Factorising & Solving Quadratics

Practice Worksheet (Problem Solving)

I Do

(a) Factorise fully $x^2 + 3x - 10$.

..... *(2 marks)*

(b) Hence solve $x^2 + 3x - 10 = 0$.

..... *(1 mark)*

(Total for Question is 3 marks)

We Do

(a) Factorise fully $x^2 + 2x - 15$.

..... *(2 marks)*

(b) Hence solve $x^2 + 2x - 15 = 0$.

..... *(1 mark)*

(Total for Question is 3 marks)

You Do 1

(a) Factorise fully $x^2 - 7x + 12$.

..... *(2 marks)*

(b) Hence solve $x^2 - 7x + 12 = 0$.

..... *(1 mark)*

(Total for Question is 3 marks)

You Do 2

(a) Factorise fully $x^2 - 4x - 21$.

..... *(2 marks)*

(b) Hence solve $x^2 - 4x - 21 = 0$.

..... *(1 mark)*

(Total for Question is 3 marks)

You Do 3

(a) Factorise fully $2x^2 + 10x - 28$.

..... *(2 marks)*

(b) Hence solve $2x^2 + 10x - 28 = 0$.

..... *(1 mark)*

(Total for Question is 3 marks)

Challenge 1

(a) Factorise fully $2x^2 + 7x - 15$.

..... *(2 marks)*

(b) Hence solve $2x^2 + 7x - 15 = 0$.

..... *(1 mark)*

(Total for Question is 3 marks)

Challenge 2

(a) Factorise fully $3x^2 - 11x - 4$.

..... *(2 marks)*

(b) Hence simplify fully

$$\frac{3x^2 - 11x - 4}{x^2 - 16}$$

..... *(2 marks)*

(Total for Question is 4 marks)

Extreme Challenge

(a) Show that the equation

$$\frac{6}{x-1} - \frac{3}{x+1} = 1$$

can be rearranged to give $x^2 - 3x - 10 = 0$.
You must show all of your algebraic working clearly.

(3 marks)

(b) Hence solve

$$\frac{6}{x-1} - \frac{3}{x+1} = 1$$

..... *(2 marks)*

(Total for Question is 5 marks)

Worked Answers

I Do
(a) Find two numbers that multiply to -10 and add to $+3$: $+5$ and -2.
$(\mathbf{x+5})(\mathbf{x-2})$.
(b) $(x+5)(x-2)=0 \implies$ **x** $=-$**5 or x** $=$ **2**.

We Do
(a) Two numbers that multiply to -15 and add to $+2$: $+5$ and -3.
$(\mathbf{x+5})(\mathbf{x-3})$.
(b) $(x+5)(x-3)=0 \implies$ **x** $=-$**5 or x** $=$ **3**.

You Do 1
(a) Two numbers that multiply to $+12$ and add to -7: -3 and -4.
$(\mathbf{x-3})(\mathbf{x-4})$.
(b) $(x-3)(x-4)=0 \implies$ **x** $=$ **3 or x** $=$ **4**.

You Do 2
(a) Two numbers that multiply to -21 and add to -4: -7 and $+3$.
$(\mathbf{x-7})(\mathbf{x+3})$.
(b) $(x-7)(x+3)=0 \implies$ **x** $=$ **7 or x** $=-$**3**.

You Do 3
(a) First factor out the common factor of 2: $2(x^2+5x-14)$.
Then factorise the quadratic: $\mathbf{2}(\mathbf{x+7})(\mathbf{x-2})$.
(b) $2(x+7)(x-2)=0 \implies$ **x** $=-$**7 or x** $=$ **2**.

Challenge 1

(a) Split the middle term using $2 \times (-15) = -30$; two numbers multiplying to -30 and adding to $+7$ are $+10$ and -3:
$2x^2 + 10x - 3x - 15 = 2x(x + 5) - 3(x + 5) = (\mathbf{2x - 3})(\mathbf{x + 5})$.

(b) $(2x - 3)(x + 5) = 0 \implies 2x - 3 = 0$ or $x + 5 = 0$.
$\mathbf{x = \frac{3}{2}}$ *(or* 1.5*)* **or x** $= -\mathbf{5}$.

Challenge 2

(a) Split the middle term using $3 \times (-4) = -12$; two numbers multiplying to -12 and adding to -11 are -12 and $+1$:
$3x^2 - 12x + x - 4 = 3x(x - 4) + 1(x - 4) = (\mathbf{3x + 1})(\mathbf{x - 4})$.

(b) Factorise the denominator using the difference of two squares: $x^2 - 16 = (x - 4)(x + 4)$.
$\frac{(3x + 1)(x - 4)}{(x - 4)(x + 4)} = \frac{\mathbf{3x + 1}}{\mathbf{x + 4}}$.

Extreme Challenge

(a) Multiply every term by $(x - 1)(x + 1)$ to clear the denominators:
$6(x + 1) - 3(x - 1) = (x - 1)(x + 1)$
Expand both sides:
$6x + 6 - 3x + 3 = x^2 - 1$
$3x + 9 = x^2 - 1$
Rearrange to set equal to zero:
$x^2 - 3x - 10 = 0$. *(Shown)*

(b) Factorise $x^2 - 3x - 10 = 0$:
$(x - 5)(x + 2) = 0 \implies$ **x** $= \mathbf{5}$ **or x** $= -\mathbf{2}$.