Mathindia

Annual Examination 2022-23

Mathematics

Std X **Score 80**

Time 2 ½ hours

set 2

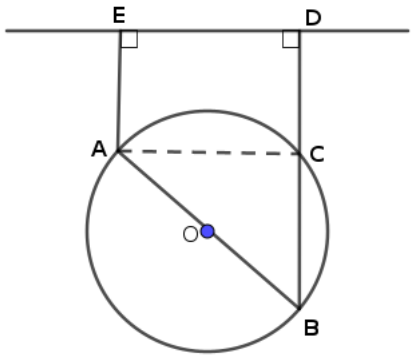
Questions from 1 to 4 carries two scores. Answer any three. $3 \times 2 = 6$

1) Consider the arithmetic sequence $1, 5, 9 \cdots$

   a) What are the next two terms of the sequence ?

   b) Write the algebraic form of the sequence.

2) In the figure AB is the diameter of the circle.Line DE is perpendicular to AE and BD.



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

   b) Suggest a suitable name to $ACDE$

3) Each of the numbers from 1 to 10 are written in small paper pieces and kept in a box. One is taken from the box without looking.

   a) What is the probability of getting a multiple of 3?

   b) What is the probability of getting a prime number?

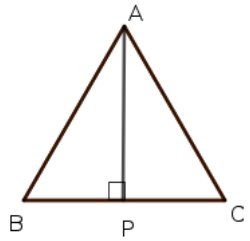
4) Sum of a counting number and its square is 2.

   a) If x is the number then write the equation

   b) Find the number

Questions from 5 to 10 carries three scores. Answer any four . $4 \times 3 = 12$

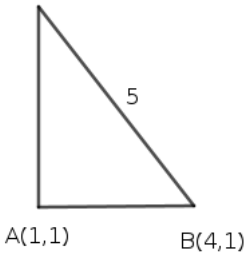
5) ABC is an equilateral triangle of perimeter 30cm



a) What is the length of its side?

b) What is the altitude of the triangle?

6) ABC is a triangle right angled at $A(1,1)$. Another vertex B has co-ordinates $(4,1)$ and $BC = 5$

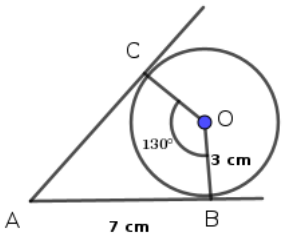


a) What is the length of the side AB?

b) Find AC and write the co-ordinates of C

c) What is the area of the triangle?

7) In the figure AB and AC are tangents from A to the circle with center O.



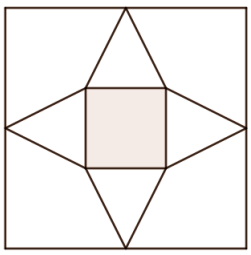
Length of the tangent AB is 7cm and radius of the circle 3cm

a) What is the perimeter of $ABOC$?

b) What is the measure of $\angle B$ and $\angle C$?

c) If $\angle BOC = 130^\circ$ then what is the measure of $\angle BAC$?

8) The base edge of a square pyramid is 10cm and lateral edge 13cm
It is made by cutting along the edges of the outline drawn on a square paper.

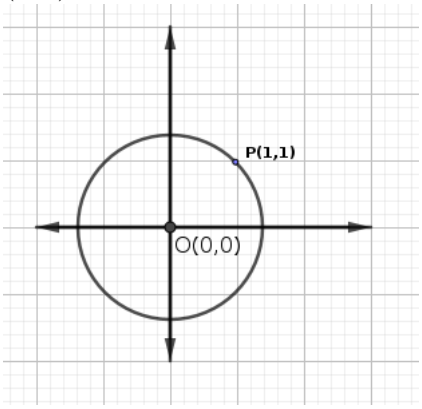


a) What is the slant height of the square pyramid?

b) What is the side of the square paper on which the outline is drawn

c) Calculate the total surface area of the square pyramid.

9) $(1, 1)$ is a point on the circle with center at the origin.



a) What is the radius of the circle?

b) What are the points where the circle cut the axes?

c) Write the equation of the circle.

10) $p(x) = ax^3 + bx^2 + cx + d$ is a third degree polynomial.
$p(x)$ has a second degree factor $x^2 - 1$

a) What are the two first degree factors of $p(x)$?

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

Questions from 11 to 21 carries four scores. Answer any eight . $8 \times 4 = 32$

11) One side of a rectangle is 12 more than twice the other side.Area of the rectangle is 80 sq.cm . If the smaller side is x then

a) Write the equation.

b) Find the sides.

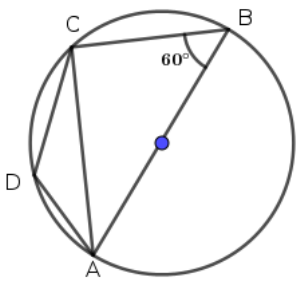
12) The difference between fifth term and first term of an increasing arithmetic sequence is 12.

a) What is the difference between second term and sixth term of this sequence?

b) If the third term is 10 then what is 7 th term?

c) What is the common difference of this sequence ?

13) In the figure AB is the diameter of a circle.$\angle ABC = 60°$



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

b) What is the measure of $\angle ADC$?

c) If $AD = CD$ then find $\angle BCD$

d) Find the measure of $\angle DAB$

14) A box contains 4 white balls and 3 black balls.One is taken from the box without looking

a) What is the probability of getting white ball?

b) What is the probability of getting black ball?

c) How many black balls should be added into the box to become the probability of getting black $\frac{5}{7}$

15) Sum of the areas of two circles is 58π
Radius of one circle is 1 more than two times the other . If the radius of small circle is x then

a) Form an equation.

b) Find the radii of both circles.

16) The window A of a building can be seen at the angle of elevation 32° at the distance 100 away from the foot of the building.
Window B can be seen at the angle of elevation 45° from the same point.

a) Draw a suitable diagram

b) What is the height from the foot of the building to the window B?

c) Calculate the distance between the windows.

$\sin 32^\circ = 0.52, \cos 32 = 0.84, \tan 32 = 0.62$

17) $A(-3, 2), B(7, 2), C(5, 11)$ are the vertices of a triangle.

a) What is the length of the side parallel to x axis ?

b) What is the altitude to that side?

c) Calculate the area of triangle.

18) In triangle ABC , $AB = 6$cm, $\angle A = \angle B = 40^\circ$

a) Draw the triangle and construct the incircle

b) Write the radius of the incircle by measuring it.

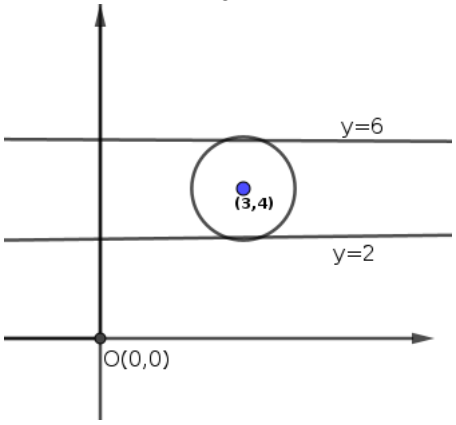
19) A circular sheet of radius 24cm is cut into two sectors of central angles 120° and 240°.Sectors are rolled into cones.

a) What is the slant height of both the cones?

b) Find the base radius of the cones.

c) Calcualte the curved surface area of the cones so formed.

20) $y = 6$ and $y = 2$ are two parallel lines. Both are parallel to x axis.
These lines are tangents to a circle with center$(3, 2)$



a) What are the co-ordinates of the points the circle touches the lines ?

b) What is the radius of the circle

c) Write the equation of a tangent perpendicular to both the given lines

d) Write the equation of the circle.

Questions from 22 to 29 carries five scores. Answer any seven. $6 \times 5 = 30$

21) The table shows the marks scored by the students of a class in an examination.

Marks	Number of children
0-10	5
10-20	11
20-30	10
30-40	12
40-50	7

a) If the students are arranged in the ascending order of marks at what position the median mark occurs ?

b) What is the mark of 17 th student as the assumption of calculating median

c) Calculate median

22) The difference between fifth term and first term of an increasing arithmetic sequence is 16.Third term is 19

a) What is the difference between second term and sixth term of this sequence?

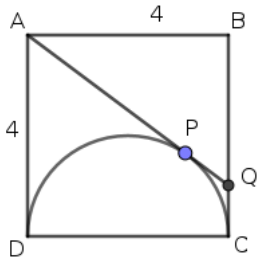
b) What is 7 th term?

c) What is the common difference of this sequence ?

d) Write the algebraic form of the sequence.

23) Two angles of a triangle are $70°$ and $50°$.The verices of the triangle are on a circle of radius 4cm Construct the triangle .

24) $ABCD$ is a square of side 4cm.Line AQ touches the semicircle at P



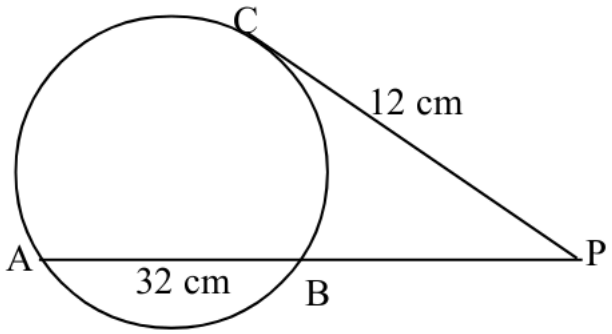
a) What is the length AP?

b) If $QP = x$ then write QC and QB in x

c) Find x by considering triangle ABQ and write the length of AQ.

25) In the figure chord AB of the circle is extented and marked a point P .The line PC is a tangent to the circle.

$AB = 32$cm, PC=12cm

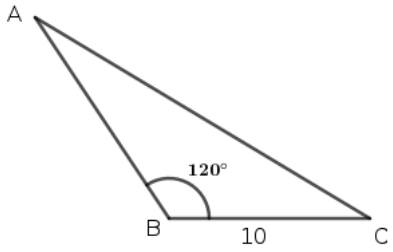


a) What is $PA \times PB$?

b) If $PB = x$ then what is PA?

c) Find PB and PA.

26) In triangle ABC ,$\angle C = 30°, \angle ABC = 120°$, $BC = 10$cm

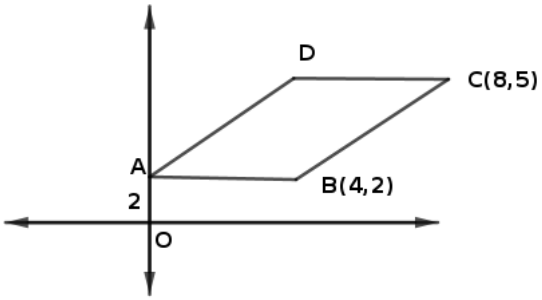


a) What is the measure of $\angle BAC$?

b) What is the altitude from A to BC?

c) Find the area of triangle ABC.

27) In the figure $ABCD$ is a parallelogram.A is on y axis at the distance 2 from the origin.The vertices $B(4, 2)$ and $(8, 5)$ are marked in the figure.



a) Write the co-ordinates of A and D

b) What is the distance between the parallel sidesAB and CD?

c) What is the area of $ABCD$?

28) The second degree polynomial $p(x) = x^2 + 4x - 21$ is written as $p(x) = (x + a)(x + b) = x^2 + (a + b)x + ab$

a) What is $a + b$ and ab

b) Find a and b . Write the polynomial as the product of two first degree factors.

c) Find the solution of the equation $x^2 + 4x - 21 = 0$

29) Look at the sequence of natural numbers.
$1, 2, 3, 4 \cdots$
■ This is grouped by taking 2 at a time as below
$(1, 2), (3, 4), (5, 6), (7, 8) \cdots$
Sequence of the sum of numbers in the group is $3, 7, 11 \cdots$
This is an arithemtic sequence having common difference 4.
■ Think about the groups by taking 3 at a time
$(1, 2, 3), (4, 5, 6), (7, 8, 9) \cdots$
Sequence formed by adding them is $6, 15, , 24 \cdots$
This is an arithmetic sequence having common difference 9

a) Write the sequence by taking 4 numbers as above.

b) What is the common difference of the sequence so formed by adding the numbers?

c) How many numbers should grouped to get the common difference of the arithemtic sequence 25?

d) What is the difference between the sum of first 10 natural numbers and the sum of next 10 natural numbers?

e) Difference between the sum of first n natural numbers and sum of the next n natural numbers is 400. What is n?

Answers

Questions from 1 to 4 carries two scores. Answer any three. $3 \times 2 = 6$

1) a) $13, 17$

   b) $4n - 3$

2) a) 90°

   b) Rectangle.

3) a) $\frac{3}{10}$

   b) $\frac{4}{10}$

4) a) $x^2 + x = 2$

   b) $x = 1$

Questions from 5 to 11 carries two scores. Answer any five . $5 \times 3 = 15$

5) a) 10cm

   b) $5\sqrt{3}$cm

6) a) $| 4 - 1 | = 3$

   b) $AC = \sqrt{5^2 - 3^2} = 4$
   $C(1, 5)$

   c) $\frac{1}{2} \times 3 \times 4 = 6$

7) a) $7 + 3 + 7 + 3 = 20$cm

   b) 90°

   c) $180 - 130 = 50^\circ$

8) a) $l = \sqrt{13^2 - 5^2} = 12$cm

   b) $12 + 12 + 10 = 34$cm

   c) $a^2 + 2al = 100 + 260 = 360$ sq.cm

9) a) $\sqrt{2}$

   b) $(1, 0), (0, 1), (-1, 0), (0, -1)$

   c) $x^2 + y^2 = 1$

10) a) $x - 1, x + 1$

   b) Since $x - 1$ is a factor $p(1) = 0$
   $a + b + c + d = 0$

11) a) Let x be the smaller side. $x(2x + 12) = 80$, $2x^2 + 12x = 80$, $x^2 + 6x = 40$

   b) $x^2 + 6x + 3^2 = 40 + 3^2$
   $(x + 3)^2 = 7^2, x + 3 = 7, x = 4$
   Sides are 4 and $2 \times 4 + 12 = 20$

Questions from 12 to 21 carries four scores. Answer any six . $6 \times 4 = 24$

12) a) Since $x_5 - x_1 = 12$ then $x_6 - x_2$ is also 12

b) $x_7 = x_3 + 4d = 10 + 12 = 22$

c) $4d = 12, d = 3$

13) a) 90°

b) $180 - 60 = 120^\circ$

c) Since $AD = CD$ opposite angles of $\triangle ADC$ are 30° each
$\angle BCD = 90 + 30 = 120^\circ$

d) $\angle DAB = 180 - 120 = 60^\circ$

14) a) $\frac{4}{7}$

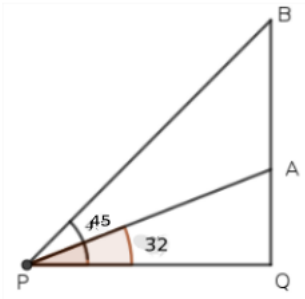
b) $\frac{3}{7}$

c) x black balls should be added.
$\frac{3+x}{7+x} = \frac{5}{7}$
$7 \times (3 + x) = 5 \times (7 + x)$
$21 + 7x = 35 + 5x, 2x = 14, x = 7$
7 black balls should be added.

15) a) Let r be the radius of small circle. Radius of other circle is $2r + 1$
$\pi r^2 + \pi(2r + 1)^2 = 58\pi$, $r^2 + (2r + 1)^2 = 58$
$5r^2 + 4r - 57 = 0$

b) Solving $r = 3$.Radii are 3 and 7.

16) a) Diagram



b) $QB = 100$ meter

c) $\tan 32 = \frac{AQ}{100}$
$AQ = 62$ meter
$AB = 100 - 62 = 38$ meter

17) a) $AB = \mid 7 - (-3) \mid = 10$

b) $\mid 11 - 2 \mid = 9$

c) $\frac{1}{2} \times 10 \times 9 = 45$

18) Steps of construction.

a) Draw the triangle with the given measurement

b) Draw bisectors of two angles.The bisectors intersect at a point Oinside the triangle.

c) Draw perpendicular from O to a side. Draw circle with O as the center and perpendicular distance to the side as the radius.

19) a) 24cm

b) $lx = 360r \to 24 \times 120 = 360 \times r$
$r = \frac{24 \times 120}{360} = 8$cm
For the second cone $r = 16$cm

c) For the first cone, curved surface area $= \pi \times 8 \times 24 = 192\pi$ sq.cm
For the secone cone curved surface area is $2 \times 192\pi = 384\pi$ sq.cm

20) a) $(3, 6), (3, 2)$

b) 2

c) $x = 5$ or $x = 1$

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

Questions from 21 to 29 carries five scores. Answer any seven. $7 \times 5 = 35$

21) Table

Marks	Number of children
Below 10	5
Below 20	16
Below 30	26
Below 40	38
Upto 50	45

a) The number of students $n = 45$.Since its is odd, $\frac{45+1}{2}$ th term comes in the middle.The mark of 23 rd student is median.

b) It is assumed that distribution of marks in the median class are in arithmetic sequence.
$20 - 30$ is the median class.10 marks is divided equally among 10 children. Each one's share is 1.
Score of 17 th term is $20 + \frac{1}{2} = 20.5$

c) 7 th term of the arithmetic sequence having first term $20.$ and common difference 1 is the median. It is the score of 23 rd term.
Median $= f + 6d = 20.5 + 6 \times 1 = 26.5$

22) a) Since $x_5 - x_1 = 16$ then $x_6 - x_2$ is also 16

b) $x_7 - x_3 = 16$
$x_7 = x_3 + 16 = 19 + 16 = 35$

c) $4d = 16, d = 4$

d) $f = x_3 - 2d = 19 - 2 \times 4 = 11$
$x_n = 4n + 7$

23) ⋆ Draw the circle of radius 4cm

⋆ Divide the angle around the center as $2 \times 50 = 10^\circ, 2 \times 70 = 140^\circ$ by drawing radii

⋆ Join the ends of radii. It makes the traingle.

24) a) $AP = 4$cm

b) $QC = x, QB = 4 - x$

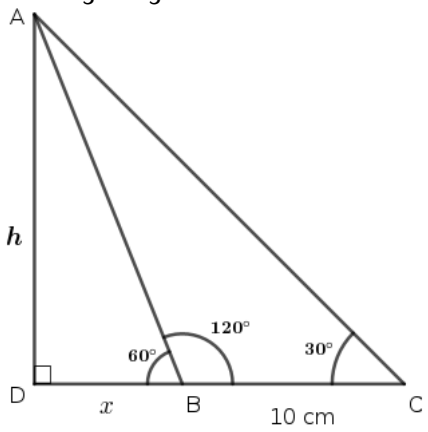
c) $4^2 + (4 - x)^2 = (4 + x)^2$
Solving $x = 1$
$PQ = 4 + 1 = 5$cm

25) a) $PA \times PB = PC^2 = 144$

b) $PA = x + 32$

c) $(x+32)\times x=144$
$x^2+32x+16^2=144+16^2$
$(x+16)^2=20^2$
$x+16=20, x=4$
$PA=36, PB=4$

26) Draw rough diagram.



a) 60°

b) Take $AD=h, BD=x$. Triangle ADC is a $30-60-90$ triangle. Triangle ADB is also a $30-60-90$ triangle
$x+10=h\sqrt{3}$
$h=x\sqrt{3}$
$\therefore x+10=x\sqrt{3}\times\sqrt{3}$
$x+10=3x, 2x=10, x=5$, $h=5\sqrt{3}$

c) Area $=\frac{1}{2}\times 10\times 5\sqrt{3}=25\sqrt{3}$

27) a) $A(0,2), D(4,5)$

b) $\mid 5-2\mid=3$

c) $AB\times BD=4\times 3=12$

28) a) $a+b=4, ab=-21$

b) $(a-b)^2=(a+b)^2-4ab$
$(a-b)^2=4^2-4\times -21=100$
$a-b=10, a+b=4\rightarrow a=7, b=-3$

c) $p(x)=(x+7)(x-3)=0$
$x+7=0, x=-7$
$x-3=0, x=3$

29) a) $10, 26, 42\cdots$

b) $4^2=16$

c) 5

d) $10^2=100$

e) 20

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[1]Prepared by John P A , mathematics teacher . jpavpz@gmail.com