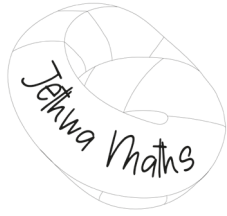


# A-Level Starter Activity



## Topic: Algebraic Fractions

Chapter Reference: Pure 1, Chapter 7

**7**  
**minutes**

1. Show that  $\frac{1}{2x^2+x-15} \div \frac{1}{3x^2+9x}$  simplifies to  $\frac{ax}{bx+c}$ , where  $a$ ,  $b$  and  $c$  are integers to be found. (2)

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2. Solve  $\frac{6}{x-1} - \frac{6}{x+1} = 1$  (4)

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3. Simplify fully,  $\frac{5}{2x-6} - \frac{x+2}{x^2-4x+3}$  (4)

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## Solutions

1.

$\frac{1}{2x^2+x-15} \div \frac{1}{3x^2+9x}$ $= \frac{1}{(2x-5)(x+3)} \times \frac{3x(x+3)}{1}$	<b>M1</b>
$= \frac{3x}{2x-5}$	<b>M1</b>

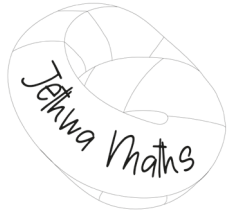
2.

$\frac{6}{x-1} - \frac{6}{x+1} = 1$ $\frac{6(x+1)-6(x-1)}{(x-1)(x+1)} = 1$	<b>M1</b>
$\frac{6x+6-6x+6}{x^2+1} = 1$ $\frac{12}{x^2+1} = 1$	<b>M1</b>
$12 = x^2 + 1$ $x^2 = 11$	<b>M1</b>
$x = \pm \sqrt{11}$	<b>M1</b>

3.

$\frac{5}{2x-6} - \frac{x+2}{x^2-4x+3} = \frac{5}{2(x-3)} - \frac{x+2}{(x-3)(x-1)}$	<b>M1</b>
$= \frac{5(x-1)-2(x+2)}{2(x-3)(x-1)}$ $= \frac{5x-5-2x-4}{2(x-3)(x-1)}$ $= \frac{3x-9}{2(x-3)(x-1)}$	<b>M1</b>
$= \frac{3(x-3)}{2(x-3)(x-1)}$	<b>M1</b>
$= \frac{3}{2(x-1)}$	<b>M1</b>

# A-Level Starter Activity



## Topic: Dividing Polynomials

Chapter Reference: Pure 1, Chapter 7

**6**  
**minutes**

1. Find the quotient obtained by dividing  $(x^2 + 2x^2 - x - 2)$  by  $(x + 1)$  (3)

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2. Find the quotient by dividing  $(20 + x + 3x^2 + x^3)$  by  $(x + 4)$  (4)

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## Solutions

1.

Attempt to divide **M1**  
 $x^2$  term, **M1**  
Full quotient **M1**

$$\begin{array}{r} x^2 + x - 2 \\ x + 1 \overline{) x^3 + 2x^2 - x - 2} \\ \underline{x^3 + x^2} \phantom{- x - 2} \\ x^2 - x \phantom{- 2} \\ \underline{x^2 + x} \phantom{- 2} \\ -2x - 2 \\ \underline{-2x - 2} \\ 0 \end{array}$$

quotient:  $x^2 + x - 2$

2.

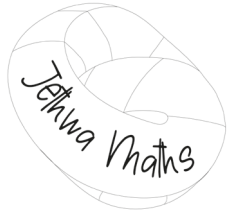
Rewriting  $20 + x + 3x^2 + x^3$  as  $x^3 + 3x^2 + x + 20$  **M1**  
Attempt to divide **M1**  
 $x^2$  term, **M1**  
Full quotient **M1**

$$\begin{array}{r} x^2 - x + 5 \\ x + 4 \overline{) x^3 + 3x^2 + x + 20} \\ \underline{x^3 + 4x^2} \phantom{+ x + 20} \\ -x^2 + x \phantom{+ 20} \\ \underline{-x^2 - 4x} \phantom{+ 20} \\ 5x + 20 \\ \underline{5x + 20} \\ 0 \end{array}$$

quotient:  $x^2 - x + 5$



# A-Level Starter Activity



**Topic: Proof by Counter Example**

Chapter Reference: Pure 1, Chapter 7

**6  
minutes**

1. 'If  $m$  and  $n$  are irrational numbers, where  $m \neq n$ , then  $mn$  is also irrational.'

Disprove this statement by means of a counter example.

(2)

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2. 'For every real number  $x$ ,  $(x + 1)^2 = x^2 + 1$ .'

Disprove this statement by means of a counter example.

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3. 'If  $n$  is an integer and  $n^2$  is divisible by 4, then  $n$  is divisible by 4'.

Disprove this statement by means of a counter example.

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## Solutions

1.

$3\sqrt{2} = \sqrt{(9)(2)} = \sqrt{18}$	<b>M1</b>
$\sqrt{2} \sqrt{18} = \sqrt{36} = 6$ So if $m$ and $n$ are irrational numbers then $mn$ is not always irrational.	<b>M1</b>

2.

$(x + 1)^2 = x^2 + 1$ When $x = -2$	<b>M1</b>
$(-2 + 1)^2 = (-2)^2 + 1$ $1 \neq 5$ Therefore, proof by counter example.	<b>M1</b>

3.

Consider $n = 6$ (or suitable alternative)	<b>M1</b>
$n^2 = 36$ $n^2$ is divisible by 4, but $n$ is not. Therefore, proof by counter example.	<b>M1</b>





## Solutions

1.

Let $f(x) = x^3 + 2x^2 - 2x - 1$ Find $f(1)$	<b>M1</b>
$f(1) = 1 + 2 - 2 - 1 = 0$ Therefore, $(x - 1)$ is a factor.	<b>M1</b>

2.

Let $f(x) = 2 - 17x + 25x^2 - 6x^3$ Find $f(\frac{2}{3})$	<b>M1</b>
$f(\frac{2}{3}) = 2 - \frac{34}{3} + \frac{100}{9} - \frac{16}{9} = 0$ Therefore $(3x - 2)$ is a factor	<b>M1</b>

3a.

$g(-2) = 0,$ Therefore $(x + 2)$ is a factor of $g(x)$	<b>M1</b>
$\begin{array}{r} x^2 + 5x - 3 \\ x+2 \overline{) x^3 + 7x^2 + 7x - 6} \\ \underline{x^3 + 2x^2} \phantom{- 6} \\ 5x^2 + 7x \phantom{- 6} \\ \underline{5x^2 + 10x} \phantom{- 6} \\ - 3x - 6 \\ \underline{- 3x - 6} \\ 0 \end{array}$ <p style="margin-left: 150px;">Attempt to divide <b>M1</b> Obtaining <math>x^2 + 5x - 3</math> <b>M1</b></p>	
Therefore, $g(x) = (x + 2)(x^2 + 5x - 3)$	<b>M1</b>

3b.

Other solutions given by, $x^2 + 5x - 3 = 0$ $x = -5.54, 0.54$	<b>M1</b>
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