SET-II

DESIGN OF THE QUESTION PAPER

MATHEMATICS – CLASS IX

Time : 3 Hours **Maximum Marks : 80**

The weightage or the distribution of marks over different dimensions of the question paper shall be as follows:

1. Weightage to Content/ Subject Units

S.No.	Units	Marks
1.	Number Systems	06
2.	Algebra	20
3.	Coordinate Geometry	06
4.	Geometry	22
5.	Mensuration	14
6.	Statistics and Probability	12

2 Weightage to Forms of Questions

S.No.	Forms of Questions	Marks for each Question	Number of Questions	Total Marks
1.	MCQ	01	10	10
2.	SAR	02	05	10
3.	SA	03	10	30
4.	LA	06	05	30
		Total	**30**	**80**

3. Scheme of Options

All questions are compulsory, i.e., there is no overall choice. However, internal choices are provided in two questions of 3 marks each and 1 question of 6 marks.

4. Weightage to Difficulty Level of Questions

S.No.	Estimated Difficulty Level of Questions	Percentage of Marks
1.	Easy	20
2.	Average	60
3.	Difficult	20

Note

A question may vary in difficulty level from individual to individual. As such, the assessment in respect of each question will be made by the paper setter/ teacher on the basis of general anticipation from the groups as whole taking the examination. This provision is only to make the paper balanced in its weight, rather to determine the pattern of marking at any stage.

BLUE PRINT
MATHEMATICS – CLASS IX

Forms of Questions → Content Units ↓	MCQ	SAR	SA	LA	Total
NUMBER SYSTEMS	1 (1)	2 (1)	3 (1)	–	6 (3)
ALGEBRA Polynomials, Linear Equations in Two Variables	1 (1)	4 (2)	9 (3)	6 (1)	20 (7)
COORDINATE GEOMETRY	1 (1)	2 (1)	3 (1)	–	6 (3)
GEOMETRY Introduction to Euclid's Geometry, Lines and Angles, Triangles, Quadrilaterals, Areas, Circles, Constructions	4 (4)	–	6 (2)	12 (2)	22 (8)
MENSURATION Areas, Surface areas and Volumes	2 (2)	–	6 (2)	6 (1)	14 (5)
STATISTICS AND PROBABILITY Statistics, Probability	1 (1)	2 (1)	3 (1)	6 (1)	12 (4)
Total	**10 (10)**	**10 (05)**	**30 (10)**	**30 (05)**	**80 (30)**

SUMMARY

Multiple Choice Questions (MCQ)	Number of Questions: 10	Marks: 10
Short Answer with Reasoning (SAR)	Number of Questions: 05	Marks: 10
Short Answer (SA)	Number of Questions: 10	Marks: 30
Long Answer (LA)	Number of Questions: 05	Marks: 30
Total	**30**	**80**

MATHEMATICS
CLASS IX

Time: 3 hours **Maximum Marks: 80**

General Instructions

1. All questions are compulsory.

2. The question paper consists of four sections A, B, C and D. Section A has 10 questions of 1 mark each, section B has 5 questions of 2 marks each, section C has 10 questions of 3 marks each and section D is of 5 questions of 6 marks each.

3. There is no overall choice. However internal choices are provided in 2 questions of 3 marks each and 1 question of 6 marks.

4. Construction should be drawn neatly and exactly as per the given measurements.

5. Use of calculators is not allowed.

SECTION A

In Questions 1 to 10, four options of answer are given in each, out of which only one is correct. Write the correct option.

1. Which of the following represent a line parallel to x-axis?

(A) $x + y = 3$ (B) $2x + 3 = 7$ (C) $2y - 3 = y + 1$ (D) $x + 3 = 0$

2. Zero of the polynomial $p(x) = 3x + 5$ is :

(A) 0 (B) -5 (C) $\frac{5}{3}$ (D) $\frac{-5}{3}$

3. The abscissa of a point P, in cartesian plane, is the perpendicular distance of P from:

(A) y-axis (B) x-axis (C) origin (D) line $y = x$

4. The reflex angle is an angle:

(A) less than 90° (B) greater than 90°
(C) less than 180° (D) greater than 180°

5. If the lines l, m, and n are such that $l \| m$ and $m \| n$, then

(A) $l \| n$ (B) $l \perp n$
(C) l and n are intersecting (D) $l = n$

6. In Fig.1, $\angle B < \angle A$ and $\angle D > \angle C$, then:

(A) AD > BC

(B) AD = BC

(C) AD < BC

(D) AD = 2BC

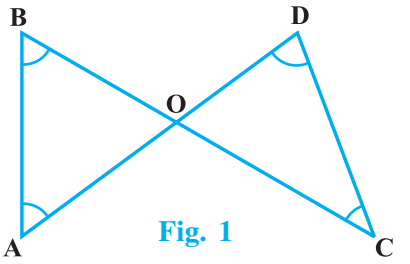


Fig. 1

7. In Fig. 2, the measure of $\angle BCD$ is:

(A) 100°

(B) 70°

(C) 80°

(D) 30°

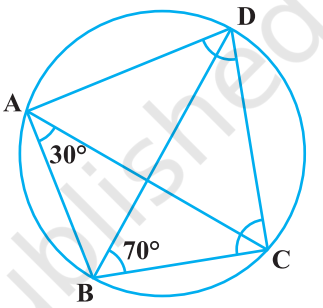


Fig. 2

8. The height of a cone of diameter 10 cm and slant height 13cm is:

(A) $\sqrt{69}$ cm (B) 12 cm (C) 13 cm (D) $\sqrt{194}$ cm

9. The surface area of a solid hemisphere with radius r is

(A) $4\pi r^2$ (B) $2\pi r^2$ (C) $3\pi r^2$ (D) $\frac{2}{3}\pi r^3$

10. If the mode of the following data

10, 11, 12, 10, 15, 14, 15, 13, 12, x, 9, 7 is 15, then the value of x is:

(A) 10 (B) 15 (C) 12 (D) $\frac{21}{2}$

SECTION B

11. Find an irrational number between two numbers $\frac{1}{7}$ and $\frac{2}{7}$ and justify your answer.

It is given that $\frac{1}{7} = 0.\overline{142857}$

12. Without actually dividing, find the remainder when $x^4 + x^3 - 2x^2 + x + 1$ is divided by $x - 1$, and justify your answer.

13. Give the equations of two lines passing through (2, 10). How many more such lines are there, and why?

14. Two points with coordinates (2, 3) and (2, –1) lie on a line, parallel to which axis? Justify your answer.

15. A die was rolled 100 times and the number of times, 6 came up was noted. If the experimental probability calculated from this information is $\frac{2}{5}$, then how many times 6 came up? Justify your answer.

SECTION C

16. Find three rational numbers between $\frac{2}{5}$ and $\frac{3}{5}$.

17. Factorise: $54a^3 - 250b^3$

18. Check whether the polynomial $p(y) = 2y^3 + y^2 + 4y - 15$ is a multiple of $(2y - 3)$.

19. If the point (3, 4) lies on the graph of the equation $2y = ax + 6$, find whether (6, 5) also lies on the same graph.

20. Plot (–3, 0), (5, 0) and (0, 4) on cartesian plane. Name the figure formed by joining these points and find its area.

21. Diagonals AC and BD of a trapezium ABCD with $AB \| DC$, intersect each other at O. Prove that ar(AOD) = ar(BOC).

OR

ABCD is a rectangle in which diagonal AC bisects $\angle A$ as well as $\angle C$. Show that ABCD is a square.

22. Construct a triangle PQR in which $\angle Q = 60°$ and $\angle R = 45°$ and PQ + QR + PR = 11 cm.

23. Find the area of a triangle two sides of which are 18 cm and 10 cm and the perimeter is 42 cm.

24. A cylindrical pillar is 50 cm in diameter and 3.5 m in height. Find the cost of painting the curved surface of the pillar at the rate of Rs 12.50 per m^2.

OR

The height of a solid cone is 16 cm and its base radius is 12 cm. Find the total surface area of cone. $\left(\text{Use } \pi = \frac{22}{7}\right)$

25. A die is thrown 400 times, the frequency of the outcomes of the events are given as under.

Outcome	1	2	3	4	5	6
Frequency	70	65	60	75	63	67

Find the probability of occurence of an odd number.

SECTION D

26. A field is in the shape of a trapezium whose parallel sides are 25 m and 10 m. The non-parallel sides are 14 m and 13 m. Find the area of the field.

27. Draw a histogram and frequency polygon for the following distribution:

Marks Obtained	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of Students	7	10	6	8	12	3	2	2

28. Prove that two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of the other triangle.

Using above, prove that CD bisects AB, in Figure 3, where AD and BC are equal perpendiculars to line segment AB.

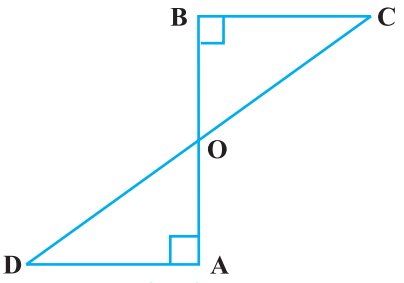


Fig. 3

29. Prove that equal chords AB and CD of a circle subtend equal angles at the centre. Use the above to find $\angle ABO$ in Figure 4, where O is the centre of the circle

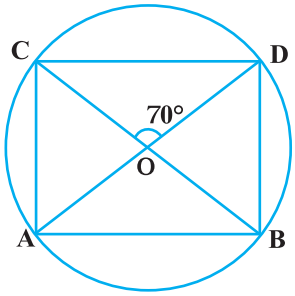


Fig. 4

30. Factorise the expression

$$8x^3 + 27y^3 + 36x^2y + 54xy^2$$

OR

The Linear equation that converts Fahrenheit to Celsius is $F = \frac{9}{5} C + 32$

Draw the graph of the equation using Celsius for x-axis and Fahrenheit for y-axis. From the graph find the temperature in Fahrenheit for a temprature of 30°C.

Marking Scheme

MATHEMATICS – CLASS IX

SECTION A

1. (C) **2.** (D) **3.** (A) **4.** (D) **5.** (A)

6. (C) **7.** (C) **8.** (B) **9.** (C) **10.** (B)

$(1 \times 10 = 10)$

SECTION B

11. Since $\frac{1}{7} = 0.142857\ 142857\ ...$ and $(\frac{1}{2})$

$\frac{2}{7} = 0.285714\ 285714\ ...$ $(\frac{1}{2})$

Therefore, an irrational number between $\frac{1}{7}$ and $\frac{2}{7}$ $(\frac{1}{2})$

can be $0.1501500\ 15000\ ...$ $(\frac{1}{2})$

12. Let $p(x) = x^4 + x^3 - 2x^2 + x + 1$, then by Remainder theorem,

on dividing with $x - 1$, remainder is $f(1)$ $(1\frac{1}{2})$

Therefore, remainder $= 1 + 1 - 2 + 1 + 1 = 2$ $(\frac{1}{2})$

13. $3x - y + 4 = 0$, $x - y + 8 = 0$ $(\frac{1}{2})$

Through one point, infinitely many lines can pass.

Therefore, infinitely many such lines will be there. $(1\frac{1}{2})$

14. Parallel to y-axis. $(\frac{1}{2})$

Since x-coordinate of both points is 2.

So, both points lie on the line $x = 2$ which is parallel to y-axis. $(1\frac{1}{2})$

15. Answer is 40 $(\frac{1}{2})$

Probability of an event = $\frac{\text{frequency of the event occurring}}{\text{the total number of trials}}$

Therefore, $\frac{2}{5} = \frac{x}{100}$, i.e., $x = 40$ $(1\frac{1}{2})$

SECTION C

16. $\frac{2}{5} = \frac{8}{20}$ and $\frac{3}{5} = \frac{12}{20}$ (1)

Therefore, three rational numbers can be $\frac{9}{20}, \frac{10}{20}, \frac{11}{20}$ (2)

17. $54a^3 - 250b^3 = 2[27a^3 - 125b^3]$ (1)

$= 2[(3a)^3 - (5b)^3]$ $(\frac{1}{2})$

$= 2(3a - 5b)(9a^2 + 15ab + 25b^2)$ $(1\frac{1}{2})$

18. $p(y)$ is a multiple of $(2y - 3)$ if $(2y - 3)$ is a factor of $p(y)$. (1)

Therefore, $p\left(\frac{3}{2}\right)$ must be zero

$p\left(\frac{3}{2}\right) = 2\left(\frac{3}{2}\right)^3 + \left(\frac{3}{2}\right)^2 + 4\left(\frac{3}{2}\right) - 15$ (1)

$= \frac{27}{4} + \frac{9}{4} + 6 - 15 = 9 + 6 - 15 = 0$

Hence, $p(y)$ is a multiple of $(2y - 3)$ (1)

19. Since, (3, 4) lies on $2y = ax + 6$. Therefore, $8 = 3a$, i.e., $a = \frac{2}{3}$ (1)

Now, we have $2y = \frac{2}{3}x + 6$ $(\frac{1}{2})$

Putting $x = 6$, $y = 5$, we get $10 = \frac{2}{3}.6 + 6 = 4 + 6 = 10$ (1)

Hence (6, 5) lies on the same graph $(\frac{1}{2})$

20. Correct plotting figure formed is a triangle $(1\frac{1}{2})$

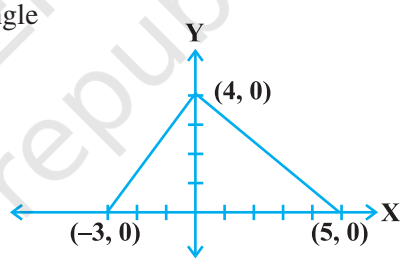


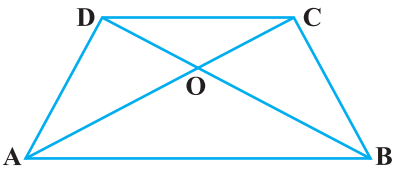
Figure formed is a triangle $(\frac{1}{2})$

Area $= \frac{1}{2} \times 8 \times 4 = 16$ sq. unit (1)

21. ar (ABD) = ar (ABC) (1)

[Δs between same parallels and on the same base]

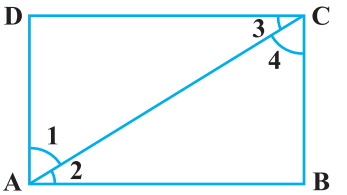
Therefore, ar (ABD) – ar (AOB) = ar (ABC) – ar (AOB) (1)



i.e., ar (AOD) = ar (BOC) (1)

OR

Given ABCD is a rectangle



with $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$ $(\frac{1}{2})$

But $\angle 1 = \angle 4$ (alternate angles) (1)

Therefore, we have $\angle 2 = \angle 4$, which means AB = BC, similarly AD = CD $(\frac{1}{2})$

Hence, ABCD is a square. (1)

22. For neat and accurate construction (3)

23. $a = 18$ cm, $b = 10$ cm. Therefore, $c = 42 - 28 = 14$ cm and s = 21 $(\frac{1}{2})$

$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ $(\frac{1}{2})$

$= \sqrt{(21)(3)(11)(7)}$ (1)

$= 21\sqrt{11}$ or 69.69 cm^2 (Approx) (1)

24. $r = 25$ cm, $h = 3.5$ m $(\frac{1}{2})$

C.S.A. $= 2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{25}{100} \times \frac{35}{10} = \frac{11}{2}$ m^2 $(1\frac{1}{2})$

Therefore, cost = Rs $\frac{11}{2} \times 12.50$ = Rs 68.75 (1)

OR

$h = 16$ cm and $r = 12$ cm, therefore, $l = \sqrt{h^2 + r^2} = 20$ cm (1)

Total surface area $= \pi rl + \pi r^2 = \pi r\ (l + r)$ (1)

$= \frac{22}{7} \times 12 \times 32 = 1206\frac{6}{7}$ cm^2 (1)

25. Sum of frequencies = 400 $(\frac{1}{2})$

Odd numbers are 1, 3, 5

Therefore, frequency of all odd numbers = 70 + 60 + 63 = 193 (1)

P(event) $= \frac{\text{Frequency of occurring of event}}{\text{The total number of trials}}$ $(\frac{1}{2})$

Therefore, probability of occurence of odd number = $\frac{193}{400}$ (1)

SECTION D

26. Let AL = x, therefore, BM = $15 - x$ ($\frac{1}{2}$)

Now $13^2 - x^2 = (14)^2 - (15 - x)^2$ 1

Solving to get $x = 6.6$ m ($\frac{1}{2}$)

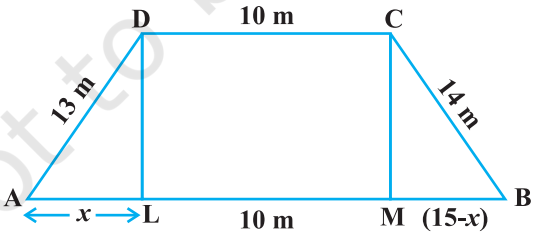
Therefore, height DL = $\sqrt{(13)^2 - (6.6)^2}$ ($\frac{1}{2}$)

$= 11.2$ m (1)

Therefore, area of trapezium = $\frac{1}{2}$ (sum of parallel sides) × height (1)

$= \frac{1}{2}(10 + 25)(11.2)\ m^2$ (1)

$= 196\ m^2$ ($\frac{1}{2}$)



27. For correctly making the histogram (4)

For correctly making the frequency polygon (2)

28. For correct given, to prove, construction and figure $(\frac{1}{2} \times 4 = 2)$

For correct proof (2)

$\angle A = \angle B = 90°$ $(\frac{1}{2})$

$\angle 1 = \angle 2$ (vert. opp. angles)

AD = BC (Given) $(\frac{1}{2})$

Therefore, Δ AOD $\cong \Delta$ BOC [AAS] $(\frac{1}{2})$

Therefore, AO = OB, i.e., CD bisects AB $(\frac{1}{2})$

29. For correct given, to prove, construction and figure $(\frac{1}{2} \times 4 = 2)$

For correct proof (2)

$\angle$ AOB = $\angle$ DOC = 70° (1)

Therefore, $\angle$ ABO = 180° – [70° + 40°] = 70° (1)

30. $8x^3 + 27y^3 + 36x^2y + 54xy^2$

$= (2x)^3 + (3y)^3 + 18xy\,(2x + 3y)$ (2)

$= (2x)^3 + (3y)^3 + 3(2x)\,(3y)\,(2x + 3y)$ (2)

$= (2x + 3y)^3 = (2x + 3y)\,(2x + 3y)\,(2x + 3y)$ (2)

OR

For correct graph taking Celsius on x-axis and Fahrenheit on y-axis (4)

From graph getting F = 86 for C = 30 (2)

NOTES

NOTES

Other Exemplar Problems by NCERT

- Exemplar Problems in Science for Class IX
- Exemplar Problems in Physics for Class XI
- Exemplar Problems in Chemistry for Class XI
- Exemplar Problems in Mathematics for Class XI
- Exemplar Problems in Biology for Class XI