

1 Equation or identity?

P $5(x+2) - 3 = 5x + 7$ Q $x^2 - 9 = (x-3)^2$

R $(x-2)(x+2) = x^2 - 4$

a) Sort P, Q and R into equations and identities.

b) Solve the equation.

a) P and R are identities, Q is an equation

b) $x^2 - 9 = x^2 - 6x + 9$, $6x = 18$

$x = 3$

2 Identities: finding unknowns

a) $3(x+a) - 2(x-1) \equiv x + 14$. Find a .

b) $(2x+a)^2 \equiv 4x^2 + bx + 9$ and $a > 0$. Find a and b .

a) $x + 3a + 2 \equiv x + 14$, $a = 4$

b) $a^2 = 9$, $a = 3$

$b = 4a = 12$

3 Simplifying algebraic fractions

Simplify fully

a) $\frac{6x+9}{4x+6}$

b) $\frac{x^2+5x+6}{x^2-4}$

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

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

4 Multiplying and dividing

Simplify fully

a) $\frac{3x}{x-5} \times \frac{x^2-25}{9x}$

b) $\frac{x^2-x-6}{4} \div \frac{x-3}{8}$

a) $\frac{3x}{x-5} \times \frac{(x-5)(x+5)}{9x} = \frac{x+5}{3}$

b) $\frac{(x-3)(x+2)}{4} \times \frac{8}{x-3} = 2(x+2)$

Algebraic fractions and algebraic proof revision mat answers

5 Adding and subtracting

Write each as a single fraction in its simplest form.

a) $\frac{x+1}{3} + \frac{x-2}{5}$

b) $\frac{2}{x} + \frac{3}{x+4}$

a) $\frac{5(x+1) + 3(x-2)}{15} = \frac{8x-1}{15}$

b) $\frac{2(x+4) + 3x}{x(x+4)} = \frac{5x+8}{x(x+4)}$

6 Algebraic fractions: equations

Solve $\frac{3}{x-1} - \frac{2}{x+1} = 1$

$3(x+1) - 2(x-1) = (x-1)(x+1)$

$x+5 = x^2-1$

$x^2-x-6=0$, $(x-3)(x+2)=0$

$x = 3$ or $x = -2$

7 Algebraic proof

a) Prove that the product of any two odd numbers is odd.

b) Prove that $(n+5)^2 - (n+1)^2$ is a multiple of 8 for any whole number n .

a) $(2a+1)(2b+1) = 4ab + 2a + 2b + 1$
 $= 2(2ab + a + b) + 1$, odd

b) $n^2 + 10n + 25 - (n^2 + 2n + 1)$
 $= 8n + 24 = 8(n+3)$

8 Algebraic proof: true or false?

a) Leo says that two square numbers never add to make a square number. Show that he is wrong.

b) Is $(n+3)^2 - n^2$ always odd for a whole number n ?
Prove your answer.

a) $9 + 16 = 25$, and $25 = 5^2$

b) $n^2 + 6n + 9 - n^2 = 6n + 9$
 $= 2(3n+4) + 1$: yes, always odd