Activities

1. Formulate an equation for the following statement. 'Andy is three years older than his brother Nick who is half the age of their father'.

2. Plot the points A(2, 3), B(4, 0) and C(-4, -1) on a graph and find the equations of the three lines which form the sides of the triangle ABC.

3. Solve the following linear equations.

   (a) $2x + 3x - 7x = 6$ (b) $5v + 7v = 0$

   (c) $12y = -144$ (d) $y + y - 3y = 16$

4. Expand the following equations.

   (a) $y = (x + 3)(x - 1)$ (b) $y = (x - 6)(2 - x)$

   (c) $y = x(x + 3)(x - 7)$ (d) $y = (4x^2 + 1)(2 - x)(x + 5)$

5. Plot the graphs of the following equations for values of x between -4 and 4.

   (a) $y = x^2 - 3x + 1$ (b) $y = x - 1$

   (c) $y = x^3$ (d) $y = x^4$

   (e) $y = -x^2$ (f) $y = x^3 + 2x^2 - x - 1$

6. What is the point of intersection of the two curves below? Show this by plotting them on the same set of axes.

   $y = 2x^2 - 7x - 17$
   $y = 2x^2 + 9x - 13$

7. Factorise and solve the following equations completely.

(a) $x^2 - 5x + 4 = 0$ (b) $6x^2 - x - 1 = 0$

(c) $4x^3 - 2x^2 - 2x = 0$ (d) $x^4 - 1 = 0$

(e) $2x^3 + x^2 - 2x - 1 = 0$ (f) $x^2 + x - 1 = 0$

(g) $2x^2 + 3x - 1 = 0$ (h) $x^2 + 3x - 1 = 0$

8. Find the remainder on dividing

(a) $x^2 - 5x + 4$ by $(x - 2)$

(b) $y = \dfrac{x^3 + x^2 + x + 1}{x + 1}$

(c) $y = x^4 + x^2 + 1$ by $y = x + 2$

9. For what values of k does the equation below have real roots?

$$(x - 5)(x + 1) = k(x - 7)$$

10. What is the equation whose roots are α, β and γ?
What is the equation whose roots are α, β, γ and δ?
Is there a pattern emerging?

11. If the equation $x^2 + 3x - 5 = 0$ has roots α and β, what is the equation whose roots are $1/\alpha$ and $1/\beta$?

[Solutions: **1** A = 2N - C/2 + 3.

2 AB , y = 6 - 3x/2 ; AC, y = 2x/3 + 5/3 ; BC, y = x/8 -1/2.

3 (a) -3; (b) 0; (c) -12; (d) -16.

4 (a) $y = x^2 + 2x - 3$; (b) $y = -x^2 + 8x - 12$; (c) $y = x^3 - 4x^2 - 21x$;
(d) $y = -4x^4 - 12x^3 + 39x^2 - 3x + 10$.

6 (-1/4, -121/8).

7 (a) x = 1, 4; (b) x = 1/2, -1/3; (c) x = 0, -1/2, 1; (d) x = 1 twice, -1 twice;
(e) x = 1, -1, -1/2; (f) $x = -1/2 \pm \sqrt{5}/2$; (g) $x = -3/4 \pm \sqrt{17}/4$; (h) $-3/2 \pm \sqrt{5}/2$.

8 (a) -2; (b) 0; (c) 21.

9 $k \leq 2$ and $k \geq 18$.

10 $x^3 - x^2(\alpha + \beta + \gamma) + x(\alpha\beta + \alpha\gamma + \beta\gamma) - \alpha\beta\gamma = 0$,
$x^4 - x^3(\alpha + \beta + \gamma + \delta) + x^2(\alpha\beta + \alpha\gamma + \alpha\delta + \beta\gamma + \beta\delta + \gamma\delta) - x(\alpha\beta\gamma + \alpha\beta\delta + \alpha\gamma\delta + \beta\gamma\delta) + \alpha\beta\gamma\delta = 0$.

11 $5x^2 - 3x - 25 = 0$.]