

Telangana Board SSC Class 10 Maths 2019 Question Paper 2 with Solutions

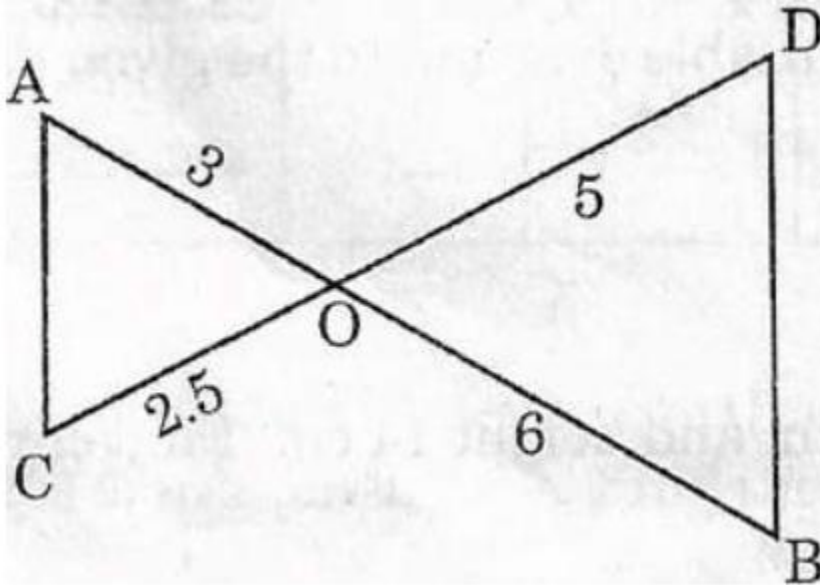
PART A SECTION - I

1. Evaluate $\operatorname{cosec} 39^\circ \sec 51^\circ - \tan 51^\circ \cot 39^\circ$.

Solution:

$$\begin{aligned} & \operatorname{cosec} 39^\circ \sec 51^\circ - \tan 51^\circ \cot 39^\circ \\ &= \operatorname{cosec} (90^\circ - 51^\circ) \sec 51^\circ - \tan 51^\circ \cot (90^\circ - 51^\circ) \\ &= \sec 51^\circ \sec 51^\circ - \tan 51^\circ \tan 51^\circ \\ &= \sec^2 51^\circ - \tan^2 51^\circ \\ &= 1 \end{aligned}$$

2. Write the similarity criterion by which the given pair of triangles are similar.



Solution:

From the given,
 $OA/OB = 3/6 = \frac{1}{2}$
 $OC/OD = 2.5/5 = \frac{1}{2}$
 $\angle AOC = \angle BOD$ (vertically opposite angles)
By SAS similarity criterion,
 $\triangle AOC \sim \triangle BOD$

3. From English alphabet, if a letter is chosen at random, then find the probability that the letter is a consonant.

Solution:

Total number of outcomes = 26

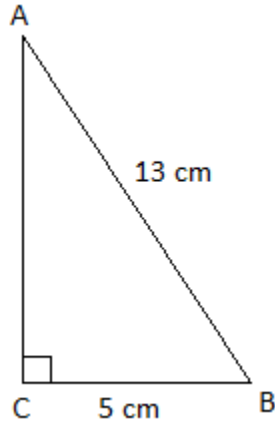
i.e. English alphabet = 26
 Number of consonants = 21
 $P(\text{choosing a consonant}) = 21/26$

4. In a right triangle ABC, right angled at C in which AB = 13 cm, BC = 5 cm, determine the value of $\cos^2 B + \sin^2 A$.

Solution:

Given,

In a right triangle ABC, right angled at C in which AB = 13 cm, BC = 5 cm.



$$AC = 12 \text{ cm}$$

$$\cos B = 5/13$$

$$\sin A = 5/13$$

$$\cos^2 B + \sin^2 A = (5/13)^2 + (5/13)^2$$

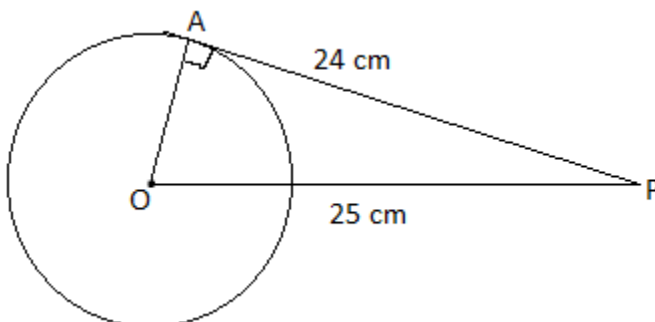
$$= (25 + 25) / 1369$$

$$= 50/169$$

5. A point P is 25 cm from the center O of the circle. The length of the tangent drawn from P to the circle is 24 cm. Find the radius of the circle.

Solution:

Given,



We know that the radius is perpendicular to the tangent through the point of contact.

In right triangle OAP,

$$OP^2 = AP^2 + OA^2$$

$$OA^2 = OP^2 - AP^2$$

$$= (25)^2 - (24)^2$$

$$= 625 - 576$$

$$= 49$$

$$OA = 7 \text{ cm}$$

Hence, the radius of the circle is 7 cm.

6. Find the median of the first seven composite numbers.

Solution:

The first seven composite numbers are 4, 6, 8, 9, 10, 12, 14.

These numbers are in ascending order.

$$n = 7$$

$$\text{Median} = (7 + 1)/2 \text{ th term}$$

$$= 4\text{th term}$$

$$= 9$$

Hence, the median of the first seven composite numbers is 9.

7. In a hemispherical bowl of 2.1 cm radius ice-cream is there. Find the volume of the bowl.

Solution:

Given,

Radius of hemispherical bowl = $r = 2.1 \text{ cm}$

$$\text{Volume} = \left(\frac{2}{3}\right)\pi r^3$$

$$= \left(\frac{2}{3}\right) \times \left(\frac{22}{7}\right) \times 2.1 \times 2.1 \times 2.1$$

$$= 19.404 \text{ cm}^3$$

Therefore, the volume of the bowl is 19.404 cm^3 .

SECTION - II

8. Write the mode formula for grouped data and explain the terms in it.

Solution:

$$\text{Mode for grouped data} = l + \left[\frac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)}\right] \times h$$

Here,

l = Lower limit of the modal class

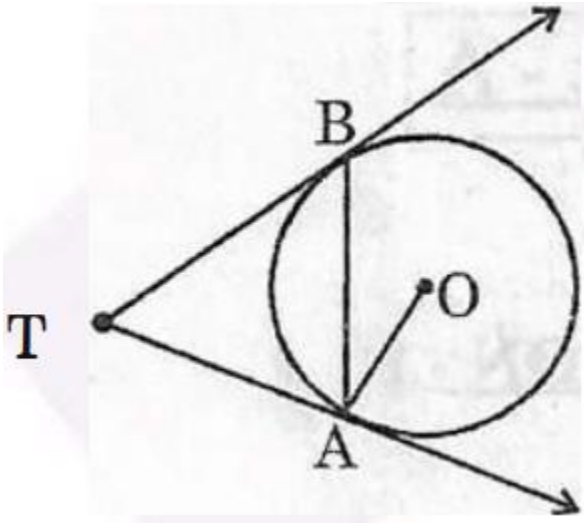
f_1 = Frequency of the modal class

f_0 = Frequency of the class preceding the modal class

f_2 = Frequency of the class succeeding the modal class

h = class size (or class height)

9. In the given figure, TA and TB are tangents to the circle with centre O. If $\angle ATB = 80^\circ$, then find the measure of $\angle ABT$.



Solution:

Given,

TA and TB are tangents to the circle.

$$\angle ATB = 80^\circ$$

In triangle TAB,

$$\angle ATB + \angle TBA + \angle BAT = 180^\circ$$

$$80^\circ + \angle ABT + \angle ABT = 180^\circ \text{ (TA and TB are tangents from an external point T)}$$

$$2\angle ATB = 180^\circ - 80^\circ$$

$$\angle ATB = 100^\circ/2$$

$$\angle ATB = 50^\circ$$

10. A bag contains balls which are numbered from 1 to 50. A ball is drawn at random from the bag, the probability that it bears a two digit number multiple of 7.

Solution:

Total number of outcomes = 50

i.e. numbers from 1 to 50

Two digit multiples of 7 are 14, 21, 28, 35, 42, 49.

Number of favourable outcomes = 6

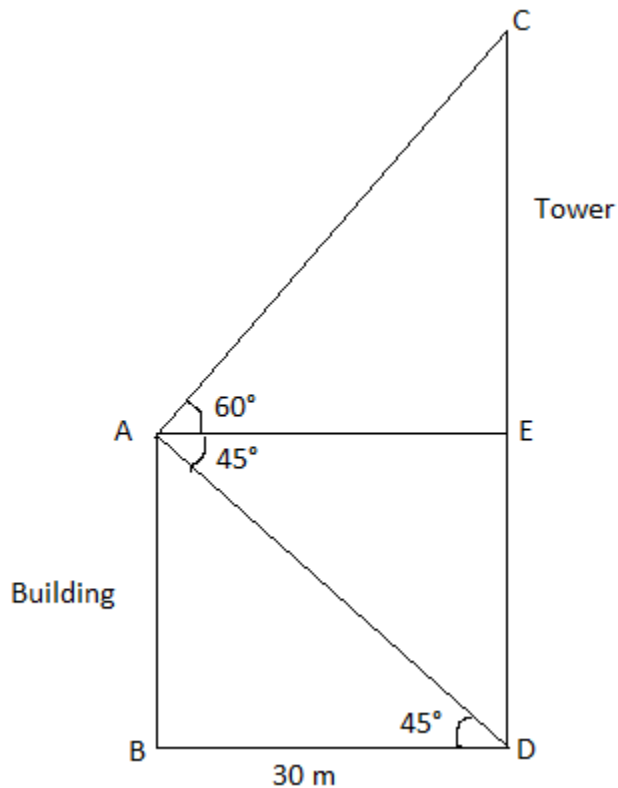
Hence, the required probability = $6/50 = 3/25$

11. From the top of the building the angle of elevation of the top of the cell tower is 60° and the angle of depression to its foot is 45° , if the distance of the building from the tower is 30 meters, draw the suitable diagram to the given data.

Solution:

Let AB be the building and CD be the cell tower.

BD is the distance of the building from the tower.



12. Find the value of $(\tan^2 60^\circ + \cot^2 30^\circ) / (\sin^2 30^\circ + \cos^2 60^\circ)$.

Solution:

$$\begin{aligned} & (\tan^2 60^\circ + \cot^2 30^\circ) / (\sin^2 30^\circ + \cos^2 60^\circ) \\ &= [\tan^2(90^\circ - 30^\circ) + \cot^2 30^\circ] / [\sin^2 30^\circ + \cos^2(90^\circ - 30^\circ)] \\ &= (\cot^2 30^\circ + \cot^2 30^\circ) / (\sin^2 30^\circ + \cos^2 30^\circ) \\ &= 2\cot^2 30^\circ / 1 \\ &= 2(\sqrt{3})^2 \\ &= 2(3) \\ &= 6 \end{aligned}$$

13. A right circular cylinder has a radius 3.5 cm and height 14 cm. Find the curved surface area.

Solution:

Given,

Radius of cylinder = $r = 3.5$ cm

Height of cylinder = $h = 14$ cm

Curved surface area = $2\pi rh$

$$= 2 \times (22/7) \times 3.5 \times 14$$

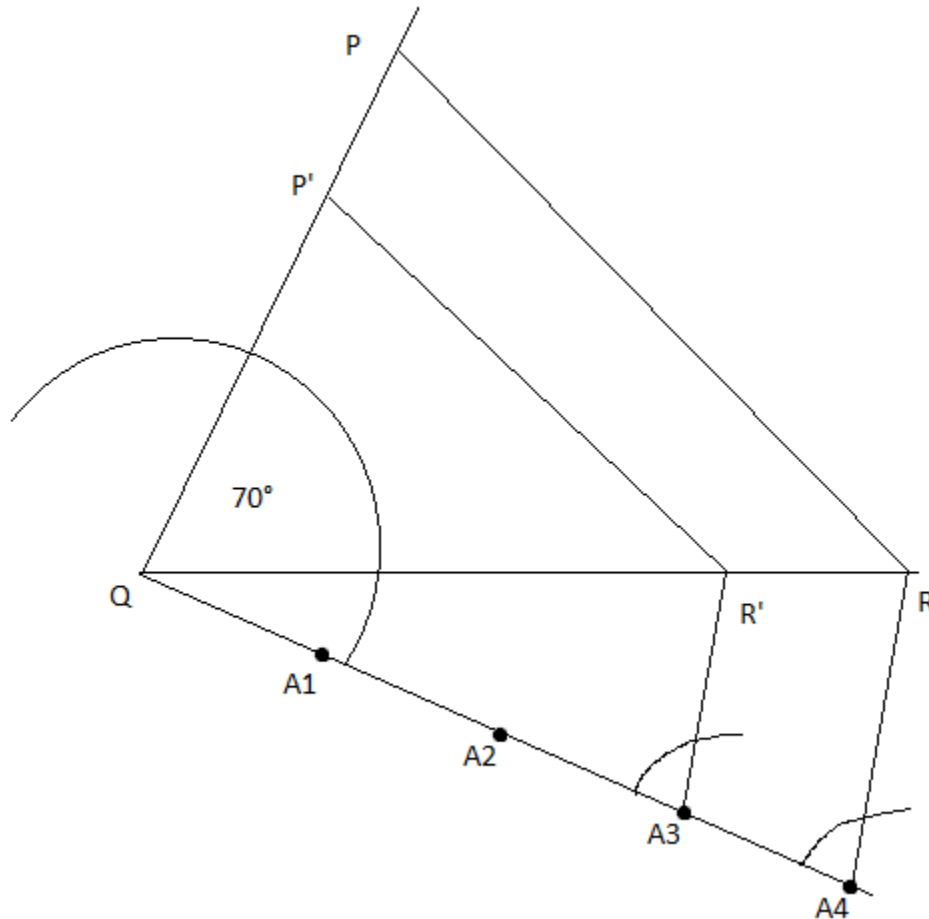
$$= 88 \times 3.5$$

$$= 308 \text{ cm}^2$$

SECTION - III

14. Construct a triangle PQR, in which $PQ = 4$ cm, $QR = 6$ cm and $\angle PQR = 70^\circ$. Construct a triangle such that each side of the new triangle is $\frac{3}{4}$ of the triangle PQR.

Solution:



Therefore, $\Delta P'Q'R'$ is the required triangle similar to the ΔPQR .

OR

Draw less than Ogive for the following frequency distribution. Find the median from the obtained curve.

IQ	60 - 70	70 - 80	80 - 90	90 - 100	100 - 110	110 - 120	120 - 130
No.of students	2	5	12	31	39	10	4

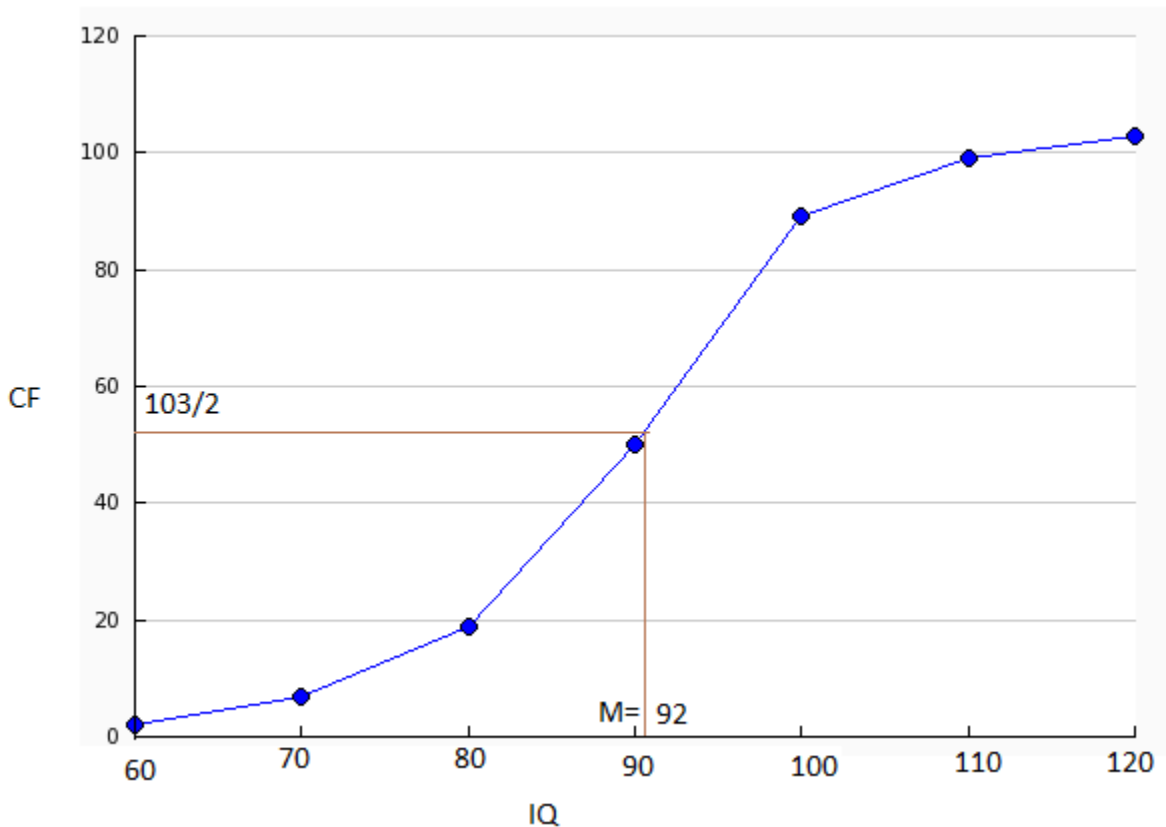
Solution:

Class	Cumulative Frequency
Less than 60	2

Less than 70	$2 + 5 = 7$
Less than 80	$7 + 12 = 19$
Less than 90	$19 + 31 = 50$
Less than 100	$50 + 39 = 89$
Less than 110	$89 + 10 = 99$
Less than 120	$99 + 4 = 103$

$N = 103$

$n/2 = 103/2 = 51.5$



Median = 92

15. Show that $[\cos \theta / (1 - \sin \theta)] + [(1 - \sin \theta) / \cos \theta] = 2 \sec \theta$

Solution:

$$\begin{aligned}
 \text{LHS} &= [\cos \theta / (1 - \sin \theta)] + [(1 - \sin \theta) / \cos \theta] \\
 &= [\cos^2 \theta + (1 - \sin \theta)^2] / [\cos \theta (1 - \sin \theta)] \\
 &= [\cos^2 \theta + 1 + \sin^2 \theta - 2 \sin \theta] / [\cos \theta (1 - \sin \theta)] \\
 &= (2 - 2 \sin \theta) / [\cos \theta (1 - \sin \theta)] \\
 &= [2(1 - \sin \theta)] / [\cos \theta (1 - \sin \theta)] \\
 &= 2 / \cos \theta
 \end{aligned}$$

$$= 2 \sec \theta$$

$$= \text{RHS}$$

$$\text{Therefore, } [\cos \theta / (1 - \sin \theta)] + [(1 - \sin \theta) / \cos \theta] = 2 \sec \theta$$

OR

In a right angle triangle, the hypotenuse is 10 cm more than the shortest side. If the third side is 6 cm less than the hypotenuse, find the sides of the right angle triangle.

Solution:

Let x cm be the shortest side of a right triangle.

$$\text{Hypotenuse} = (x + 10) \text{ cm}$$

$$\text{Length of the third side} = (x + 10) - 6 = (x + 4) \text{ cm}$$

By Pythagoras theorem,

$$(x + 10)^2 = x^2 + (x + 4)^2$$

$$x^2 + 20x + 100 = x^2 + x^2 + 8x + 16$$

$$\Rightarrow x^2 + 8x + 16 - 20x - 100 = 0$$

$$\Rightarrow x^2 - 12x - 84 = 0$$

$$\Rightarrow x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(1)(-84)}}{2(1)}$$

$$= \frac{[12 \pm \sqrt{(144 + 336)}]}{2}$$

$$x = 16.9 \text{ cm}$$

$$\text{Therefore, shortest side} = 16.95 \text{ cm}$$

$$\text{Hypotenuse} = 26.95 \text{ cm}$$

$$\text{Third side} = 26.95 \text{ cm}$$

16. Find the mean age of 100 residents of a colony from the following data.

Age (in years)	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of Persons	10	15	25	25	10	10	5

Solution:

Age (in years)	Mid-point (x)	No. of persons (f)	fx
0 - 10	5	10	50
10 - 20	15	15	225
20 - 30	25	25	625
30 - 40	35	25	875
40 - 50	45	10	450
50 - 60	55	10	550

60 - 70	65	5	325
		$\sum f = 100$	$\sum fx = 3100$

Mean = $\frac{\sum fx}{\sum f} = \frac{3100}{100} = 31$
Therefore, the mean age is 31 years.

OR

A toy is made with seven equal cubes of sides $\sqrt{7}$ cm. Six cubes are joined to six faces of a seventh cube. Find the total surface area of the toy.

Solution:

Given,

Side of cube = $\sqrt{7}$ cm

Surface area of one face of a cube = $(\sqrt{7})^2 = 7 \text{ cm}^2$

Six cubes are joined to six faces of a seventh cube.

Thus, only five sides of a cube are exposed and only a surface area of six cubes is effective.

Surface area of five faces of a cube = $5 \times 7 = 35 \text{ cm}^2$

Total surface area of the toy = $6 \times$ Area of five faces of a cube
 $= 6 \times 35$
 $= 210 \text{ cm}^2$

17. If two dice are thrown at the same time, find the probability of getting the sum of the dots on top is prime.

Solution:

Total number of outcomes = $6^2 = 36$

Favourable outcomes of getting the sum of the dots on the top of dice is prime = $\{(1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2), (5, 6), (6, 1), (6, 5)\}$
 $= 15$

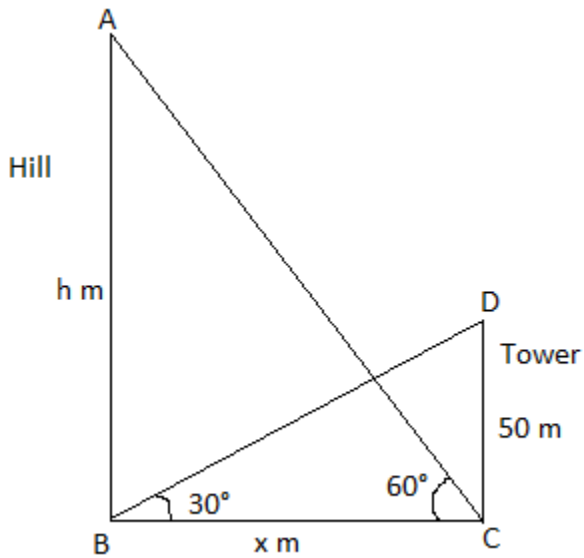
Hence, the required probability = $\frac{15}{36}$

OR

The angle of elevation of the top of the hill from the foot of a tower is 60° and the angle of elevation of the top of the tower from the foot of the hill is 30° . If the tower is 50 m high. Find the height of the hill.

Solution:

Let AB be the hill and CD be the tower.



CD = 50 m

In right triangle ABC,

$$\cot 60^\circ = x/h$$

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

$$x = h/\sqrt{3} \dots(i)$$

In right triangle DBC,

$$\cot 30^\circ = x/50$$

$$\sqrt{3} = x/50$$

$$x = 50\sqrt{3} \dots(ii)$$

From (i) and (ii),

$$h/\sqrt{3} = 50\sqrt{3}$$

$$h = 50 \times 3$$

$$h = 150 \text{ m}$$

Hence, the height of the hill is 150 m.