UNIT TEST PAPER

Algebra

1. Write the degrees of the following algebraic expressions and name them.

   (i) $5 \times x \times x \times x \times y + y \times y \times z - z \times z$

   (ii) $\dfrac{x^3 y^3 z^3}{3}$

   (iii) $\dfrac{x^4 y^3 z^2}{5} - \dfrac{x^3 y^2 z}{4}$

   (iv) $\dfrac{3x^3 + 4y^2 - 2z^2 + 6}{7}$

2. Add the following:

   (i) $(5x^2 - 6) + (4y^2 + 4)$

   (ii) $(3x^2 y^2 + 2y^3 x^2 + 8) + (5y^3 x^2 + 3z^3 y^2 - 12)$

   (iii) $(8x^2 y + 9y^2 x + 6) + (x^2 y - 11y^2 x + 5xy - 3)$

   (iv) $(5x^2 y^2 - 6x^2 z^2 - 2y^2 z^2 + 29) +$
        $(8x^2 z^2 + 6y^2 z^2 - 7x^2 y^2 - 38)$

3. Subtract the following:

   (i) $(6y^2 + 9) - (y^2 + 9)$

   (ii) $(3x^2 y^2 + y^2 z^2 + 2) - (3y^2 z^2 + x^2 y^2 - 3)$

   (iii) $(8x^3 y + 9y^3 x + 4) - (7y^3 x - z^3 y - 6)$

   (iv) $(12x^2 yz - 11y^2 xz + 4z^2 yx - 17) -$
        $(5x^2 yz + y^2 xz - z^2 xy - 11)$

4. Multiply the following:

   (i) $\dfrac{3x^2 y}{z}\left(\dfrac{z^2}{xy} + \dfrac{2z^2}{3x^2} - \dfrac{yz}{9x^2}\right)$

   (ii) $\dfrac{x^3 y}{7z}\left(\dfrac{21z^2}{x^2 y} - \dfrac{2zy}{x^3} + \dfrac{14z}{x^3 y}\right)$

   (iii) $(6x^2 - 4)(2x^2 + 3)$

   (iv) $(5x - 2y)(3x + 4y)$

   (v) $(5x^2 + 2y^2 + z)(5x^2 - 2y^2 + z)$

   (vi) $(3x + 2y + 1)(9x^2 + 4y^2 - 6xy - 3x - 2y + 1)$

5. Divide the following:

   (i) $\left(\dfrac{xz}{6y} + \dfrac{3x^2 z^2}{6y^2} - \dfrac{5y}{x} + \dfrac{x^2}{4y^2}\right) \div \dfrac{x^2}{2y^2}$

   (ii) $\left(6x^2 y^2 - \dfrac{3x^2 y}{4z^2} + \dfrac{2y^2 x}{3z^2} - \dfrac{9xy}{8z}\right) \div \dfrac{3xy}{4z}$

   (iii) $(18x^2 + 18x - 20) \div (6x - 4)$

   (iv) $(8x^2 + 18xy - 35y^2) \div (2x + 7y)$

   (v) $(3x^3 - x^2 y - 23y^2 x + 21y^3) \div (3x - 7y)$

   (vi) $(8x^3 - 64y^3) \div (2x - 4y)$

6. Simplify the following:

   (i) $\dfrac{1}{3x}\left[5x^2 + 2x - 3 - (x+3)\left\{3x + y - \dfrac{1}{3}\right.\right.$
       $\left.\left.(6x - y + 9 - \overline{3x - 4y + 6})\right\}\right]$

   (ii) $[\{(3x - 5)(9x^2 + 15x + 25) + 125\} + 9x^2] - 3x$

7. Find the values of the following by applying the concept of special products.

   (i) 289×311 (ii) 693×707

   (iii) $567^2 - 565^2$ (iv) $1399^2 - 1398^2$

8. Find the continued product of the following:

   (i) $\left(\dfrac{2}{x} - 1\right)\left(\dfrac{2}{x} + 1\right)\left(\dfrac{4}{x^2} + 1\right)$

   (ii) $(2x - y)(2x + y)(4x^2 + y^2)(16x^4 + y^4)$

9. What should be subtracted from $36x^2 - 42xy + 16y^2$ to make it a perfect square?

10. What should be added to $\dfrac{x^2}{4} + xy + 9y^2$ to make it a perfect square?

11. Given that $y + \dfrac{1}{y} = 9$, find the value of $y^2 + \dfrac{1}{y^2}$.

12. Given that $y + \dfrac{1}{y} = 1$, find the value of $y^4 + \dfrac{1}{y^4}$.

13. Given that $y^2 + \dfrac{1}{y^2} = 98$, find the value of $y + \dfrac{1}{y}$.

14. Factorise the following expressions.

    (i) $15x^4 y^2 - 5x^3 y^3 + 10x^3 y^2$

    (ii) $15xy - 12y + 15x - 12$

    (iii) $6x^3 y^2 + 2y^3 x^2 - 36x^2 y^2 - 12y^3 x$

    (iv) $8x^4 y + 16x^2 y^2 + 24x^3 y - 12x^3 y - 24y^2 x - 36xy$

    (v) $3x^2 - 5xy - 12y^2$

    (vi) $10x^2 + 6xy - 28y^2$

15. Given $K = \dfrac{1}{2} mv^2$, find v given that $K = 312.5$ and $m = 0.01$.

16. Solve the following equations.

    (i) $3(x + 7) - 4(x - 3) = 2x$

    (ii) $5(x - 3) + 2(x + 4) = 4(x - 7)$

(iii) $\dfrac{x}{2} - \dfrac{x}{3} = \dfrac{x-6}{5}$ (iv) $\dfrac{2x+3}{11} + \dfrac{x-3}{2} = \dfrac{x+3}{2}$

17. Ramya thought of a number, halved it and then added 2. The sum divided by 3 gave the quotient 5. What was the number Ramya thought of?

18. Find 3 consecutive odd numbers such that the sum of twice the least number and thrice the greatest number is 107.

19. Mr Yadav is 3 years elder to Mrs Yadav. If the sum of $\dfrac{1}{5}$ of his age and $\dfrac{1}{6}$ of her age is 27 years, find their ages.

20. Divide Rs 8030 between A and B such that $\dfrac{1}{5}$ of A's share equals $\dfrac{1}{6}$ of B's share.

21. The denominator of a common fraction exceeds the numerator by 3. If 1 is added to the numerator as well as the denominator, the fraction $\dfrac{4}{5}$ is obtained. Find the original common fraction.

22. The sum of the digits of a 2-digit number is 11. When the digits are reversed, the number decreases by 9. Find the original 2-digit number.

23. A piggy bank has Rs 45.60 made of 50 p, 25 p, and 20 p coins. If six-sevenths of the number of 50 p coins are 20 p coins and $\dfrac{2}{3}$ of the number of 20 p coins are 25 p coins, find the number of coins of each denomination.

24. Given the replacement set as $x \in Z$, solve $-57 \le 3(4x-3) \le 15$ and represent the solution on the number line.

25. 3 calculators and 12 batteries cost Rs 585 while a calculator and 5 batteries cost Rs 202.50. How much does a calculator and a battery cost?

26. Solve the following simultaneous equations.
   (i) $5x = 19 + 3y;\ 3x = 38 - 2y$
   (ii) $8x - y + 19 = 0;\ 2x + 5y - 11 = 0$
   (iii) $\dfrac{y}{3} - \dfrac{x}{5} = 5; \dfrac{y}{8} + \dfrac{x}{3} = 8$ (iv) $\dfrac{3}{x} + \dfrac{1}{y} = 7; \dfrac{12}{x} - \dfrac{2}{y} = 10$

27. There are 12 more passengers on the lower deck of a double decker bus than the upper deck. If 24 passengers from the lower deck climb upstairs, the upper deck will have 3 times as many passengers as the lower deck. How many passengers are there on each deck of the bus?

28. A tug-boat first travels 40 km upstream and 36 km downstream in 8 hours. Then it travels 54 km downstream and 20 km upstream in 7 hours. Find the speed of the tug-boat in still water and the speed of the water current.

29. How many values of x will the equation $4x^2 + 12x + 9 = 0$ have? Why?

30. Solve the following quadratic equations.
   (i) $9x^2 - 36 = 0$ (iii) $7x^2 - 32x = 15$
   (ii) $x^2 - 13x + 40 = 0$ (iv) $30x^2 + 13x = 10$

31. Given that speed = 3 m/s, draw the graph showing the mapping between time (t) and distance (d).

32. The C.P. and S.P. of 7 different articles bought and sold by a trader are as under:

C.P.	7.50	2.50	4.50	5.50	3.50
S.P.	9.00	2.80	9.00	7.15	4.90

Is the relation between the profit per cent of each article and its S.P. a mapping? Represent the relation by an arrow diagram and explain why.

33. Draw graphs for the following equations.
   (i) $5x + y = 15$ (ii) $3x - 7y = 14$
   (iii) $3x + 5y = 20$ (iv) $x - \dfrac{y}{6} - 2 = 0$

34. Can a solution be found that satisfies the equations $2x = 16$ and $\dfrac{x}{11} - 1 = 0$ simultaneously? Draw graphs for both the equations and explain why.

35. By now you must have figured out that there is less of 'magic' and more of Algebra in a 'Magic Square'. Work out the numbers in the following magic squares such that the sums of all the rows, columns, and diagonals in each are the same.

(i)

15	x	14	3
	13		
5	12		
18	y	11	6

(ii)

		$3x$
	$2x$	$y-1$
x	$2y$	y