

CBSE

MATHEMATICS (Standard), Class-X

Sample Question Paper

For 2020 Examination

Time : 3 Hours

Max. Marks : 80

General Instructions :

- (i) All the questions are compulsory.
- (ii) The question paper consists of 40 questions divided into four sections A, B, C and D.
- (iii) Section A comprises 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.
- (iv) There is no overall choice. However, an internal choice has been provided in six questions of 1 marks each, two questions of 2 marks each, three questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
- (v) Use of calculators is not permitted.

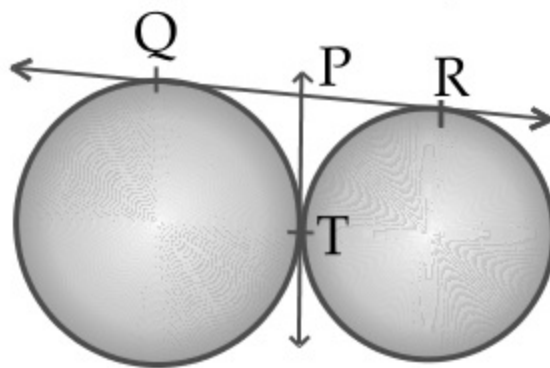
Section 'A'

Question numbers 1 to 10 carry 1 mark each. For each of these questions four alternative choices have been provided of which only one is correct. Select the correct choice.

1. The 11th term of the A.P.: $-5, -\frac{5}{2}, 0, \frac{5}{2}, \dots$ is:

- (a) -20 (b) 20 (c) -30 (d) 30

AI 2. In fig. QR is a common tangent to the given circles, touching externally at the point T. The tangent at T meets QR at P. If PT = 3.8 cm, then the length of QR (in cm) is :



- (a) 3.8 (b) 7.6 (c) 5.7 (d) 1.9

OR

If $\triangle ABC \sim \triangle EDF$ and $\triangle ABC$ is not similar to $\triangle DEF$, then which of the following is not true ?

- (a) $BC \times EF = AC \times FD$ (b) $AB \times EF = AC \times DE$
(c) $BC \times DE = AB \times EF$ (d) $BC \times DE = AB \times FD$

3. A ladder makes an angle of 60° with the ground when placed against a wall. If the foot of the ladder is 2m away from the wall, then the length of the ladder (in meters) is :

- (a) $\frac{4}{\sqrt{3}}$ (b) $4\sqrt{3}$ (c) $2\sqrt{2}$ (d) 4

4. If two different dice are rolled together, the probability of getting an even number on both dice, is :

- (a) $\frac{1}{36}$ (b) $\frac{1}{2}$ (c) $\frac{1}{6}$ (d) $\frac{1}{4}$

OR

If x_i 's are the mid-points of the class intervals of grouped data f_i 's are the corresponding frequencies and \bar{x} is the mean, then $\sum (f_i x_i - \bar{x})$ is equal to :

- (a) 0 (b) -1 (c) 1 (d) 2

5. If the point A ($x, 2$), B ($-3, -4$) and C ($7, -5$) are collinear, then the value of x is :

- (a) -63 (b) 63 (c) 60 (d) -60

6. The number of solid spheres, each of diameter 6 cm that can be made by melting a solid metal cylinder of height 45 cm and diameter 4 cm is :

- (a) 3 (b) 5 (c) 4 (d) 6

7. The perimeter of a triangle with vertices ($0, 4$), ($0, 0$) and ($3, 0$) is :

- (a) 5 (b) 12 (c) 11 (d) $7 + \sqrt{5}$

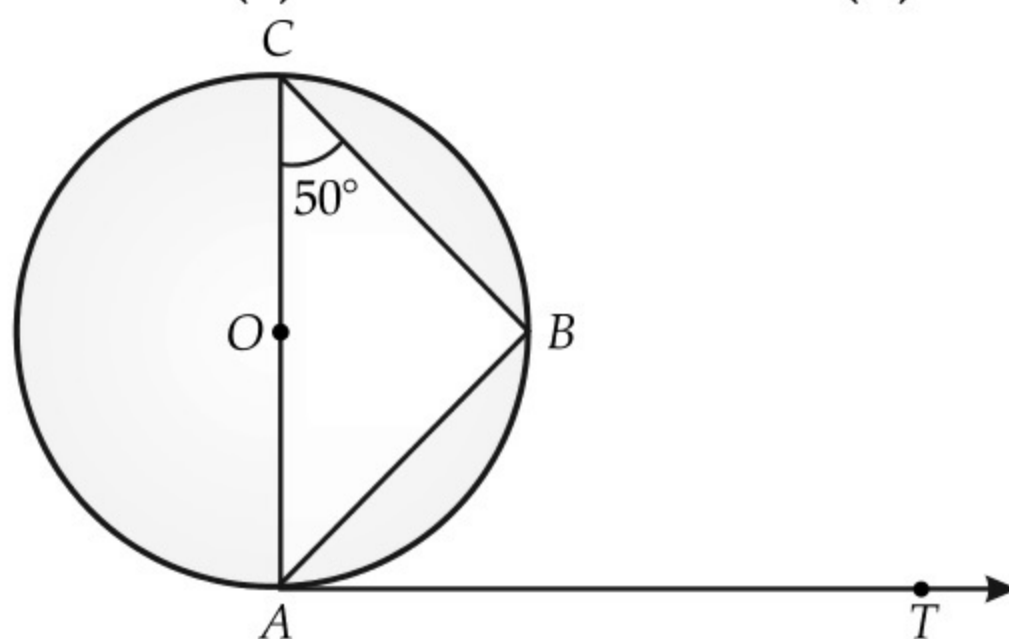
8. ABC and BDE are two equilateral triangles such that D is the mid-point of BC . Ratio of the areas of triangles ABC and BDE is :

- (a) 2 : 1 (b) 1 : 2 (c) 4 : 1 (d) 1 : 4

OR

AI In the given figure, AB is a chord of the circle and AOC is its diameter, such that $\angle ACB = 50^\circ$. If AT is the tangent to the circle at the point A , then $\angle BAT$ is equal to :

- (a) 65° (b) 60° (c) 50° (d) 40°



9. Given that $\sin \theta = \frac{a}{b}$, then $\cos \theta$ is equal to:

- (a) $\frac{b}{\sqrt{b^2 - a^2}}$ (b) $\frac{b}{a}$ (c) $\frac{\sqrt{b^2 - a^2}}{b}$ (d) $\frac{a}{\sqrt{b^2 - a^2}}$

10. If $\frac{1}{2}$ is a root of the equation $x^2 + kx - \frac{5}{4} = 0$, then the value of k is :

- (a) 2 (b) -2 (c) $\frac{1}{4}$ (d) $\frac{1}{2}$

Question numbers 11 to 15 carry 1 mark each. Write whether the statements are true or false.

11. Every quadratic equation has exactly one root.

12. The point A ($2, 7$) lies on the perpendicular bisector of line segment joining the points P ($6, 5$) and Q ($0, -4$).

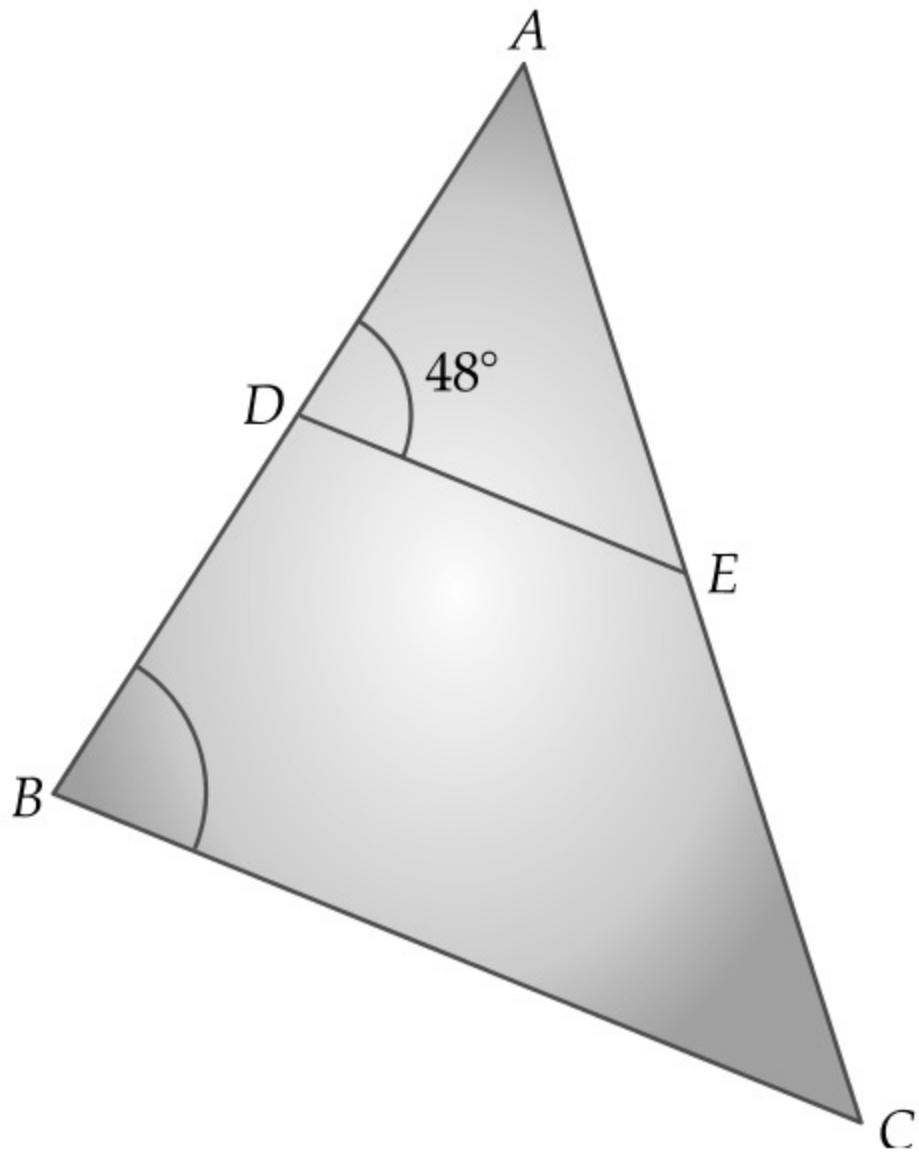
13. $\frac{\tan 47^\circ}{\cot 43^\circ} = 1$

14. The length of tangent from an external point on a circle is always greater than radius of the circle.

15. By geometrical construction, it is possible to divide a line segment in ratio $\sqrt{3} : \frac{1}{\sqrt{3}}$.

Question numbers 16 to 20 carry 1 mark each.

16. Find the value of a , for which point $P \left(\frac{a}{3}, 2 \right)$ is the mid-point of the line segment joining the points $Q (-5, 4)$ and $R (-1, 0)$. 1
17. Find the value of k , for which one root of the quadratic equation $kx^2 - 14x + 8 = 0$ is 2. 1
- OR**
- Find the value (s) of k for which the equation $x^2 + 5kx + 16 = 0$ has real and equal roots.
18. Write the value of $\cot^2 \theta - \frac{1}{\sin^2 \theta}$. 1
- OR**
- If $\sin \theta = \cos \theta$, then find the value of $2 \tan \theta + \cos^2 \theta$.
19. If the n^{th} term of an A.P. is $(2n + 1)$, what is the sum of its first three terms ? 1
- OR**
- AI** Write whether $\frac{2\sqrt{45} + 3\sqrt{20}}{2\sqrt{5}}$ on simplification gives an irrational or a rational number.
20. In the figure if $AD = 6\text{cm}$, $DB = 9\text{cm}$, $AE = 8\text{cm}$ and $EC = 12\text{cm}$ and $\angle ADE = 48^\circ$. Find $\angle ABC$. 1



Question numbers 21 to 26 carry 2 marks each.

21. The HCF and LCM of two numbers are 9 and 360 respectively. If one number is 45, find the other number. 2
- OR**
- Show that $7 - \sqrt{5}$ is irrational, given that $\sqrt{5}$ is irrational.
22. Find the 20th term from the last term of the AP 3, 8, 13,.....,253. 2
- OR**
- If 7 times the 7th term of an A.P is equal to 11 times its 11th term, then find its 18th term.
23. Find the coordinates of the point P which divides the line joining of A $(-2, 5)$ and B $(3, -5)$ in the ratio 2 : 3. 2
24. A card is drawn at random from a well shuffled deck of 52 cards. Find the probability of getting neither a red card nor a queen. 2
25. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is a prime number. 2
- AI** 26. For what value of p will the following pair of linear equations have infinitely many solutions. 2
- $(p - 3)x + 3y = p$
 $px + py = 12$

Section 'C'

Question numbers 27 to 34 carry 3 marks each.

27. Use Euclid's Division Algorithm to find the HCF of 726 and 275. 3

AI 28. Find the zeroes of the following polynomial : 3

$$5\sqrt{5}x^2 + 30x + 8\sqrt{5}$$

29. Places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in same direction they meet in 8 hours and if they move towards each other they meet in 1 hour 20 minutes. Find the speed of cars. 3

30. The points A (1, -2), B(2, 3), C (k, 2) and D (-4, -3) are the vertices of a parallelogram. Find the value of k. 3

OR

Find the value of k for which the points (3k - 1, k - 2), (k, k - 7) and (k - 1, -k - 2) are collinear.

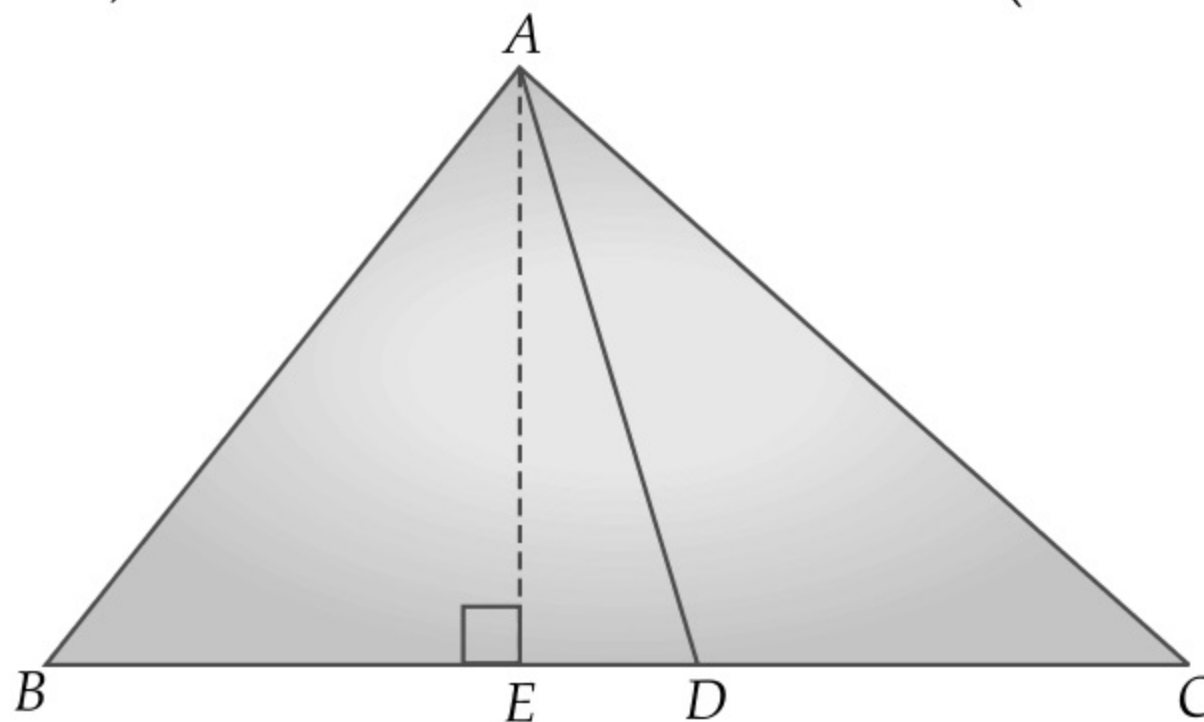
31. Prove that $\cot \theta - \tan \theta = \frac{2\cos^2 \theta - 1}{\sin \theta \cos \theta}$ 3

OR

Prove that $\sin \theta (1 + \tan \theta) + \cos \theta (1 + \cot \theta) = \sec \theta + \operatorname{cosec} \theta$.

32. The radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle and BD is a tangent to the smaller circle touching it at D and intersecting the larger circle at P on producing. Find the length of AP. 3

33. In $\triangle ABC$, if AD is the median, then show that $AB^2 + AC^2 = 2(AD^2 + BD^2)$



34. Water is flowing at the rate of 15 km per hour through a pipe of diameter 14 cm into a rectangular tank which is 50 m long and 44 m wide. Find the time in which the level of water in the tank will rise by 21 cm. 3

OR

A solid sphere of radius 3 cm is melted and then recast into small spherical balls each of diameter 0.6 cm. Find the number of balls.

Section 'D'

Question numbers 35 to 40 carry 4 marks each.

35. A train takes 2 hours less for a journey of 300 km if its speed is increased by 5 km/h from its usual speed. Find the usual speed of the train. 4

OR

Solve for x : $\frac{1}{(a+b+x)} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$, $[a \neq 0, b \neq 0, x \neq 0, x \neq -(a+b)]$

36. Prove that in a right angled triangle, square of the hypotenuse is equal to sum of the squares of other two sides. 4

37. Draw a $\triangle ABC$ with sides 6cm, 8 cm and 9 cm and then construct a triangle similar to $\triangle ABC$ whose sides are $\frac{3}{5}$ of the corresponding sides of $\triangle ABC$. 4

AI 38. A man on the top of a vertical observation tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change from 30° to 45° , how long will the car take to reach the observation tower from this point ? 4

39. The median of the following data is 525. Find the values of x and y if the total frequency is 100.

Class Interval	Frequency
0 – 100	2
100 – 200	5
200 – 300	x
300 – 400	12
400 – 500	17
500 – 600	20
600 – 700	y
700 – 800	9
800 – 900	7
900 – 1000	4

OR

The following data indicates the marks of 53 students in Mathematics.

Marks	Number of Students
0 – 10	5
10 – 20	3
20 – 30	4
30 – 40	3
40 – 50	3
50 – 60	4
60 – 70	7
70 – 80	9
80 – 90	7
90 – 100	8

Draw less than type ogive for the data above and hence find the median.

40. If $\sec \theta + \tan \theta = p$, then find the value of $\operatorname{cosec} \theta$. 4

OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.