EXPAND AND SIMPLIFY BRACKETS

Key Concepts

Expanding brackets
Single: Where each term inside the bracket is multiplied by the term on the outside of the bracket.
Double: Where each term in the first bracket is multiplied by all terms in the second bracket.

Factorising expressions
Putting an expression back into brackets. To "factorise fully" means take out the HCF.

Difference of two squares
When two brackets are repeated with the exception of a sign change. All numbers in the original expression will be square numbers.

Examples

Linear expressions

Expand and simplify where appropriate

1) $7(3 + a) = 21 + 7a$

2) $2(5 + a) + 3(2 + a) = 10 + 2a + 6 + 3a$
$= 5a + 16$

3) Factorise $9x + 18 = 9(x + 2)$

4) Factorise $6e^2 - 3e = 3e(2e - 1)$

Quadratic expressions

Expand and simplify:

1) $(p + 2)(2p - 1)$
$= 2p^2 + 4p - p - 2$
$= 2p^2 + 3p - 2$

2) $(p + 2)^2$
$(p + 2)(p + 2)$
$= p^2 + 2p + 2p + 4$
$= p^2 + 4p + 4$

Factorise:

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

Factorise and solve:

4) $x^2 + 4x - 5 = 0$
$(x - 1)(x + 5) = 0$
Therefore the solutions are:
Either $x - 1 = 0$
$x = 1$
Or $x + 5 = 0$
$x = -5$

sparx

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Key Words

Expand
Factorise
Simplify
Product
Solve

1) Expand and simplify (a) $3(2 - 7f)$ (b) $5(m - 2) + 6$ (c) $3(4 + t) + 2(5 + t)$

2) Factorise (a) $6m + 12t$ (b) $9t - 3p$ (c) $4d^2 - 2d$

3) Expand $(5g - 4)(2g + 1)$

4) (a) **Factorise** $x^2 - 8x + 15$ **(b) Factorise and solve** $x^2 + 7x + 10 = 0$

ANSWERS: 1) (a) $6 - 21f$ (b) $5m - 4$ (c) $22 + 5t$ 2) (a) $6(m + 2t)$ (b) $3(3t - p)$ (c) $2d(2d - 1)$
3) $10g^2 - 3g - 4$ 4) (a) $(x - 3)(x - 5)$ (b) $x = -2$ or $x = -5$

REARRANGING EQUATIONS

Key Concepts

Rearranging an equation: Working with inverse operations to isolate a highlighted variable.

When rearranging we **undo the operations** starting from the last one.

Examples

Rearrange to make r the subject of the formulae :

$$Q = \frac{2r-7}{3}$$

×3   × 3

$$3Q = 2r - 7$$

+7   +7

$$3Q + 7 = 2r$$

÷ 2   ÷ 2

$$\frac{3Q+7}{2} = r$$

Rearrange to make c the subject of the formulae :

$$2(3a - c) = 5c + 1$$

expand

$$6a - 2c = 5c + 1$$

$+2c$ $+2c$

$$6a = 7c + 1$$

-1   -1

$$6a - 1 = 7c$$

÷ 7   ÷ 7

$$\frac{6a-1}{7} = c$$

Rearrange to make a the subject of the formulae :

$$\sqrt{\frac{ac}{b}} = d$$

square   square

$$\frac{ac}{b} = d^2$$

$\times\, b$ $\times\, b$

$$ac = bd^2$$

$\div\, c$ $\div\, c$

$$a = \frac{bd^2}{c}$$

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Key Words

Rearrange

Term

Inverse

1) Rearrange to make a the subject $r = \frac{5a+3}{t}$

2) Rearrange to make m the subject $2(2p + m) = 3 - 5m$

3) Rearrange to make x the subject $\sqrt{\frac{4x}{y}} = z$

ANSWERS: 1) $a = \frac{rt-3}{5}$ 2) $m = \frac{3-4p}{7}$ 3) $x = \frac{yz^2}{4}$

ADVANCED REARRANGING EQUATIONS

Key Concepts

Rearranging an equation:
Working with inverse operations to isolate a highlighted variable.

In rearranging we **undo the operations** starting from the last one.

Examples

Rearrange to make m the subject of the formulae :

$$m(r + p) = r(h - m)$$

expand expand

$$mr + mp = rh - mr$$

$+mr$ $+mr$

$$2mr + mp = rh$$

factorise factorise

$$m(2r + p) = rh$$

$\div (2r + p)$ $\div (2r + p)$

$$m = \frac{rh}{2r + p}$$

Rearrange to make v the subject of the formulae :

$$\frac{1}{f} + \frac{1}{u} = \frac{1}{v}$$

$\times v$ $\times v$

$$\frac{v}{f} + \frac{v}{u} = 1$$

$\times f$ $\times f$

$$v + \frac{fv}{u} = f$$

$\times u$ $\times u$

$$uv + fv = fu$$

factorise factorise

$$v(u + f) = fu$$

$\div (u + f)$ $\div (u + f)$

$$v = \frac{fu}{u + f}$$

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Key Words

Rearrange

Term

Inverse

Operation

1) Rearrange to make m the subject $m(c + d) = m + f$

2) Rearrange to make x the subject $\frac{1}{x} = \frac{1}{y} - \frac{1}{z}$

ANSWERS: 1) $m = \frac{f}{c+d-1}$ 2) $x = \frac{yz}{z-y}$