

# Year 7 Maths – Autumn 2023

## Equality and Equivalence



### Keywords

- Equality:** two expressions that have the same value
- Equation:** a mathematical statement that two things are equal
- Equals:** represented by '=' symbol – means the same
- Solution:** the set or value that satisfies the equation
- Solve:** to find the solution.
- Inverse:** the operation that undoes what was done by the previous operation. (The opposite operation)
- Term:** a single number or variable
- Like:** variables that are the same are 'like'
- Coefficient:** a multiplicative factor in front of a variable e.g.  $5x$  (5 is the coefficient,  $x$  is the variable)
- Expression:** a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)

### Equality

$$2 + 14 = 5 + 5 + 6$$

16

16

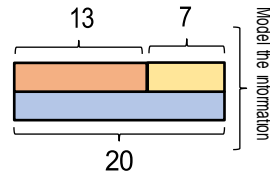
"Is equal to"

Saying it out loud sometimes helps you to understand equality

The sum on the left has the same result as the sum on the right

### fact families

Use a bar model to display the relationships between terms and numbers.

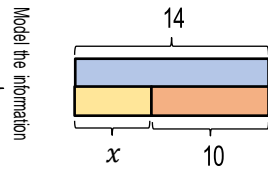


$$13 + 7 = 20$$

$$7 + 13 = 20$$

$$20 - 7 = 13$$

$$20 - 13 = 7$$

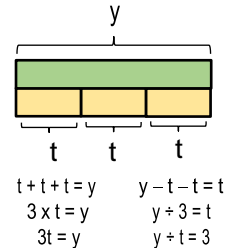


$$x + 10 = 14$$

$$10 + x = 14$$

$$14 - 10 = x$$

$$14 - x = 10$$



$$t + t + t = y$$

$$3t = y$$

$$3t = y$$

$$y - t - t = t$$

$$y + 3 = t$$

$$y + t = 3$$

### Solve one step equations (+/-)

There is more to this than just spotting the answer

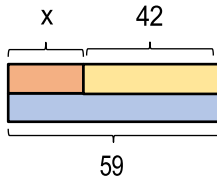
$$x + 42 = 59$$

$$x + 42 = 59$$

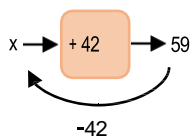
$$42 + x = 59$$

$$59 - x = 42$$

$$59 - 42 = x$$



Don't forget you know how to use function machines



### Solve one step equations (x/÷)

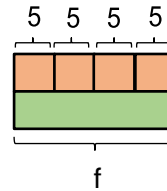
$$\frac{f}{4} = 5$$

$$f \div 4 = 5$$

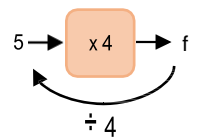
$$f \div 5 = 4$$

$$5 \times 4 = f$$

$$4 \times 5 = f$$



Don't forget you know how to use function machines



### Like and unlike terms

Like terms are those whose variables are the same

♥ and 3♥ are like terms  
the variable is the same

★ and 3♥ are unlike terms  
the variables are NOT the same

### Examples and non-examples

#### Like terms

$y, 7y$   
 $2x^2, x^2$   
 $ab, 10ba$   
 $5, -2$

#### Un-like terms

$y, 7x$   
 $2x^2, 2c^2$   
 $ab, 10a$   
 $5, -2t$

Note here  $ab$  and  $ba$  are commutative operations, so are still like terms

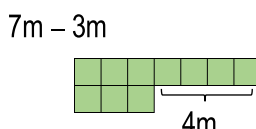
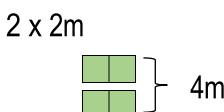
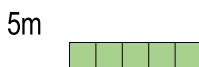
### Equivalence

Check equivalence by substitution  
e.g.  $m=10$

$5m$	$2 \times 2m$	$7m - 3m$
$5 \times 10$	$2 \times (2 \times 10)$	$(7 \times 10) - (3 \times 10)$
$= 50$	$= 2 \times 20$	$= 70 - 30$
	$= 40$	$= 40$

Equivalent expressions

Repeat this with various values for  $m$  to check



### Collecting like terms $\equiv$ symbol

The  $\equiv$  symbol means equivalent to.

It is used to identify equivalent expressions

#### Collecting like terms

Only like terms can be combined

$$4x + 5b - 2x + 10b$$

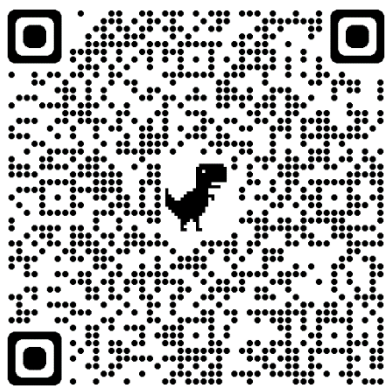
$$(4x) + (5b) - (2x) + (10b)$$

$$2x + 15b$$

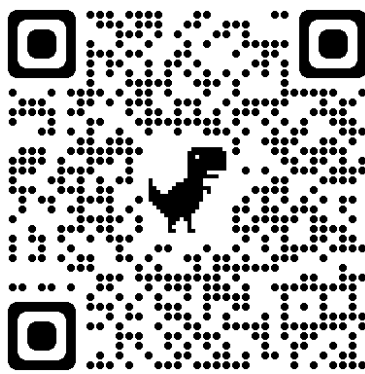
#### Common misconceptions

$$2x + 3x^2 + 4x \equiv 6x + 3x^2$$

Although they both have the  $x$  variable  $x^2$  and  $x$  terms are unlike terms so can not be collected



Fact Families



Collecting like terms

## Questions

### One step equations

(a)  $w + 5 = 7$       (b)  $c + 2 = 10$       (c)  $a - 1 = 6$       (d)  $x - 4 = 5$

(e)  $x + 4 = 13$       (f)  $3w = 12$       (g)  $2x = 18$       (h)  $\frac{w}{2} = 6$

(i)  $\frac{x}{4} = 7$       (j)  $5y = 30$       (k)  $x + 10 = 40$       (l)  $2x = 34$

(m)  $x - 9 = 7$       (n)  $\frac{m}{6} = 8$       (o)  $w - 15 = 35$       (p)  $\frac{x}{10} = 5$

(q)  $11y = 55$       (r)  $2x = 11$       (s)  $b + 6 = 4$       (t)  $\frac{x}{3} = 1.5$

(u)  $4y = 10$       (v)  $10g = 37$       (w)  $a - 7 = -3$       (x)  $v + 2 = -6$

(y)  $\frac{w}{4} = 2.7$       (z)  $5y = 24$

## Answers

