Telangana Board SSC Class 10 Maths 2018 Question Paper 2 with Solutions

PART A
SECTION - I

1. Prathyusha stated that "the average of the first 10 odd numbers is also 10". Do you agree with her? Justify your answer.

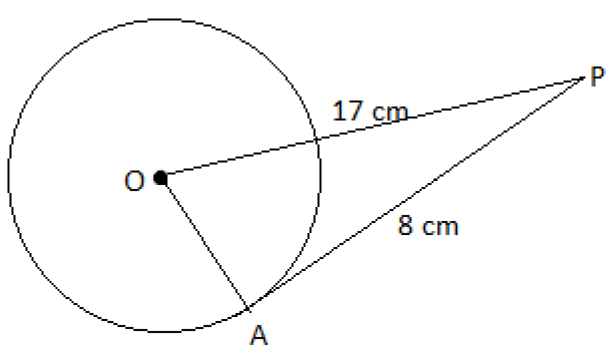
Solution:
The first 10 odd numbers are 1, 3, 5, 7, 9, 11, 13, 15, 17, 19
Average = (1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19)/10
= 100/10
= 10
Therefore, the average of the first 10 odd numbers is also 10.
Hence, I agree with Prathyusha.

2. Write the formula to find the median of a grouped data and explain the alphabet in it.

Solution:
Median = l + {[(n/2) - cf]/ f} × 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

3. The length of the tangent to a circle from a point 17 cm from its centre is 8 cm. Find the radius of the circle.

Solution:
Given,
Length of the tangent = AP = 8 cm



We know that the radius perpendicular to the tangent through the point of contact.
In right triangle OAP,

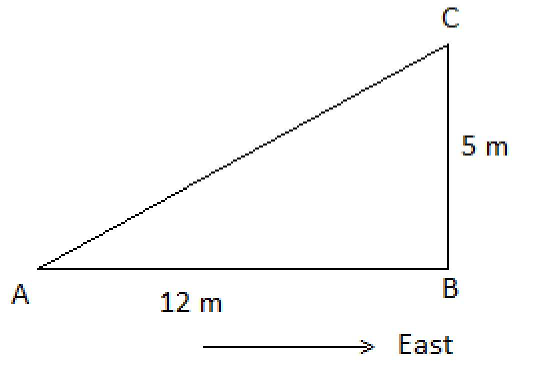
$OP^2 = OA^2 + AP^2$
$OA^2 = OP^2 - AP^2$
$= (17)^2 - (8)^2$
$= 289 - 64$
$= 225$
$OA = 15$
Hence, the radius of the circle is 15 cm.

4. Find the value of tan 2A, if cos 3A = sin 45°.

Solution:
Given,
cos 3A = sin 45°
cos 3A = sin (90° - 45°)
cos 3A = cos 45°
⇒ 3A = 45°
⇒ A = 45°/3
⇒ A = 15°
tan 2A = tan 2(15°)
= tan 30°
= $1/\sqrt{3}$

5. Srivani walks 12 m due East and turns left and walks another 5 m, how far is she from the place she started?

Solution:
Given information can be put diagrammatically as below.

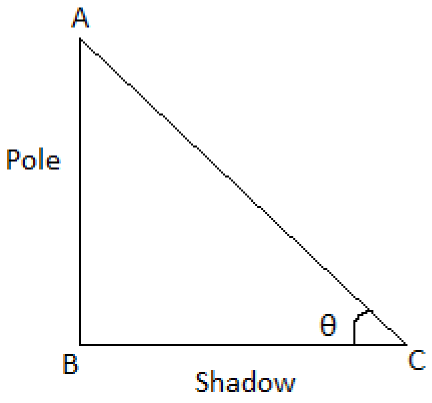


In right triangle ABC,
$AC^2 = AB^2 + BC^2$
$= (12)^2 + (5)^2$
$= 144 + 25$
$= 169$
AC = 13 cm
Hence, Srivani is 13 cm away from the starting point.

6. A pole and its shadow have the same length, find the angle of the Sun ray made with the earth at that time.

Solution:
Let AB be the pole and BC be its shadow.

Θ be the angle of elevation made by the Sun.



In right triangle ABC,
tan θ = AB/AC
tan θ = 1 (given that AB = AC)
tan θ = tan 45°
θ = 45°
Hence, the angle of the Sun ray made with the earth is 45°.

7. What is the probability of getting exactly two heads, when three coins tossed simultaneously?

Solution:
Total number of outcomes = $2^3 = 8$
Favourable outcomes of getting exactly two heads = {HHT, HTH, THH} = 3
P(getting exactly two heads) = ⅜

SECTION - II

8. Find measure of the angles A and B, is cos (A - B) = √3/2 and sin (A + B) = √3/2.

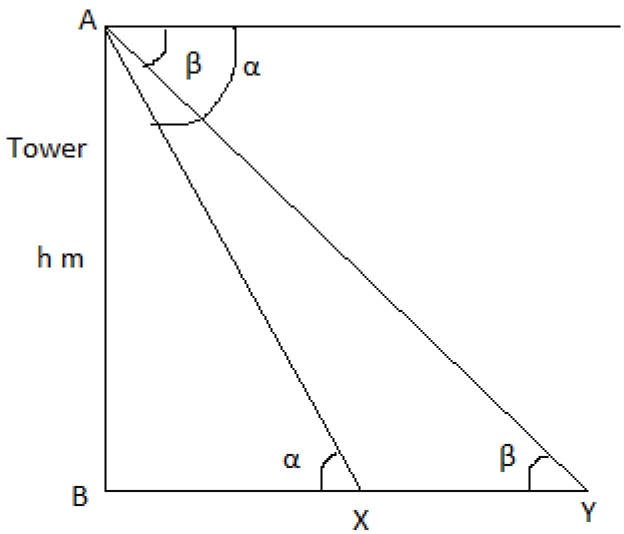
Solution:
Given,
cos (A - B) = √3/2
cos (A - B) = cos 30°
A - B = 30°....(i)
And
sin (A + B) = √3/2
sin (A + B) = sin 60°
A + B = 60°....(ii)
Adding (i) and (ii),
A - B + A + B = 30° + 60°
2A = 90°
A = 90°/2
A = 45°
Substituting A = 45° in (ii),
45° + B = 60°
B = 60° - 45°
B = 15°

9. What is the probability that a number picked from the first twenty natural numbers is even composite number?

Solution:
Total number of outcomes = 20
i.e. first twenty natural numbers: 1, 2, 3,..., 30
Even composite numbers are: 4, 6, 8, 10, 12, 14, 16, 18, 20.
Number of favourable outcomes = 9
Hence, the required probability = 9/20

10. From the top of a tower of h m height, Anusha observes the angles of depression of two points X and Y on the same side of tower on the ground to be α and β. Draw the suitable figure for the given information.

Solution:



11. Find the median of 2/3, 4/5, 1/2, 3/4, 6/5.

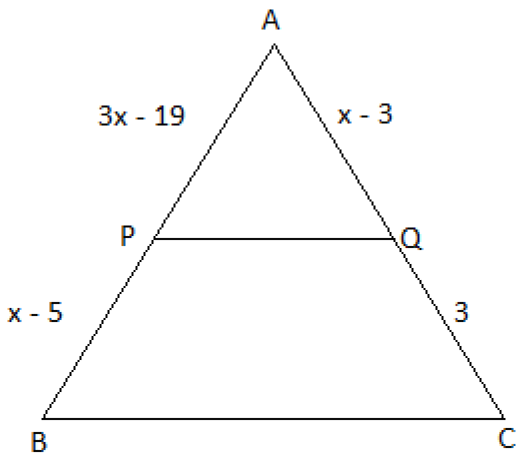
Solution:
Given,
2/3, 4/5, 1/2, 3/4, 6/5
LCM of denominators = 60
Thus,
(2/3) × (20/20) = 40/60
(4/5) × (12/12) = 48/60
(1/2) × (30/30) = 30/60
(3/4) × (15/15) = 45/60
(6/5) × (12/12) = 72/60
The ascending order of the given fractions is:
30/60, 40/60, 45/60, 48/60, 72/60
Middlemost fraction is 45/60.
Hence, the median is 3/4.

12. The height and the base radius of a cone and a cylinder are equal to the radius of a sphere. Find the ratio of their volumes.

Solution:
Let r be the radius and h be the height of a cone and cylinder.
Also, r be the radius of the sphere.
According to the given,
r = h
Volume of cone : Volume of cylinder : Volume of sphere
$= (1/3)\pi r^2 h : \pi r^2 h : (4/3)\pi r^3$
$= (1/3)r^3 : r^3 : (4/3)r^3$ [since r = h]
= 1 : 3 : 4

13. In ΔABC, PQ || BC and AP = 3x - 19, PB = x - 5, AQ = x - 3, QC = 3 cm. Find x.

Solution:
Given,
PQ || BC



By BPT,
(3x - 19)/ (x - 5) = (x - 3)/3
3(3x - 19) = (x - 3)(x - 5)
$9x - 57 = x^2 - 5x - 3x + 15$
$x^2 - 8x + 15 - 9x + 57 = 0$
$x^2 - 17x + 72 = 0$
$x^2 - 8x - 9x + 72 = 0$
x(x - 8) - 9(x - 8) = 0
(x - 9)(x - 8) = 0
x - 9 = 0, x - 8 = 0
x = 9, x = 8

SECTION - III

14. How many silver coins of diameter 5 cm and thickness 4 mm have to be melted to prepare a cuboid of 12 cm × 11 cm × 5 cm dimension?

Solution:
Given,
Dimensions of the cuboid are 12 cm × 11 cm × 5 cm.
Diameter of coin = 5 cm

Radius = r = 5/2 = 2.5 cm
Thickness of the coin = h = 4 mm = 0.4 cm
Number of silver coins = Volume of cuboid/ Volume of one coin
= (12 cm × 11 cm × 5 cm)/ $\pi r^2 h$
= (12 × 11 × 5)/ [(22/7) × 2.5 × 2.5 × 0.4)]
= 4620/ 55
= 84
Hence, 84 coins are required to be melted to form a cuboid.

OR

Income of the families in a locality are given. Find the mode of the data.

Income (in Rs.)	1 - 200	201 - 400	401 - 600	601 - 800	801 - 1000
Number of families	7	10	16	12	3

Solution:
Given class intervals are discontinuous, hence let us convert them into continuous classes as shown below.

CI	Number of families (f)
0.5 - 200.5	7
200.5 - 400.5	10 = f0
400.5 - 600.5	16 = f1
600.5 - 800.5	12 = f2
800.5 - 1000.5	3

Highest frequency = 16
Thus, modal class is 400.5 - 600.5
Lower limit of modal class = l = 400.5
Frequency of the class preceding the modal class = f_0 = 10
Frequency of the modal class = f_1 = 16
Frequency of the class succeeding the modal class = f_2 = 12
Class height = h = 200
Mode = $l + [(f_1 - f_0)/ (2f_1 - f_0 - f_2)] \times h$
= 400.5 + [(16 - 10)/ (2 × 16 - 10 - 12)] × 200
= 400.5 + [6/(32 - 22)] × 200
= 400.5 + (6/10) × 200
= 400.5 + 120
= 520.5

15. Prove that:
[cos A/ (1 - tan A)] + [sin A/ (1 - cot A)] = sin A + cos A

Solution:

$$\text{LHS} = \frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A}$$

$$= \frac{\cos A}{1-\frac{\sin A}{\cos A}} + \frac{\sin A}{1-\frac{\cos A}{\sin A}}$$

$$= \frac{\cos A}{\frac{\cos A - \sin A}{\cos A}} + \frac{\sin A}{\frac{\sin A - \cos A}{\sin A}}$$

$$= \frac{\cos^2 A}{\cos A - \sin A} + \frac{\sin^2 A}{\sin A - \cos A}$$

$$= \frac{\cos^2 A}{\cos A - \sin A} - \frac{\sin^2 A}{\cos A - \sin A}$$

$$= \frac{\cos^2 A - \sin^2 A}{\cos A - \sin A}$$

$$= \frac{(\cos A + \sin A)(\cos A - \sin A)}{\cos A - \sin A}$$

$$= \cos A + \sin A$$

$$= \text{RHS}$$

Hence proved.

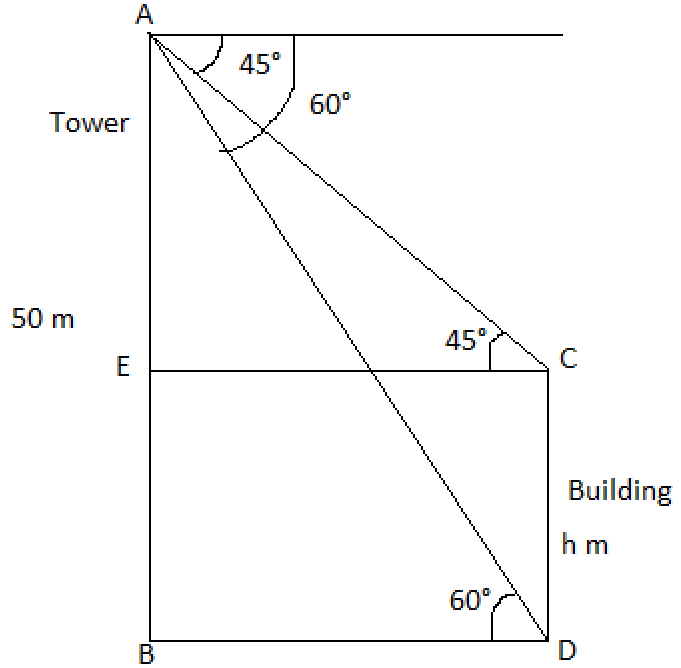
OR

Show that:
$(\sec \theta - \tan \theta)^2 = (1 - \sin \theta)/ (1 + \sin \theta)$

Solution:
$(\sec \theta - \tan \theta)^2$
$= [(1/\cos \theta) - (\sin \theta/\cos \theta)]^2$
$= [(1 - \sin \theta)/\cos \theta]^2$
$= (1 - \sin \theta)^2/ \cos^2\theta$
$= (1 - \sin \theta)^2/ (1 - \sin^2\theta)$
$= [(1 - \sin \theta)(1 - \sin \theta)]/ [(1 - \sin \theta)(1 + \sin \theta)]$
$= (1 - \sin \theta)/ (1 + \sin \theta)$

16. From the top of a tower of 50 m high, Neha observes the angles of depression of the top and foot of another building to be 45° and 60° respectively. Find the height of the building.

Solution:
Let AB be the tower and CD be the building.



In right triangle ABD,
tan 60° = AB/BD
√3 = 50/BD
BD = 50/√3 m
In right triangle AEC,
tan 45° = AE/EC
1 = AE/BD
BD = AE = 50/√3 m
AB = AE + BE
50 = (50/√3) + BE
BE = 50 - (50/√3)
= (50√3 - 50)/√3
= 50(√3 - 1)/√3
Hence, the height of the building = 50(√3 - 1)/√3 m

OR

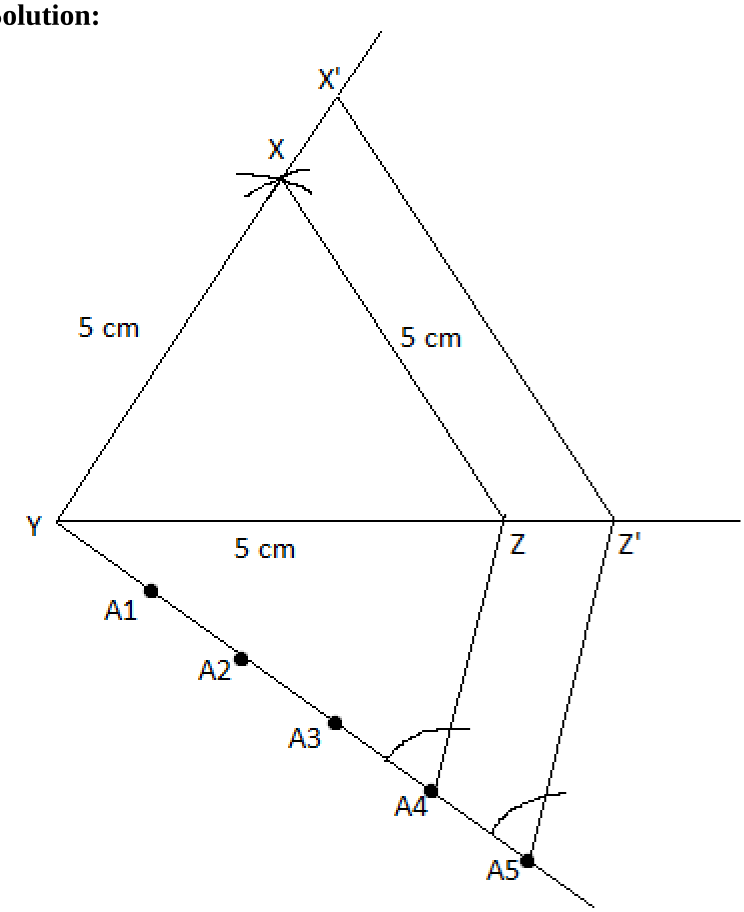
From the deck of 52 cards, if a card is randomly chosen, find the probability of getting a card with
(i) a prime number on it
(ii) face on it

Solution:
Total number of outcomes = n(S) = 52
(i) Let A be the event of getting a prime number on the card.
Number of outcomes favourable to A = n(A) = 16
i.e. 2, 3, 5, 7 (4 times)

P(A) = n(A)/n(S)
= 16/52
= 4/13
(ii) Let B be the event of getting a face card.
Number of outcomes favourable to B = n(B) = 12
i.e. king, queen, jack (4 times)
P(B) = n(B)/n(S)
= 12/52
= 3/13

17. Construct an equilateral triangle XYZ of side 5 cm and construct another triangle similar to ΔXYZ, such that each of its sides is 4/5 of the sides of ΔXYZ.

Solution:



Hence, ΔX'YZ' is the required triangle similar to the ΔXYZ.

OR

Heights of the pupils of a particular school are given. Draw greater than cumulative curve and find the median height from it.

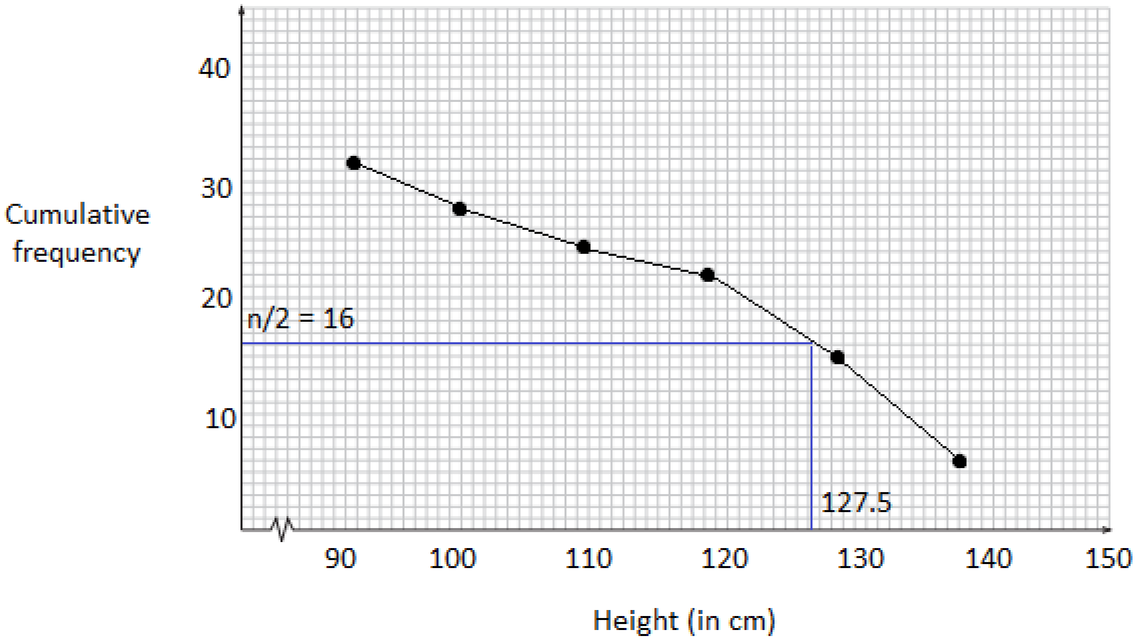
Height (in cm)	90 - 100	100 - 110	110 - 120	120 - 130	130 - 140	140 - 150

Number of pupils	5	2	3	8	8	6

Solution:
Cumulative frequency distribution table:

Class interval	Cumulative frequency
More than 90	32
More than 100	27
More than 110	25
More than 120	22
More than 130	14
More than 140	6

n/2 = 32/2 = 16
More than type ogive:



Median = 127.5