Revision Exercise (Core)

1. Simplify each of the following algebraic expressions.

   (i) $\dfrac{12m^2n^3}{(6m^4n^5)^2}$

   (ii) $\dfrac{3 + \frac{1}{x}}{\frac{5}{x} + 4}$

   (iii) $\dfrac{2 + \frac{x}{2}}{x^2 - 16}$

2. Solve for x and y:

   (i) $y = x + 4$
       $5y + 2x = 6$

   (ii) $3x + y = 7$
        $x^2 + y^2 = 13$

3. Using long division, find $x^3 - x^2 - 7x + 3 \div x - 3$.

4. Divide $3x^4 - 9x^2 + 27x - 66$ by $x - 2$.

5. Solve the equations.

   (i) $x^4 - 9x^2 = 0$

   (ii) $(2x - 1)^3(2 - x) = 0$

6. Given that $4x^2 + 20x + k$ is a perfect square, find k.

7. Find the integers a and b such that

   (i) $(3 - \sqrt{2})^2 = a - b\sqrt{2}$

   (ii) $\left(\dfrac{1 - \sqrt{2}}{1 + \sqrt{2}}\right) = a\sqrt{2} - b$.

8. Factorise $x^3 - 27$.

9. If $p(x - q)^2 + r = 2x^2 - 12x + 5$ for all values of x, find the values of p, q and r.

10. Solve the simultaneous equations $3x + 5y - z = -3$
                                        $2x + y - 3z = -9$
                                        $x + 3y + 2z = 7.$

11. Simplify $(b + 1)^3 - (b - 1)^3$.

12. Find the rule for each of the following quadratic patterns.
    (i) $3, 12, 27, 48, 75 \ldots$
    (ii) $5, 20, 45, 80, 125 \ldots$
    (iii) $0.5, 2, 4.5, 8, 12.5 \ldots$

13. Find the rule for the pattern $6, 12, 20, 30, 42$ using first and second differences. Hence find the 100th term of this pattern.

14. Three times the width of a certain rectangle exceeds twice the length by 3 cm. Four times the length is 12 cm more than its perimeter. Find the dimensions of the rectangle.