through (3,4) with centre as origin
b)5
 Point on x axis are (5,0)(–5,0)
points on y axis are (0,5)(0,–5)
c)x²+y²=25
SET 1: (3,4)(3-4)(-3,4)(-3,-4)
SET 2:(4,3)(4,-3)(-4,3)(-4,-3)

15)a) pricture
b)
AB=8,h=4
Area of the triangle =16 cm²
c)P(1,5) Q(6,5)
ΔABP /ΔABQ are the traingles of equal area to the area of Δ ABC

16)
a) Draw a circle with centre (0,0) and radius 4 cm .
b) Draw the tangent at P
c) (4√2,0) (0,4√2)
 A,B can be in other 3 ways as given below.

(0,4√2) (-4√2,0)
(-4√2,0) (0,-4√2)
(0,-4√2) (4√2,0)

7 TANGENTS

"The tangent at a point on a circle is perpendicular to the diameter through that point."

---
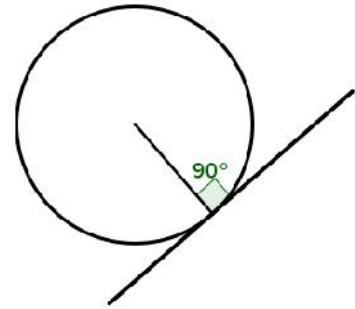
1) O is the centre of the circle with radius 4 cm.PA, PB are the tangents from P .
If ∠APB = 90° then find the lengths of PA,PB

(1)

---
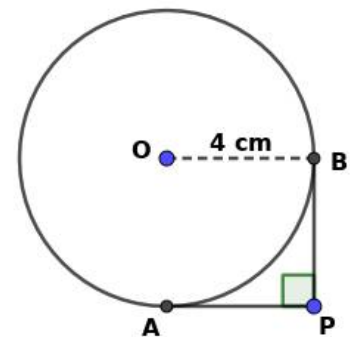
2) Draw a circle of radius 2 cm then mark a point P on the circle then draw a tangent through P.

(4)

---

3) O is the circumcentre of triangle ABC.
i) If ∠ C= 40° , ∠ POQ=........

(1)

ii) If ∠ POR = 120° , ∠ A=.......
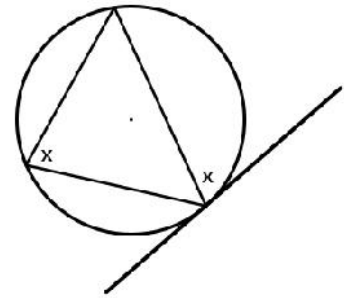
(1)

iii) Draw a circle of radius 3 cm then draw a triangle having two angles 50°, 60° whose sides touches the circle.

(4)
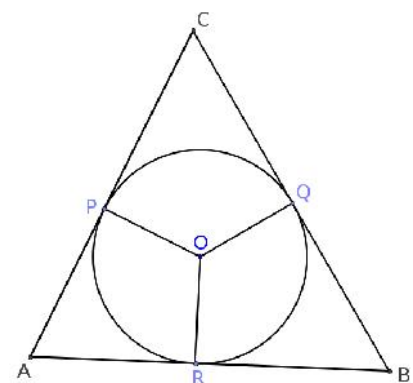
"In a circle, the angle which a chord makes with the tangent at one end on any side is equal to the angle which it makes on the part of the circle on the other side. "

4) In the figure O is the centre of the circle, In triangle ABC ∠ C= 70°. PA, PB are the tangents to the circle. Then

i) ∠ AOB=.......   (1)
ii) In triangle AOB , ∠ BAO= ∠ ABO=.......   (1)
iii) ∠ABP = ∠ BAP =......   (1)
iv) What is the relation betwen ∠ C and the angles made by chord AB with tangents PA,PB.   (1)
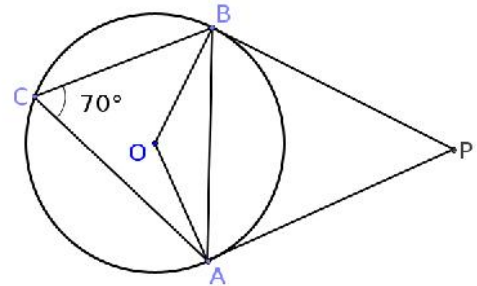
"We can draw two equal tangents from a point which is outside the circle ."

In a circle ,the angles between the radii through two points and the angle between the tangents at these points are supplementary."
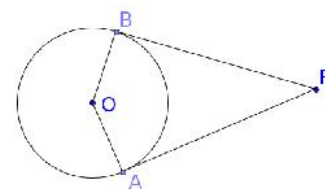
∠AOB + ∠ APB = 180^0

5) PA ,PB are the tangents to the circle with centre O. OA is the radius of the circle.

i) ∠ OAP = ∠ OBP =......
  What is the relation between the lengths of PA, PB ?   (2)
ii) ∠ OAP + ∠ OBP =....
    ∠ AOB+ ∠ APB =......   (2)
iii) Draw a circle of radius 4 cm, then mark a point 9cm away from the centre then draw two tangents from that point to the circle and measure the lengths.   (3)
iv) What is the shortest distance from the centre of a circleto point from where we can draw two tangents ?   (1)
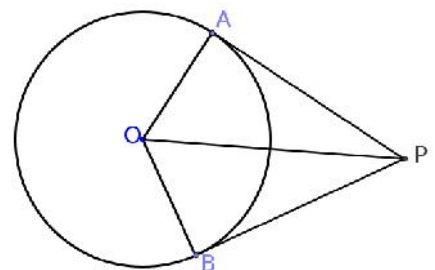
Chord and tangent.
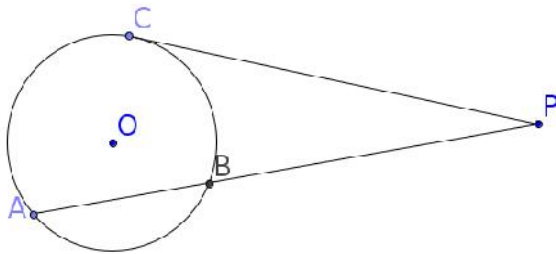
$$PA \times PB = PC^2$$

6) The tangent through C and the chord AB extended intersects at P

i) Write the relation between PA, PB, and PC
            (1)

ii) PB = 9 cm, PC = 6 cm then PA =..........
            (1)

iii) What is the area of the rectangle whose sides are PA,PB ? What is the area of the square whose side is PC ?
                (4)
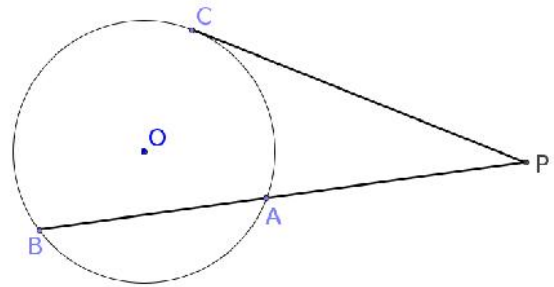
Construction of incircle.

7) ME, MF are two tangents meet at M,O is the centre of the circles touches these two lines.

i) What is the measures of ∠ MEO ,∠ MFO ?
                (2)

ii) If ∠OME = x ° then ∠OMF =..........
                (1)

iii) Draw a triangle with sides 6 cm , 7cm, 8 cm then draw a circle which touches the sides of this triangle.
                (5)

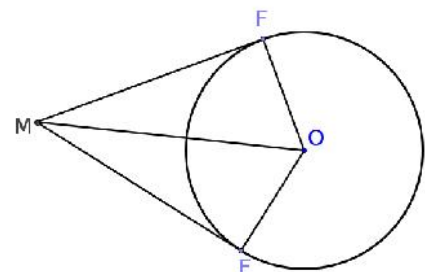Perimeter, Area and Inradius of a triangle........
If half of the perimeter of a triangle is s and area A ,

inradius r ഉം then $r = A / s$

$r = A / s$

---
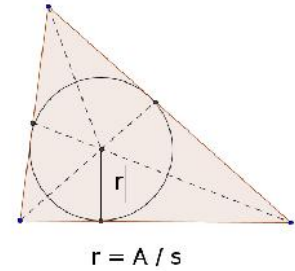
8) The inradius of triangle with sides 5 cm ,6 cm ,7 cm is 2.5 cm.

i) Find the perimeter of the triangle?   (1)
ii) Find the area of the triangle ?   (2)
iii) If the perpendicular sides of a triangle are 6 cm, 8 cm then find its inradius.

(3)

---
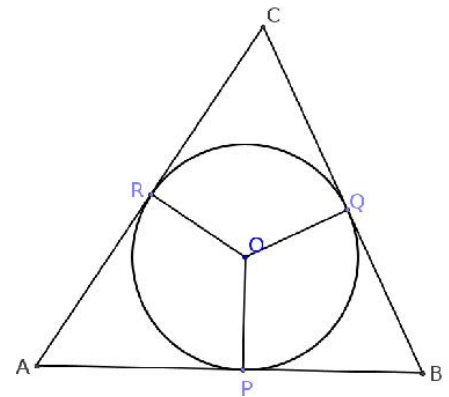
9) Three sides of a triangle are 6 cm,7cm, 9 cm. Find the lengths of AP, BR, CQ .   (6)

TANGENTS: Answers

1) 4 cm

2) Draw the figure

3) i) ∠ POQ= 140°

  ii) ∠ A= 60°

  iii) Draw a circle of radius 3 cm , Draw the radius , Then measure 130°, 120°, 110° at the centre and mark it then draw the radii which cuts the circle in the above measures.Then draw the tangents through that three points which intersects at three different points to complete a triangle.

4) i) ∠ AOB= 140°

  ii) ∠ ABO= 20°

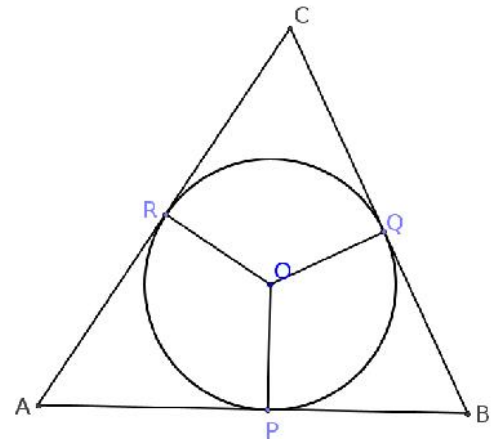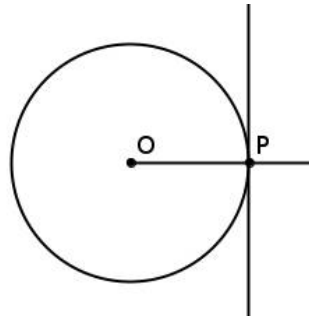 iii) ∠ ABP = ∠ BAP = 70°

  iv) equal

5) i) ∠ OAP = ∠ OBP = 90°

    PA= PB

  ii) ∠ OAP + ∠ OBP = 180°

    ∠ AOB + ∠ APB = 180°

  iii)Draw a circle of radius 4cm with centre O. Mark a point 'P', 9cm away from the centre.Draw the perpendicular bisector of OP then draw a circle with radius half of   OP which intersects the first circle at A,B.Then join PA,PB and measue the lengths.

  iv) Distance from centre has to be more than the radius.

6) i) PA xPB = PC^2

  ii) PA= 4

  iii) AB= 5

  iv) Area of the rectangle = 36cm^2

    Area of the square = 36 cm^2

    Areas are equal

7) i) ∠ MEO= ∠ MFO= 90°

  ii) Equal right triangles.

  iii) ∠ OMF = x°

iv) Draw the figure and measure the radius.

Draw the triangle first. Then draw the bisectors of two angles , then take the point which the two bisectors intersect as the centre of the incircle.Then draw the circle which touches the sides of the triangle. Then measure the radius.
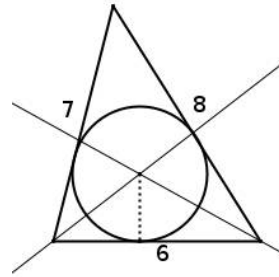
8) i) Perimeter = 18 cm

ii) Area A= r x s = 2.5 x 9 = 22.5 cm^2

iii) Third side = 10 cm

Area = 24cm^2

Perimeter = 24 cm

radius r = A/s = 24/12 = 2 cm

9) Permeter = 9 + 7 + 6 = 22

s = 22/2 = 11

AP = s - a = 11 - 6 = 5

BR = s - b = 11 - 7 = 4

CQ = s - c = 11 - 9 = 2

8 SOLIDS
CONE, SQUARE PYRAMID
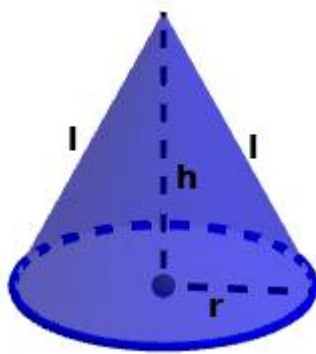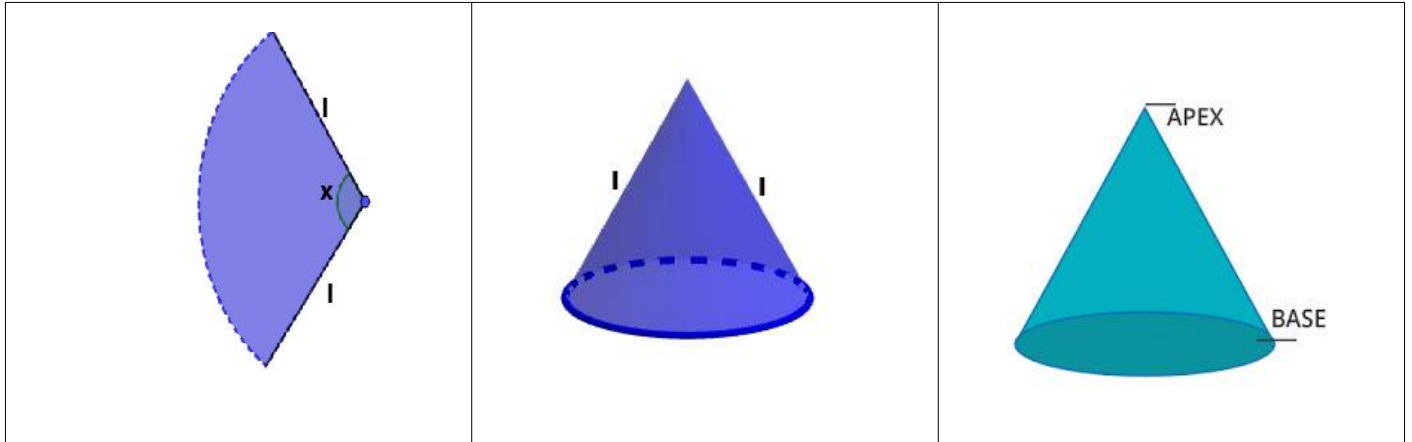
$$r:l=x:360$$

$$h^2+r^2=l^2$$

Lateral area of a cone = Area of the sector used to make that cone

Volume of a cone is one third of the product of its base area and height

1) Base radius is 12 cm, slant height 25 cm, Find the lateral area of the cone?

(1)

(lateral area = $\pi\times12\times25$)

2) Base diameter is 60 cm, height 40 cm, Find the total surface area of the cone ?

(1+1)

(r = 30 cm, l = $\sqrt{30^2+40^2}=50$ Total area = $\pi 30\times 50+\pi\times 30^2$)

3) Having radius 12 cm and center angle 120^0 is bent into form a cone.
   a) What is the slant height of the cone ?
   b) Find the base radius of the cone.
   c) Find the lateral area of the cone.   (1+2+1)

 (a) 12 cm

 b) $\dfrac{r}{12}=\dfrac{120}{360}$ r = 4 cm

 c) $Lateral\,area=\Pi\times 4\times 12$)

4) Base radius of the cone is 12 cm , height is 6 cm
  a) Find the volume of the cone
  b) Ratio of the base radii of two cones is 2:3 ,ratio of their heights is 3:2 .Find the ratio of their volumes.   (1+1)

 [a) Volume = $\dfrac{1}{3}\times\pi\times 12^2\times 6$ b) $2^2\times 3:3^2\times 2$]

5) A cone having slant height 17 cm, and base radius 8cm is melted and recast into small cones having height 3 cm and base radius 2 cm.
  a) Find the height of the large cone.
  b) Find the volume of the large cone
  c) How many small cones can be made ?   (2+1+3)

 (a) $Height=\sqrt{17^2-8^2}=15$

 b) Volume = $\dfrac{1}{3}8^2\times 15$

 c) $\dfrac{8^2\times 15}{2^2\times 3}$)

6) A square pyramid is made from a square sheet of paper as shown in the figure . Base edge of the square pyramid is 10 cm. Lateral edge is 13 cm.

  a) Find the slant height of the cone ?

  b) What is the length of one side of the paper used ?

  c) Find the total surface area of the square pyramid ?
                                  (2+1+1)
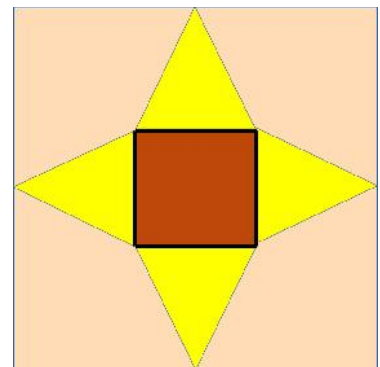
a) slant height = $\sqrt{13^2+5^2}=12$

b) 13+10+13 = 36 cm

c) Total area = $2\times10\times12+10^2$

SPHERE

7) Radius of a sphere is 10 cm.

  a) Find the surface area of the sphere.

  b) Find the volume of the sphere.

 c) What is the area of the hemisphere having same radius ?

 d) Find the ratio of the areas of the sphere and hemisphere having same radius .

                               (1+1+1+1)

(a)   *Area of the sphere* $=4\,\Pi\times10^2$

b)   *Volume* $=\dfrac{4}{3}\Pi\times10^3$

c)   *Area of the hemisphere* $=3\,\Pi\times10^2$

d) 4:3

8) a) One side of a cube is 24 cm, Find the height and base radius of the square pyramid which can be carved from the cube.

  b) Find the volume and area of the square pyramid.

  c) What is the radius of the sphere that can be carved from a cube of side 24 cm having maximum volume ?   (1+4+1)

(a) height = 24 cm, base edge = 24 cm.

b)   *Volume* $=\dfrac{1}{3}24^2\times24$

   Slant height $=\sqrt{24^2+12^2}=\sqrt{720}=12\sqrt{5}$

   Area $=2\times24\times12\sqrt{5}+24^2$

c) radius = 12 cm

9) A hemisphere is attached to one end of a cone having radius 9 cm . Total height of the shape is 21 cm.

      a) Find the height of the cone

      b) Find the total volume of the shape ?   (1+3)

(a) 21 - 9 = 12 cm

b) Total volume of the shape = $\dfrac{1}{3}\Pi\times9^2\times12+\dfrac{2}{3}\Pi\,9^3$

10 POLYNOMIALS

Concepts
- If $p(x) = (x-a)(x-b)(x-c)$, then the factors of $p(x)$ are x-a , x-b , x-c.
- The solution of $(x-a)(x-b)(x-c) = 0$ are , a , b , c
- In a polynomial $p(x)$, if $p(a)=0$, then x-a is a factor of it.
- In a polynomial $p(x)$, if $p(-a)=0$, then x+a is a factor of it.
- If x-a is a factor of $p(x)$, then $p(a) = 0$.
- If x+a is a factor of $p(x)$, then $p(-a) = 0$.
- If x= a is a solution of $p(x)=0$, then x-a is a factor of it.
- If x= -a is a solution of $p(x)=0$, then x+a is a factor of it.
- For any polynomial $p(x)$, and a number a , $p(x)-p(a)$ is a multiple of x-a
- $x^2+px+q = (x+a)(x+b)$ എങ്കിൽ a+b = p , ab = q ആയിരിക്കും.

1 Mark questions

1. If $p(x) = x(x-3)$, find p(4).

2. If $p(x) = x^2-7x-8$,find p(-1).

3. If $p(x) = (x+1)(x-2)$, find p(2).

4. If $p(x)$ a polynomial and $p(-3) = 0$, then Write a factor of $p(x)$.

5. If x+2 is a factor of $q(x)$,find q(-2).

6. If $x^2+8x-105 = (x+15)(x+a)$, find the value of a.

7. sum of two numbers is 17 , their product is 70 , Guess the numbers.

8. In a polynomial $p(x)$, and for a number a , write one factor of $p(x)-p(a)$.

9. If $p(x)$ is a polynomial , then $p(x)-p(3)$ is a multiple of ....

10. If $x^2+18x-100 = (x+a)(x+b)$, find a+b

11. $p(x)$ is a polynomial and $p(-3) = 0$, $p(2)=0$, $p(-1) = 0$. Which of the following is not a factor
    { x+3 , x+2 , x-2 , x+1 }

12. If x-3 , x+4 , x-7 are factors of $p(x)$, Which of the following is a wrong statement ?
    {P(3)=0 , p(-4)=0 , p(-3)=0 , p(7)=0}

2 Mark questions

13. Given $p(x) = 4x^2+x-3$
    a) Find $p(-1)$
    b) Is $x+1$ a factor of $p(x)$?

14. Given $p(x) = 2x^2-5x-3$
    a) Find $p(3)$.
    b) Is $x-3$ a factor of $p(x)$?

3 Mark questions

15. If $p(x) = 2x^2+kx+3$.
    a) Find $p(3)$.
    b) If $x-3$ is a factor of $p(x)$, Find the value of k.

16. $x-2$ is a factor of $x^3-7x+ k$.
    a) Find $p(2)$.
    b) Find the value of k.

17. $P(x)$ is a polynomial such that $p(3)=0$, $p(-2)=0$.
    a) Write two factors of $p(x)$.
    b) Write $p(x)$.

18. $P(x)$ is a polynomial such that $p(\sqrt2)=0$, $p(-\sqrt2)=0$.
    a) Write two factors of $p(x)$.
    b) Write $p(x)$.

4 Mark questions

19. $p(x) = x^3+ax^2-10x+b$, Also $x+1$, $x-4$ are its factors.
    a) Find $p(-1)$, $p(4)$
    b) Find the values of a , b.

20. a) Find the solution of the equation $x^2+6x+8 =0$ using formula.
    b) Hence write x^2+6x+8 as a product of two first degree polynomials.

21. a) Find the solution of the equation $x^2+5x-24 =0$.
    b) Hence write $x^2+5x-24$ as a product of two first degree polynomials.

6 Mark questions

22. If $p(x) = x^2-7x+5$
    a) Find $p(2)$.
    b) Find $p(x) – p(2)$.
    c) Write one factor of $p(x) – p(2)$.
    d) Find the other factor also.

23.   a) If $x^2+8x+15 = (x+a)(x+b)$. write the value of $a+b$, ab.
       b) Hence write $x^2+8x+15$ as a product of two first degree polynomials.
       c) Hence solve the equation $x^2+8x+15 = 0$.

24.   a) Write $x^2 +3x-40$ as a product of two first degree polynomials.
       b) Hence solve the equation $x^2 +3x-40 = 0$.

Answers

1. -4
2. 0
3. 0
4. x+3
5. 0
6. 7
7. 10,7
8. x-a
9. x-3
10. 18
11. x+2
12. p(-3)=0
....
13. a) 11 , b) No
14. a) 0 , b) Yes
....
15. a) 3k+21 , b) -7
16. a) k-6 , b) 6
17. a) x-3 , x+2 , b) $p(x) = (x-3)(x+2) = x^2 -x -6$
18. a) x-√2 , x+√2 b) $p(x) = x^2 – 2$
....
19. a) p(-1) = a+b+9 , p(4) = 16a+b+24
   b) a = -1 , b = -8
20. a) x= -2 , x= -4 , b) (x+2)(x+4)
21. a) x= -8 , x= +3 , b) (x+8)(x-3)
....
22. a) 4 , b) $x^2 -7x +10$, c) x - 2 d) x-5
23. a) 8,15 , b) (x+5)(x+3) , c) -5 , -3
24. a) (x+8)(x-5) , b) x= -8 , 5

11 STATISTICS

1. The marks obtained by five children are given below.
   26, 21, 36, 32, 45

       a) Find Arithmetic mean of these marks.

       b) Find the Median marks of the children.

2. The marks obtained by six children are given below.
   26, 21, 37, 33, 45, 48

       a) Find Arithmetic mean of these marks.

       b) Find the Median marks of the children.

3.   The table below shows the weight of children in a class.

Weight (in kg)	Number of children
40	5
44	6
48	9
52	12
56	8
60	5
64	4

a) If children are placed in ascending order based on weight what is the position of child whose weight is the median?

b) Find the median weight.

Weight (in kg)	Number of children	Number of children
40	5	Up to 40 - 5
44	6	Up to 44 - 11
48	9	Up to 48 - 20
52	12	Up to 52 - 32
56	8	Up to 56 - 40
60	5	Up to 60 - 45
64	4	Up to 64 - 49
Total	49	

    a) The median weight will be the weight of 25th child.

b) The weight of the 21st child to the 32nd child is 52 according to the table. Then the weight of the 25th child is also 52, then the median weight is 52 kg.

4. The table below shows the 45 workers sorted according to their daily wage.

Daily Wage (Rs)	Number of workers
400 - 500	8
500 - 600	11
600 - 700	10
700 - 800	7
800 - 900	9
Total	45

a) Workers are arranged in ascending order based on their wages, what is the position of worker whose wage is considered to be the median?
b) What is the wage of the 20th worker?
c) Calculate the median wage.

Daily Wage (Rs)	Number of workers	Number of workers
400 - 500	8	Up to 500 - 8
500 - 600	11	Up to 600 - 19
600 - 700	10	Up to 700 - 29
700 - 800	7	Up to 800 - 36
800 - 900	9	Up to 900 - 45
Total	45	

a) The median wage will be the wage of 23rd person.
b) According to the table, the wage of the 23rd person will be between 600 and 700 rupees. If 10 people from 20th to 29th are arranged in ascending order at equal intervals between 600 and 700, each will be at a difference of $\frac{700-600}{10} = 10$ rupees. Then the 20th person's wage will be between 600 and 610 that is **605**.

20th	21st	22nd	23rd	24th	25th	26th	27th	28th	29th
600 –	610 –	620 –	630 –	640 –	650 –	660 –	670 –	680 –	690 – 700

c) Median wage = $\frac{630+640}{2} = 635$

If we use the method of arithmetic sequence
20th term $= 605$
23rd term $= 605 + 3 \times 10 = 635$

*****