Mathindia

Set 1

Annual Examination 2022-23

Mathematics

Std X **Score 80**

Time 2 ½ hours

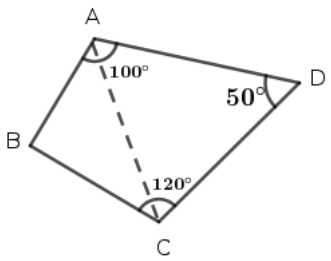
From 1 to 4 attempt any three . Score $3 \times 2 = 6$

1) n th term of an arithmetic sequence is $3n + 1$

   a) What is the common difference ?

   b) What is the difference between 7 th term and 12 th term?

2) In the quadrilateral $ABCD$, $\angle A = 100°$, $\angle C = 120°, \angle D = 50°$. A circle is drawn with the diagonal AC as the diameter.



   a) What is the position of B based on a circle with diameter AC?

   b) What is the position of D based on the circle with diameter AC?

3) $p(x) = ax^2 + bx + c$ is a second degree polynomial. $x - 1$ is a factor of $p(x)$

   a) What is $a + b + c$?

   b) If $x + 1$ is a factor then which of the following is correct

   (a) $a + b = c$ (b) $a + c = b$ (c) $a - b = c$ (d) $a = b + c$

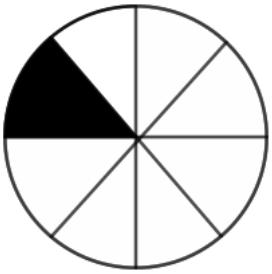
4) $x + y = 0$ is the equation of a line.

   a) Write the co-ordinates of the point on this line having x and y co-ordinates equal?

   b) Write the co-ordinates of another point on this line.

From 5 to 11 attempt any five . Score $5 \times 3 = 15$

5) A circular disc is divided into 8 equal sectors, one of them is coloured.



   a) What is the central angle of a sector?

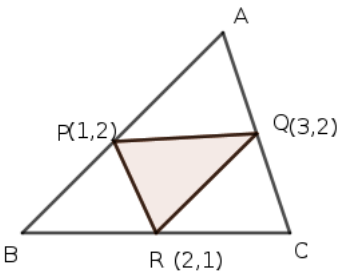
   b) A fine dot is placed into the figure. What is the probability of falling the dot in the coloured sector?

6) In a cyclic quadrilateral two opposite angles are x^2 and $24x$.

   a) What is $x^2 + 24x$?

   b) Find these angles.

7) In the figure ABC is a triangle.Triangle PQR is drawn by joining the mid points of the sides.
Mid points of the sides are $P(1,2), Q(3,2), R(2,1)$



   a) Name the parallelograms shown in the figure

   b) Find the co-ordinates of the vertices of the triangle.

8) $ABCD$ is a rectangle having vertices $A(-2,1), B(2,1), C(2,4)$

   a) Find the co-ordinates of D

   b) Find the perimeter of $ABCD$

   c) Find the length of the diagonal.

9) Surface area of a solid hemisphere is $243\pi \text{cm}^2$.

   a) What is the radius of the hemisphere?

   b) Find the area of circular face of the solid hemisphere?

   c) Find the surface area of sphere formed by two such hemispheres?

10) Draw a circle of radius 3cm.Draw two parallel tangents to this circle?

11) $y = 2$ and $y = 6$ are the lines parallel to x axis. These lines are tangents to a circle.

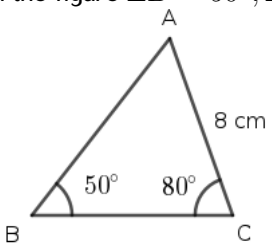
   a) What is the radius of the circle?

   b) If $(3,4)$ is the center of the circle then what are the co-ordinates of points the circle touches the lines

   c) Write the equation of the circle.

From 12 to 20 attempt any six . Score $4 \times 7 = 28$

12) In the figure $\angle B = 50°, \angle C = 80°, AC = 8$cm



a) What is the measure of $\angle A$?

b) What is the length of side BC?

c) Find the altitude to BC

$\sin 80° = 0.98, \cos 80 = 0.17, \tan 80 = 5.67$

13) $p(x) = x^3 + 2x^2 - 7x + k$ is a polynomial.

a) If $x - 1$ is a factor then what is k?

b) Write the polynomial and check whether $x + 1$ a factor of $p(x)$ or not

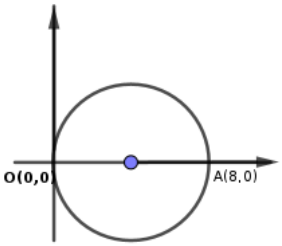
14) The scores of 17 students in a test are in an arithmetic sequence when the scores are arranged in the ascending order.
It can be noted that the smallest score is 10 and largest score 74

a) What is the common difference of the sequence?

b) Find the median score

c) What is the mean of these scores.

15) The circle passing through the origin is centered on x axis.$A(8, 0)$ is a point on the circle.



a) Find the co-ordinates of the center and radius of the circle.

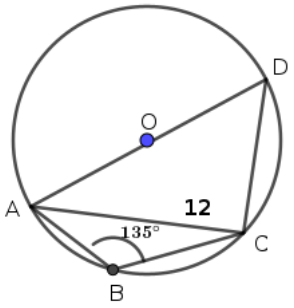
b) Find the equation of the circle.

16) Area of a rectangle is twice its perimeter.One side is double the other.

a) If the smaller side is x then write the equation.

b) Find the sides of the triangle.

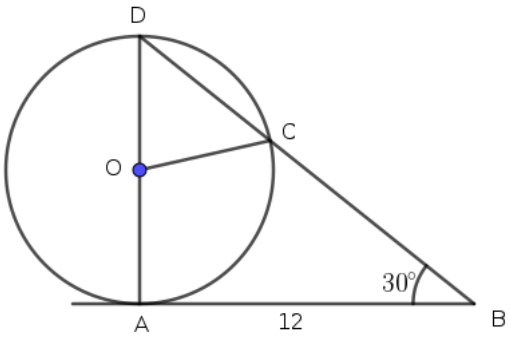
17) The vertices of triangle ABC are on a circle with center O.
$\angle B = 135°$ and $AC = 12$cm



a) Find the measure of $\angle ADC$ and $\angle CAD$

b) Find the radius of the circle.

18) In the figure AD is the diameter of the circle, O is the center, $\angle ABD = 30°$ and $BA = 12$cm is tangent from the outerpoint to the circle.



a) Find the measure of $\angle ADC$ and $\angle AOC$

b) Find the radius of the circle.

19) A cone of radius 5cm and slant height 10cm is made by rolling a sectoral sheet .

a) What is the radius of the sectoral sheet?

b) Find the central angle of the sector.

c) Calculate the volume of the cone.

20) The table shows the children of a class sorted according to their scores in an examination.

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

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

b) Calculate the median score.

From 21 to 29 attempt any seven . Score $7 \times 5 = 35$

21) Algebraic form of an arithmetic sequence is $3n + 2$.

a) What is the common difference of this sequence?

b) If x_n stands for the n th term then what are the differences$x_{21}-x_1, x_{22}-x_2 \cdots x_{40}-x_{20}$

c) What is the distance between sum of the first 20 terms and the sum of next 20 terms?

22) Draw a circle of radius 3cm.Mark a point at the distance 7cm from the center of the circle.Draw tangents from outer point to this circle.

23) The difference between the perimeters of two squares is 24cm.The sum of the areas is 356 sq.cm

a) What the difference between the sides of these squares?

b) If side of a square is x then what is the side of the other square?

c) Form an equation and find the side of each square.

24) From the top of a 7 meter building the angle of elevation of the top of a light house is $60°$ and angle of depression of the foot of the light house is $32°$.

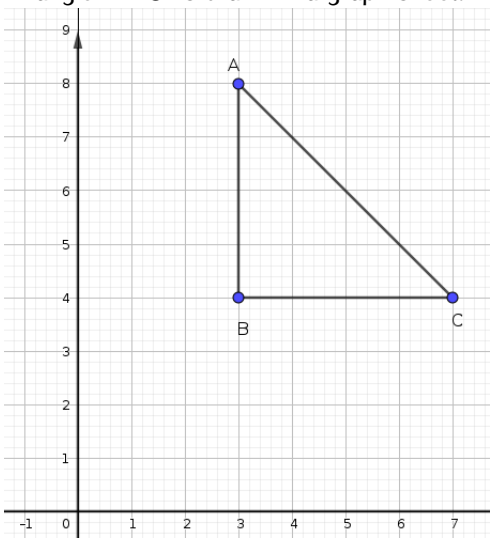
a) Draw a diagram

b) What is the difference between the building and light house?

c) Find the height of the light house.

$(\sin 32 = 0.52, \cos 32 = 0.84, \tan 32 = 0.62)$

25) Triangle ABC is drawn in a graph sheet.$\angle B = 90°$

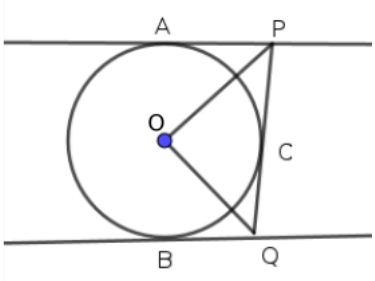


a) Write the coordinates of its vertices.

b) What are the length of its sides?What are the angles of this triangle?

c) Find the center of the circle passing through the vertices and its radius

26) In the figure PA and QB are parallel tangents. Another line touch the circle at C and cut the parallel tangents.

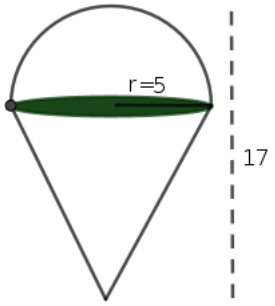


a) Draw a rough diagram and join OA, OC and OB.

b) Name the equal triangles in the figure.

c) Find the measure of $\angle POQ$

27) A toy is made by fixing a hemisphere on the base of a cone.The common radius is 5cm and total height 17cm



a) Find the height and slant height of the cone.

b) Calculate total suface area of the toy

c) Find the volume of the toy.

28) Study the following arithmetic sequences

$1, 2, 3, 4 \cdots$ the sequence of natural numbers

$2, 4, 6, 8, 10 \cdots$ the sequence of even numbers

$1, 3, 5, 7, 9 \cdots$ the sequence of odd numbers

⋆ Sum of first n natural numbers $= \frac{n(n+1)}{2}$

⋆ Sum of first n even numbers$= n(n+1)$

⋆ Sum of first n odd numbers $= n^2$

a) What is the sum of first 10 natural numbers ?

b) What is the sum of first 10 even numbers?

c) What is the sum of first 10 odd numbers?

d) What is the difference between the sum of first 100 even numbers and sum of first 100 odd numbers?

e) How many odd numbers from 1 in the order make the sum 900?

29) Look at the pattern carefully

2^n	Number	Digit in one's place
2^1	2	2
2^2	4	4
2^3	8	8
2^4	16	6
2^5	32	2
2^6	64	4
2^7	128	8
2^8	256	6
$\cdots$	$\cdots$	$\cdots$

Answer the questions given below

a) Write the sequence of digits in one's place by observing the pattern

b) Which digit comes in the one's place of 2^{48}

c) Which digit comes in the one's place of 2^{50}?

d) What is the sum of the digits in the one's place of all powers from 2^1 to 2^{50}

Answers
Set 1

1) a) 3

   b) $5d = 5 \times 3 = 15$

2) a) $\angle B = 360 - (100 + 120 + 50) = 90^\circ$
   B is on the circle.

   b) Since $\angle D$ is less than 90° we can say D is outside the circle with AC as the diameter.

3) a) $p(1) = 0 \rightarrow a + b + c = 0$

   b) $p(-1) = 0$
   $a - b + c = 0, a + c = b$

4) a) $(0, 0)$

   b) $(1, -1)$

From 5 to 11 attempt any five . Score $5 \times 3 = 15$

5) a) 45°

   b) $\frac{1}{8}$

6) a) $x^2 + 24x = 180^\circ$

   b) $x^2 + 24x + 144 = 180 + 144$, $(x + 12)^2 = 324$, $x + 12 = 18, x = 6$
   Angles are $36^\circ, 144^\circ$

7) a) $BPQR, RPQC, APRQ$ are the parallelograms

   b) $B(1 + 2 - 3, 2 + 1 - 2)$, $B(0, 1)$
   $A(1 + 3 - 2, 2 + 2 - 1)$, $A(2, 3)$
   $C(2 + 3 - 1, 1 + 2 - 2)$, $C(4, 1)$

8) a) $D(-2, 4)$

   b) $AB = 4, BC = 3$. Perimeter is 14

   c) Diagonal $= \sqrt{(2 - {}^- 2)^2 + (4 - 1)^2} = 5$

9) a) $3\pi r^2 = 243\pi$, $r^2 = 81, r = 9$

   b) $\pi r^2 = 81\pi$

   c) $4\pi \times 9^2 = 324\pi$

10) ⋆ Draw a circle of radius 3cm

   ⋆ Draw a diameter. Construct tangents to the circle at the ends of the diameter.

   ⋆ These are parallel tangents

11) a) 2

   b) $(3, 6), (3, 2)$

   c) $(x - 3)^2 + (y - 4)^2 = 2^2$

From 12 to 20 attempt any six . Score $7 \times 4 = 28$

12) a) $\angle A = 50^\circ$

b) Since $\angle A = \angle B$ the opposite sides are equal.$BC = 8$cm

c) Draw AD perpendicular to BC.(Draw a rough diagram)
In the right triangle ADC , $\sin 80 = \frac{AD}{8}$
$AD = 8 \times 0.98 = 7.84$cm

13) a) $x - 1$ is a factor. $p(1) = 0$,
$1^3 + 2 \times 1^2 - 7 \times 1 + k = 0, k = 4$

b) $p(x) = x^3 + 2x^2 - 7x + 4$
$p(-1) = (-1)^3 + 2(-1)^2 - 7(-1) + 4 = 12 \neq 0$
$x + 1$ is not a factor.

14) a) Since $x_1 = 10, x_{17} = 74$ then $16d = 74 - 10 = 64$
$d = 4$

b) Median is 9 th term. It is $\frac{10+74}{2} = 42$
or
$x_1 + 8d = 10 + 8 \times 4 = 42$

c) Since data is in arithmetic sequence mean and median are equal. So mean is also 42

15) a) Center$(4, 0)$, Radius 4

b) $(x - 4)^2 + (y - 0)^2 = 4^2$
$x^2 + y^2 - 8x = 0$

16) a) One side is x and other side $2x$
Area $2x \times x = 2x^2$,Perimeter is $2(x + 2x) = 6x$
Given that $2x^2 = 12x$

b) $2x^2 = 12x, x = 6$
Sides are 6 and 12

17) a) $ABCD$ is a cyclic quadrilateral
$\angle ADC = 180 - 135 = 45^\circ$
$\angle CAD = 45^\circ$

b) $\triangle ACD$ is a $45^\circ, 45^\circ, 90^\circ$ triangle.
$AD = 12\sqrt{2}$cm

18) a) $\triangle ADB$ is a $30^\circ - 60^\circ - 90^\circ$ triangle
$\angle ADC = 60^\circ, \angle AOC = 2 \times 60 = 120^\circ$

b) Side opposite to 60° is 12
Side opposite to 30° is $\frac{12}{\sqrt{3}} = 4\sqrt{3}$cm
Radius is $2\sqrt{3}$cm

19) a) Radius of the sectoral sheet is equal to slant height of the cone. It is 10cm

b) $lx = 360r \rightarrow 10 \times x = 360 \times 5, x = 180^\circ$

c) $l^2 = h^2 + r^2, 100 - 25 = h^2, h = 5\sqrt{3}$
Volume $\frac{1}{3} \times \pi r^2 h = \frac{125\sqrt{3}\pi}{3}$

20) Table

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

a) $n = 45$ (odd number)
23 rd score in the ascending order comes in the middle.It belons to the class $20 - 30$
10 scores is divided equally among 10 children. Each one's share is 1
14 th score is $20 + \frac{1}{2} = 20.5$

b) It is assumed that the score distribution in the median class are in arithmetic sequence.The first term is 20.5 and common difference 1.
10 th term is the score of 23 rd child.
It is $20.5 + 9 \times 1 = 29.5$
Median is 29.5

From 21 to 29 attempt any six . Score $7 \times 5 = 35$

21) a) $d = 3$

b) $x_{21} - x_1 = 20d, x_{22} - x_2 = 20d, x_{23} - x_3 = 20d \cdots$
All are $20 \times 3 = 60$

c) $(x_{21} + x_{22} + x_{23} \cdots + x_{40}) - (x_1 + x_2 + x_3 + \cdots + x_{20})$
$= (x_{21} - x_1) + (x_{22} - x_2) + \cdots + (x_{40} - x_{20}) = 20 \times 20d = 20 \times 60 = 1200$

22) a) Draw a circle of radius 3cm and mark its center as O

b) Draw a line through O , mark a point P at the distance 7cm from O on this line

c) Draw a circle with diameter OP.This circle intersect the first circle at A and B

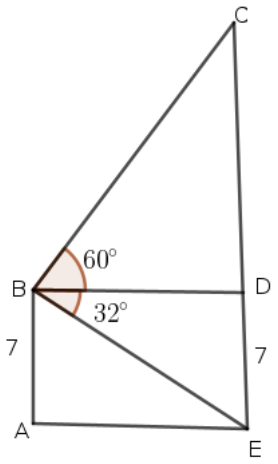
d) Draw PA and PB. These are tangents to the circle.

23) a) $\frac{24}{4} = 6$

b) Sides are x and $x + 6$

c) $x^2 + (x + 6)^2 = 356$
$x^2 + x^2 + 12x + 36 - 356 = 0$
$2x^2 + 12x - 320 = 0, x^2 + 6x - 160 = 0$
Solving $x = 10$. Sides are 10 and 16

24) a) Draw a diagram
$AB \rightarrow$Building
$CE \rightarrow$ Light house



b) In triangle BDE , $\tan 32 = \frac{7}{BD}$
$BD = 11.29$ meter
The distance between building and light house is 11.29 meter

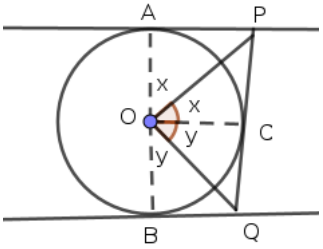
c) Triangle BDC is a $30-60-90$ triangle.$CD = BD \times \sqrt{3} = 11.29 \times 1.73 = 19.53$ meter
Height of light house $19.53 + 7 = 26.53$meter

25) a) $A(3,8), B(3,4), C(7,4)$

b) $AB = \mid 8-4 \mid 4$, $BC = \mid 7-3 \mid = 4$, $AC = 4\sqrt{2}$
Angles are $\angle A = \angle C = 45°$

c) Radius $2\sqrt{2}$,Center $(\frac{3+7}{2}, \frac{8+4}{2}) = (5,6)$

26) a) Diagram



b) $\triangle AOP, \triangle COP$ are equal
$\triangle BOQ, \triangle COQ$ are equal

c) $\angle AOP = \angle COP = x, \angle BOQ = \angle COQ = y$
$2x + 2y = 180, x + y = 90°$
$\angle POQ = 90°$

27) a) $h = 17 - 5 = 12$cm, $l = \sqrt{12^2 + 5^2} = 13$cm

b) Total surface area $= 2\pi r^2 + \pi rl = 115\pi$ cm^2

c) Volume $= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 \times 12 = \frac{550\pi}{3}$

28) a) 55

b) 110

c) 100

d) 100

e) 30

29) a) $2, 4, 8, 6, 2, 4, 8, 6 \cdots$

b) 6

c) 4

d) $20 \times 12 + 2 + 4 = 246$