



EXAM PAPERS PRACTICE

GCSE Edexcel Math
1MA1
Algebraic Fractions

Answers

*"We will help you to
achieve A Star "*



Answer 1

(a) Simplify fully $\frac{x^2 + 3x - 4}{2x^2 - 5x + 3}$

$$\begin{aligned} &= \frac{(x+4)(\cancel{x-1})}{(2x-3)(\cancel{x-1})} \\ &= \frac{x+4}{2x-3} \end{aligned}$$

ALGEBRAIC FRACTIONS
FACTORISE TOP AND
BOTTOM AND CANCEL



Answer 2

Simplify $\frac{x+1}{2} + \frac{x+3}{3}$

$= \frac{3(x+1)}{2 \times 3} + \frac{2(x+3)}{2 \times 3}$

$= \frac{3x+3 + 2x+6}{6}$

$= \frac{5x+9}{6}$

ALGEBRAIC FRACTIONS

- LOOK FOR (LOWEST) COMMON DENOMINATOR.
- TREAT LIKE NORMAL FRACTIONS

eg. $\frac{1}{2} + \frac{2}{3}$

$= \frac{1 \times 3}{2 \times 3} + \frac{2 \times 2}{2 \times 3}$

$= \frac{3}{6} + \frac{4}{6}$

$= \frac{7}{6}$



Answer 4

(b) Write $\frac{4}{x+2} + \frac{3}{x-2}$ as a single fraction in its simplest form.

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

$$= \frac{4x - 8 + 3x + 6}{(x+2)(x-2)}$$

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

$$\left(= \frac{7x - 2}{x^2 - 4} \right)$$

$$\frac{4}{5} + \frac{3}{7}$$

$$= \frac{4 \times 7}{5 \times 7} + \frac{5 \times 3}{5 \times 7}$$

etc.



Answer 5

Simplify $\frac{4(x+5)}{x^2+2x-15}$

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

$$= \frac{4}{x-3}$$

$$\rightarrow x^2 + 2x - 15$$

$$= (x+5)(x-3)$$

SIGNS DIFFERENT

→ BIGGER NUMBER POSITIVE

$$\begin{array}{r} -15 \\ 15x-1 \\ \hline 5x-3 \end{array}$$



Answer 6

Write as a single fraction in its simplest form

$$\frac{2}{y+3} - \frac{1}{y-6}$$

$$\frac{2}{y+3} - \frac{1}{y-6}$$

$$= \frac{2(y-6)}{(y+3)(y-6)} - \frac{1(y+3)}{(y+3)(y-6)}$$

$$= \frac{2(y-6) - 1(y+3)}{(y+3)(y-6)}$$

$$= \frac{2y - 12 - y - 3}{(y+3)(y-6)}$$

$$= \frac{y - 15}{(y+3)(y-6)}$$

EG

$$\frac{2}{3} - \frac{1}{5}$$
$$= \frac{2 \times 5}{3 \times 5} - \frac{3 \times 1}{3 \times 5}$$
$$= \frac{10}{15} - \frac{3}{15}$$
$$= \frac{7}{15}$$



Answer 7

Simplify fully $\frac{2x^2 - 5x + 3}{x^2 + 5x - 6}$

$x^2 + 5x - 6 = (x + 6)(x - 1)$
↓
POSITIVE
NEGATIVE SO SIGNS DIFFERENT

SO BIGGER NUMBER
WILL BE POSITIVE

$$\begin{array}{r} -6 \\ \hline 6x - 1 \\ 3x - 2 \end{array}$$

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

ALGEBRAIC FRACTION

FACTORISE TOP AND
BOTTOM AND CANCEL.

$$\frac{2x^2 - 5x + 3}{x^2 + 5x - 6} = \frac{\cancel{(x-1)}(2x-3)}{(x+6)\cancel{(x-1)}}$$

$$= \frac{2x-3}{x+6}$$



Answer 8

$2 - \frac{x+2}{x-3} - \frac{x-6}{x+3}$ can be written as a single fraction in the form $\frac{ax+b}{x^2-9}$

where a and b are integers. \rightarrow WHOLE NUMBERS

Work out the value of a and the value of b .

COMMON DENOMINATOR = $(x-3)(x+3)$

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

$$= \frac{\overset{F}{2} \overset{O}{x^2} \overset{I}{+3x} \overset{L}{-3x} - 9}{(x-3)(x+3)} - \overset{F}{[} \overset{O}{x^2} \overset{I}{+3x} \overset{L}{+2x+6]} - \overset{F}{[} \overset{O}{x^2} \overset{I}{-3x} \overset{L}{-6x+18]}$$

$$= \frac{2(x^2 - 9) - (x^2 + 5x + 6) - (x^2 - 9x + 18)}{x^2 - 9}$$

$$= \frac{\cancel{2x^2} - 18 - \cancel{x^2} - 5x - 6 - \cancel{x^2} + 9x - 18}{x^2 - 9}$$

$$= \frac{4x - 42}{x^2 - 9}$$

$$\underline{a = 4}, \underline{b = -42}$$



Answer 9

Simplify fully $\frac{3x^2 - 8x - 3}{2x^2 - 6x}$

→ FACTORISE THE TOP
AND BOTTOM, THEN
CANCEL...

TOP: $3x^2 - 8x - 3$

CHEAT
 $(3x - 3)(3x + 1)$

UNCHEAT BY CANCELLING

$= \underline{\underline{(x - 3)(3x + 1)}}$

$\frac{-9}{-9 \times 1}$

BOTTOM: $2x^2 - 6x = 2x \times x - 2x \times 3$

$= \underline{\underline{2x(x - 3)}}$

WHOLE THING:

$$\frac{3x^2 - 8x - 3}{2x^2 - 6x} = \frac{\cancel{(x - 3)}(3x + 1)}{2x \cancel{(x - 3)}}$$
$$= \underline{\underline{\frac{3x + 1}{2x}}}$$



Answer 10

Write $\frac{5}{x-3} - \frac{4}{x+3}$ as a single fraction in its simplest form.

$$\begin{aligned} \frac{5}{x-3} - \frac{4}{x+3} &= \frac{5(x+3)}{(x-3)(x+3)} - \frac{4(x-3)}{(x-3)(x+3)} && \text{NEED COMMON} \\ & && \text{DENOMINATOR} \\ & && \text{(BOTTOM)} \\ &= \frac{5(x+3) - 4(x-3)}{(x-3)(x+3)} \\ &= \frac{5x + 15 - 4x + 12}{(x-3)(x+3)} \\ &= \frac{x + 27}{(x-3)(x+3)} \end{aligned}$$



Answer 11

Simplify $\frac{x^2 - 9}{2x^2 + 5x - 3}$

DOTS
 $a^2 - b^2 = (a+b)(a-b)$

TOP: $x^2 - 9 = x^2 - 3^2$
 $= (x+3)(x-3)$

BOTTOM: $2x^2 + 5x - 3 = (x+3)(2x-1)$

(Note: In the original image, there are purple circles with '+' and '-' signs under the terms in the factors: + under x, - under 3 in (x+3); - under 2x, + under 1 in (2x-1).)

$$\frac{x^2 - 9}{2x^2 + 5x - 3} = \frac{\cancel{(x+3)}(x-3)}{\cancel{(x+3)}(2x-1)}$$
$$= \frac{x-3}{2x-1}$$



Answer 12

(b) Write $\frac{x}{x-1} - \frac{x}{x+1}$ as a single fraction in its simplest form.

$$\begin{aligned}\frac{x}{x-1} - \frac{x}{x+1} &= \frac{x(x+1)}{(x-1)(x+1)} - \frac{x(x-1)}{(x-1)(x+1)} \\ &= \frac{x(x+1) - x(x-1)}{(x-1)(x+1)} \\ &= \frac{\cancel{x^2} + x - \cancel{x^2} + x}{(x-1)(x+1)} \\ &= \frac{2x}{(x-1)(x+1)}\end{aligned}$$



Answer 13

Write

$$4 - \left[(x+3) \div \frac{x^2 + 5x + 6}{x-2} \right]$$

as a single fraction in its simplest form.
You must show your working.

ALGEBRAIC FRACTIONS

→ FACTORISE

$$x^2 + 5x + 6$$

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

$$\frac{6}{1 \times 6}$$
$$\frac{6}{2 \times 3}$$

$$4 - \left[(x+3) \div \frac{(x+2)(x+3)}{(x-2)} \right]$$

6 FUP

$$= 4 - \left[\cancel{(x+3)} \times \frac{(x-2)}{(x+2)\cancel{(x+3)}} \right]$$

$$= \frac{4}{1} - \frac{(x-2)}{(x+2)}$$

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

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

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

$$= \frac{3x + 10}{x+2}$$



Answer 14

(a) Simplify fully $\frac{3-x}{3x^2-5x-12}$

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

ALGEBRAIC FRACTIONS

$3x^2 - 5x - 12$

SIGNS DIFFERENT
→ BIGGER NUMBER -VE

-36

1×-36
2×-18
3×-12
4×-9

$$\begin{aligned}&= (3x+4)(\cancel{3x} - \cancel{9}) \\ &= (3x+4)(x-3)\end{aligned}$$



Answer 15

ALGEBRAIC FRACTIONS

Show that $\frac{1}{6x^2 + 7x - 5} \div \frac{1}{4x^2 - 1}$ simplifies to $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.

$$\begin{aligned} & \frac{1}{6x^2 + 7x - 5} \div \frac{1}{4x^2 - 1} \\ &= \frac{1}{6x^2 + 7x - 5} \times \frac{4x^2 - 1}{1} \\ &= \frac{4x^2 - 1}{6x^2 + 7x - 5} \\ &= \frac{(2x-1)(2x+1)}{(2x-1)(3x+5)} \\ &= \frac{2x+1}{3x+5} \end{aligned}$$

$4x^2 - 1$
 $= (2x)^2 - 1^2$
 $= (2x-1)(2x+1)$

TWO TERM QUADRATIC
NO x TERM!
"DIFFERENCE OF TWO SQUARES"
 $a^2 - b^2$
 $= (a-b)(a+b)$

$6x^2 + 7x - 5$

↘ SIGNS IN BRACKETS DIFFERENT
BIGGER NUMBER IS POSITIVE

(THE DODGY BIT:)

$= (6x - 3)(6x + 10)$
CANCEL IN EACH BRACKET

$= (2x-1)(3x+5)$

Factor pairs for -30 :
 -1×30
 -2×15
 -3×10