



Waseley
Sixth

**A Level Further
Maths
Bridging Course**

1. Simplify these expressions:

(a) $9x^2 \times 3(x^2)^3$

(b) $2a^3 + 3a^2 \times 6a^5$

(c) $\frac{4x^3y}{8x^2y^3}$

(d) $(3x^2)^3 + x^4$

2. Expand and simplify if possible

(a) $7(x - 2) + 3(x + 4) - 6(x - 2)$

(b) $5x - 3(4 - 2x) + 6$

(c) $4x(3x - 2) - x(2x + 5)$

(d) $(x - 1)(3x - 4y - 5)$

3. Make x the subject of the formula

(a) $v^2 = u^2 + 2ax$

(b) $y = \frac{x + 2}{x + 1}$

(c) $\frac{a}{b}(cx + d) = x + 2$

(d) $\frac{a}{b}(cx + d) = \frac{2a}{b^2}(x + 2d)$

4. Simplify these fractions

(a) $\frac{6x^4 + 10x^6}{2x}$

(b) $\frac{2x^4 - 4x^2}{4x}$

(c) $\frac{8x^3 + 5x}{2\sqrt{x}}$

(d) $\frac{20x^7 + 15x^3}{5x^2}$

5. Factorise completely:

(a) $2x^4 + 14x^2 + 24$

(b) $4x^2 - 25$

(c) $50 - 2x^2$

(d) $x^3 - 7x^2 + 6x$

6. Simplify the following compound fractions:

(a) $\frac{\frac{1}{x} + 1}{\frac{1}{x} + 3}$

(b) $\frac{\frac{2}{x} + 1}{\frac{3}{x} - 1}$

(c) $\frac{\frac{1}{x-1} + 1}{\frac{1}{x-1} - 1}$

(d) $\frac{\frac{x^2}{\sqrt{x^2+1}} - \sqrt{x^2+1}}{x^2}$

7. Write as single fractions (you don't need to rationalise the denominator for your final answer)

(a) $\frac{x+1}{\sqrt{x}} + \sqrt{x}$

(b) $\frac{2x}{\sqrt{x+3}} + \sqrt{x+3}$

(c) $\frac{x}{\sqrt[3]{x-2}} + \sqrt[3]{(x-2)^2}$

(d) $\frac{x}{\sqrt{x-2}} + \sqrt{x-2}$

8. Simplify into a single factorised expression

(a) $(x - 3)^2 + 5(x - 3)^3$

(c) $\frac{1}{2}k(k + 1) + (k + 1)$

(b) $4x(2x + 1)^3 + 5(2x + 1)^4$

(d) $\frac{1}{6}k(k + 1)(2k + 1) + (k + 1)^2$

9. Multiply out and simplify

(a) $\left(x + \frac{1}{x}\right)^2$

(c) $\left(x + \frac{2}{x}\right)\left(x - \frac{3}{x}\right)$

(b) $\left(x + \frac{1}{x}\right)\left(x - \frac{1}{x}\right)$

(d) $\left(x - \frac{2}{x-2}\right)\left(x + \frac{3}{x+1}\right)$

10. Simplify the following

(a) $\frac{2\pi x}{ab} + \frac{1}{3}\pi r^3$

(c) $2x^{1.5} + 4x^{-0.25}$

(b) $\frac{2\pi h^2}{rb} + \frac{4}{3}\pi hr^2$

(d) $\frac{4}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$

11. Simplify as far as possible

(a) $\frac{(x + 3)^2 - 2(x + 3)}{x^2 + 2x - 3}$

(c) $\frac{7x - 14}{x^2 + 4x - 12} + \frac{x - 6}{x^3 - 36x}$

(b) $\frac{x(2x - 1)^2 - x^2(2x - 1)}{(x - 1)^2}$

(d) $2 - \frac{x + 2}{x - 3} - \frac{x - 6}{x + 3}$

12. Write the following in the form $a(x + b)^2 + c$

(a) $2x^2 + 8x - 4$

(c) $3x^2 + 6x + 7$

(b) $5x^2 - 20x + 25$

(d) $2x^2 - 10x + 13$

13. Solve algebraically the following simultaneous equations

(a) $x^2 - 4y^2 = 9$
 $3x + 4y = 7$

(c) $x^2 + y^2 = 25$
 $y - 3x = 13$

(b) $2x^2 - y^2 = 17$
 $x + 2y = 1$

(d) $9x^2 + 4y^2 = 36$
 $2x - y = -1$

14. Solve the following simultaneous equations

(a) $x^2 + 3xy + 5y^2 = 5$
 $x - 2y = 1$

(c) $x^2 - y^2 = 11$
 $x - y = 11$

(b) $4x^2 - 4xy - 4y^2 = 20$
 $2x - 3y = 10$

(d) $\frac{12}{x} + \frac{1}{y} = 3$
 $x + y = 7$

15. Solve the following inequality

(a) $2x^2 + 3x - 2 > 0$

(b) $(1 - x)^2 < \frac{9}{25}$

(c) $2x^2 - x - 3 < 0$

(d) $3x^2 > 14x - 8$

16. Write as sums of powers of x .

(a) $x^3 \left(x + \frac{1}{x} \right)$

(b) $\frac{x^4 + 1}{x^2}$

(c) $x^{-5} \left(x + \frac{1}{x^2} \right)$

(d) $x^{-4} \left(x^2 + \frac{1}{x^3} \right)$

17. Work out the exact value of x .

(a) $9^{-\frac{1}{2}} = 27^{\frac{1}{4}} + 3^{x+1}$

(b) $16^{\frac{1}{3}} \times 2^x = 8^{\frac{3}{4}}$

(c) $8^{\frac{3}{4}} \times 2^x = 16^{\frac{4}{5}}$

(d) $\left(2x^{\frac{5}{2}} - x^{\frac{1}{2}} \right)^2 = x(1 + 4x^4) + 108$

18. Rationalise the denominators and simplify:

(a) $\frac{1}{3 - \sqrt{7}}$

(b) $\frac{(\sqrt{18} + \sqrt{2})^2}{\sqrt{8} - 2}$

(c) $\frac{3 - \sqrt{7}}{3 + \sqrt{7}}$

(d) $\frac{3 - 2\sqrt{5}}{\sqrt{5} - 1}$

19. Sketch the curve with the following equations, labelling the points of intersection and the turning point.

(a) $y = x^2 - 2x - 3$

(b) $y = 6 - x - x^2$

(c) $y = x^2 - 8x + 7$

(d) $y = x^2 - 2bx + c$

20. Sketch the curve with the following:

(a) $y = \frac{1}{x}$

$y = 2^x$

(c) $y = \sin x$

$y = x^3 - x$

21. Harry buys a laptop for £364

He wants to put a tag with a price on the laptop so that in the sale he can give a discount of 30% off the price on the tag and still make a profit of 20% on the price he paid for the laptop.



Work out the price that Harry should put on the tag.