CBSE 2020 Maths Standard — Set 1

English Medium

Time Allowed: 3 Hours | Maximum Marks: 80

General Instructions:

1. This question paper contains 38 questions. All questions are compulsory.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 6 questions carrying 2 marks each.
4. Section C has 6 questions carrying 3 marks each.
5. Section D has 4 questions carrying 5 marks each.
6. Section E has 3 case-study based questions carrying 4 marks each.
7. Draw neat figures wherever required.

Section A

Multiple Choice Questions (1 mark each)

Q.1 [1 mark]

If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

(a) 10
(b) –10
(c) –7
(d) –2

Q.2 [1 mark]

The total number of factors of a prime number is

(a) 1
(b) 0
(c) 2
(d) 3

Q.3 [1 mark]

The quadratic polynomial, the sum of whose zeroes is –5 and their product is 6, is

(a) $x^2 + 5x + 6$
(b) $x^2 - 5x + 6$
(c) $x^2 - 5x - 6$
(d) $-x^2 + 5x + 6$

Q.4 [1 mark]

The value of k for which the system of equations $x + y - 4 = 0$ and $2x + ky = 3$, has no solution, is

(a) –2
(b) ≠2

(c) 3

(d) 2

Q.5 [1 mark]

The HCF and the LCM of 12, 21, 15 respectively are

(a) 3, 140

(b) 12, 420

(c) 3, 420

(d) 420, 3

Q.6 [1 mark]

The value of x for which 2x, (x + 10) and (3x + 2) are the three consecutive terms of an AP, is

(a) 6

(b) –6

(c) 18

(d) –18

Q.7 [1 mark]

The first term of an AP is p and the common difference is q, then its 10th term is

(a) q + 9p

(b) p − 9q

(c) p + 9q

(d) 2p + 9q

Q.8 [1 mark]

The distance between the points (a cos θ + b sin θ, 0) and (0, a sin θ − b cos θ), is

(a) $a^2 + b^2$

(b) $a^2 - b^2$

(c) $\sqrt{(a^2 + b^2)}$

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

Q.9 [1 mark]

If the point P(k, 0) divides the line segment joining the points A(2, −2) and B(−7, 4) in the ratio 1 : 2, then the value of k is

(a) 1

(b) 2

(c) –2

(d) –1

Q.10 [1 mark]

The value of p, for which the points A(3, 1), B(5, p) and C(7, −5) are collinear, is

(a) –2

(b) 2

(c) –1

(d) 1

Q.11 [1 mark]

In Fig. 1, a triangle ABC is circumscribing a circle, the length of BC is _____ cm. (Given: A triangle ABC with a circle inscribed touching AB at a point with segment 4 cm from A, touching AC at a point with segment 11 cm from A, and touching BC at Q with segment 3 cm from B on the AB side.)

Q.12 [1 mark]

Given ΔABC ~ ΔPQR, if AB/PQ = 1/3, then ar(ΔABC)/ar(ΔPQR) = _____

Q.13 [1 mark]

ABC is an equilateral triangle of side 2a, then length of one of its altitudes is _____

Q.14 [1 mark]

$(\cos 80°)/(\sin 10°) + \cos 59° \operatorname{cosec} 31° =$ _____

Q.15 [1 mark]

The value of $(\sin^2\theta + 1/(1 + \tan^2\theta)) =$ _____

OR

Q.15 [1 mark]

The value of $(1 + \tan^2\theta)(1 - \sin\theta)(1 + \sin\theta) =$ _____

Q.16 [1 mark]

The ratio of the length of a vertical rod and the length of its shadow is $1 : \sqrt{3}$. Find the angle of elevation of the sun at that moment.

Q.17 [1 mark]

Two cones have their heights in the ratio 1:3 and radii in the ratio 3:1. What is the ratio of their volumes?

Q.18 [1 mark]

A letter of English alphabet is chosen at random. What is the probability that the chosen letter is a consonant?

Q.19 [1 mark]

A die is thrown once. What is the probability of getting a number less than 3?

OR

Q.19 [1 mark]

If the probability of winning a game is 0.07, what is the probability of losing it?

Q.20 [1 mark]

If the mean of the first n natural numbers is 15, then find n.

Section B

Very Short Answer Questions (2 marks each)

Q.21 [2 marks]

Show that $(a - b)^2$, $(a^2 + b^2)$, and $(a + b)^2$ are in AP.

Q.22 [2 marks]

In Fig. 2, DE ∥ AC and DC ∥ AP. Prove that BE/EC = BC/CP.

OR

Q.22 [2 marks]

In Fig. 3, two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠PTQ = 2∠OPQ.

Q.23 [2 marks]

The rod AC of a TV disc antenna is fixed at right angles to the wall AB and a rod CD is supporting the disc as shown in Fig. 4. If AC = 1.5 m long and CD = 3 m, find (i) tan θ (ii) sec θ + cosec θ.

Q.24 [2 marks]

A piece of wire 22 cm long is bent into the form of an arc of a circle subtending an angle of 60° at its centre. Find the radius of the circle. [Use π = 22/7]

Q.25 [2 marks]

If a number x is chosen at random from the numbers −3, −2, −1, 0, 1, 2, 3, what is the probability that $x^2 \leq 4$?

Q.26 [2 marks]

Find the mean of the following distribution:

Class: 3-5, 5-7, 7-9, 9-11, 11-13
Frequency: 5, 10, 10, 7, 8

OR

Q.26 [2 marks]

Find the mode of the following data:

Class: 0-20, 20-40, 40-60, 60-80, 80-100, 100-120, 120-140
Frequency: 6, 8, 10, 12, 6, 5, 3

Section C

Short Answer Questions (3 marks each)

Q.27 [3 marks]

Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

OR

Q.27 [3 marks]

Divide the polynomial $f(x) = 3x^2 - x^3 - 3x + 5$ by the polynomial $g(x) = x - 1 - x^2$ and verify the division algorithm.

Q.28 [3 marks]

Determine graphically the coordinates of the vertices of a triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$.

OR

Q.28 [3 marks]

If 4 is a zero of the cubic polynomial $x^3 - 3x^2 - 10x + 24$, find its other two zeroes.

Q.29 [3 marks]

In a flight of 600 km, an aircraft was slowed due to bad weather. Its average speed for the trip was reduced by 200 km/hr and time of flight increased by 30 minutes. Find the original duration of flight.

Q.30 [3 marks]

Find the area of triangle PQR formed by the points P(−5, 7), Q(−4, −5) and R(4, 5).

OR

Q.30 [3 marks]

If the point C(−1, 2) divides internally the line segment joining A(2, 5) and B(x, y) in the ratio 3:4, find the coordinates of B.

Q.31 [3 marks]

In Fig. 5, $\angle D = \angle E$ and $AD/DB = AE/EC$, prove that BAC is an isosceles triangle.

Q.32 [3 marks]

In a triangle, if the square of one side is equal to the sum of the squares of the other two sides, then prove that the angle opposite to the first side is a right angle.

Section D

Long Answer Questions (5 marks each)

Q.33 [5 marks]

If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$.

Q.34 [5 marks]

A cone of base radius 4 cm is divided into two parts by drawing a plane through the mid-point of its height and parallel to its base. Compare the volumes of the two parts.

Q.35 [5 marks]

Show that the square of any positive integer cannot be of the form $(5q + 2)$ or $(5q + 3)$ for any integer q.

OR

Q.35 [5 marks]

Prove that one of every three consecutive positive integers is divisible by 3.

Q.36 [5 marks]

The sum of four consecutive numbers in AP is 32 and the ratio of the product of the first and last terms to the product of two middle terms is 7:15. Find the numbers.

OR

Q.36 [5 marks]

Solve: $1 + 4 + 7 + 10 + \ldots + x = 287$.

Section E

Case Study Based Questions (4 marks each)

Q.37 [4 marks]

Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking B as centre, draw another circle of radius 2 cm.

Construct tangents to each circle from the centre of the other circle.

Q.38 [4 marks]

A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff of height 6 m. At a point on the plane, the angle of elevation of the bottom and top of the flag-staff are 30° and 45° respectively. Find the height of the tower. (Take $\sqrt{3} = 1.73$)

Q.39 [4 marks]

A bucket in the form of a frustum of a cone of height 30 cm with radii of its lower and upper ends as 10 cm and 20 cm, respectively. Find the capacity of the bucket. Also find the cost of milk which can completely fill the bucket at the rate of Rs. 40 per litre. [Use $\pi = 22/7$]

Q.40 [4 marks]

The following table gives production yield per hectare (in quintals) of wheat of 100 farms of a village:

Production yield (quintals/hectare): 40-45, 45-50, 50-55, 55-60, 60-65, 65-70
Number of farms: 4, 6, 16, 20, 30, 24

Change the distribution to a 'more than' type distribution and draw its ogive.

OR

Q.40 [4 marks]

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

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