ATOMIC ENERGY CENTRAL SCHOOL

Rational Numbers and Polynomials

Class: 9 Mathematics

Time: 3H

Chapter: 1, 2

Section - A

➪ **Answer the following questions. (Each carry 1 mark)** **[25]**

1. Classify given number as rational or irrational with justification: $\left(1+\sqrt{5}\right)-\left(4+\sqrt{5}\right)$

2. Simplify this: $\left(\sqrt{5}-\sqrt{2}\right)\left(\sqrt{5}+\sqrt{2}\right)$

3. Simplify this: $\left(\sqrt{11}-\sqrt{7}\right)\left(\sqrt{11}+\sqrt{7}\right)$

4. You know that $\frac{1}{7}=0.\overline{142857}$. Can you predict what the decimal expansions of $\frac{2}{7},\frac{3}{7},\frac{4}{7},\frac{5}{7},\frac{6}{7}$ are, without actually doing the long division? If so, how?

5. Is this number rational or irrational: 2π

6. Is this number rational or irrational: $\frac{1}{\sqrt{2}}$

7. Is this number rational or irrational: $\left(3+\sqrt{23}\right)-\sqrt{23}$

8. π is defined as the ratio of the circumference (say c) of a circle to its diameter (say d). That is, $\pi=\frac{c}{d}$. This seems to contradict the fact that π is irrational. How will you resolve this contradiction?

9. Divide $8\sqrt{15}$ by $2\sqrt{3}$.

10. Insert a rational number and an irrational number between the following: 6.375289 and 6.375738

11. Rationalise the denominators: $\frac{1}{\sqrt{5}+\sqrt{2}}$

12. Insert a rational number and an irrational number between the following: 0 and 0.1

13. Let x be rational and y be irrational. Is xy necessarily irrational? Justify your answer by an example.

14. Classify given number as rational or irrational with justification: $1.010010001\ldots$

15. Is zero a rational number? Can you write it in the form $\frac{p}{q}$, where p and q are integers and $q\neq 0$?

16. Write three numbers whose decimal expansion are non-terminating nonrecurring.

17. Express in the form $\frac{p}{q}$, where p and q are integers and $q\neq 0$: 0.2

18. Classify given number as rational or irrational with justification: $-\sqrt{0.4}$

19. Verify that the following are zeroes of the polynomial: $p(x) = 3x + 1,\ x = -\left(\frac{1}{3}\right)$

20. Is this number rational or irrational: $\sqrt{225}$

21. Is this number rational or irrational: $7.478478\ldots\ldots$

22. Simplify this: $\left(3 + \sqrt{3}\right)\left(3 - \sqrt{3}\right)$

23. Is this number rational or irrational: $2 - \sqrt{5}$

24. Classify given number as rational or irrational with justification: $\frac{\sqrt{12}}{\sqrt{75}}$

25. Give one example each of a binomial of degree 35, and of a monomial of degree 100.

Section - B

Answer the following questions. (Each carry 2 marks) **[20]**

26. Express $0.99999\ldots$ in the form $\frac{p}{q}$.

27. Find the following products using appropriate identities: $(x + 3)(x + 3)$

28. Factorise $6x^2 + 17x + 5$ by splitting the middle term, and by using the Factor Theorem.

29. Find the value of k, if $x - 1$ is a factor of $4x^3 + 3x^2 - 4x + k$.

30. Find $p(0), p(1)$ and $p(2)$ for the following polynomial: $p(t) = 2 + t + 2t^2 - t^3$

31. Use suitable identities to find products: $(3x + 4)(3x - 5)$

32. Find $p(0), p(1)$ and $p(2)$ for the following polynomial: $p(y) = y^2 - y + 1$

33. Write the coefficient of x^2 in each of the following:

(i) $3x - 5$ (ii) $(2x - 5)(2x^2 - 3x + 1)$

34. Rationalise the denominator of $\frac{1}{\sqrt{2}}$.

35. Write $(3a + 4b + 5c)^2$ in expanded form.

Section - C

Answer the following questions. (Each carry 3 marks) **[30]**

36. If $a = \frac{3 + \sqrt{5}}{2}$, then find the value of $a^2 + \frac{1}{a^2}$.

37. Which of the following expressions are polynomials in one variable and which are not? State reasons for your answer.

(i) $4x^2 - 3x + 7$ (ii) $y^2 + \sqrt{2}$ (iii) $3\sqrt{t} + t\sqrt{2}$

38. If $p(x) = x^2 - 4x + 3$, evaluate: $p(2) - p(-1) + p\left(\frac{1}{2}\right)$.

39. Find the decimal expansions of $\frac{10}{3}$, $\frac{7}{8}$ and $\frac{1}{7}$.

40. Show that $0.2353535\ldots = 0.2\overline{35}$ can be expressed in the form . where p and q are integers and $q \neq 0$.

41. Factorise: $2y^3 + y^2 - 2y - 1$

42. Find $p(0), p(1), p(-2)$ for the polynomial: $p(y) = (y+2)(y-2)$

43. Write the following in decimal form and say what kind of decimal expansion each has:

(i) $\frac{3}{13}$ (ii) $\frac{2}{11}$ (iii) $\frac{329}{400}$

44. If the polynomials $az^3 + 4z^2 + 3z - 4$ and $z^3 - 4z + a$ leave the same remainder when divided by $z - 3$, find the value of a.

45. Express $0.6 + 0.\overline{7} + 0.4\overline{7}$ in the form $\frac{p}{q}$, where ***p*** and ***q*** are integers and $q \neq 0$.

Section - D

➪ **Answer the following questions. (Each carry 5 marks)** **[25]**

46. The polynomial $p(x) = x^4 - 2x^3 + 3x^2 - ax + 3a - 7$ when divided by $x + 1$ leaves the remainder 19. Find the values of a. Also find the remainder when $p(x)$ is divided by $x + 2$.

47. Classify the following as a constant, linear, quadratic and cubic

(i) $2 - x^2 + x^3$ (ii) $3x^3$ (iii) $5t - \sqrt{7}$ (iv) $4 - 5y^2$ (v) 3

48. Simplify: $\frac{7\sqrt{3}}{\sqrt{10} + \sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6} + \sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15} + 3\sqrt{2}}$

49. If $\sqrt{2} = 1.414$, $\sqrt{3} = 1.732$, then find the value of $\frac{4}{3\sqrt{3} - 2\sqrt{2}} + \frac{3}{3\sqrt{3} + 2\sqrt{2}}$.

50. For the polynomial $\frac{x^3 + 2x + 1}{5} - \frac{7}{2}x^2 - x^6$, write

(i) The degree of the polynomial (ii) The coefficient of x^3 (iii)The coefficient of x^6 (iv)The constant term