



1 Factorise $x^2 - 49$

(1 mark)

$x^2 - 49$ is a difference of two squares, since $49 = 7^2$

$$x^2 - 49 = (x + 7)(x - 7)$$

Check by expanding

$(x + 7)(x - 7) = x^2 - 7x + 7x - 49$. The two middle terms cancel, leaving $x^2 - 49$

$$(x + 7)(x - 7)$$

2 Factorise $x^2 + 10x + 21$

(2 marks)

Two numbers: product 21, sum 10

$$3 \times 7 = 21 \text{ and } 3 + 7 = 10$$

$$(x + 3)(x + 7)$$

3 Factorise $x^2 - 9x + 20$

(2 marks)

Two numbers: product +20, sum -9

$$(-4) \times (-5) = 20 \text{ and } (-4) + (-5) = -9$$

$$(x - 4)(x - 5)$$

4 Factorise $x^2 + 9x + 14$

(2 marks)

Expanding $(x + a)(x + b)$ gives $x^2 + (a + b)x + ab$. Therefore the two numbers must add to the x coefficient and multiply to the constant

Find two numbers that multiply to 14 and add to 9: they are 2 and 7

$$x^2 + 9x + 14 = (x + 2)(x + 7)$$

$$(x + 2)(x + 7)$$

5 Factorise $x^2 + 5x - 24$

(2 marks)

Two numbers: product -24, sum +5

$$8 \times (-3) = -24 \text{ and } 8 + (-3) = 5$$

$$(x + 8)(x - 3)$$

6

a. Factorise $x^2 - 3x - 40$

b. Expand and simplify your answer to part a to check it.

(3 marks)

a.)

Two numbers: product -40, sum -3

$$(-8) \times 5 = -40 \text{ and } (-8) + 5 = -3$$

$$(x - 8)(x + 5)$$

b) Check by expanding

$$= (x - 8)(x + 5)$$

$$= x^2 + 5x - 8x - 40$$

$$x^2 - 3x - 40$$

7

Simplify fully $\frac{x^2 - 16}{x + 4}$

(3 marks)

Factorise the top

$$= \frac{x^2 - 16}{x + 4}$$

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

Cancel $(x + 4)$

$$x - 4$$

8

a. Expand and simplify $(x + 9)(x - 2)$ b. Factorise $x^2 - 3x - 28$

(4 marks)

$$a) (x + 9)(x - 2) = x^2 - 2x + 9x - 18 = x^2 + 7x - 18$$

b) Find two numbers that multiply to -28 and add to -3: they are -7 and 4

$$b) x^2 - 3x - 28 = (x - 7)(x + 4)$$

9

By writing $73^2 - 27^2$ as a product of two factors, work out its value without a calculator.

(3 marks)

$$= 73^2 - 27^2$$

$$= (73 + 27)(73 - 27)$$

$$= 100 \times 46$$

$$4600$$

10 Factorise fully $3x^2 - 48$

(3 marks)

Take out the common factor 3

$$= 3x^2 - 48$$

$$= 3(x^2 - 16)$$

Difference of two squares

$$\boxed{3(x + 4)(x - 4)}$$

11 a. Expand and simplify $(x + 5)(x - 2) + 2(x + 2)$

b. Factorise your answer to part a.

(4 marks)

a.)

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

$$= x^2 - 2x + 5x - 10$$

$$= x^2 + 3x - 10$$

$$2(x + 2) = 2x + 4$$

$$= x^2 + 3x - 10 + 2x + 4$$

$$\boxed{x^2 + 5x - 6}$$

b) product -6, sum +5

$$6 \times (-1) = -6 \text{ and } 6 + (-1) = 5$$

$$\boxed{(x + 6)(x - 1)}$$

12 a. Expand and simplify $(y + 7)(y - 7)$

b. Factorise $x^2 + x - 30$

(4 marks)

$$a) (y + 7)(y - 7) = y^2 - 7y + 7y - 49 = y^2 - 49$$

b) Find two numbers that multiply to -30 and add to 1: they are 6 and -5

$$b) x^2 + x - 30 = (x + 6)(x - 5)$$

13 Amy is asked to factorise $x^2 - 4x - 12$.

She writes $x^2 - 4x - 12 = (x - 6)(x - 2)$

a. Explain why Amy's answer is wrong, and write down the correct factorisation.

b. Factorise fully $2x^2 + 6x - 20$

(5 marks)

a) Expanding Amy's answer

$$(x - 6)(x - 2) = x^2 - 8x + 12, \text{ which is not } x^2 - 4x - 12$$

a) The two numbers must multiply to -12 and add to -4

$$\text{they are } -6 \text{ and } 2, \text{ so } x^2 - 4x - 12 = (x - 6)(x + 2)$$

b) Take out the common factor 2 first

$$2x^2 + 6x - 20 = 2(x^2 + 3x - 10)$$

b) Factorise the quadratic

$$x^2 + 3x - 10 = (x + 5)(x - 2)$$

$$\text{b) So } 2x^2 + 6x - 20 = 2(x + 5)(x - 2)$$

14 a. Solve $5 - 2x \geq 1$

b. Factorise $x^2 + 5x + 6$

(5 marks)

a) Subtract 5 from both sides

$$\begin{array}{rcl} -2x & > & -4 \\ \hline x & < & 2 \end{array}$$

÷-2 and reverse the inequality sign

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Dividing by a negative number reverses order: for example $6 > 2$, but $-3 < -1$ after dividing both by -2. This is why the inequality sign reverses here

b) Find two numbers with product 6 and sum 5: they are 2 and 3

$$x^2 + 5x + 6 = (x + 2)(x + 3)$$