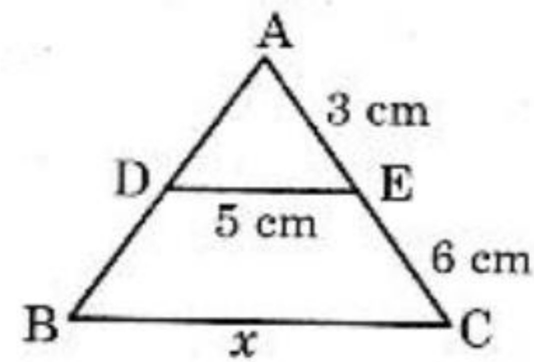
Telangana Board SSC Class 10 Maths 2016 Question Paper 2 with Solutions

PART A
SECTION - I

1. In the given figure, $\Delta ABC \sim \Delta ADE$, then find the value of x.



Solution:
In ΔADE and ΔABC,
$\angle A = \angle A$ (common)
$\angle ADE = \angle ABC$ (corresponding angles)
By SS similarity criterion,
$\Delta ADE \sim \Delta ABC$
AC/AE = BC/DE
(3 + 6)/3 = x/5
x/5 = 9/3
x = 15 cm

2. Find the probability of getting a sum of the numbers on them is 7, when two dice are rolled at a time.

Solution:
Total number of outcomes = $6^2 = 36$
n(S) = 36
Let E be the event of getting a sum of numbers on the dice is 7.
E = {(1, 6), (6, 1), (2, 5), (5, 2), (3, 4), (4, 3)}
Number of outcomes favourable to E = n(E) = 7
P(E) = n(E)/n(S) = 7/36

3. If $\tan \theta = \sqrt{3}$ (where θ is acute), then find the value of $1 + \cos \theta$.

Solution:
Given,
$\tan \theta = \sqrt{3}$
$\tan \theta = \tan 60°$

$\theta = 60°$
$1 + \cos\theta = 1 + \cos 60°$
$= 1 + (1/2)$
$= 3/2$

4. "A conical solid block is exactly fitted inside the cubical box of side 'a', then the volume of conical solid block is $4/3\ \pi a^3$". Is this statement true? Justify your answer.

Solution:
Given,
Side of a cube = a
Volume of cubical box = a^3
Volume of conical solid block = $4/3\ \pi a^3$
$4/3\ \pi a^3 > a^3$
Hence, the given statement is false since the volume of the conical block should not be greater than the volume of the cube if it is fitted exactly inside it.

5. If the surface area of a hemisphere is 'S', then express 'r' in terms of 'S'.

Solution:
Surface area of hemisphere $S = 2\pi r^2$
$r^2 = S/2\pi$
$r = \sqrt{(S/2\pi)}$

6. Write the formula to find the median for grouped data and explain each term.

Solution:
Median = $l + \{[(n/2) - cf]/ f\} \times h$
Here,
l = Lower limit of the median class
n = Sum of frequencies
cf = Cumulative frequency of the class preceding the median class
f = Frequency of the median class
h = Class height

7. "If the angle of elevation of the Sun increases from 0° to 90°, then the length of shadow of a tower decreases." Is this statement true? Justify your answer.

Solution:
Let h be the height of the tower and s be the length of its shadow.
Initially, the angle of elevation = 0°
$\tan 0° = h/s$
$h/s = 0$
Thus, the length of shadow is infinity.
Finally, the angle of elevation = 90°
$\tan 90° = h/s$
$h/s = \infty$
$h/s = 1/0$
$s = 0$
Thus, the length of shadow is minimum.

Hence, the given statement is true.

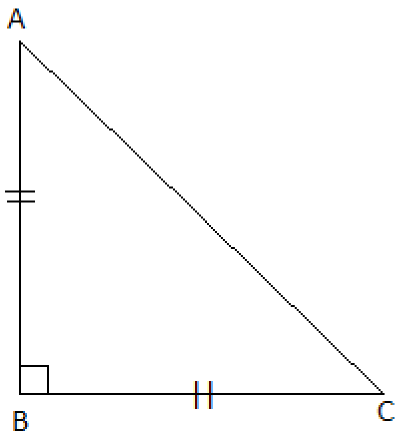
SECTION - II

8. Prove that $\sqrt{[(1 - \sin\theta)/(1 + \sin\theta)]} = \sec\theta - \tan\theta$, where θ is acute.

Solution:
LHS = $\sqrt{[(1 - \sin\theta)/(1 + \sin\theta)]}$
= $\sqrt{\{[(1 - \sin\theta)/(1 + \sin\theta)]\,[(1 - \sin\theta)/(1 - \sin\theta)]\}}$
= $\sqrt{[(1 - \sin\theta)^2/(1 - \sin^2\theta)]}$
= $\sqrt{[(1 - \sin\theta)^2/\cos^2\theta]}$
= $(1 - \sin\theta)/\cos\theta$
= $(1/\cos\theta) - (\sin\theta/\cos\theta)$
= $\sec\theta - \tan\theta$
= RHS
Hence proved.

9. ABC is an isosceles triangle and ∠B = 90°, then show that $AC^2 = 2AB^2$.

Solution:
Given,



AB = BC
By Pythagoras theorem,
$AC^2 = AB^2 + BC^2$
$AC^2 = AB^2 + AB^2$
$AC^2 = 2AB^2$
Hence proved.

10. Find the volume and surface area of a sphere of radius 42 cm. (π = 22/7)

Solution:
Given,
Radius of sphere = r = 42 cm
Surface area of sphere = $4\pi r^2$
= 4 × (22/7) × 42 × 42
= 22176 cm^2
Volume of sphere = $(4/3)\pi r^3$

= (4/3) × (22/7) × 42 × 42 × 42
= 310464 cm^3

11. If tan (A + B) = 1 and cos (A - B) = √3/2, 0° < A + B < 90° and A > B; find A and B.

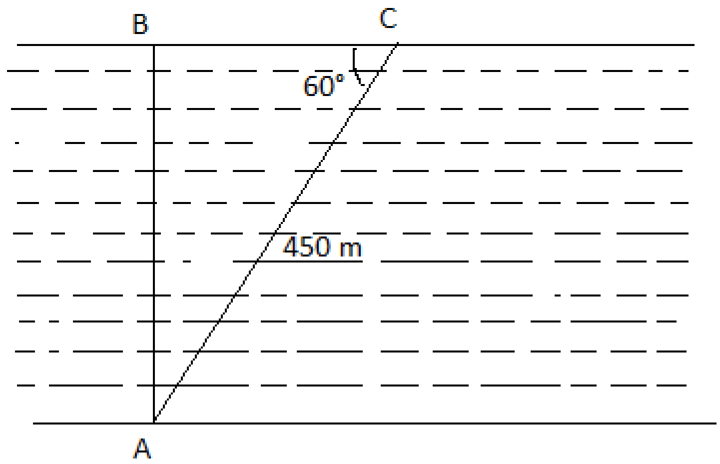
Solution:
Given,
tan (A + B) = 1
tan (A + B) = tan 45°
A + B = 45°....(i)
And
cos (A - B) = √3/2
cos (A - B) = cos 30°
A - B = 30°....(ii)
Adding (i) and (ii),
A + B + A - B = 45° + 30°
2A = 75°
A = 75°/2
A = 37.5°
Substituting A = 37.5° in (i)
37.5° + B = 45°
B = 45° - 37.5°
B = 7.5°

12. A solid metallic ball of volume 64 cm^3 melted and made into a solid cube. Find the side of the solid cube.

Solution:
Let a be the side of a solid cube.
According to the given,
Volume of metallic ball = Volume of solid cube
$64 = a^3$
$\Rightarrow a^3 = 4^3$
$\Rightarrow a = 4$
Hence, the side of the solid cube = 4 cm

13. A boat has to cross a river. It crosses the river by making an angle of 60° with the bank of the river due to the stream of the river and travels a distance of 450 m to reach the other side of the river. Draw the diagram for this data.

Solution:
Let AB be the width of the river and C be the position of boat.



SECTION - III

14. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball, find the number of blue balls in the bag.

Solution:
Given,
Number of red balls = 5
Let x be the number of blue balls.
Total number of balls = x + 5
P(getting a red ball) = 5/(x + 5)
P(getting a blue ball) = x/(x + 5)
According to the given,
2[5/(x + 5)] = x/(x + 5)
⇒ x = 10
Hence, the number of blue balls in the bag = 10

OR

Evaluate: $(\tan^2 60° + 4\cos^2 45° + 3\sec^2 30° + 5\cos^2 90°)/(\text{cosec } 30° + \sec 60° - \cot^2 30°)$

Solution:
$(\tan^2 60° + 4\cos^2 45° + 3\sec^2 30° + 5\cos^2 90°)/(\text{cosec } 30° + \sec 60° - \cot^2 30°)$
$= [(\sqrt{3})^2 + 4(1/\sqrt{2})^2 + 3(2/\sqrt{3})^2 + 5(0)^2]/[2 + 2 - (\sqrt{3})^2]$
$= [3 + 2 + 4 + 0]/(4 - 3)$
$= 9/1$
$= 9$

15. Consider the following distribution of daily wages of 50 workers of a factory.

Daily wages in Rupees	200 - 250	250 - 300	300 - 350	350 - 400	400 - 450
Number of	6	8	14	10	12

workers					

Find the mean daily wages of the workers in the factory by using step-deviation method.

Solution:

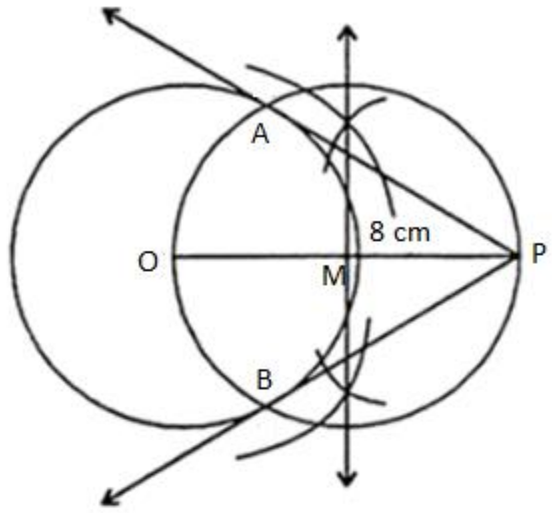
Daily wages (in Rs)	Number of workers (f_i)	Mid values (x_i)	$d_i = x_i - 325$	$u_i = (x_i - 325)/50$	f_iu_i
200 - 250	6	225	-100	-2	-12
250 - 300	8	275	-50	-1	-8
300 - 350	14	325 = A	0	0	0
350 - 400	10	375	50	1	10
400 - 450	12	425	100	2	24
	$\sum f_i = 50$				$\sum f_iu_i = 14$

Mean = $a + (\sum f_iu_i / \sum f_i) \times h$
$= 325 + (14/50) \times 50$
$= 325 + 14$
$= 339$

OR

Draw a circle of radius 5 cm. From a point 8 cm away from its centre, construct a pair of tangents to the circle. Find the lengths of tangents.

Solution:



PA and PB are the required tangents to the circle.

Length of tangents = PA = PB = 6 cm

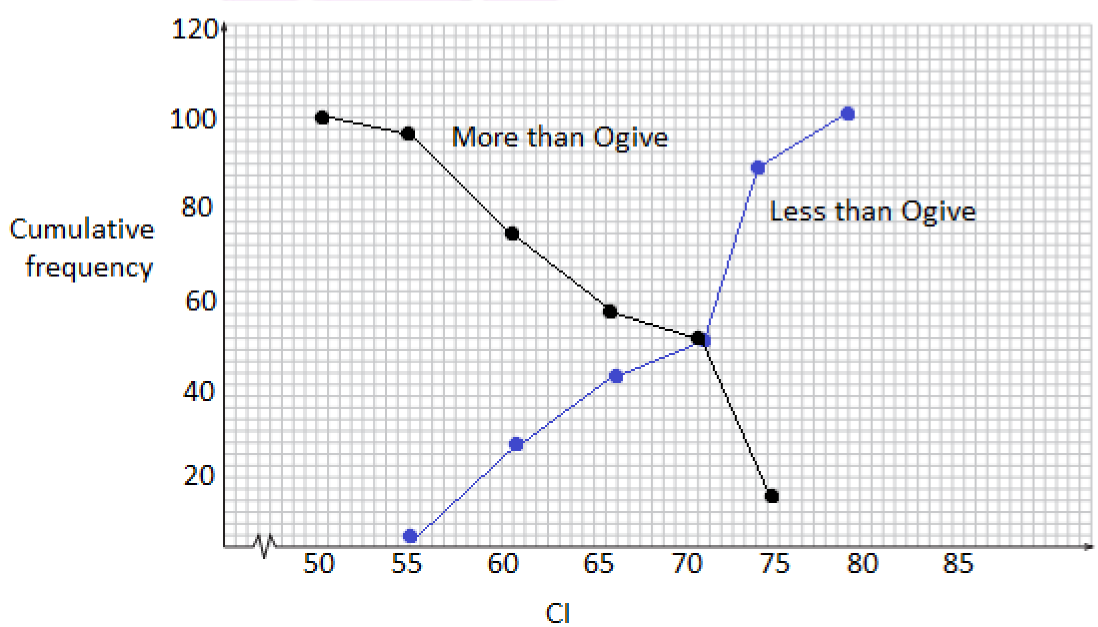
16. The following table gives production yield per hectare of wheat of 100 farms of a village.

Production yield (Quintal/ HEc.)	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80
Number of farmers	2	24	16	8	38	12

Draw both Ogives for the above data. Hence obtain the median production yield.

Solution:

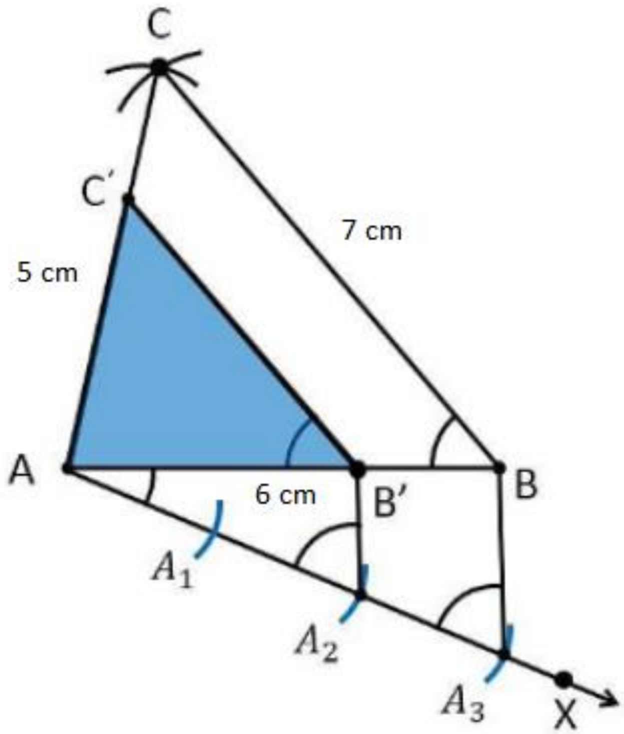
CI	Less than cumulative frequency	CI	More than cumulative frequency
Less than 55	2	More than 50	100
Less than 60	26	More than 55	98
Less than 65	42	More than 60	74
Less than 70	50	More than 65	58
Less than 75	88	More than 70	50
Less than 80	100	More than 75	12



OR

Construct a triangle of sides 5 cm, 6 cm and 7 cm, then construct a triangle similar to it, whose sides are 2/3 of the corresponding sides of the first triangle.

Solution:



Hence, ΔAB'C' be the required triangle similar to the ΔABC.

17. DWACRA is supplied with a cuboidal shaped wax block with measurements 88 cm × 42 cm × 35 cm. From this how many cylindrical candles of 2.8 cm diameter and 8 cm of height can be prepared?

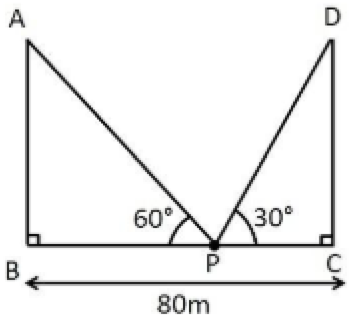
Solution:
Given,
Length of block = 88 cm
Width of block = 42 cm
Height of block = 35 cm
Volume of block = Length × Height × width
= 88 × 35 × 42
= 129360 cm^3
Also,
Diameter of candle = 2.8 cm
Radius of candle = r = 2.8/2 = 1.4 cm
Height of candle = h = 8 cm
Volume of candle = $\pi r^2 h$
= $(22/7) \times (1.4)^2 \times 8$
= 49.28 cm^3

Number of candles formed = Voume of block/Voluem of one candle
= 129360/49.28
= 2625

OR

Two poles of equal heights are standing opposite to each other, on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of top of the poles are 60° and 30° respectively. Find the height of the poles.

Solution:
Let AB and CD be the two poles.
BC is the width of the road and P be the point of observation.



In right triangle PCD,
tan 30° = CD/PC
1/√3 = CD/PC
CD = PC/√3 ....(i)
In right triangle PBA,
tan 60° = AB/PB
√3 = AB/PB
AB = √3 BP
CD = √3 BP....(ii) (given that heights of two poles are equal)
From (i) and (ii),
PC/√3 = √3 BP
PC = √3 × √3 × BP
PC = 3BP
Now,
BP + PC = BC
BP + 3BP = 80
4BP = 80
BP = 80/4
BP = 20 m
Again, PC = BC - BP
PC = 80 - 20 = 60 m
From (ii),
CD = √3 (20) = 20√3 ,
Hence, the height of the poles = 20√3 m