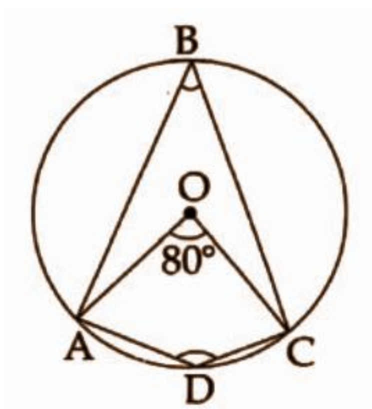
KBPE Class 10th Maths Question Paper With Solution 2019

QUESTION PAPER CODE S 1935

Answer any three questions from 1 to 4. Each question carries 2 scores. [3 * 2 = 6]

Question 1: In the figure, O is the centre of the circle.
$\angle AOC = 80^o$
[i] What is the measure of $\angle ABC$?
[ii] What is the measure of $\angle ADC$?

Solution:



Given $\angle AOC = 80^0$

[i] The measurement $\angle ABC = (1 / 2) * \angle AOC = 1 / 2 \times 80 = 40^0$.

[ii] $\angle ABC + \angle ADC = 180^o$

$40^o + \angle ADC = 180^o$

$\angle ADC = 180^o - 40^o$

$\angle ADC = 140^o$

Question 2: [i] Write the first integer term of the arithmetic sequence (1 / 7), (2 / 7), (3 / 7) …….
[ii] What is the sum of the first 7 terms of the above sequence?

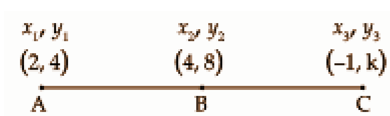
Solution:
[i] Given arithmetic sequence = 1 / 7 + 2 / 7 + 3 / 7 ,………..
Common difference d = 2 / 7 – 1 / 7 = 1 / 7.
Hence the first integer term = 7 / 7 = 1

[ii] a = (1 / 7)
d = 2 / 7 – 1 / 7
= 1 / 7
n = 7
S_n = (n / 2) (2a + [n - 1]d)
S_7 = (7 / 2) (2 * [1 / 7] + [7 - 1] * [1 / 7])
= (7 / 2) ([2 / 7] + 6 * (1 / 7))
= (7 / 2) ([2 / 7] + [6 / 7])
= (7 / 2) (8 / 7)
= 4

Question 3: [i] If C (-1, k) is a point on the line passing through the points A (2, 4) and B (4, 8) which number is k?
[ii] What is the relation between the x coordinate and the y coordinate of any point on this line?

Solution:

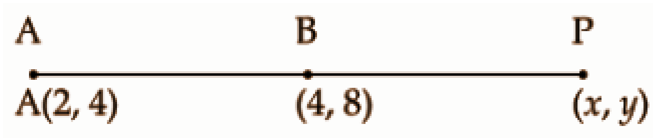
[i]



Points A, B and C are collinear.
Area of triangle ABC = 0
$(1 / 2) (x_1 [y_2 - y_3] + x_2 [y_3 - y_1] + x_3 [y_1 - y_2])$
|2 (8 - k) + 4 (k - 4) + (-1) (4 - 8)| = 0
16 - 2k + 4k - 16 - 4 + 8 = 0
2k = -4

k = -2

[ii]



Area of triangle ABP = 0

$(1 / 2) (x_1 [y_2 - y_3] + x_2 [y_3 - y_1] + x_3 [y_1 - y_2])$

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

16 - 2y + 4y - 16 - 4x = 0

2y - 4x = 0

2y = 4x

y = 2x

2x - y = 0

Question 4: [i] Find P(1) if P(x) = x^2 + 2x + 5
[ii] If (x - 1) is a factor of x^2 + 2x + k, what is the value of k?

Solution:

[i] P(x) = $x^2 + 2x + 5$

P(1) = $1^2 + 2 * 1 + 5$

= 1 + 2 + 5

P(1) = 8

[ii] Since (x - 1) is the factor of $x^2 + 2x + k$, then

x - 1 = 0

x = 1

$(1)^2 + 2(1) + k = 0$

1 + 2 + k = 0

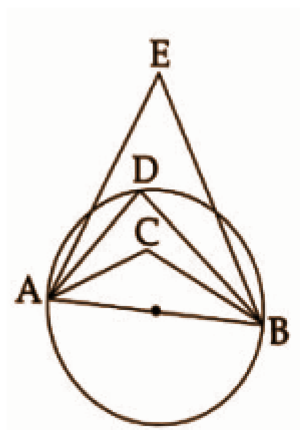
k = -3

Answer any five questions from 5 to 11. Each question carries 3 scores. [5 * 3 = 15]

Question 5: [i] What is the remainder on dividing the terms of the arithmetic sequence 100, 107, 114 ….. by 7?
[ii] Write the sequence of all three-digit numbers. Which leaves the remainder 3 on division by 7? Which is the last term of this sequence?

Solution:
[i] Given sequence be 100, 107, 114, ………..
d = 7
Remainder = 100 / 7 = 2
[ii] 101, 108, 115 ……………..
Hence the last three-digit term = 997.

Question 6: AB is the diameter of the circle. D is the point on the circle.



$\angle ACB + \angle ADB + \angle AEB = 270^o$. The measure of one among $\angle ACB$, $\angle ADB$ and $\angle AEB$ is 110^o. Write the measures of $\angle ACB$, $\angle ADB$, $\angle AEB$.

Solution:
$\angle ADB = 90^0$ (Measurement of semi circle angle)
$\angle ACB + \angle ADB + \angle AEB = 270^0$ (given)
$\angle ACB + 90^o + \angle AEB = 270^0$
$\angle ACB + \angle AEB = 270^0 – 90^o = 180^0$
The given condition is that any one of the angles $\angle ACB$, $\angle AEB$ be 110^0.
Take $\angle ACB = 110^0$
Hence $\angle AEB = 180^o – 110^o = 70^0$

So the angles , $\angle ADB = 90^0$, $\angle ACB = 110^0$, $\angle AEB = 70^0$.

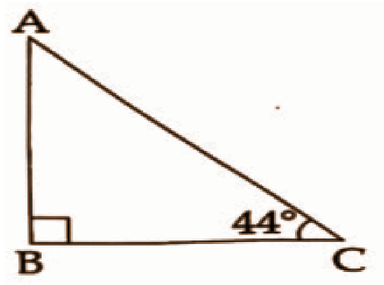
Question 7: If x is a natural number,
[a] What number is to be added to $x^2 + 6x$ to get a perfect square?
[b] If $x^2 + ax + 16$ is a perfect square number, then which number is a?
[c] If $x^2 + ax + b$ is a perfect square, prove that $a^2 = 4b$.

Solution:
Given $x^2 + 6x$
[a] $6x = 2ab$
$a = x$
$b = ?$
$b = 6x / 2x = 3$
Perfect square = $b^2 = 3^2 = 9$.
Hence 9 is to be added to them.

[b] Given, $x^2 + ax + 16$ is perfect square
This is the form of $a^2 + 2ab + b^2 = (a + b)^2$
$2ab = ax$
$a = x$
$b^2 = 16$
$b = \sqrt{16} = 4$
So, $(x + 4)^2 = x^2 + ax + 16$
Hence $a = 2ab = 2 \times 4 = 8$.

[c] Here b = the square of the half of a
$b = (a / 2)^2$
$b = a^2 / 4$
$a^2 = 4b$

Question 8: In the figure, $\angle B = 90^o$, $\angle C = 44^o$.



[a] What is the measure of A?
[b] Which among the following is tan 44°:
(AB / BC) , (AB / AC), (BC / AB), (BC / AC)
[c] Prove that tan 44° * tan 46° = 1

Solution:

[a] $\angle A + \angle B + \angle C = 180^\circ$

$\angle A + 90^\circ + 44^\circ = 180^\circ$

$\angle A = 180^\circ - 90^\circ - 44^\circ$

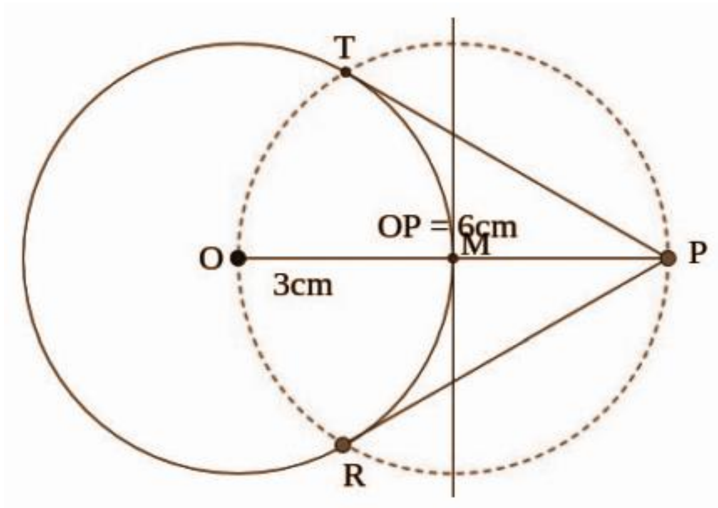
$\angle A = 46^\circ$

[b] In triangle ABC,
tan 44° = opposite / adjacent
= AB / BC {from the figure}

[c] Take LHS = tan 44° * tan 46°
= tan 44° * cot (90° - 46°) [tan θ = cot (90 - θ)]
= tan 44° * cot 44°
= tan 44° * [1 / tan 44°]
= 1
= RHS

Question 9: Draw a circle of radius 3 centimetres. Mark a point P at a distance of 6cm from the centre of the circle. Draw tangents from P to the circle.

Solution:



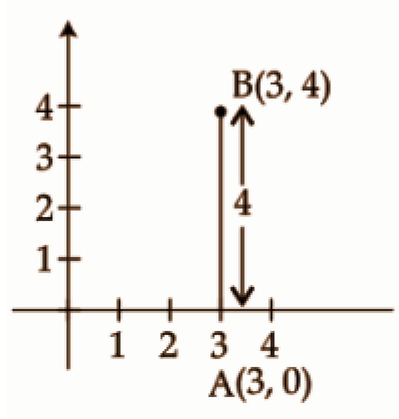
Steps of construction:

- Draw a circle of radius 3cm with O as the centre.
- From the centre O, draw OP = 6cm and perpendicular to OP marking it as M.
- Draw another circle with centre M cutting T and R respectively.
- Join PT and PR which are the required tangents.

Question 10: [i] Find the coordinates of the point on the x-axis, which is at a distance of 4 units from (3, 4).
[ii] Find the coordinates of the point on the x-axis at a distance of 5 units from (3, 4).

Solution:
[i]

$4 = \sqrt{(x - 3)^2 + (0 - 4)^2}$
On squaring both sides,
$4^2 = (x - 3)^2 + 16$
$x - 3 = 0$
$x = 3$
A (3, 0) is the required point.



[ii]

AB = 5

$\sqrt{(x - 3)^2 + (0 - 4)^2} = 5$

On squaring both sides,

$(x - 3)^2 + 16 = 5^2$

$(x - 3)^2 + 16 = 25$

$(x - 3)^2 = 25 - 16$

$(x - 3)^2 = 9$

$(x - 3) = \pm 3$

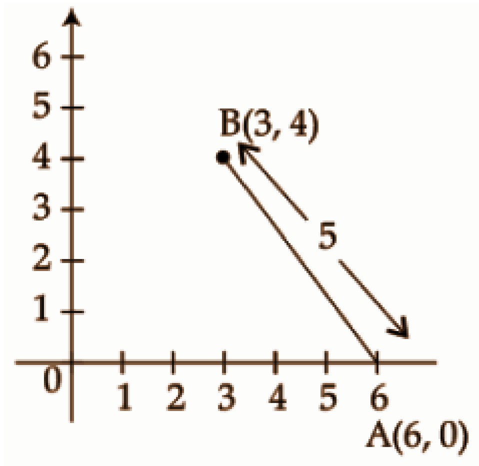
x - 3 = 6

x = 6

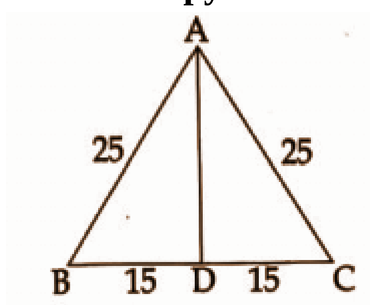
x - 3 = -3

x = 0

Hence, (6, 0) and (0, 0) is the required point.



Question 11: The given figure is the lateral face of a square pyramid. AB = AC = 25 centimeters and BD = DC = 15 centimeters.
[i] What is the length of its base edge?
[ii] Find the lateral surface area of the pyramid.



Solution:

Side of the base = diagonal / √2

= (30 / √2) * (√2 / √2)

= 15 √2 cm

= 15 * 1.414

= 17.210

Side of the base = 17.210 cm

Lateral surface area = (1 / 2) * perimeter of the base * slant height

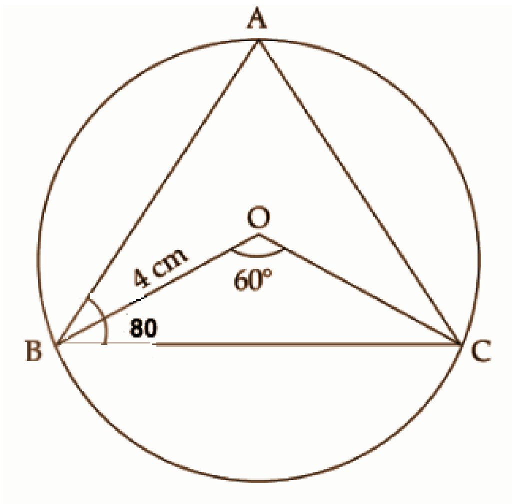
= (1 / 2) * (17.21) * 4 * 25

= 860.50 cm^2

Answer any 7 questions from 12 to 21. Each question carries 4 scores. [7 * 4 = 28]

Question 12: In triangle ABC, $\angle A = 30^\circ$, $\angle B = 80^\circ$, the circumradius of the triangle is 4 centimetres. Draw the triangle. Measure the length of its smallest side.

Solution:



Steps of construction:

- Draw a circle of radius 4cm having a centre at O.
- Make an angle $\angle BOC = 60^\circ$.
- Construct an angle $\angle CBA = 80^\circ$.
- Join AC.
- $\triangle ABC$ is the required triangle.

$\angle A + \angle B + \angle C = 180^\circ$

$30^\circ + 80^\circ + \angle C = 180^\circ$

$\angle C = 180^\circ - 110^\circ$

$\angle C = 70^\circ$

$30^\circ < 70^\circ < 80^\circ$

$\angle A < \angle C < \angle B$

The smallest angle is $\angle A$.

BC is the smallest side of $\triangle ABC$.

Question 13: Find the following sums:

[i] 1 + 2 + 3 + …… 100

[ii] 1 + 3 + 5 + …… 99
[iii] 2 + 4 + 6 + …… 100
[iv] 3 + 7 + 11 + ……. 199

Solution:

[i] 1 + 2 + 3 + …… 100
a = 1
d = 2 - 1 = 1
Last term = 100 = l
l = a + (n - 1) d
100 = 1 + (n - 1) 1
100 = 1 + n - 1
n = 100
S_n = (n / 2) (n + 1)
S_{100} = (100 / 2) (100 + 1)
= (50) * (101)
= 5050

[ii] 1 + 3 + 5 + …… 99
a = 1
d = 3 - 1 = 2
Last term = 99 = l
l = a + (n - 1) d
99 = 1 + (n - 1) 2
99 = 1 + 2n - 2
99 = 2n - 1
100 = 2n
100 / 2 = n
50 = n
S_n = (n / 2) (a + a_n)
S_{50} = (50 / 2) (1 + 99)
= (25) * (100)
= 2500

[iii] 2 + 4 + 6 + …… 100

a = 2
d = 4 - 2 = 2
Last term = 100 = l
l = a + (n - 1) d
100 = 2 + (n - 1) 2
100 = 2 + 2n - 2
100 = 2n
n = 100 / 2
n = 50
S_n = (n / 2) (a + a_n)
S_{50} = (50 / 2) (2 + 100)
= (25) * (102)
= 2550

[iv] 3 + 7 + 11 + ……. 199
a = 3
d = 7 - 3 = 4
Last term = 199 = l
l = a + (n - 1) d
199 = 3 + (n - 1) 4
199 = 3 + 4n - 4
199 = 4n - 1
200 / 4 = n
n = 50
S_n = (n / 2) (a + a_n)
S_{50} = (50 / 2) (3 + 199)
= (25) * (202)
= 5050

Question 14: A box contains some green and blue balls. 7 red balls are put into it. Now the probability of getting a red ball from the box is 7 / 24 and that of the blue ball is 1 / 6.
[i] How many balls are there in the box?
[ii] How many of them are blue?
[iii] What is the probability of getting a green ball from the box?

Solution:

Let the number of green balls be x.

The number of blue balls is y.

Number of red balls = 7

Total number of balls = x + y + 7

P (red ball) = 7 / 24

P (blue ball) = 1 / 3

[i] Since P(red ball) = 7 / 24,

7 / [x + y + 7] = 7 / 24

24 = x + y + 7

24 - 7 = x + y

17 = x + y ---- (1)

P (blue ball) = 1 / 3

y / [x + y + 7] = 1 / 3

3y = x + y + 7

2y = x + 7

-x + 2y = 7 ---- (2)

On adding equation (1) and (2),

17 = x + y

-x + 2y = 7

____

3y = 24

y = 24 / 3

y = 8

Put y = 8 in equation (1),

17 = x + 8

17 - 8 = x

x = 9

Total number of balls = 8 + 9 + 7 = 24

[ii] Number of blue balls

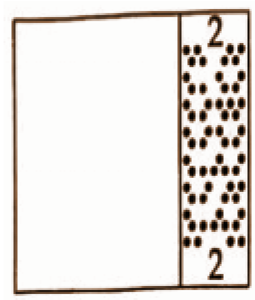
y / 24 = 1 / 3

3y = 24

y = 8

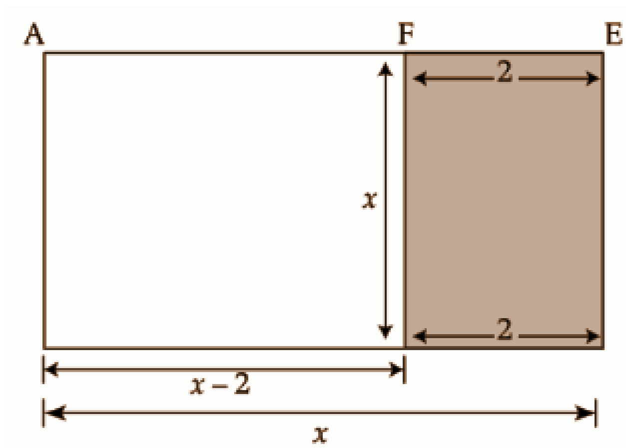
[iii] P (green ball) = x / 24 = 9 / 24 = 3 / 8

Question 15: Land is acquired for road widening from a square ground, as shown in the figure. The width of the acquired land is 2 meters. Area of the remaining ground is 440 square meters.



[i] What is the shape of the remaining ground?
[ii] What is the length of the remaining ground?

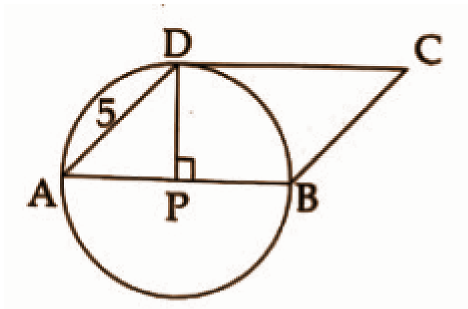
Solution:



[i] The shape of the remaining ground is rectangular.
[ii] Let the length be x and breadth be x - 2.
Given,
Area = 440 m^2
L * B = 440
x * (x - 2) = 440
x^2 - 2x = 440
x^2 - 2x - 440 = 0

$(x - 22)(x + 20) = 0$
$x = 22, -20$
Since the values must be positive, $x = 22$ is taken.
Length = 22m
Breadth = 22 - 2 = 20m

Question 16: In the figure, P is the centre of the circle. A, B and D are points on the circle. $\angle P = 90^o$, AD = 5cm.



(a) What is the measure of $\angle A$?
(b) What is the area of the triangle APD?
(c) Find the area of the parallelogram ABCD.

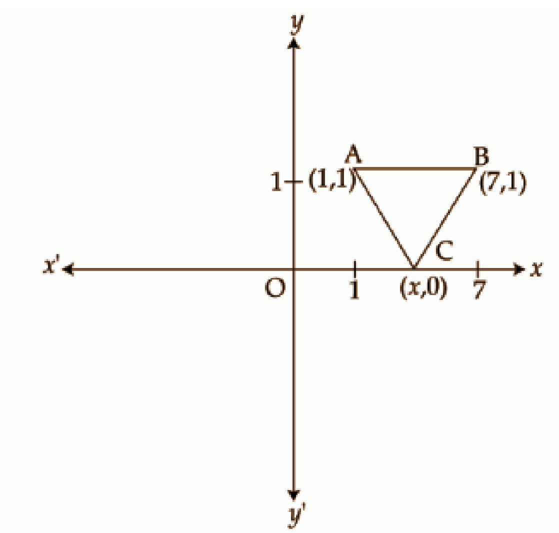
Solution:
[a] In triangle APD, $\angle P = 90^o$
$\angle A = \angle D$ [angle opposite to equal side are equal]
$\angle A + \angle ADP + \angle APD = 180^o$ [angle sum property of a triangle]
$\angle A + \angle A + 90^o = 180^o$
$2\angle A = 90^o$
$\angle A = 45^o$

[b] In triangle APD,
$\sin 45^o = PD / AD$
$1 / \sqrt{2} = PD / 5$
$5 / \sqrt{2} = PD = AP$
Area of $\triangle ADP = (1 / 2) * AP * PD$
$= (1 / 2) * (5 / \sqrt{2}) * (5 / \sqrt{2})$
$= 25 / 4 \text{ cm}^2$

[c] Area of a parallelogram = base * height
= AB * PD
= 2AP * PD
= 2 * (5 / √2) * (5 / √2)
= 25 cm^2

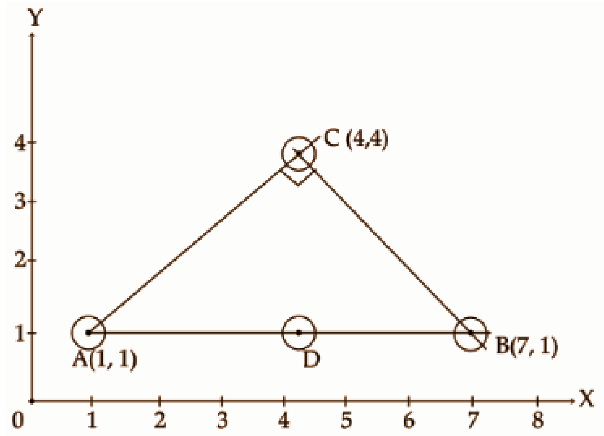
Question 17: [a] Draw the coordinates and mark the points A (1, 1), B (7, 1).
[b] Draw an isosceles triangle ABC with AB as the hypotenuse.
[c] Write the coordinates of C.

Solution:
[a]



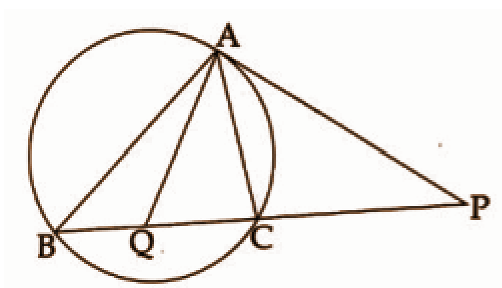
AC = BC
$\sqrt{(x - 1)^2 + 1} = \sqrt{(x - 7)^2 + 1}$
On squaring both sides,
$(x - 1)^2 + 1 = (x - 7)^2 + 1$
$x^2 + 1 - 2x + 1 = x^2 + 49 - 14x + 1$
-2x + 14x = 49 - 1
12x = 48
x = 48 / 12
x = 4

[b]



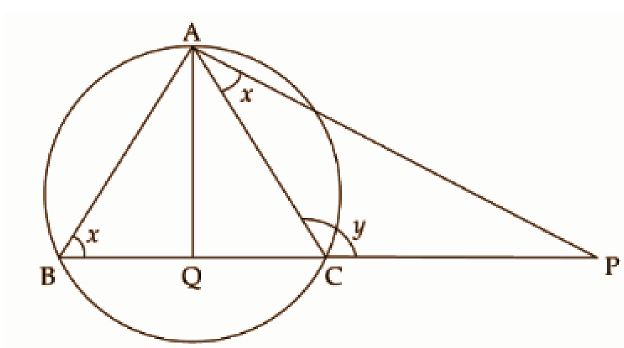
C (4, 0) is the required point.
Coordinate of C (4, 4) [AD = BC = CD]
The midpoint of the hypotenuse is equal distance from the vertex of the triangle.

Question 18: In the figure, chord BC is extended to P. Tangent from P to the circle is PA. AQ is the bisector of ∠BAC.



[a] Write one pair of equal angles from the figure.
[b] If ∠PAC = x and ∠PCA = y, then prove that ∠BAC = y - x.
[c] Prove that ∠PAQ = [y +x] / 2

Solution:



[a] ∡BAC = ∡PAC

[b] ∡PAC = ∡ABC

∡ACP = ∡BAC + ∡ABC [exterior angle property]

y = ∡BAC + x

∡BAC = y - x

[c] ∡PAQ = ∡PAC + ∡CAQ

= x + (1 / 2) * ∡BAC

= x + (1 / 2) * (y - x)

= x + (1 / 2) y - (1 / 2) x

∡PAQ = (1 / 2) (x + y)

Question 19: If (x - 1) is a factor of the second-degree polynomial P (x) = ax^2 + bx + c and P(0) = -5.
[a] What is the value of c?
[b] Prove that a + b = 5.
[c] Write a second-degree polynomial whose one factor is x - 1.

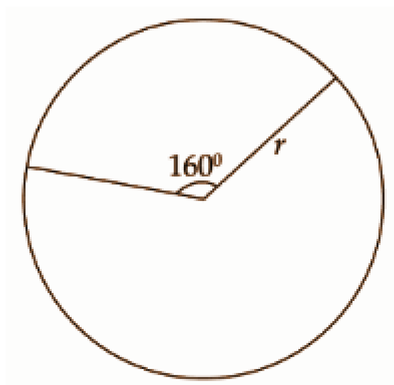
Solution:
[a] Given that x - 1 is a factor of the polynomial $ax^2 + bx + c$
x - 1 = 0
x = 1
P(1) = 0
$a (1)^2 + b * 1 + c = 0$
a + b + c = 0 ---- (1)
Now, at x = 0, P(0) = -5
a * 0 + b * 0 + c = -5
c = -5

[b] a + b + c = 0
a + b - 5 = 0
a + b = 5

[c] Second-degree polynomial = $3x^2 + 2x - 5$ or $2x^2 - 3x + 5$ or $4x^2 + x - 5$ [any of them]

Question 20: A circular sheet of paper is divided into two sectors. The central angle of one of them is 160º.
[a] What is the central angle of the remaining sector?
[b] These sectors are bent into cones of maximum volume. If the radius of the small cone is 8 centimetres, what is the radius of the other?
[c] What is the slant height of the cone?

Solution:



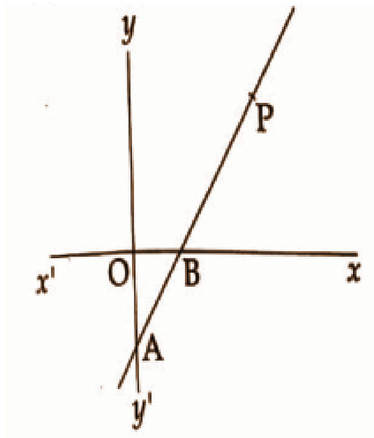
[a] Central angle of the remaining sector = $360^\circ - 160^\circ = 200^\circ$

[b] R_1 is the radius of the small cone = 8cm
$2\pi R_1 = 2\pi r (\theta_1) / 360^\circ$
$8 = r * (160^\circ / 360^\circ)$
$r = (360^\circ * 8) / 160^\circ$
r = 18cm
$2\pi R_2 = 2\pi r (\theta_2) / 360^\circ$
$R_2 = (18 * 200^\circ) / 360^\circ$
R_2 = 10cm

[c] Slant height (l_1) = 18cm
Slant height (l_2) = 18cm

Question 21: Equation of the line AB is 3x - 2y = 6. P is a point on the line. The line intersects the y-axis at A and the x-axis at B.

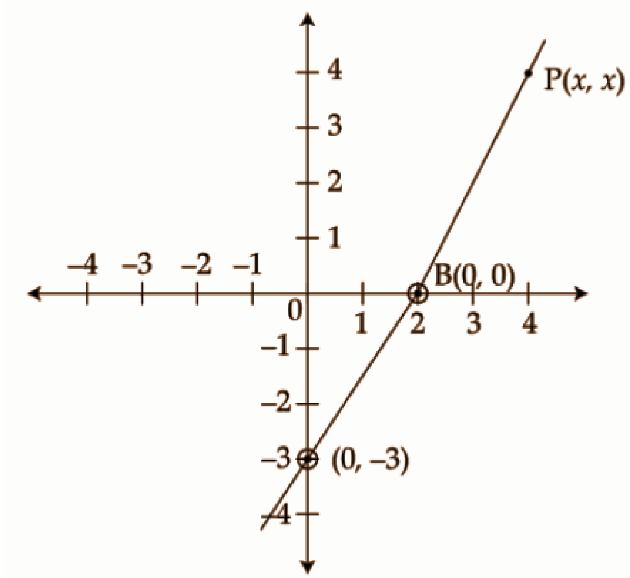
[a] What is the x coordinate of A?
[b] What is the length of OA?
[c] What is the length of OB?
[d] The x coordinate and the y coordinate of P are the same. Find the coordinates of P.



Solution:
Given, the equation of line AB is 3x - 2y = 6

x	0	2
y	-3	0

[a] x coordinate of A = 0
[b] OA = 3 units
[c] OB = 2 units
[d]



A, B, P are collinear.
Area of △ABP = 0
(1 / 2) [0 (0 - x) + 2 (x + 3) + x (-3 -0)] = 0
2x + 6 - 3x = 0
x = 6
Hence, the coordinates of P are (6, 6).

Answer any 5 questions from 22 to 28. Each question carries 5 scores. [5 * 5 = 25]

Question 22: If the terms of the arithmetic sequence (2 / 9), (3 / 9), (4 / 9), (5 / 9), ……. Are represented as x_1, x_2, …. then
[a] $x_1 + x_2 + x_3$ =
[b] $x_4 + x_5 + x_6$ =
[c] Find the sum of the first 9 terms.
[d] What is the sum of the first 300 terms?

Solution:
[a] $x_1 + x_2 + x_3$
= (2 / 9) + (3 / 9) + (4 / 9)
= 9 / 9
= 1

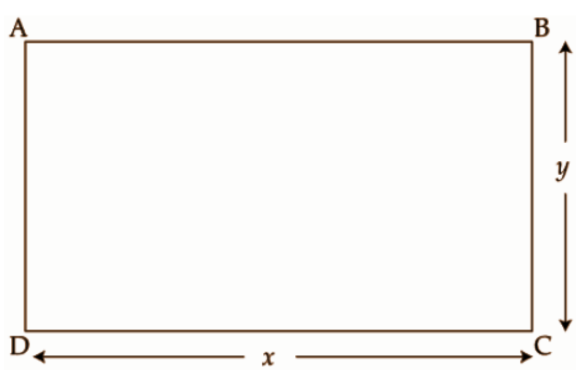
[b] $x_4 + x_5 + x_6$
= (5 / 9) + (6 / 9) + (7 / 9)
= (18 / 9)
= 2

[c] n = 9
a = 2 / 9
d = (3 / 9) - (2 / 9) = (1 / 9)
S_n = (n / 2) (2a + [n - 1]d)
S_9 = (9 /2) (2 * [2 / 9] + [9 - 1] * (1 / 9))
= (9 / 2) [(4 / 9) + (8 / 9)]
= (9 / 2) (12 / 9)
= 6

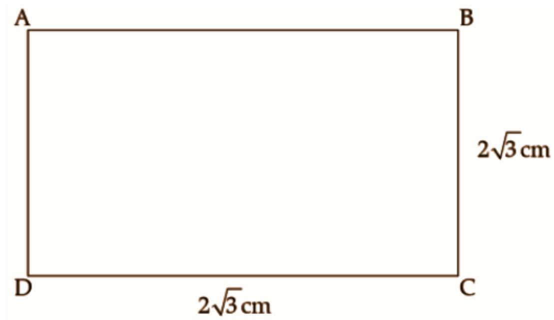
[d] n = 300
a = 2 / 9
d = (3 / 9) - (2 / 9) = (1 / 9)
S_n = (n / 2) (2a + [n - 1]d)
S_{300} = (300 /2) (2 * [2 / 9] + [300 - 1] * (1 / 9))
= (300 / 2) [(4 / 9) + (299 / 9)]
= (150) (303 / 9)
= 5050

Question 23: Draw a rectangle of area 12 square centimetres. Draw a square having the same area.

Solution:

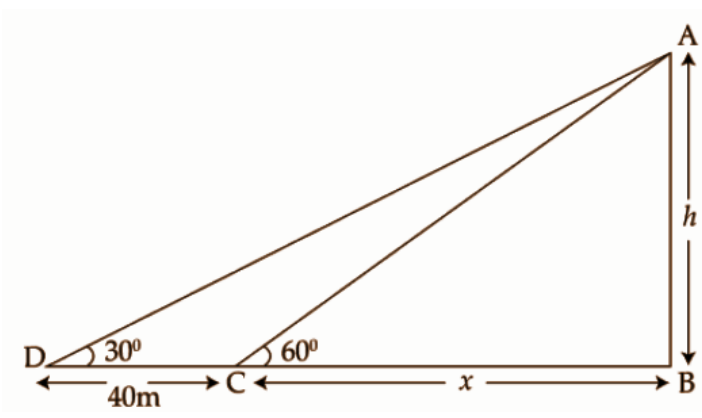


For the given rectangle,
Area = $12cm^2$
$x * y = 12cm^2$
For a square, x = y.
$x * x = 12cm^2$
$x^2 = 12cm^2$
$x = 2\sqrt{3}$ cm



Question 24: A boy standing at one bank of a river sees the top of a tree on the other bank directly opposite to the boy at an elevation of 60°. Stepping 40 meters back, he sees the top of the elevation at 30°.
[a] Draw a rough sketch and find the height of the tree.
[b] What is the width of the river?

Solution:



Let AB be h and CB be x.
In △ABC,
tan 60° = AB / BC
$\sqrt{3} = h / x$

$h = \sqrt{3}x$ ---- (1)

In $\triangle ABD$,

$\tan 30^o = AB / BD$

$1 / \sqrt{3} = h / x + 40$

$x + 40 = \sqrt{3} (\sqrt{3}x)$ --- (2)

$x + 40 = 3x$

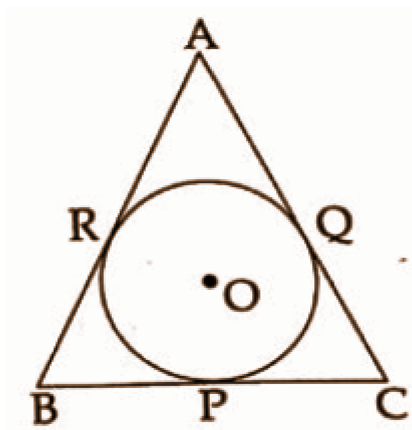
$40 = 2x$

$x = 20$

$h = 20\sqrt{3}$ m

Width of the river is 20m and the height of the tree is $20\sqrt{3}$m.

Question 25: Circle with centre O touches the sides of a triangle at P, Q and R, AB = AC, AQ = 4cm and CQ = 6cm.

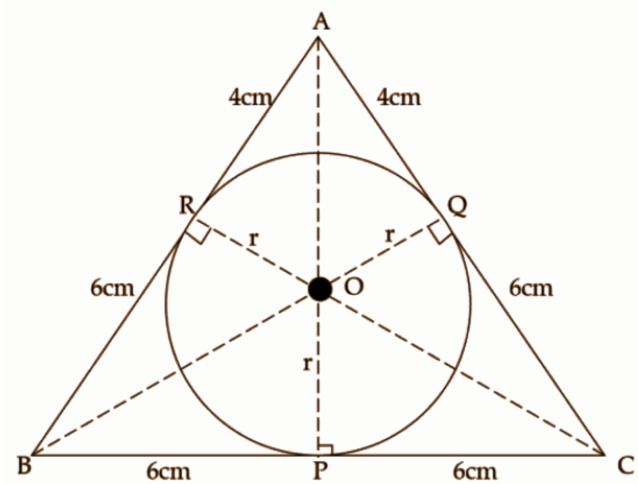


[a] What is the length of CP?

[b] Find the perimeter and the area of the triangle.

[c] What is the radius of the circle?

Solution:



[a] CP = CQ [Length of external tangents are equal]
CP = 6cm
[b] Perimeter of triangle = 4 + 6 + 6 + 6 + 4 + 6 = 32 cm
For the area of △ABC,
s = [AB + BC + CA] / 2
= [10 + 12 + 10] / 2
= 16cm
Area of △ABC = $\sqrt{s(s-a)(s-b)(s-c)}$
= $\sqrt{(16)(16-10)(16-12)(16-10)}$
= $\sqrt{16 * 6 * 4 * 6}$
= $48cm^2$

[c] Area of △ABC = area of △AOB + area of △BOC + area of △COA
48 = (1 / 2) * 10 * r + (1 / 2) * 12 * r + (1 / 2) * 10 * r
48 * 2 = r (10 + 12 + 10)
48 * 2 = 32 * r
r = 3cm

Question 26: Radius of a cylinder is equal to its height. If the radius is taken as 'r', the volume of the cylinder is $\pi r^2 * r = \pi r^3$. Like this find the volumes of the solids, with the following measures.

Solids	Measures	Volume
Cone	radius = height = r	
Hemisphere	radius = r	
Sphere	radius = r	

[a] What is the ratio of the volumes of the cone, hemisphere, cylinder and the sphere?
[b] A solid metal sphere of radius 6cm is melted and recast into solid cones of radius 6cm and height 6cm. Find the number of cones.

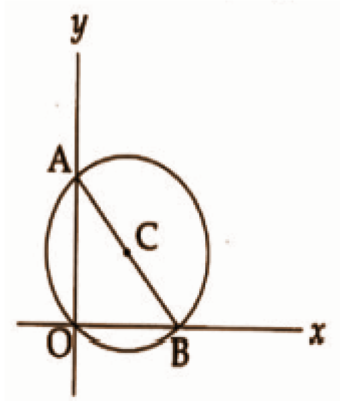
Solution:
[a]

Solids	Measures	Volume
Cone	radius = height = r	$\frac{1}{3}\pi r^2 h \Rightarrow \frac{1}{3}\pi r^2 \times r \Rightarrow \frac{1}{3}\pi r^3$
Hemisphere	radius = r	$\frac{2}{3}\pi r^3$
Sphere	radius = r	$\frac{4}{3}\pi r^3$

[b] $V_c : V_h : V_{cy} : V_s = [\pi r^3 / 3] : [2 / 3]\ \pi r^3 : \pi r^3 : [4 / 3]\ \pi r^3$
= (1 / 3) : (2 / 3) : 1 : (4 / 3)
= 1 : 2 : 3 : 4

Number of cones = Volume of the sphere / Volume of the cone
= $[(4 / 3)\ \pi r^3] / [\pi R^2 h / 3]$
= $\{[4 * \pi * 6^3] / (3)\} / \{[\pi * 6^2 * 6] / (3)\}$
= 4

Question 27: C is at the centre of the circle passing through the origin. Circle cuts the y-axis at A (0, 4) and the x-axis at B(4, 0).



[a] Write the coordinates of C.

[b] Write the equation of the circle.

[c] (0, 0) is a point on the circle. There is one more point on the circle with x and y coordinates equal. Which is that?

Solution:

[a] C is the midpoint of AB.

x = [4 + 0] / 2

= 4 / 2

x = 2

y = [4 + 0] / 2

= 4 / 2

y = 2

The coordinates of C are (2, 2).

[b] The equation of the circle is given by $(x - a)^2 + (y - b)^2 = r^2$

$(x - 2)^2 + (y - 2)^2 = [\sqrt{(4 - 2)^2 + (0 - 2)^2}]^2$

$x^2 + 4 - 4x + y^2 + 4 - 4y = 8$

$x^2 + y^2 - 4x - 4y = 0$

[c] Let P(x, x) be a point on the circle.

$x^2 + x^2 - 4x - 4x = 0$

$2x^2 - 8x = 0$

x = 0, 4

The required point is (4, 4).

Question 28: The table below shows the number of children in a class, sorted according to their heights.

Height (Centimetres)	Number of Children
130 -140	7
140 - 150	9
150 -160	10
160 -170	10
170 -180	9

If the students are directed to stand in a line according to the order of their heights starting from the smallest, then
[a] The height of the child at what position is taken as the median?
[b] What is the assumed height of the child in the 17th position?
[c] Find the median height.

Solution:

Class interval	frequency	Cumulative frequency
130 - 140	7	7
140 - 150	9	16
150 - 160	10	26
160 - 170	10	36
170 - 180	9	45

[a] N = 45
Median is taken as [N + 1] / 2
= [45 + 1] / 2
= 46 / 2
= 23

The height of the child at the 23rd position is taken as the median.
[b] Height of the child in the 17th position between 150 - 160. Assumed height is 152cm.

[c] Median = $[l_1] + \{[(N / 2) - C] / cf\} * h$
= 150 + [22.5 - 16] / 10 * (10)
= 150 + 6.5
= 156.5

Question 29: Read the following. Understand mathematical concepts in it and answer the questions that follow.
The remainders obtained on dividing the powers of two by 7 have an interesting property.
We can understand it from the table given below.

Number	2^1	2^2	2^3	2^4	2^5	2^6	2^7	....
Remainder	2	4	1	2	4	1	2	....

If the powers are 1, 4, 7 ….. the remainder is 2.
If the powers are 3, 6, 9 ….. the remainder is 1.
[a] What is the remainder on dividing 2^8 by 7?
[b] Write the sequence of powers of 2 leaving remainder 1 on division by 7.
[c] Check whether 2019 is a term of arithmetic sequence 3, 6, 9 …….
[d] What is the remainder on dividing 2^{2019} by 7?
[e] Write the algebraic form of the arithmetic sequence 1, 4, 7 ……
[f] Write the algebraic form of the sequence 2^1, 2^4, 2^7 ….. [powers of two leaving remainder 2 on division by 7].

Solution:
[a] If 2^8 is divided by 7, then the remainder is 7.

[b] 2^3, 2^6, 2^9 ……. when divided by 7 leaves a remainder 1.

[c] Yes
2019 = 3 (n - 1) 3
2019 = 3n - 9

$2019 + 9 = 3n$
$2018 = 3n$
$2018 / 3 = n$
$n = 673$ terms

[d] 1 is the remainder on dividing 2^{2019} by 7.

[e] $a_n = a + (n - 1)d$
$a_n = 1 + (n - 1)3$
$= 1 + 3n - 3$
$a_n = 3n - 2$

[f] 1, 4, 7 ….. n^{th} term is $3n - 2$.
So, the algebraic form is 2^{3n-2}.