CBSE Class 10
Mathematics
Important 1 mark questions

1. Classify $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ as rational or irrational.

Solution.

$$\frac{\sqrt{2}-1}{\sqrt{2}+1}=\frac{\sqrt{2}-1}{\sqrt{2}+1}\times\frac{\sqrt{2}-1}{\sqrt{2}-1} \qquad ...(i)$$

$$=\frac{\left(\sqrt{2}-1\right)^2}{2-1}$$

$$=2+1-2\sqrt{2}=3-2\sqrt{2}$$

Hence, this is an irrational number.

2. If the HCF of 65 and 117 is expressible in the form of 65 m – 117, then find the value of m.

Solution.

We have, 65 = 13 × 5

And 117 = 13 × 9

Hence, HCF = 13

According to question 65m – 117 = 13

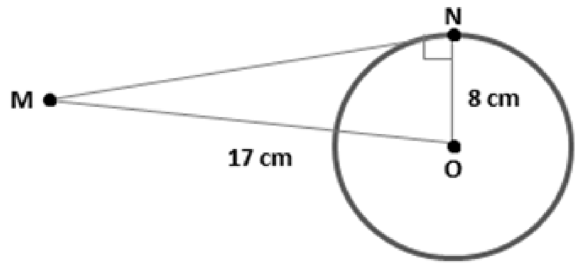
⇒ 65m = 13 + 117 = 130

⇒ m = 130/65 = 2

3. Find the length of the tangent from a point M which is at a distance of 17 cm from the centre O of the circle of radius 8 cm.

Solution.

Consider the figure:



Since, MN is the tangent of the circle,

$\angle MNO = 90^{o}$

$\Rightarrow MO^2 = MN^2 + ON^2$

$\Rightarrow 17^2 = MN^2 + 8^2$

$\Rightarrow 289 = MN^2 + 64$

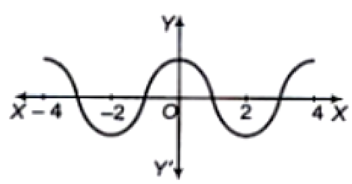
$\Rightarrow 289 - 64 = MN^2$

$\Rightarrow 225 = MN^2$

$\Rightarrow MN = 15$

Thus, the length of the tangent is 15 cm.

4. The number of zeroes lying between – 2 and 2 of the polynomial f(x) whose graph is given below is:



Solution.

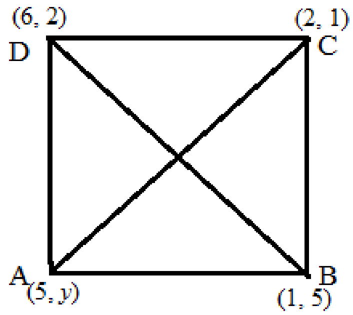
From the graph, it is clear that the curve $y = f(x)$ cuts the x-axis at two places between − 2 and 2.

Required number of zeroes = 2.

5. If A (5, *y*) B (1, 5), C (2, 1) and D (6, 2) are the vertices of a square, then find the value of *y*.

Solution.

The figure is as follows:



Since diagonals of square are equal,

So, $AC = BD$

$\Rightarrow \quad \frac{1}{2}AC = \frac{1}{2}BD$

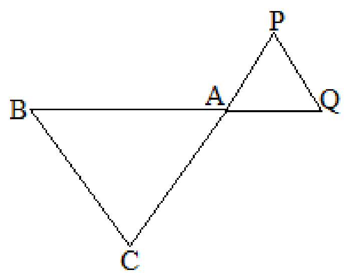
$\Rightarrow \quad \frac{1+y}{2} = \frac{5+2}{2}$

$\Rightarrow \quad 1+y = 7$

$\Rightarrow \quad y = 7-1$

$\Rightarrow \quad y = 6$

6. In the given figure , $\Delta ACB \sim \Delta APQ$. If BA = 6m and BC = 8 cm and PQ = 4 cm then find the length of AQ.



Solution.

As $\Delta ACB \sim \Delta APQ$

So, $\frac{AB}{AQ} = \frac{BC}{PQ}$

$\Rightarrow \quad \frac{6}{AQ} = \frac{8}{4}$

(AB = 6cm, BC = 8cm and PQ = 4cm given)

$\Rightarrow \quad AQ = \frac{6 \times 4}{8}$

$\therefore \quad AQ = 3cm$

7. How many spherical chocolate balls of diameter 8 inches can be made from a chocolate cube of side 24 inches?

Solution.

Number of spherical chocolate balls = $\frac{\text{Volume of chocolate cube}}{\text{Volume of chocolate ball}}$

Volume of chocolate cube = $a^3 = 24 \times 24 \times 24 = 13824\ in^3$

Volume of chocolate ball = $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 4 \times 4 \times 4 = 268.19\ in^3$

$\therefore$ Number of spherical chocolate balls $= \frac{13824}{268.19} = 51.54$

Thus, 51 spherical chocolate balls can be made.

8. If the ratio of the perimeter of two similar triangles is 4:25, then what is the ratio of the areas of the similar triangles.

Solution.

For similar triangles,

$$\frac{\text{Area of triangle 1}}{\text{Area of triangle 2}} = \left(\frac{\text{Perimeter of}\Delta 1}{\text{Perimeter of}\Delta 2}\right)^2$$

$$= \left(\frac{4}{25}\right)^2 = \frac{16}{625}$$

9. Calculate the mean of the first five prime numbers.

Solution.

The mean of the first five prime numbers $= \frac{2+3+5+7+11}{5} = \frac{28}{5} = 5.6$

7. What is the value of k, for equations $2x + ky = 7, 4x + 8y = 14$ will represent coincident lines.

Solution.

For coincident lines

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$\Rightarrow$ $$\frac{2}{4} = \frac{k}{8} = \frac{7}{14}$$

$\Rightarrow$ $k = 4$

10. If the common difference of an A.P. is 3, then find $a_{20} – a_{15}$.

Solution.

Let the first term of the AP be a.

$a_n = a(n − 1)d$

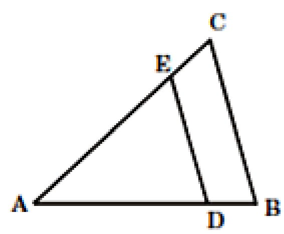
$a_{20} – a_{15} = [a + (20 – 1)d] – [a + (15 – 1)d]$

$= 19d – 14d$

$= 5d$

$= 5 \times 3$

11. In the figure, $DE \parallel BC$. If $AD = x, DB = x-2, AE = x+2$ and $EC = x-1$, then the value of x.



Solution.

In given ΔABC,

$DE \parallel BC$ (Given)

$\therefore$ $$\frac{AD}{DB} = \frac{AE}{EC}$$ (By B.P.T)

$\Rightarrow$ $$\frac{x}{x-2} = \frac{x+2}{x-1}$$

$\Rightarrow$ $x(x-1) = (x-2)(x+2)$

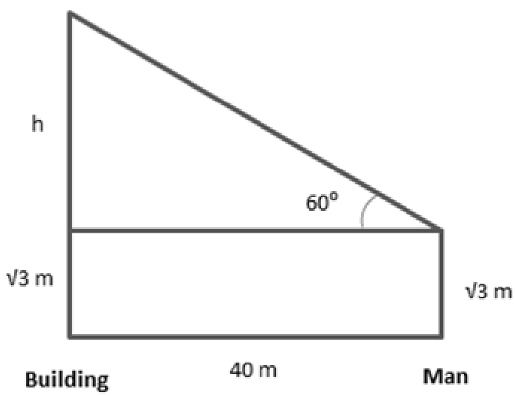
$\Rightarrow$ $x^2 - x = x^2 - 4$

$\Rightarrow$ $x = 4.$

12. A $\sqrt{3}$ m tall man is standing at a distance of 40 m from a building. Find the height of the building, if the angle of elevation from the eye to the top of the building is 60°.

Solution.

Consider the figure:



$\tan 60^0 = \frac{h}{40}$

$\Rightarrow \sqrt{3} = \frac{h}{40}$

$\Rightarrow h = 40\sqrt{3}m$

Height of building = $40\sqrt{3} + \sqrt{3} = 41\sqrt{3}\ m$

Thus, height of the building is $41\sqrt{3}\ m$.

13. What is the perimeter of a square circumscribing a circle of radius *a* cm.

Solution.

The radius of the circle is given as *a* cm.
Diameter of the circle = 2 × *a* cm = 2*a* cm
Side of the circumscribing square = Diameter of the circle = 2*a* cm
∴ Perimeter of the circumscribing square = 4 × 2*a* cm = 8*a* cm

14. The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge 4.2 cm is

Solution.

The height and diameter of the base of the largest right circular cone that can be cut out from a cube are equal to the edge of the cube

Let the radius of the cone be *r* cm.

$\therefore$ 2r = 4.2 cm

$\Rightarrow$ r = 4.2/2 = 2.1 cm

15. For the following distribution:

Classes	10-15	15-20	20-25	25-30	30-35
Frequency	25	30	27	35	21

Solution.

In the distribution, Median class = 20 – 25

Hence, Lower limit of median class = 20

And Model class = 25 - 30

So, Lower limit of modal class = 25

Sum of lower of median class and lower limit of modal class = 25 + 20 = 45.

16. A box contains 3 blue, 2 white and 4 red marbles. If a marble is drawn at random from the box, the probability that it will not be a white marble is:

Solution.

There are total 9 marbles; 3 blue, 2 white and 4 red marbles

$$\therefore \quad \text{P(not white)} = 1 - (\text{P(white)})$$

$$\Rightarrow \quad \text{P(not white)} = 1 - \left(\frac{2}{9}\right)$$

$$\Rightarrow \quad \text{P(not white)} = \frac{7}{9}$$

17. If x = 3 is one root of the quadratic equation $x^2 - 2kx - 6 = 0$, then find the value of k.

Solution.

x = 3 is one root of the equation

$\therefore$ 9 – 6k – 6 = 0

$$\Rightarrow \quad k = \frac{1}{2}$$

18. What is the HCF of smallest prime number and the smallest composite number?

Solution.

The required numbers are 2 and 4.
Thus, HCF of 2 and 4 is 2.

19. Find the distance of a point P(x, y) from the origin.

Solution.

$$OP = \sqrt{x^2 + y^2}$$

20. In an AP, if the common difference (d) = –4, and the seventh term (a_7) is 4, then find the first term.

Solution.

a + 6 (–4) = 4

$\Rightarrow$ a = 28

21. What is the value of ($\cos^2 67° - \sin^2 23°$)?
Solution.

∵ $\cos^2 67° = \sin^2 23°$

∴ $\cos^2 67° - \sin^2 23° = 0$

22. Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{1}{3}$, then find $\frac{ar\Delta ABC}{ar\Delta PQR}$.

Solution.

$$\frac{ar\Delta ABC}{ar\Delta PQR} = \frac{AB^2}{PQ^2} = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$$

23. probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap?

Solution.

We know that Probability of an event (E) = $\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

Let E be the event of selecting rotten apple.

Let n be the number of rotten apples in the heap.

$$P(E) = \frac{n}{900}$$

$$\Rightarrow \quad 0.18 = \frac{n}{900}$$

$$\Rightarrow \quad n = 162$$

Thus, total rotten apples = 162.

24. If a pair of dice is thrown, the probability of getting a prime number on both the dice is:

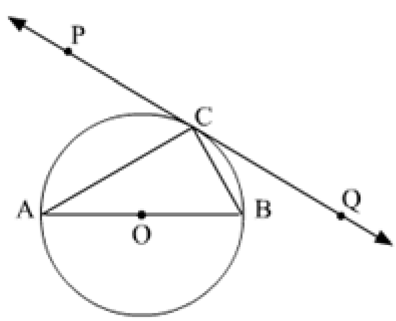
Solution.

Total number of outcomes = 36

Total favorable outcomes = {(2, 2), (3, 3), (5, 5)} = 3

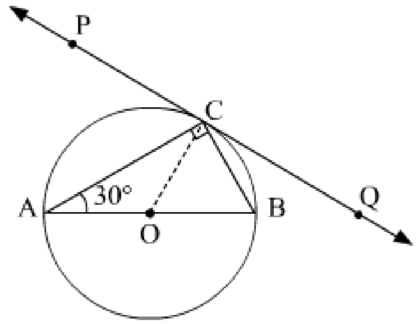
$\therefore$ Probability of getting a prime number on both the dices $= \frac{3}{36} = \frac{1}{12}$

25. In given figure, PQ is a tangent at a point C to a circle with centre O. If AB is a diameter and $\angle CAB = 30^0$, find $\angle PCA$.



Solution.

Construction: Join OC



Now in Δ AOC

AO = OC (radius of the same circle)

So, ∠OAC= ∠OCA $=30^0$

Also, ∠OCP= 90^0

Therefore, ∠PCA= $90^0 - 30^0 = 60^0$.

26. For what value of k will $k + 9$, $2k - 1$ and $2k + 7$ are the consecutive terms of an A.P.?

Solution.

If three terms x, y and z are in A.P. then, $2y = x + z$

Since $k + 9$, $2k - 1$ and $2k + 7$ are in A.P.

$$\therefore 2(2k-1)=(k+9)+(2k+7)$$
$$\Rightarrow 4k-2=3k+16$$
$$\Rightarrow k=18.$$

27. Three sides of a triangle are a, 3a and $\sqrt{10}$ a. Find the measurement of angle opposite to the largest side.

Solution.

Three sides of a triangle are a, 3a and $\sqrt{10}$ a .

As, $a^2+(3a)^2=a^2+9a^2=10a^2$

We observe sum of squares of smaller sides is equal to the square of the greatest side i.e. Pythagoras theorem is being followed in this triangle. Hence the triangle is right angled triangle. Therefore angle opposite to the greatest side will be right angle i.e. 90°.

28. If the sum of first m terms of an AP is $2m^2 + 3m$, then what is its second term?

Solution.

$S_m = 2m^2 + 3m$
Putting m = 1
$S_1 = 2 + 3 = 5 = a_1$
$S_2 = 8 + 6 = 14$
Hence, $a_1 = 5$
And $a_1 + a_2 = 14$
$\Rightarrow \quad a_2 = 14 - 5$
$\Rightarrow \quad a_2 = 9$

29. Find the value of a so that the point (3, a) lies on the line represented by 2x – 3y = 5.

Solution.

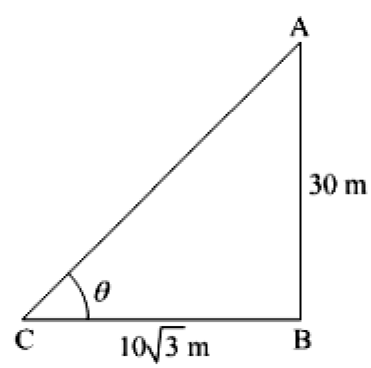
Since point (3, a) lies on line 2x – 3y = 5.
Then, 2 x 3 – 3 x a = 5
$\Rightarrow \quad 6 - 5 = 3a$
$\Rightarrow \quad a = 1/3$

30. If a tower 30 m high, casts a shadow $10\sqrt{3}$ m long on the ground, then what is the angle of elevation of the sun?

Solution.

Let AB be the 30 m high tower and BC = $10\sqrt{3}$ m be the length of its shadow on ground.

Let the angle of elevation of the sun from the ground be θ.



Now, in ΔABC,

$$\tan\theta = \frac{AB}{BC}$$

$$\Rightarrow \quad \tan\theta = \frac{30}{10\sqrt{3}}$$

$$\Rightarrow \quad \tan\theta = \frac{30\sqrt{3}}{10\times 3}$$

$$\Rightarrow \quad \tan\theta = \frac{30\sqrt{3}}{30} = \sqrt{3}$$

$$\Rightarrow \quad \tan\theta = \tan 60^{o}$$

$$\Rightarrow \quad \theta = 60^{o}$$

Thus, the angle of elevation of the sun is 60°.

31. Find the value of $\tan^2 10^o - \cot^2 80^o$.

Solution.

We have,

$\tan^2 10^o - \cot^2 80^o = \tan^2 10^o - \cot^2(90^o - 10^o)$

$= \tan^2 10^o - \tan^2 10^o$

$= 0$

32. Find the median using an empirical relation, when it is given that mode and mean are 8 and 9 respectively.

Solution.

The relation between Mean, Median and Mode of the given data is:

Mode = 3Median − 2Mean

⟹ 8 = 3Median − 2 × 9

⟹ 3Median = 8 + 18

⟹ Median = 26/3

⟹ Median = 8.67