

YEAR 7

KNOWLEDGE

ORGANISERS



SUMMER TERM 1

REASONING WITH

NUMBER

Unit 12: Number Sense

Unit 13: Prime Numbers

APPLICATIONS OF NUMBER...

Unit 12: Directed Numbers

What do I need to be able to do?

By the end of this unit you should be able to:

- Perform calculations that cross zero
- Add/ Subtract directed numbers
- Multiply/ Divide directed numbers
- Evaluate algebraic expressions
- Use order of operations with directed number

Keywords

Negative: a value less than zero.

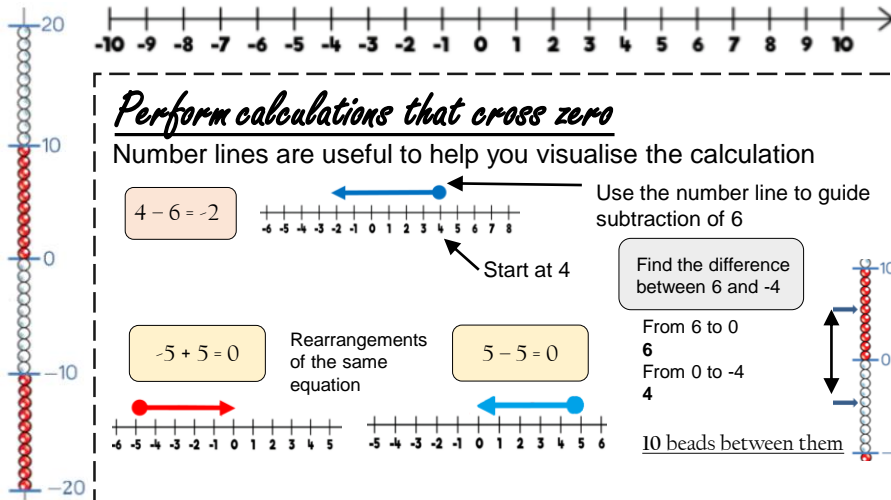
Commutative: changing the order of the operations does not change the result

Product: multiply terms

Inverse: the opposite function

Square root: a square root of a number is a number when multiplied by itself gives the value (symbol $\sqrt{\quad}$)

Square: a term multiplied by itself.



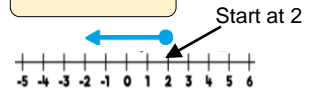
Add directed numbers

Generalisation

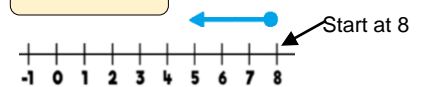
$$+ - = -$$

Adding a negative is the same as subtracting

$$2 + -4 = -2$$



$$8 + -3 = 5$$



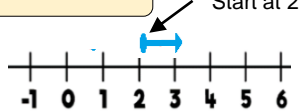
Subtract directed numbers

Generalisation

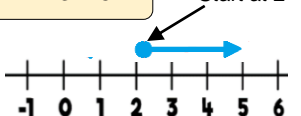
$$- - = +$$

Subtracting a negative is the same as adding

$$2 - -1 = 3$$



$$2 - -3 = 5$$



Multiply/ Divide directed numbers

$$-3 \times -3 = 9$$

$$2 \times -3 = -6$$

Multiply the numbers and then decide on the sign of the answers

$$-2 \times -3 = 6$$

Generalisation

$$+ \times + = +$$

$$+ \div + = +$$

$$+ \times - = -$$

$$+ \div - = -$$

$$- \times + = -$$

$$- \div + = -$$

$$- \times - = +$$

$$- \div - = +$$

Divisions are the inverse operations

Evaluate algebraic expressions



$$a = 5$$

$$a^2 = 5^2$$

$$a^2 = 25$$

$$b = -4$$

$$b^2 = (-4)^2$$

$$b^2 = 16$$

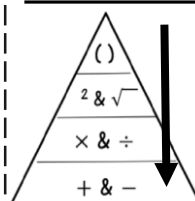
With negative numbers the brackets are important so that it performs -4×-4 .

Brackets around negative substitutions helps remove calculation errors

$$2a - b = 2 \times 5 - (-4) = 10 + 4 = 14$$

$$3b - 2a = 3(-4) - 2(5) = -12 - 10 = -22$$

Use order of operations



Brackets

Indices

Multiplication or division

Addition or subtraction

Brackets around negative substitutions helps remove calculation errors

Remember square roots have a positive and negative value

x	-3	-2	-1	0	1	2	3
-3	9	6	3	0	-3	-6	-9
-2	6	4	2	0	-2	-4	-6
-1	3	2	1	0	-1	-2	-3
0	0	0	0	0	0	0	0
1	-3	-2	-1	0	1	2	3
2	-6	-4	-2	0	2	4	6
3	-9	-6	-3	0	3	6	9

REASONING WITH NUMBER...

Unit 13: Prime numbers

What do I need to be able to do?

By the end of this unit you should be able to:

- Find and use multiples
- Identify factors of numbers and expressions
- Recognise and identify prime numbers
- Recognise square and triangular numbers
- Find common factors including HCF
- Find common multiples including LCM

Keywords

Multiples: found by multiplying any number by positive integers – its times table.

Factor: integers that multiply together to get another number.

Prime: an integer with only 2 factors.

Expression: a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)

HCF: highest common factor (biggest factor two or more numbers share)

LCM: lowest common multiple (the first time the times table of two or more numbers match)

Multiples The "times table" of a given number

All the numbers in this lists below are multiples of 3.

3, 6, 9, 12, 15...

3x, 6x, 9x ...

This list continues and doesn't end

Non example of a multiple

4.5 is not a multiple of 3 because it is 3×1.5

Not an integer

x could take any value and as the variable is a multiple of 3 the answer will also be a multiple of 3

Factors

Arrays can help represent factors

5 x 2 or 2 x 5

Factors of 10: 1, 2, 5, 10

10 x 1 or 1 x 10

Factors and expressions

The number itself is always a factor

Factors of 6x: 6, x, 1, 6x, 2x, 3, 3x, 2

6x x 1 OR 6 x x

2x x 3

3x x 2

Prime numbers

- Integer
- Only has 2 factors
- 1 and itself

2

The first prime number

The only even prime number

Learn or how-to quick recall...

2, 3, 5, 7, 11, 13, 17, 19, 23...

Square and triangular numbers

Square numbers

Representations are useful to understand a square number n^2

1, 4, 9, 16, 25, 36, 49, 64 ...

odd even odd

Triangular numbers

Representations are useful – an extra counter is added to each new row

1, 3, 6, 10, 15, 21, 28, 36, 45...

Add two consecutive triangular numbers and get a square number

Common factors and HCF

1 is a common factor of all numbers

Common factors are factors two or more numbers share

HCF – Highest common factor

Common factors (factors of both numbers)

1, 2, 3, 6

HCF = 6

6 is the biggest factor they share

HCF of 18 and 30

18: 1, 2, 3, 6, 9, 18

30: 1, 2, 3, 5, 6, 10, 15, 30

Common multiples and LCM

Common multiples are multiples two or more numbers share

LCM – Lowest common multiple

The first time their multiples match

LCM of 9 and 12

9: 9, 18, 27, 36, 45, 54

12: 12, 24, 36, 48, 60

LCM = 36

Comparing fractions

Compare fractions using a LCM denominator

$\frac{3}{5}$ and $\frac{7}{10}$

$\frac{6}{10}$ and $\frac{7}{10}$

Product of prime factors

Multiplication part-whole models

30 = 2 x 15 = 2 x 3 x 5

30 = 3 x 10 = 3 x 2 x 5

30 = 5 x 6 = 5 x 2 x 3

All three prime factor trees represent the same decomposition

Multiplication is commutative

30 = 2 x 3 x 5

Multiplication of prime factors

Using prime factors for predictions

e.g. 60: 30 x 2 = 2 x 3 x 5 x 2

150: 30 x 5 = 2 x 3 x 5 x 5