SUBJECT: MATHEMATICS   **MAX. MARKS : 40**
CLASS : IX   **DURATION : 1½ hrs**

General Instructions:
(i).   **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v).   Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. $(x – 2y)^3 + (2y – 3z)^3 + (3z – x)^3$ is equal to
    (a) $(x – 2y) (2y – 3z) (3z – x)$ (b) $2(x – 2y) (2y – 3z) (3z – x)$
    (c) $3(x – 2y) (2y – 3z) (3z – x)$ (d) $3(x – 2y) (3z – x)$

2. $(x + 1)$ is a factor of the polynomial
    (a) $x^3 + x^2 – x + 1$ (b) $x^3 + x^2 + x + 1$
    (c) $x^4 + x^3 + x^2 + 1$ (d) $x^4 + 3x^3 + 3x^2 + x + 1$

3. If polynomial $p(x) = 3x^4 – 4x^3 – 3x – 1$ is divided by $(x – 1)$, then remainder is
    (a) 3   (b) – 4   (c) – 1   (d) p(1)

4. The coefficient of x in the expansion of $(x + 3)^3$ is
    (a) 1   (b) 9   (c) 18   (d) 27

5. Zeros of the polynomial $p(x) = (x – 2)^2 – (x + 2)^2$ are
    (a) 2, – 2   (b) 2x   (c) 0, – 2   (d) 0

6. Factors of $x^2 + 11x + 18$ are
    (a) $(x + 9) (x – 2)$ (b) $(x – 9) (x – 2)$
    (c) $(x – 9) (x + 2)$ (d) $(x + 9) (x + 2)$

7. If $(2x + 5)$ is a factor of $2x^2 – k$, then value of k is
    (a) 2   (b) – 1   (c) 25   (d) 25/2

8. Given a polynomial $p(t) = t^4 – t^3 + t^2 + 6$, then $p(–1)$ is
    (a) 6   (b) 9   (c) 3   (d) – 1

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** The value of $(28)^3 + (–15)^3 + (–13)^3$ is 16380.

Reason (R): If $a + b + c = 0$, then $a^2 + b^2 + c^2 = 3abc$

10. **Assertion (A):** The factors of $x^6 - 64$ is $(x + 2)(x - 2)(x^4 + x^2 + 16)$.
    Reason (R): $x^3 - y^3 = (x - y)(x^2 + y^2 + xy)$.

SECTION – B
Questions 11 to 14 carry 2 marks each.

11. Examine whether $x - 1$ is a factor of the following polynomials:
    (i) $4x^3 + 3x^2 - 4x - 3$ (ii) $x^3 - 3x^2 - 9x + 5$

12. Using suitable identity, evaluate $(-32)^3 + (18)^3 + (14)^3$

13. Find the zeroes of the polynomial: $p(x) = (x - 2)^2 - (x + 2)^2$

14. Simplify: $(x + y + z)^2 - (x - y + z)^2$

SECTION – C
Questions 15 to 17 carry 3 marks each.

15. If $p(x) = x^2 - 4x + 3$, evaluate: $p(2) - p(-1) + p(½)$.

16. Factorise the following: (i) $x^2 - \dfrac{y^2}{9}$ (ii) $2x^2 - 7x - 15$ (iii) $6x^2 + 5x - 6$

17. If $2x + 3y = 13$ and $xy = 6$, find the value of $8x^3 + 27y^3$.
    ### OR
    If $x + y + z = 8$ and $xy + yz + zx = 20$, find the value of $x^3 + y^3 + z^3 - 3xyz$.

SECTION – D
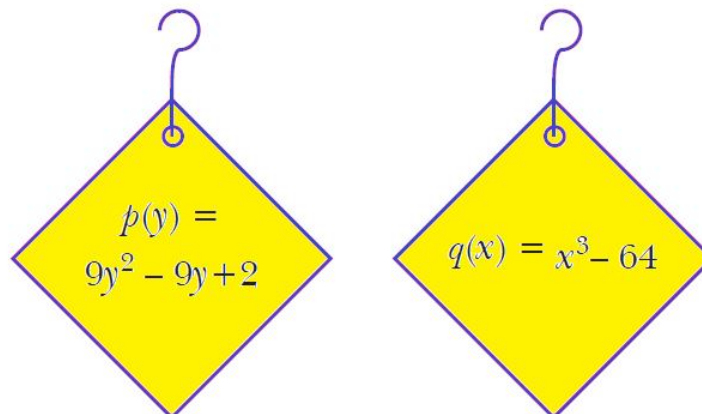### Questions 18 carry 5 marks each.

18. (a) If $x + 2a$ is a factor of $x^5 - 4a^2x^3 + 2x + 2a + 3$, find a. [2]
    (b) Find the value of a and b so that $x + 1$ and $x - 1$ are factors of $x^4 + ax^3 + 2x^2 - 3x + b$. [3]
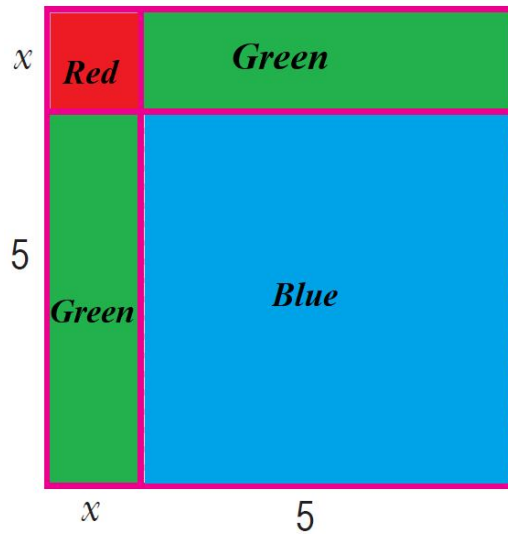
SECTION – E (Case Study Based Questions)
Questions 19 to 20 carry 4 marks each.

19. A school organised a mathematics exhibition in the school premises. Children of all classes made various models and games to depict the use of mathematics in daily life. To make the decoration more attractive, they made hangings related to mathematics one of the students made two hangings with polynomials written on them.

$p(y) = 9y^2 - 9y + 2$

$q(x) = x^3 - 64$

(a) Find the factors of polynomial q(x)   [1]
(b) Find the factors of polynomial p(y)   [1]
(c) Find the value of value of p(–2).   [1]
(d) Find the zeroes of the polynomial $x^2 - 81$ [1]

20. Mahesh formed a square using four pieces of origami, as shown in the figure.

Based on above information answer the following questions.

(i) (a) Write the trinomial which describes the area of the given square. [1]

(b) If area of the square is given by the polynomial $x^2 - 10x + 25$; then what will be the side of the square?   [1]

(ii) (a) If $p(y) = y^2 - 2y + 1$, then find the value of $p(y) + p(-y)$.   [1]

(b) What is the degree of the trinomial $x^3 + 2x^2 + 3x + 4$?   [1]