

$$\rightarrow a^2 - b^2 \equiv (a+b)(a-b)$$

5. Work out the values of a and b in the identity.



$$9(2x + 5) + 2(3x + b) \equiv ax + 23$$

$$18x + 45 + 6x + 2b$$

$$24x + 45 + 2b \equiv ax + 23$$

$$a = 24$$

$$\cancel{45} + 2b = 23$$

$$-45$$

$$\cancel{2}b = \frac{-22}{2}$$

$$b = -11$$

a = ...

b = ...

(3)

6. Work out the values of a and b in the identity.



$$4(2x + b) + a(x + 3) \equiv 10x + 2$$

a = ...

b = ...

(3)

9. $(x + 4)(x - 6) + ax + b \equiv x^2 + 8x - 25$



Work out the values of a and b.

$$x^2 - 2x - 24 + ax + b$$

$$x^2 - 2x + ax - 24 + b$$

$$x^2 + (-2 + a)x - 24 + b \equiv x^2 + 8x - 25$$

$$-2 + a = 8$$

$$-24 + b = -25$$

$$a = 10$$

$$b = -1$$

a = ...

b = ...

(3)

10. $(2x - 5)(2x - 7) + ax^2 + b \equiv 3x^2 - 24x + 12$



Work out the values of a and b.

a = ...

b = ...

(3)

13. $(x + 2c)(x + c) \equiv x^2 + dx + 50$



Find the two possible values of d .

$d = \dots\dots\dots$ or $d = \dots\dots\dots$
(3)

14. $4x^3 + (x + a)(x + b) + cx \equiv ax^3 - 3x^3 + x^2 - x - 42$



Work out the values of a , b and c .

$$4x^3 + x^2 + bx + ax + ab + cx$$

$$4x^3 + x^2 + (a + b + c)x + ab \equiv$$

$$(a - 3)x^3 + x^2 - x - 42$$

$$4 = a - 3$$

$$a + b + c = -1$$

$$ab = -42$$

$$a = 7$$

$$7 - 6 + c = -1$$

$$a = \downarrow \dots\dots\dots$$

$$7b = -42$$

$$b = \dots\dots\dots$$

$$1 + c = -1$$

$$b = -6$$

$$c = -2$$

$$c = \dots\dots\dots$$

(5)

$$\Rightarrow 4x^3 + x^2 + (a+b+c)x + ab \equiv -x - 42$$



$$0x^3 + 0x^2 - x - 42$$

$$\Rightarrow \text{Prove that } (3n-5)^2 - 2(4n-5)(n-3) = (n+5)(n-1)$$

$$9n^2 - 30n + 25 - 2(4n^2 - 17n + 15)$$

$$9n^2 - 30n + 25 - 8n^2 + 34n - 30$$

$$n^2 + 4n - 5$$

$$(n-1)(n+5)$$

$$\begin{array}{cc} & (ac) \\ & -5 \\ -1 & \times & 5 \\ & +4 \\ & (b) \end{array}$$

- * Any even #: $2n$
- * Any odd #: $2n+1$
- * Any 2 even #'s: $2n, 2m$
- * Two consecutive even #'s: $2n, 2n+2$
- * Any 2 odd #'s: $2n+1, 2m+1$
- * Two consecutive odd #'s: $2n+1, 2n+3$
- * Prove multiple of 4: $4(\quad)$



n is a positive integer.

Prove algebraically that $(2n + 5)^2 - (2n + 1)^2$ is always a multiple of 8

$8(\quad)$

$$4n^2 + 20n + 25 - (4n^2 + 4n + 1)$$

$$\cancel{4n^2} + 20n + 25 - \cancel{4n^2} - 4n - 1$$

$$16n + 24$$

$$\rightarrow 8(2n + 3) \rightarrow \text{Multiple of 8}$$

$$\rightarrow 2(8n + 12) \rightarrow \text{Multiple of 2 / Even}$$



Prove algebraically that the sum of five consecutive positive integers is always a multiple of 5.

$5(\quad)$

$$n, n+1, n+2, n+3, n+4$$



Any positive
integer

$$n + n+1 + n+2 + n+3 + n+4$$

$$5n + 10$$

$$5(n+2)$$



n is a positive integer.

Prove that $(4n - 3)^2 - 3(5n - 3)(n - 1)$ is always a square number.

$(\quad)^2$



n is a positive integer.

Prove that $(3n + 1)(9n^2 - 3n + 1)$ is always 1 more than a cube number.

$(\quad)^3 + 1$

$$27n^3 - \cancel{9n^2} + \cancel{3n} + \cancel{9n^2} - \cancel{3n} + 1$$

$$27n^3 + 1$$

$$3^3 n^3 + 1$$

$$(3n)^3 + 1$$



n is an integer.

Prove that $2n - n^2 - 2$ is always negative.



Prove algebraically that the difference between the squares of two consecutive even numbers is always a multiple of 4

$$4(\quad)$$

$$2n, 2n+2$$

$$(2n+2)^2 - (2n)^2$$

$$\cancel{4n^2} + 4n + 4 - \cancel{4n^2}$$

$$4n + 4$$

$$4(n+1)$$



Prove algebraically that the difference between the squares of consecutive integers is equal to the sum of the two integers.

$$n, n+1$$

$$(n+1)^2 - n^2$$

$$\cancel{n^2} + 2n + 1 - \cancel{n^2}$$

$$n + n + 1$$

$$2n + 1$$

$$2n + 1$$