CBSE 2020 Maths Standard — Set 2

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 sum of exponents of prime factors in the prime factorisation of 196 is:

(a) 3

(b) 4

(c) 5

(d) 2

Q.2 [1 mark]

Euclid's division Lemma states that for two positive integers a and b, there exists unique integers q and r satisfying a = bq + r, and:

(a) $0 < r < b$

(b) $0 < r \leq b$

(c) $0 \leq r < b$

(d) $0 \leq r \leq b$

Q.3 [1 mark]

The zeroes of the polynomial $x^2 - 3x - m(m + 3)$ are:

(a) m, m + 3

(b) −m, m + 3

(c) m, −(m + 3)

(d) −m, −(m + 3)

Q.4 [1 mark]

The value of k for which the system of linear equations x + 2y = 3, 5x + ky + 7 = 0 is inconsistent is:

(a) −14/3

(b) 2/5

(c) 5

(d) 10

Q.5 [1 mark]

The roots of the quadratic equation $x^2 - 0.04 = 0$ are:

(a) ± 0.2
(b) ± 0.02
(c) 0.4
(d) 2

Q.6 [1 mark]

The common difference of the A.P. 1/p, (1 − p)/p, (1 − 2p)/p, ... is:

(a) 1
(b) 1/p
(c) −1
(d) −1/p

Q.7 [1 mark]

The n-th term of the A.P. a, 3a, 5a, ... is:

(a) na
(b) (2n − 1)a
(c) (2n + 1)a
(d) 2na

Q.8 [1 mark]

The point P on x-axis equidistant from the points A(−1, 0) and B(5, 0) is:

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

Q.9 [1 mark]

The coordinates of the point which is the reflection of point (−3, 5) in the x-axis are:

(a) (3, 5)
(b) (3, −5)
(c) (−3, −5)
(d) (−3, 5)

Q.10 [1 mark]

If the point P(6, 2) divides the line segment joining A(6, 5) and B(4, y) in the ratio 3 : 1, then the value of y is:

(a) 4
(b) 3
(c) 2
(d) 1

Q.11 [1 mark]

In Fig. 1, MN ‖ BC and AM : MB = 1 : 2, then ar(△AMN)/ar(△ABC) = _____.

Q.12 [1 mark]

In Fig. 2, two concentric circles have centre O. PA is a tangent to the outer circle and PB is a tangent to the inner circle. OA = 5 cm and OP = 3 cm is the radius of the inner circle. The length PB = _____ cm.

Q.13 [1 mark]

In △ABC, AB = 6√3 cm, AC = 12 cm and BC = 6 cm, then ∠B = _____.

OR

Q.13 [1 mark]

Two triangles are similar if their corresponding sides are _____.

Q.14 [1 mark]

The value of (tan 1° tan 2° ..... tan 89°) is equal to _____.

Q.15 [1 mark]

In Fig. 3, the angles of depression from the observing positions O_1 and O_2 respectively of the object A are _____, _____.

Q.16 [1 mark]

If $\sin A + \cos^2 A = 1$, then find the value of the expression $(\cos^2 A + \cos^4 A)$.

Q.17 [1 mark]

In Fig. 4, a sector of a circle of radius 10.5 cm has angle 60°. Find the perimeter of the sector. (Take $\pi = 22/7$)

Q.18 [1 mark]

If a number x is chosen at random from the numbers −3, −2, −1, 0, 1, 2, 3, then find the probability that $x^2 < 4$.

OR

Q.18 [1 mark]

What is the probability that a randomly taken leap year has 52 Sundays?

Q.19 [1 mark]

Find the class marks of the classes 10–25 and 35–55.

Q.20 [1 mark]

A die is thrown once. What is the probability of getting a prime number?

Section B

Very Short Answer Questions (2 marks each)

Q.21 [2 marks]

A teacher asked 10 of his students to write a polynomial in one variable on a paper and then to handover the paper. The following were the answers given by the students: $2x + 3$, $3x^2 + 7x + 2$, $4x^3 + 3x^2 + 2$, $x^3 + \sqrt{x} + 7$, $7x + \sqrt{7}$, $5x^3 - 7x + 2$, $2x^2 + 3 - (5/x)$, $5x - 1/2$, $ax^3 + bx^2 + cx + d$ $(a \neq 0)$, $x + 1/x$. Answer the following: (i) How many of the above ten are not polynomials? (ii) How many of the above are quadratic polynomials?

Q.22 [2 marks]

In Fig. 5, ABC and DBC are two triangles on the same base BC. If AD intersects BC at O, show that $ar(\triangle ABC)/ar(\triangle DBC) = AO/DO$.

OR

Q.22 [2 marks]

In Fig. 6, if $AD \perp BC$, then prove that $AB^2 + CD^2 = BD^2 + AC^2$.

Q.23 [2 marks]

Prove that: $1 + \cot^2\alpha/(1 + \text{cosec } \alpha) = \text{cosec } \alpha$.

OR

Q.23 [2 marks]

Show that $\tan^4\theta + \tan^2\theta = \sec^4\theta - \sec^2\theta$.

Q.24 [2 marks]

The volume of a right circular cylinder with its height equal to the radius is 25 1/7 cm^3. Find the height of the cylinder. (Use $\pi = 22/7$)

Q.25 [2 marks]

A child has a die whose six faces show the letters A, B, C, D, E, A as shown. The die is thrown once. What is the probability of getting (i) A, (ii) D?

Q.26 [2 marks]

Compute the mode for the following frequency distribution:

Size of items (in cm): 0–4, 4–8, 8–12, 12–16, 16–20, 20–24, 24–28
Frequency: 5, 7, 9, 17, 12, 10, 6

Section C

Short Answer Questions (3 marks each)

Q.27 [3 marks]

If $2x + y = 23$ and $4x - y = 19$, find the value of $(5y - 2x)$ and $(y/x - 2)$.

OR

Q.27 [3 marks]

Solve for x: $1/(x + 4) - 1/(x + 7) = 11/30$, where $x \neq -4, 7$.

Q.28 [3 marks]

Show that the sum of all terms of an A.P. whose first term is a, the second term is b and the last term is c, is equal to $(a + c)(b + c - 2a) / [2(b - a)]$.

OR

Q.28 [3 marks]

Solve the equation: $1 + 4 + 7 + 10 + ... + x = 287$.

Q.29 [3 marks]

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

Q.30 [3 marks]

If the mid-point of the line segment joining the points A(3, 4) and B(k, 6) is

P(x, y) and x + y − 10 = 0, find the value of k.

OR

Q.30 [3 marks]

Find the area of triangle ABC with A(1, −4) and the mid-points of sides AB and AC being (2, −1) and (0, −1) respectively.

Q.31 [3 marks]

In Fig. 7, if △ABC ~ △DEF and their sides of lengths (in cm) are marked along them, then find the lengths of the sides of each triangle.

Q.32 [3 marks]

If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R respectively, prove that AQ = 1/2 (BC + CA + AB).

Section D

Long Answer Questions (5 marks each)

Q.33 [5 marks]

If sin θ + cos θ = √2, prove that tan θ + cot θ = 2.

Q.34 [5 marks]

The area of a circular play ground is 22176 cm². Find the cost of fencing this ground at the rate of Rs.50 per metre.

Q.35 [5 marks]

Prove that √5 is an irrational number.

Q.36 [5 marks]

It can take 12 hours to fill a swimming pool using two pipes. If the pipe of larger diameter is used for four hours and the pipe of smaller diameter for 9

hours, only half of the pool can be filled. How long would it take for each pipe to fill the pool separately?

Section E

Case Study Based Questions (4 marks each)

Q.37 [4 marks]

Draw a circle of radius 2 cm with centre O and take a point P outside the circle such that OP = 6.5 cm. From P, draw two tangents to the circle.

OR

Q.37 [4 marks]

Construct a triangle with sides 5 cm, 6 cm and 7 cm and then construct another triangle whose sides are 3/4 times the corresponding sides of the first triangle.

Q.38 [4 marks]

From a point on the ground, the angles of elevation of the bottom and the top of a tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

Q.39 [4 marks]

Find the area of the shaded region in Fig. 8, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

OR

Q.39 [4 marks]

Find the curved surface area of the frustum of a cone, the diameters of whose circular ends are 20 m and 6 m and its height is 24 m.

Q.40 [4 marks]

The mean of the following frequency distribution is 18. The frequency f in the class interval 19–21 is missing. Determine f.

Class interval: 11–13, 13–15, 15–17, 17–19, 19–21, 21–23, 23–25
Frequency: 3, 6, 9, 13, f, 5, 4

OR

Q.40 [4 marks]

The following table gives production yield per hectare of wheat of 100 farms of a village:

Production yield: 40–45, 45–50, 50–55, 55–60, 60–65, 65–70
No. of farms: 4, 6, 16, 20, 30, 24

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