

Year 8 Knowledge Organiser

SIMPLIFYING & MANIPULATING ALGEBRA

Key Concept

Formula

$$V = u + at$$

Expression

$$f^2 + f^2 + f^2$$

Equation

$$34 = 12 + 6t$$

Identity

$$c \times c = c^2$$

Key Words

Formula: A rule written using symbols that describe a relationship between different quantities.

Expression: Shows a mathematical relationship whereby there is no solution.

Equation: A mathematical statement that shows that two expressions are equal.

Identity: A relation which is true. No matter what values are chosen.

Tip

When expanding brackets be careful with negatives.

Examples

Simplify:

$$4a + 3b - a + 2b = 3a + 5b$$

Expand and simplify:

$$9a - 2(3a - 4) = 9a - 6a + 8 = 3a + 8$$

Factorise:

$$9x^2 + 6x$$

Factorising is the opposite of expanding brackets

3x is common to both terms

$$3x(3x + 2)$$

Expand and simplify:

$$2(4a + 2b) - 2(a + 3b)$$

$$8a + 4b - 2a - 6b = 6a - 2b$$

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Clip Numbers

154-169, 548-550

Questions

- 1) $5x + 3y - 2x + 4y$ 2) $2p - 6q + 2q + 4p$ 3) $12b - 3(2b + 5)$
 4) Factorise a) $4x + 10$ b) $8a^2 - 10a$

ANSWERS: 1) $3x + 7y$ 2) $6p - 4q$ 3) $6b - 15$
 4) a) $2(2x + 5)$ b) $2a(4a - 5)$

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SOLVING EQUATIONS

Key Concept

Inverse Operations

Operation	Inverse
+	−
−	+
×	÷
÷	×
x^2	\sqrt{x}

Key Words

Unknown: A letter which represents a number we do not know the value of.

Terms: The numbers and letters in the expression or equation.

Inverse: The operation which will do the opposite.

Examples

$x + 9 = 16$ $-9 \quad -9$ $x = 7$	$x - 12 = 20$ $+12 \quad +12$ $x = 32$	$\frac{x}{3} = 5$ $\times 3 \quad \times 3$ $x = 15$	$2x + 5 = 14$ $-5 \quad -5$ $2x = 9$ $\div 2 \quad \div 2$ $x = 4.5$
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$\frac{x}{4} - 2 = 4$ $+2 \quad +2$ $\frac{x}{4} = 6$ $\times 4 \quad \times 4$ $x = 24$	$2(3x + 5) = -14$ expand $6x + 10 = -14$ $-10 \quad -10$ $6x = -24$ $\div 6 \quad \div 6$ $x = -4$	$2x + 7 = 5x + 1$ $-2x$ (smallest x term) $+7 = 3x + 1$ $-1 \quad -1$ $6 = 3x$ $\div 3 \quad \div 3$ $2 = x$
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Clip Numbers
177 – 184

Tip

Answers can be:

- Integers
- Decimals
- Fractions
- negatives

Questions

- $x + 8 = 19$
- $y - 25 = 15$
- $2y = 82$
- $\frac{t}{4} = 7$
- $\frac{p}{2} - 6 = 2$
- $3(2x - 3) = 15$
- $4x - 8 = 2x + 1$

ANSWERS: 1) $x = 11$, 2) $y = 40$, 3) $y = 41$, 4) $t = 28$, 5) $p = 16$, 6) $x = 4$, 7) $x = 4.5$

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EXPRESSIONS/EQUATIONS/IDENTITIES AND SUBSTITUTION

Key Concepts

A **formula** involves two or more letters, where one letter equals an **expression** of other letters.

An **expression** is a sentence in algebra that does NOT have an equals sign.

An **identity** is where one side is the equivalent to the other side.

When **substituting** a number into an expression, replace the letter with the given value.

Examples

- 1) $5(y + 6) \equiv 6y + 30$ is an identity as when the brackets are expanded we get the answer on the right hand side
- 2) $5m - 7$ is an **expression** since there is no equals sign
- 3) $3x - 6 = 12$ is an **equation** as it can be solved to give a solution
- 4) $C = \frac{5(F - 32)}{9}$ is a **formula** (involves more than one letter and includes an equal sign)
- 5) Find the value of $3x + 2$ when $x = 5$
 $(3 \times 5) + 2 = 17$
- 6) Where $A = b^2 + c$, find A when $b = 2$ and $c = 3$
 $A = 2^2 + 3$
 $A = 4 + 3$
 $A = 7$

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153, 189

Key Words

Substitute
Equation
Formula
Identity
Expression

Questions

- 1) Identify the equation, expression, identity, formula from the list (a) $v = u + at$ (b) $u^2 - 2as$
(c) $4x(x - 2) = x^2 - 8x$ (d) $5b - 2 = 13$
- 2) Find the value of $5x - 7$ when $x = 3$
- 3) Where $A = d^2 + e$, find A when $d = 5$ and $e = 2$

(d) equation

(c) identity

(b) expression

ANSWERS: 1) (a) formula
3) $A = 27$
8 (2)