CBSE 2020 Maths Standard — Set 3

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]

The HCF of 135 and 225 is

(a) 15
(b) 75
(c) 45
(d) 5

Q.2 [1 mark]

The exponent of 2 in the prime factorization of 144 is

(a) 2
(b) 4
(c) 1
(d) 6

Q.3 [1 mark]

The common difference of an AP, whose nth term is $a_n = (3n + 7)$, is

(a) 3
(b) 7
(c) 10
(d) 6

Q.4 [1 mark]

The value of λ for which $(x^2 + 4x + \lambda)$ is a perfect square, is

(a) 16
(b) 9
(c) 1
(d) 4

Q.5 [1 mark]

The value of k, for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ have infinitely many solutions, is

(a) ±1
(b) 1
(c) −1
(d) 2

Q.6 [1 mark]

The value of p for which (2p + 1), 10 and (5p + 5) are three consecutive terms of an AP is

(a) −1
(b) −2
(c) 1
(d) 2

OR

Q.6 [1 mark]

The number of terms of an AP 5, 9, 13, ..., 185 is

(a) 31
(b) 51
(c) 41
(d) 40

Q.7 [1 mark]

In the given figure, the graph of the polynomial p(x) is shown. The number of zeroes of the polynomial is

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

Q.8 [1 mark]

If (a, b) is the mid-point of the line segment joining the points A(10, −6) and B(k, 4) and a − 2b = 18, the value of k is

(a) 30
(b) 22
(c) 4
(d) 40

Q.9 [1 mark]

The value of k for which the points A(0, 1), B(2, k) and C(4, −5) are collinear is

(a) 2
(b) −2
(c) 0
(d) 4

Q.10 [1 mark]

If ΔABC ~ ΔDEF such that AB = 1.2 cm and DE = 1.4 cm, the ratio of the areas of ΔABC and ΔDEF is

(a) 49 : 36
(b) 6 : 7
(c) 7 : 6
(d) 36 : 49

Q.11 [1 mark]

√2 times the distance between (0, 5) and (−5, 0) is _____.

Q.12 [1 mark]

The distance between two parallel tangents of a circle of radius 4 cm is _____.

Q.13 [1 mark]

In the figure, PA and PB are tangents to the circle with centre O such that ∠APB = 50°. The measure of ∠OAB is _____.

OR

Q.13 [1 mark]

In the figure, PQ is a chord of a circle and PT is tangent at P such that ∠QPT = 60°. The measure of ∠PRQ is _____.

Q.14 [1 mark]

$(3 \cot 40°)/(\tan 50°) - (1/2)(\cos 35°/\sin 55°)$ = _____.

Q.15 [1 mark]

If $\cot \theta = 7/8$, then the value of $((1 + \sin \theta)(1 - \sin \theta)) / ((1 + \cos \theta)(1 - \cos \theta))$ is _____.

Q.16 [1 mark]

What is the value of $(1/(1 + \cot^2\theta) + 1/(1 + \tan^2\theta))$?

Q.17 [1 mark]

Two right circular 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]

Using the empirical formula, find the mode of a distribution whose mean is 8.32 and the median is 8.05.

Q.19 [1 mark]

The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow?

Q.20 [1 mark]

What is the arithmetic mean of first n natural numbers?

Section B

Very Short Answer Questions (2 marks each)

Q.21 [2 marks]

Find the 11th term from the last term (towards the first term) of the AP 12, 8, 4, ..., −84.

OR

Q.21 [2 marks]

Solve the equation: 1 + 5 + 9 + 13 + ... + x = 1326.

Q.22 [2 marks]

In the figure, AB is a chord of a circle with centre O, AOC is a diameter and AT is tangent at A. Prove that ∠BAT = ∠ACB.

Q.23 [2 marks]

If $\tan\theta = 3/4$, find the value of $(1 - \cos^2\theta)/(1 + \cos^2\theta)$.

OR

Q.23 [2 marks]

If $\tan\theta = \sqrt{3}$, find the value of $(2\sec\theta)/(1 + \tan^2\theta)$.

Q.24 [2 marks]

Students of Class XII presented a gift to their school in the form of an electric lamp — a glass hemispherical base surmounted by a metallic cylindrical top of same radius 21 cm and height 3.5 cm. The top was silver coated and the glass surface was painted red.

(i) What is the cost of silver coating the top at the rate of Rs.5 per 100 cm²?

(ii) What is the surface area of the glass part to be painted red?

Q.25 [2 marks]

A leap year is randomly chosen. Find the probability that it will contain 53 Sundays and 53 Mondays.

Q.26 [2 marks]

Find the value of p if the mean of the following distribution is 7.5.

Classes: 2–4, 4–6, 6–8, 8–10, 10–12, 12–14
Frequency: 6, 8, 15, p, 8, 4

Section C

Short Answer Questions (3 marks each)

Q.27 [3 marks]

Find a, b and c if it is given that the numbers a, 7, b, 23, c are in AP.

OR

Q.27 [3 marks]

If m times the mth term of an AP is equal to n times its nth term, show that the (m + n)th term of the AP is zero.

Q.28 [3 marks]

Find the values of k for which the quadratic equation $(k + 4)x^2 + (k + 1)x + 1 = 0$ has equal roots.

Q.29 [3 marks]

On dividing $x^3 - 3x^2 + x + 2$ by a polynomial g(x), the quotient and remainder were $x - 2$ and $-2x + 4$ respectively. Find g(x).

OR

Q.29 [3 marks]

If the sum of the squares of zeroes of the quadratic polynomial $f(x) = x^2 - 8x + k$ is 40, find the value of k.

Q.30 [3 marks]

In what ratio does the point P(−4, y) divide the line segment joining the points A(−6, 10) and B(3, −8)? If it lies on AB, hence find the value of y.

Q.31 [3 marks]

Prove that a tangent to a circle is perpendicular to the radius through the point of contact.

OR

Q.31 [3 marks]

Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.

Q.32 [3 marks]

In a right triangle, prove that the square of the hypotenuse is equal to the sum of squares of the other two sides (Pythagoras Theorem).

Section D

Long Answer Questions (5 marks each)

Q.33 [5 marks]

If $\sin\theta + \cos\theta = p$ and $\sec\theta + \operatorname{cosec}\theta = q$, show that $q(p^2 - 1) = 2p$.

Q.34 [5 marks]

500 persons are taking dip into a cuboidal pond which is 80 m long and 50 m

broad. What is the rise of water level in the pond, if the average displacement of water by a person is 0.04 m^3?

Q.35 [5 marks]

Show that (12)^n cannot end with digit 0 or 5 for any natural number n.

OR

Q.35 [5 marks]

Prove that $(\sqrt{2} + \sqrt{5})$ is irrational.

Q.36 [5 marks]

A train covered a certain distance at a uniform speed. If the train would have been 6 km/hr faster, it would have taken 4 hours less than the scheduled time and if the train were slower by 6 km/hr, it would have taken 6 hrs more than the scheduled time. Find the length of the journey.

Section E

Case Study Based Questions (4 marks each)

Q.37 [4 marks]

In an equilateral triangle ABC, D is a point on the side BC such that BD = (1/3)BC. Prove that $9\ AD^2 = 7\ AB^2$.

OR

Q.37 [4 marks]

Prove that the sum of squares of the sides of a rhombus is equal to the sum of the squares of its diagonals.

Q.38 [4 marks]

If the angle of elevation of a cloud from a point 10 metres above a lake is 30° and the angle of depression of its reflection in the lake is 60°, find the height

of the cloud from the surface of the lake.

OR

Q.38 [4 marks]

A vertical tower of height 20 m stands on a horizontal plane and is surmounted by a vertical flag-staff of height h. At a point on the plane, the angle of elevation of the bottom and top of the flag staff are 45° and 60° respectively. Find the value of h.

Q.39 [4 marks]

A solid iron cuboidal block of dimensions 4.4 m × 2.6 m × 1 m is cast into a hollow cylindrical pipe of internal radius 30 cm and thickness 5 cm. Find the length of the pipe.

Q.40 [4 marks]

For the following frequency distribution, draw a cumulative frequency curve of 'more than' type and hence obtain the median value.

Classes: 0–10, 10–20, 20–30, 30–40, 40–50, 50–60, 60–70
Frequency: 5, 15, 20, 23, 17, 11, 9