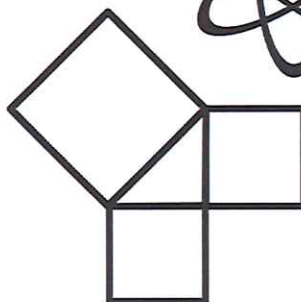
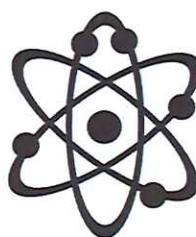
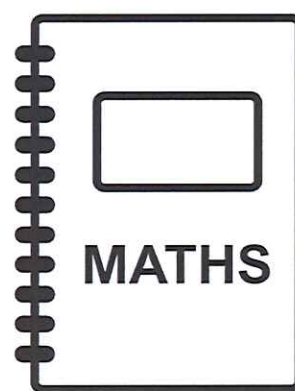


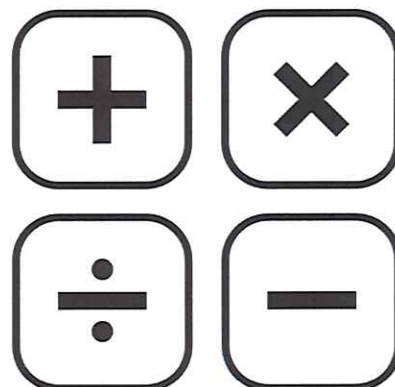
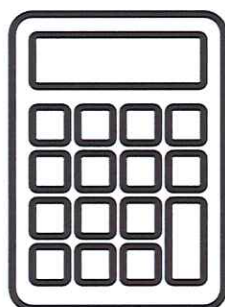
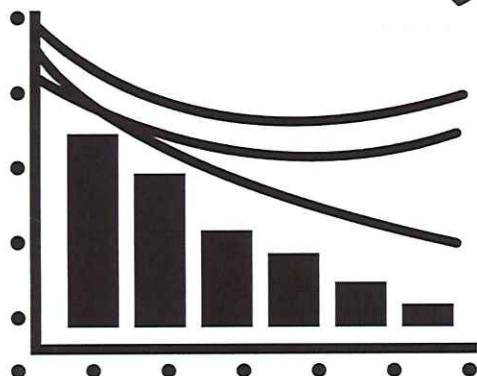
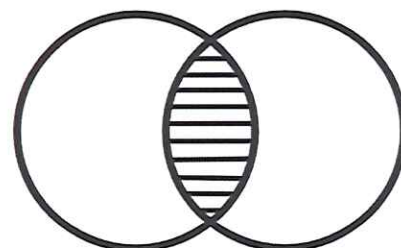
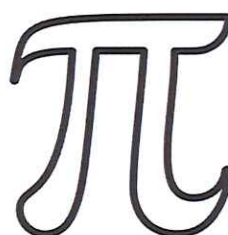
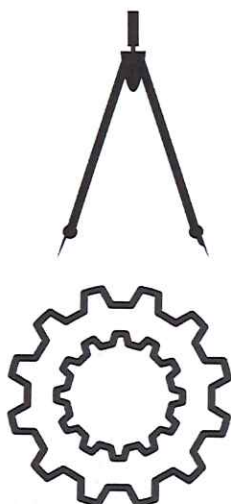
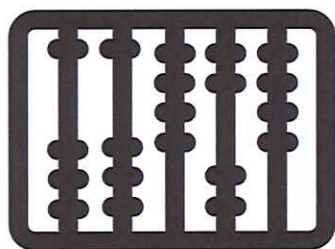
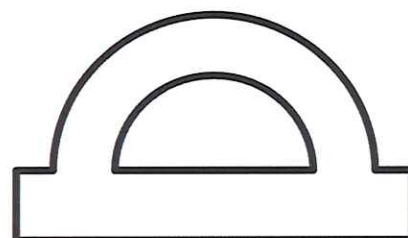
# MATHSDIY

SOLUTIONS

## GCSE TOPIC BOOKLET ALGEBRAIC FRACTIONS



$$a^2 = b^2 + c^2$$



1. Express the following as a single fraction in its simplest form.

$$\begin{aligned} & \frac{5}{3x-1} - \frac{4}{2x+3} \\ &= \frac{5(2x+3) - 4(3x-1)}{(3x-1)(2x+3)} \\ &= \frac{10x+15-12x+4}{(3x-1)(2x+3)} \\ &= \frac{-2x+19}{(3x-1)(2x+3)} \end{aligned}$$

get a common denominator of  $(3x-1)(2x+3)$

expand and simplify

(4)

2. Solve the following equation.

$$\begin{aligned} & \frac{2}{2x+3} + \frac{1}{x+2} = 3 \\ & 2(x+2) + 1(2x+3) = 3(2x+3)(x+2) \\ & 2x+4+2x+3 = 3[2x^2+7x+6] \\ & 4x+7 = 6x^2+21x+18 \\ & 0 = 6x^2+17x+11 \\ & 0 = 6x^2+6x+11x+11 \\ & 0 = 6x(x+1)+11(x+1) \\ & 0 = (x+1)(6x+11) \\ & x = -1 \text{ and } x = -\frac{11}{6} \end{aligned}$$

'x' everything by  $(2x+3)(x+2)$

expand

simplify

| xac | +b    |
|-----|-------|
| 66  | 17    |
|     | 11, 6 |

factorise the quadratic

(7)

3. Solve the following equation.

$$\frac{4x-5}{2} + \frac{7x-10}{5} = 4$$

x by the LCM of the denominators, so  $\times 10$

$$10 \left( \frac{4x-5}{2} \right) + 10 \left( \frac{7x-10}{5} \right) = 4 \times 10$$

$$5(4x-5) + 2(7x-10) = 40$$

expand and  
simplify

$$20x - 25 + 14x - 20 = 40$$

$$34x - 45 = 40$$

$$34x = 85$$

$$x = \frac{85}{34} = x = \frac{5}{2}$$

(4)

4. Express the following as a single fraction in its simplest form.

$$\frac{3x}{3x+2} - \frac{2x}{2x+7}$$

get a common  
denominator of  
 $(3x+2)(2x+7)$

$$= \frac{3x(2x+7) - 2x(3x+2)}{(3x+2)(2x+7)}$$

expand and  
simplify

$$= \frac{6x^2 + 21x - 6x^2 - 4x}{(3x+2)(2x+7)}$$

$$= \frac{17x}{(3x+2)(2x+7)}$$

(3)

5. Prove

$$\overbrace{\frac{2x}{7} + \frac{x+3}{4} + \frac{4x+1}{3}}^{\text{LHS}} = \overbrace{\frac{157x+91}{84}}^{\text{RHS}}$$

$$\begin{aligned} \text{LHS} &= \frac{2x}{7} + \frac{(x+3)}{4} + \frac{4x+1}{3} \\ &= \frac{12 \times 2x}{84} + \frac{21 \times (x+3)}{84} + \frac{28 \times (4x+1)}{84} \\ &= \frac{24x + 21x + 63 + 112x + 28}{84} \end{aligned}$$

$$= \frac{157x+91}{84} = \text{RHS}$$

Method  
start with the LHS and get a common denominator and simplify to end up with the RHS

(4)

6. Simplify

$$\frac{a^2 + 4ab + 4b^2}{5a + 10b}$$

← factorise top & bottom

$$= \frac{(a+2b)(a+2b)}{5(a+2b)}$$

cancel

$$= \frac{a+2b}{5}$$

(3)

7. Express the following as a single fraction in its simplest form.

$$\frac{7x}{2x+3} + \frac{2}{3x-2}$$

get a common denominator of  $(2x+3)(3x-2)$

$$= \frac{7x(3x-2) + 2(2x+3)}{(2x+3)(3x-2)}$$

expand and simplify

$$= \frac{21x^2 - 14x + 4x + 6}{(2x+3)(3x-2)}$$

$$= \frac{21x^2 - 10x + 6}{(2x+3)(3x-2)}$$

(4)

8. Solve the following equation.

$$\frac{5x-1}{2} - x = \frac{1}{2}$$

x everything by 2

$$5x - 1 - 2x = 1$$

$$3x - 1 = 1$$

$$3x = 2$$

$$x = \frac{2}{3}$$

(3)

9. Express the following as a single fraction in its simplest terms.

$$\frac{2x-3}{3} - \frac{x+5}{4}$$

get a common denominator of 12

$$= \frac{4(2x-3) - 3(x+5)}{12}$$

expand and simplify

$$= \frac{8x-12-3x-15}{12} = \frac{5x-27}{12}$$

(3)

10. Prove that

$$\frac{2x+3}{4} - \frac{3x-2}{3} + \frac{1}{6} \equiv \frac{19-6x}{12}$$

Start with the LHS and get a common denominator of 12

$$\text{LHS} \equiv \frac{3(2x+3) - 4(3x-2) + 2(1)}{12}$$

expand and simplify

$$\equiv \frac{6x+9-12x+8+2}{12}$$

$$\equiv \frac{19-6x}{12} \equiv \text{RHS}$$

(5)

11. Simplify

$$\frac{2x^2 + 5x - 7}{10x + 35}$$

factorise

$$= \frac{(2x+7)(x-1)}{5(2x+7)}$$

cancel

$$= \frac{x-1}{5}$$

(4)

12. Solve

$$\frac{8x-5}{3} + \frac{4x+5}{4} = \frac{149}{12}$$

x by the LCM of the denominators

so  $\times 12$

$$\frac{12(8x-5)}{3} + \frac{12(4x+5)}{4} = 12\left(\frac{149}{12}\right)$$

$$4(8x-5) + 3(4x+5) = 149$$

expand and simplify

$$32x - 20 + 12x + 15 = 149$$

$$44x - 5 = 149$$

$$44x = 154$$

$$x = \frac{154}{44}$$

$$x = 3.5$$

$$\left(\frac{7}{2}\right)$$

(4)

13. Express the following as a single fraction, simplifying your answer.

$$\frac{a-b}{a+b} - \frac{a+b}{a+2b}$$

get a common denominator of  $(a+b)(a+2b)$

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

expand and simplify

$$= \frac{a^2 + 2ab - ab - 2b^2 - [a^2 + ab + ab + b^2]}{(a+b)(a+2b)}$$

$$= \frac{\cancel{a^2} + ab - 2b^2 - [\cancel{a^2} + 2ab + b^2]}{(a+b)(a+2b)}$$

$$= \frac{-ab - 3b^2}{(a+b)(a+2b)}$$

(4)

14. Simplify

$$\frac{n+1}{n} - \frac{n}{n+1}$$

get a common denominator of  $n(n+1)$

$$= \frac{(n+1)(n+1) - n(n)}{n(n+1)}$$

$$= \frac{n^2 + 2n + 1 - n^2}{n(n+1)}$$

expand and simplify

$$= \frac{2n+1}{n(n+1)}$$

(4)

15. Express the following as a single fraction, simplifying your answer.

$$\frac{5}{y+4} - \frac{3}{2y-1}$$

get a common denominator of  $(y+4)(2y-1)$

$$= \frac{5(2y-1) - 3(y+4)}{(y+4)(2y-1)}$$

expand and simplify

$$= \frac{10y - 5 - 12 - 3y}{(y+4)(2y-1)}$$

$$= \frac{7y - 17}{(y+4)(2y-1)}$$

(4)

16. Simplify

difference of 2 squares

$$\frac{9x^2 - 25}{6x + 10}$$

factorise

$$= \frac{(3x-5)(3x+5)}{2(3x+5)}$$

cancel

$$= \frac{3x-5}{2}$$

(4)