1. Expand brackets and simplify:

(a) $(x+3)(x+2)$ (b) $(x+7)(x+6)$
(c) $(x-1)(x+4)$ (d) $(x-4)(x-2)$
(e) $(x+3)(2x+1)$ (f) $(3x+1)(2x-1)$
(g) $(2x+3)(2x-3)$ (h) $(3x-2)(4x+3)$
(i) $(2x-5)(x-2)$ (j) $(2x-7)(3x-1)$

2. Square each of these brackets:

(a) $(x+4)^2$ (b) $(x-7)^2$
(c) $(2x+1)^2$ (d) $(3x-2)^2$
(e) $(5x+2)^2$ (f) $(3-x)^2$

3. Expand and simplify

(a) $x+3 \quad x^2+4x+7$ (b) $x-2 \quad x^2-x+3$

4. Simplify

(a) $\sqrt{2} \quad \sqrt{2}-1$ (b) $2-\sqrt{2} \quad 2+\sqrt{2}$

5. Simplify each of these surds.

(a) $\sqrt{12}$ (b) $\sqrt{8}+\sqrt{32}$ (c) $\sqrt{45}$

6. Express with a rational denominator:

(a) $\frac{4}{\sqrt{2}}$ (b) $\frac{3}{\sqrt{5}}$ (c) $\sqrt{\frac{1}{8}}$

7. Evaluate

(a) $3\sqrt{2}^{\,2}$ (b) $\sqrt{3}^{\,4}$ (c) $\sqrt{2}-1^{\,2}$

8. Find the exact value of:

(a) $25^{\frac{1}{2}}$ (b) $8^{\frac{2}{3}}$ (c) $9^{\frac{3}{2}}$
(d) 2^{-1} (e) $4^{\frac{3}{2}}$ (f) $4^{-\frac{3}{2}}$

9. Simplify:

(a) $x^2 \times x^5$ (b) $x^2 \div x^5$ (c) $\left(x^3\right)^2$

(d) $4y^2 \times 3y^{-1}$ (e) $\left(x^{\frac{1}{2}}\right)^4$ (f) $2a^{-3} \times 4a^{-1}$

10. Solve each of these equations algebraically, giving your answers as integers or fractions. **Do not** use decimals.

(a) $5x+1=16$ (b) $7x-1=14$ (c) $3(x+5)=36$

(d) $4(1+y)=8$ (e) $3x+5=x+16$ (f) $6(x+2)=2x+14$

11. Simplify as far as possible:

(a) $3(x+5)-2x+12$ (b) $5(2a+3b)-2(a-2b)$

(c) $x(x+y)-y(x+y)$ (d) $3(f-g)-(g-f)$

12. (a) A plot of land which cost £40 000 in 2009 has appreciated by 40%.
What is it now worth?

(b) A car cost £14 000 new. It depreciates 28% in its first year.
Calculate its value at the end of the first year.

(c) An antique was sold for £8 200 in 1999. In 2003 it was resold for £9 600. Calculate the percentage appreciation, correct to one decimal place.

13. The area of a triangle for which the lengths of the sides are *a*, *b* and *c* units can be found using the formula

$$A=\sqrt{s(s-a)(s-b)(s-c)}, \text{ where } s=\tfrac{1}{2}(a+b+c).$$

This is known as Heron's formula, after a Mathematician from Alexandria who lived about 2000 years ago.

Use this formula to find the area of the triangle sketched below.