Retrieval Practice

Career Focus - Where could this take you?

As an auditor, I have to make sure I understand lots of number skills and Identify patterns to make sure accounts make sense and comply with the law

Topic Link

This topic links to:

Additional Resources

To further practice and develop your knowledge see :
https://corbettmaths.com/contents/

Anagrams

Self quizzing

Challenge Activities
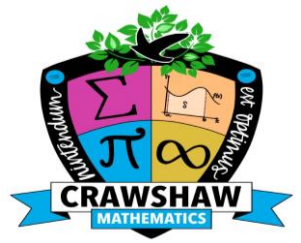
Crawshaw Academy

Knowledge Organisers

Year 7 HT1

*A framework for effective
home learning*

Mathematics Department Vision:

Mathematics provides students with powerful ways to describe, analyse, change and improve the world. The mathematics department at Crawshaw Academy aims to spark a passion in mathematics for all students, no matter what their starting point is, through the beauty of discovering patterns, making connections and looking for the 'why' behind mathematical formulae.

We want our students to:

EXCELLENCE:

•Strive to improve and progress each lesson, allowing themselves to achieve their personal best in mathematics.
•Develop the skills to understand science, technology and engineering as well as everyday tasks essential for keeping safe and healthy and maintaining their own economic well-being.

PURPOSE:

•Tackle rich and diverse problems fluently and make reasoned decisions based on their deep understanding.
•Share our passion for mathematics and have the belief that by working hard at mathematics they can succeed and that making mistakes is to be seen not as a failure but as a valuable opportunity for new learning.
•Apply reason to all that they do, determined to achieve their goals.

AMBITION:

•Strive to develop a curiosity for mathematics through our passion for the subject by having access to mathematics that is both challenging and relevant to everyday life, with an emphasis on problem solving.
•Become fully participating citizens in an ever-changing society who are able to think mathematically, reason and solve problems, and assess risks in a range of contexts.
•Access high quality teaching and learning, so they are encouraged to develop into thinking individuals who are mathematically literate and can achieve their potential.
•Have the desire and enthusiasm to aim higher, with motivation to succeed in our plans for the future.

Year 7 HALF TERM 1:

A1 - SEQUENCES

A2 - ALGEBRAIC NOTATION AND SUBSTITUTION

A3 - EXPRESSIONS AND EQUATIONS
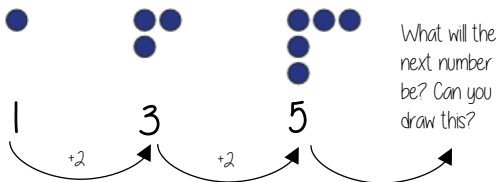
CRAWSHAW MATHEMATICS

What do I need to be able to do?

Step 1 Describe and continue sequences
Step 2 Find the next term(s)
Step 3 Linear and non-linear sequences
Step 4 Continue linear sequences
Step 5 Continue non-linear sequences
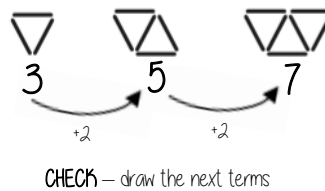Step 6 Term-to-term rules
Step 7 Find missing terms (E)

Keywords

Sequence: items or numbers put in a pre-decided order
Term: a single number or variable
Position: the place something is located
Rule: instructions that relate two variables
Linear: the difference between terms increases or decreases by the same value each time
Non-linear: the difference between terms increases or decreases in different amounts
Difference: the gap between two terms
Arithmetic: a sequence where the difference between the terms is constant
Geometric: a sequence where each term is found by multiplying the previous one by a fixed nonzero number

Describe and continue a sequence diagrammatically

Count the number of circles or lines in each image

1   3   5

+2   +2

What will the next number be? Can you draw this?

Find the next term(s)

3   5   7

+2   +2

CHECK — draw the next terms

9   11   13

Predictions:
Look at your pattern and consider how it will increase.

e.g. How many lines in pattern 6?
Prediction - 13
If it is increasing by 2 each time - in 3 more patterns there will be 6 more lines

Explain term-to-term rule How you get from term to term

Try to explain this in full sentences not just with mathematical notation.
Use key maths language — doubles, halves, multiply by two, add four to the previous term etc.

To explain a whole sequence, you need to include a term to begin at…

The next term is found by tripling the previous term. The sequence begins at 4.

4, 12, 36, 108…

x3 x3 x3

First term
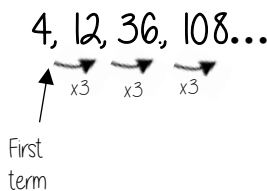
Linear and Non-Linear Sequences

Linear Sequences — increase by addition or subtraction and the same amount each time
Non-linear Sequences — do not increase by a constant amount — quadratic, geometric and Fibonacci.
- Do not plot as straight lines when modelled graphically
- The differences between terms can be found by addition, subtraction, multiplication or division.

Fibonacci Sequence — look out for this type of sequence

0 1 1 2 3 5 8 …
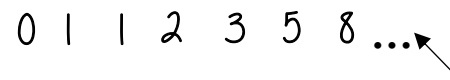
Each term is the sum of the previous two terms.

Continue Linear Sequences

7, 11, 15, 19…

How do I know this is a linear sequence?
It increases by adding 4 to each term.

How many terms do I need to make this conclusion?
At least 4 terms — two terms only shows one difference not if this difference is constant. (a common difference).

How do I continue the sequence?
You continue to repeat the same difference through the next positions in the sequence.

Continue non-linear Sequences

1, 2, 4, 8, 16 …

How do I know this is a non-linear sequence?
It increases by multiplying the previous term by 2 — this is a geometric sequence because the constant is multiply by 2

How many terms do I need to make this conclusion?
At least 4 terms — two terms only shows one difference not if this difference is constant. (a common difference).
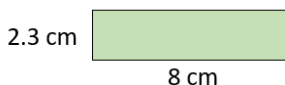
How do I continue the sequence?
You continue to repeat the same difference through the next positions in the sequence.

A1- SEQUENCES

Retrieval Practice

1) What mass is 350 g less than 1 kg?

2) How many hours are there in 3 days?

3) Divide 51 by 3

4) Work out $\frac{2}{3}$ of 21

5) Find the perimeter of the rectangle.

2.3 cm

8 cm

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:

Click on 'Independent Learning' on home page then enter code in search box

Step 1: Describe and continue sequences – M420

Step 2: Find the next term(s) – M420

Step 3: Linear and non-linear sequences – M421

Step 4: Continue linear sequences – M422

Step 5: Continue non-linear sequences – M423

Step 6: Term-to-term rules – M424

Step 7: Find missing terms (E) – M425

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Topic Links

This topic links to:
- Adding, Subtracting, Science and Multiplication.

Additional Resources

To further practice and develop your knowledge see:
https://corbettmaths.com/contents/
Number: 286-290

Self quizzing

Describe in words how these sequences change from one term to the next:
- 1 , 5 , 9 , 13 , _____ , _____
- 64 000 , 32 000 , 16 000 , _____ , _____
- 8 , 24 , 72 , _____ , _____
- 100 , 150 , 225 , _____ , _____ , _____
- 1 , 1 , 2 , 3 , 5 , 8 , _____ , _____

The first term of a sequence is 4 and the third term is 16

If the sequence is arithmetic, what are the second and fourth terms?

If the sequence is geometric, what are the second and fourth terms?

Can you find rules for other sequences that start 4 , _____ , 16?
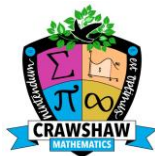
Challenge Activities

This pattern repeats every three terms as shown.

🍏⭐💗🍏⭐💗

What will be the 9th term in the pattern?

_____

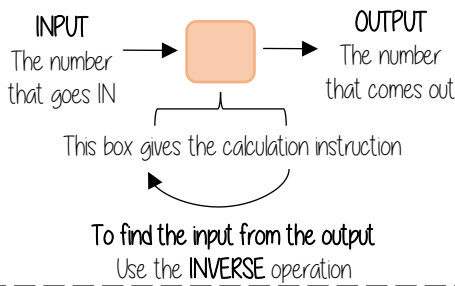What will be the 31st term in the pattern?

_____

What do I need to be able to do?

Step 1 One-step function machines (number)
Step 2 One-step function machines (algebra)
Step 3 Find a function (one step)
Step 4 Substitution (one step)
Step 5 Two-step function machines (number)
Step 6 Two-step function machines (algebra)
Step 7 Find a function (two step)
Step 8 Substitution (two step)

Keywords

Function: a relationship that instructs how to get from an input to an output.
Input: the number/ symbol put into a function
Output: the number/ expression that comes out of a function.
Operation: a mathematical process
Inverse: the operation that undoes what was done by the previous operation. (The opposite operation)
Commutative: the order of the operations do not matter.
Substitute: replace one variable with a number or new variable.
Expression: a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)
Evaluate: work out
Linear: the difference between terms increases or decreases by the same value each time
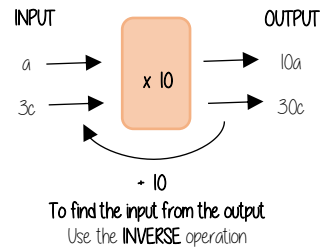**Sequence**: items or numbers put in a pre-decided order

Single function machines

INPUT — The number that goes IN

This box gives the calculation instruction

OUTPUT — The number that comes out

To find the input from the output
Use the INVERSE operation

Find functions from expressions

INPUT $7x$ → ? → OUTPUT $14x$

Find the relationship between the input and the output

Sometimes there can be a few possible functions.
e.g. $+7x$ or $\times 2$ could both be solutions to the above function machine
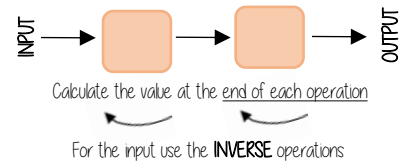
Substitution into an expression

Put the expression into a function machine

INPUT → $+3$ → $\times 2$ → OUTPUT

$2(x + 3)$

Add 3 to the input then times 2

If $x = 10$
$10 + 3 = 13...$
$13 \times 2 = 26$

If $x = 2$
$2 + 3 = 5...$
$5 \times 2 = 10$

FIND THE INPUT IF THE OUTPUT IS 22
$22 \div 2 = 11...$
$11 - 3 = 8$

Using letters to represent numbers

$5 + 5 + 5$ $y + y + y + y$ $20 - h$
3×5 $y \times 4$ $\dfrac{20}{h}$
5×3 $4 \times y$
                $4y$

Addition and multiplication can be done in any order
Commutative calculations

4 lots of 'y'

20 shared into 'h' number of groups

Substitution into expressions

$4y$ ← 4 lots of 'y'

If $y = 7$ this means the expression is asking for 4 'lots of' 7

4×7 OR $7 + 7 + 7 + 7$ OR 7×4 $= 28$

e.g: $y - 2$
$= 7 - 2 = 5$

Single function machines (algebra)

INPUT   OUTPUT
a → $\times 10$ → $10a$
$3c$ → → $30c$

$\div 10$
To find the input from the output
Use the INVERSE operation

Two step function machines

INPUT → ☐ → ☐ → OUTPUT

Calculate the value at the end of each operation

For the input use the INVERSE operations

Find functions from expressions

$\dfrac{f + 5}{3}$

f add 5 divided by 3

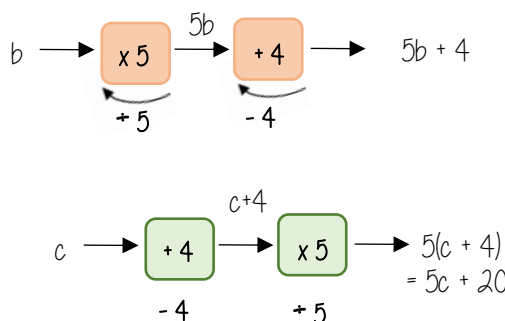f → $\times 5$ → $+3$

NOTE: the difference in the two expressions

$\dfrac{f}{3} + 5$

f divided by then add 5

f → $\div 3$ → $+5$

Sometimes it helps to try to explain the expression in word — and consider what has happened to the input

Two step function machines (algebra)

b → $\times 5$ → $5b$ → $+4$ → $5b + 4$

$\div 5$ $- 4$

IMPORTANT
Calculate the value at the end of each operation

c → $+4$ → $c+4$ → $\times 5$ → $5(c + 4)$
$= 5c + 20$

$- 4$ $\div 5$

NOTE:
The whole first output is multiplied by 5

A2 - ALGEBRAIC NOTATION AND SUBSTITUTION

Retrieval Practice

1) Find the fourth term in the sequence.

Position	1	2	3	4	5
Term	4	7	10		16

2) Calculate 25% of 80

3) Multiply 7.2 by 100

4) Add 8.4 to 7.3

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:

Click on 'Independent Learning' on home page then enter code in search box

Step 1: One-step function machines (number) – M175
Step 2: One-step function machines (algebra) – M428
Step 3: Find a function (one step) – M428
Step 4: Substitution (one step) – M417
Step 5: Two-step function machines (number) – M979
Step 6: Two-step function machines (algebra) – M979
Step 7: Find a function (two step) – M979
Step 8: Substitution (two step) – M417

Career Focus - Where could this take you?

As an auditor, I have to make sure I understand lots of number skills and Identify patterns to make sure accounts make sense and comply with the law

Topic Links

This topic links to:
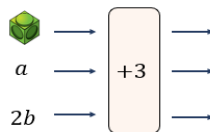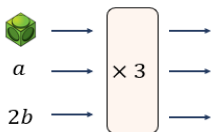- Adding, subtracting, function machines

Additional Resources

To further practice and develop your knowledge see:
- https://corbettmaths.com/contents/
  Number: 386

Self quizzing

Find the output for each of the function machines with these inputs.

$a \longrightarrow \boxed{\times 3} \longrightarrow$
$2b \longrightarrow$

$a \longrightarrow \boxed{+3} \longrightarrow$
$2b \longrightarrow$

Investigate other function machines e.g. "÷ 2"

Substitute $a = 5$ into each of these expressions.

$7a$	$\frac{7}{a}$	$19.8 - a$	a^2
$2a$	$a - 3.6$	$a + 3.6$	

Challenge Activities

Lucy shades in part of a rectangle.
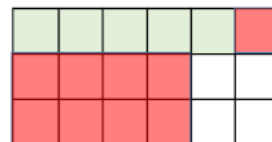
She shades some more squares.

$\frac{7}{9}$ of the rectangle is now shaded.

How many more squares did Lucy shade?

YEAR 7 — AUTUMN

A3 - EXPRESSIONS AND EQUATIONS

CRAWSHAW MATHEMATICS

Sparx Maths

Step 1: Equality and equivalence — M795
Step 2: Related facts — M796
Step 3: Like and unlike terms — M797
Step 4: Collect like terms — M798
Step 5: Solve 1-step equations (+/−) — M634
Step 6: Solve 1-step equations (×/÷) — M647
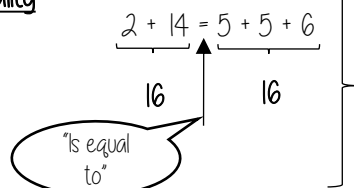Step 7: Solve 2-step equations — M656

What do I need to be able to do?

Step 1 Equality and equivalence
Step 2 Related facts
Step 3 Like and unlike terms
Step 4 Collect like terms
Step 5 Solve 1-step equations (+/-)
Step 6 Solve 1-step equations (x/÷)
Step 7 Solve 2-step equations

Equality — When two expressions have the same value
Equation — A statement that two things are equal
Equals (=) — Symbol that shows equality
Solution — The value that makes an equation true
Solve — To find the solution
Inverse — The opposite operation
Term — A number or variable
Like Terms — Terms with the same variable(s) and power(s)
Coefficient — The number in front of a variable
Expression — A group of terms without an equals sign
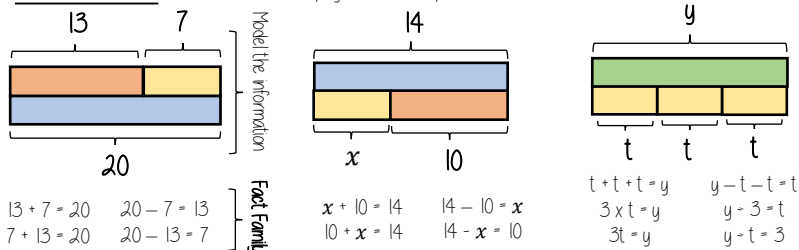Equivalent (≡) — Expressions that always have the same value

Keywords

Equality

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

16   16

"Is equal to"

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

Saying it out loud sometimes helps you to understand equality

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

Model the information

13   7

20

x 10

14

y

t   t   t

Fact Family

13 + 7 = 20   20 − 7 = 13
7 + 13 = 20   20 − 13 = 7

$x + 10 = 14$ $14 − 10 = x$
$10 + x = 14$ $14 − x = 10$

t + t + t = y   y − t − t = t
3 × t = y   y − 3 = t
3t = y   y ÷ t = 3

Solve one step equations (+/-)
There is more to this than just spotting the answer

$$x + 42 = 59$$
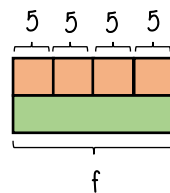
x   42

59
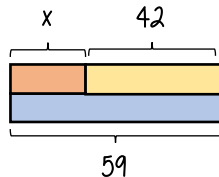
$x + 42 = 59$
$42 + x = 59$

$59 − x = 42$
$59 − 42 = x$

Don't forget you know how to use function machines

x → + 42 → 59

−42
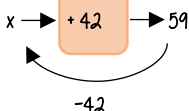
Solve one step equations (x/÷)

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

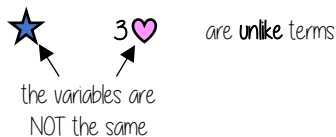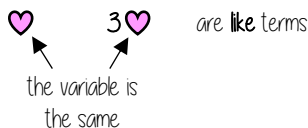5 5 5 5

f

$f ÷ 4 = 5$
$f ÷ 5 = 4$

$5 × 4 = f$
$4 × 5 = f$

Don't forget you know how to use function machines

5 → × 4 → f

÷ 4
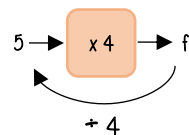
Like and unlike terms

Like terms are those whose variables are he same

♥   3♥   are like terms

the variable is the same

★   3♥   are unlike terms

the variables are NOT the same

Examples and non-examples

Like terms	Un-like terms
y, 7y	y, 7x
$2x^2$, x^2	$2x^2$, $2c^2$
ab, 10ba	ab, 10a
5, -2	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 x 2m	7m − 3m
5 x 10	2 x (2x10)	(7x10) − (3x10)
= 50	= 2 x 20	= 70 − 30
	= 40	= 40

Equivalent expressions
Repeat this with various values for m to check.

5m

2 x 2m   4m

7m − 3m   4m
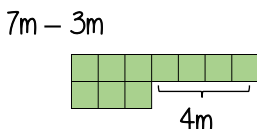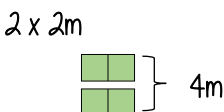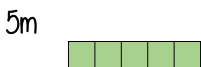
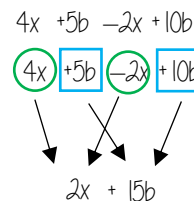## Collecting like terms ≡ symbol

The ≡ symbol means equivalent to.
It is used to identify equivalent expressions

Collecting like terms
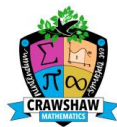Only like terms can be combined

$4x$ $+5b$ $−2x$ $+10b$

$2x$ $+ 15b$

Common misconceptions

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

Although they both have the x variable x2 and x terms are un-like terms so can not be collected

A3 - EXPRESSIONS AND EQUATIONS
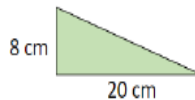
Sparx Maths

Retrieval Practice

1) A graph of the sequence $5n - 2$ is drawn.
   Will the points lie in a straight line? How do you know?

2) Find the value of $a + 2b$ when $a = 7$ and $b = 2$

3) Work out the next term in the sequence.

   5   10   20   40   ___

4) Calculate the area of the triangle.

   8 cm
   20 cm

Extension work
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Topic Links

This topic links to:
- Sequences, Algebra, bar moddeling

Additional Resources

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- https://corbettmaths.com/contents/
  Number: 9

Self quizzing

Find expressions that simplify to $8x + 10y$

Substitute $x = 7$ into each of these expressions.

$5x$	$2x$	$8x - 3x$	$x + x$
$2 + 4x$	$3x + 2x$	$6x - x$	$4x + 2$

Which expressions give you the same answers?
Why?
Repeat with a different value of x.
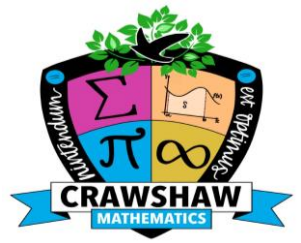What do you notice?

Challenge Activities

Circle all the fractions that are greater than 1 but less than 2

$$\frac{12}{5} \qquad \frac{12}{6} \qquad \frac{12}{7} \qquad \frac{12}{8}$$

Mathematics Department Vision:

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Year 7 HALF TERM 2:
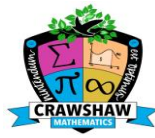
N1 – PLACE VALUE, ORDERING AND ROUNDING

N2 – FOUR OPERATIONS

S1 – AVERAGES AND RANGE

N3 – ROUNDING AND ESTIMATING

Sparx Maths

Write integers in numerals and words — M704, Intervals on a number line — M763
Compare and order integers — U600 Place value for decimals — U435
Decimals on a number line — U435 Compare and order decimals — U435
Round to powers of 10 — U480 Round to the nearest integer — U480
Round to decimal places — U298 Powers of 10 (E) — U235
Numbers greater than 1 in standard form (E) — U330
Negative powers of 10 (E) — U534 Numbers between 0 and 1 in standard form (E) — U534

What do I need to be able to do?

Step 1 Write integers in numerals and words
Step 2 Intervals on a number line
Step 3 Compare and order integers
Step 4 Place value for decimals
Step 5 Decimals on a number line
Step 6 Compare and order decimals
Step 7 Round to powers of 10
Step 8 Round to the nearest integer
Step 9 Round to decimal places
Step 10 Powers of 10 (E)
Step 11 Numbers greater than 1 in standard form
Step 12 Negative powers of 10
Step 13 Numbers between 0 - 1 in standard form

Keywords

Integer — A whole number that can be positive, negative, or zero.
Number line — A line that shows numbers in order and helps us see their positions.
Interval — The space or distance between two numbers on a number line.
Place value — The value of a digit based on where it is in a number.
Decimal — A number with a decimal point that shows parts of a whole.
Compare — To look at numbers and decide which is bigger, smaller, or equal.
Order — To arrange numbers from smallest to biggest or biggest to smallest.
Round — To change a number to one that is close and easier to work with.
Powers of 10 — Numbers like 10, 100, 1000 made by multiplying 10 by itself.
Standard form — A short way to write very big or very small numbers using powers of 10
Decimal places — The digits that come after the decimal point, showing parts of a whole.
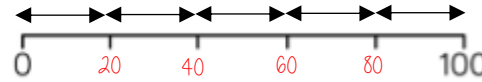**Exponent** — A small number that shows how many times to multiply a number by itself.

Integer Place Value

Billions			Millions			Thousands			Ones		
H	T	O	H	T	O	H	T	O	H	T	O
		3	1	4	8	0	3	3	0	2	9

Placeholder

Three billion, one hundred and forty eight million, thirty three thousand and twenty nine
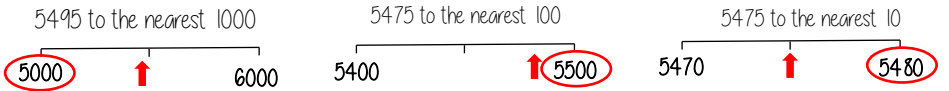1 billion 1, 000, 000, 000
1 million 1, 000, 000

Intervals on a number line

0   20   40   60   80   100

Divide the difference by the number of intervals (gaps).
E.g. 100 ÷ 5 = 20

Rounding to the nearest power of ten

If the number is halfway between we "round up"

5495 to the nearest 1000
(5000)   6000

5475 to the nearest 100
5400   (5500)

5475 to the nearest 10
5470   (5480)

Decimals

We say "nought point five two"

ones	tenths	hundredths

0 ones, 5 tenth and 2 hundredths
0 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.01 + 0.01
= 0 + 0.5 + 0.2
= 0.52
Five tenths and two hundredths

Comparing decimals

Ones	Tenths	hundredths
	0.1 0.1	
	0.1	

0.3 > 0.23
"There are more counters in the furthest column to the left"

Ones	Tenths	hundredths
	0.1	0.01 0.01
	0.1	0.01

Rounding

Decimal place

3.27 to 1 DP is 3.3
Greater than 5 so the number rounds up

0.224 to 1 DP is 0.2
less than 5 so stays the same

Compare integers using <, >, =, ≠

< less than
> greater than
= equal to
≠ not equal to

Two and a half million (=) 2 500 000
300 000 000 (=) Three billion
Six thousand and eighty (<) 68 000

Significant figure
370 to 1 significant figure is 400
37 to 1 significant figure is 40
3.7 to 1 significant figure is 4
0.37 to 1 significant figure is 0.4
0.00000037 to 1 significant figure is 0.0000004

Round to the first non zero number

Positive powers of 10

1 billion — 1 000 000 000
$10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^9$

Addition rule for indices $10^a \times 10^b = 10^{a+b}$

Subtraction rule for indices $10^a - 10^b = 10^{a-b}$

Numbers between 0 and 1

0.054
$= 5.4 \times 10^{-2}$

1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
10^0	10^{-1}	10^{-2}	10^{-3}
0	0	5	4

A negative power does not mean a negative answer — it means a number closer to 0

Standard form with numbers >1

Any number between 1 and less than 10

$A \times 10^n$

Any integer

Example
3.2×10^4
$= 3.2 \times 10 \times 10 \times 10 \times 10$
$= 32000$

Non-example
(0.8) x 10^4
5.3×10^{07}

Negative powers of 10

0.001
$1 \times \frac{1}{1000}$
1×10^{-3}

	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
	10^1	10^0	10^{-1}	10^{-2}	10^{-3}
	0	0	0	0	1

Any value to the power 0 always = 1

Negative powers do not indicate negative solutions

Order numbers in standard form

10^2	10^1	10^0	10^{-1}	10^{-2}	10^{-3}	10^{-4}

6.4×10^{-2} 2.4×10^2 3.3×10^0 1.3×10^{-1}

0.064   240   1   0.13

Look at the power first will the number be = > or < than 1

Use a place value grid to compare the numbers for ordering

Retrieval Practice

1) Find the sum of 327 and 99

2) What mass is 350 g less than 1 kg?

3) How many hours are there in 3 days?

4) Divide 51 by 3

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:

Click on 'Independent Learning' on home page then enter code in search box

Step 1: Write integers in numerals and words — M704
Step 2: Intervals on a number line — M763
Step 3: Compare and order integers — U600
Step 4: Place value for decimals — U435
Step 5: Decimals on a number line — U435
Step 6: Compare and order decimals — U435
Step 7: Round to powers of 10 — U480
Step 8: Round to the nearest integer — U480
Step 9: Round to decimal places — U298
Step 10: Powers of 10 (E) — U235
Step 11: Numbers greater than 1 in standard form (E) — U330
Step 12: Negative powers of 10 (E) — U534
Step 13: Numbers between 0 and 1 in standard form (E) — U534

Career Focus - Where could this take you?

As an auditor, I have to make sure I understand lots of number skills and Identify patterns to make sure accounts make sense and comply with the law

Topic Links

This topic links to:
• Place value, rounding, inequalities

Additional Resources

To further practice and develop your knowledge see:
• https://corbettmaths.com/contents/
  Number: 95

Self quizzing

Write down the numbers that are:

◆ Three million more than 917 000 000

◆ The sum of three hundred million and 700 000 000

Put your answers to the following in descending order.

◆ $180\,000 - 42\,781$

◆ 360×25

◆ One billion divided by forty-thousand

◆ The sixth term of the sequence 200 , 800 , 3200 ….

◆ The value of x^2 when $x = 305$

◆ Two hundred thousand more than 610 408

Challenge Activities

Ron and Eva each make a 3-digit number from these digit cards.

3   6   8

• Ron makes the largest even number possible.

• Eva makes the smallest odd number possible.

What is the difference between their numbers?

CRAWSHAW MATHEMATICS

Sparx Maths

Step 1: Add and subtract integers — M400   Step 2: Add and subtract decimals — M401   Step 3: Multiply and divide by 10, 100, and 1000 — M402 Step 4: Multiply by 0.1 and 0.01 (E) — M403   Step 5: Multiply integers — M404 Step 6: Divide integers — M405   Step 7: Multiply decimals — M406 Step 8: Divide decimals by integers — M407   Step 9: Divide by a decimal (E) — M408 Step 10: Order of operations — M409

What do I need to be able to do?

Step 1 Add and subtract integers
Step 2 Add and subtract decimals
Step 3 Multiply and divide by 10, 100, and 1000
Step 4 Multiply by 0.1 and 0.01 (E)
Step 5 Multiply integers
Step 6 Divide integers
Step 7 Multiply decimals
Step 8 Divide decimals by integers
Step 9 Divide by a decimal (E)
Step 10 Order of operations

Keywords

Integer — A whole number that can be positive, negative, or zero.
Decimal — A number with a fractional part separated by a decimal point.
Place value — The value of a digit based on its position in a number.
Addition — Combining two or more numbers to get a total (sum).
Subtraction — Finding the difference between two numbers.
Multiplication — Repeated addition; increasing a number by a factor.
Division — Splitting a number into equal parts or groups.
Scaling — Increasing or decreasing a number using multiplication or division.
Decimal point — A symbol (.) used to separate the whole number part from the fractional part of a decimal.
Order of operations — The rules that define the correct sequence to evaluate a mathematical expression (e.g, BIDMAS/BODMAS: Brackets, Indices/Orders, Division/Multiplication, Addition/Subtraction)

Addition/ Subtraction with integers
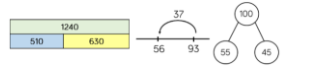
Modelling methods for addition/ subtraction
- Bar models
- Number lines
- Part/ Whole diagrams

Addition is commutative
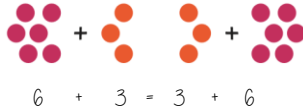
$6 + 3 = 3 + 6$

The order of addition does not change the result

Subtraction the order has to stay the same

$360 - 147 = 360 - 100 - 40 - 7$

- Number lines help for addition and subtraction
- Working in 10's first aids mental addition/ subtraction
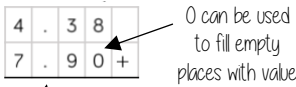- Show your relationships by writing fact families
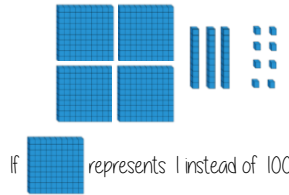
Formal written methods

Remember the place value of each column. You may need to move 10 ones to the ones column to be able to subtract
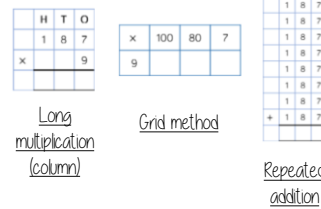
Addition/ Subtraction with decimals

0 can be used to fill empty places with value

The decimal place acts as the placeholder and aligns the other values

$5.43 + \frac{8}{10}$

If ▨ represents 1 instead of 100

Revisit Fraction = Decimal equivalence
$543 + 0.8$

Multiplication methods

Long multiplication (column)

Grid method

Repeated addition

Less effective method especially for bigger multiplication

Multiplication with decimals
Perform multiplications as integers
eg 0.2 x 0.3 ⟶ 2 x 3

Make **adjustments** to your answer to match the question: 0.2 x 10 = 2
0.3 x 10 = 3
Therefore 6 ÷ 100 = **0.6**

Estimations: Using estimations allows a 'check' if your answer is reasonable

Division methods

Short division

$3584 \div 7 = 512$

$7 | 3\ ^3 5\ 8\ ^1 4$

Complex division

$\div 24 = \div 6 \div 4$

Break up the divisor using factors

The placeholder in division methods is essential — the decimal lines up on the dividend and the quotient

Division with decimals

$24 \div 0.02 \longrightarrow 24 \div 0.2 \longrightarrow 240 \div 2$

All give the same solution as represent the same proportion.
Multiply the values in proportion until the divisor becomes an integer

Multiply/ Divide by powers of 10

$3 \times 100 = 300$
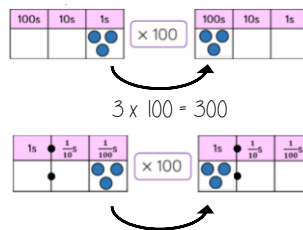
$0.03 \times 100 = 3$

Repeated multiplication and division by powers of 10 is commutative

$\div 10$ then $\div 10 \longrightarrow \div 100$

Order of operations

Brackets
Indices or roots
Multiplication or division
Addition or subtraction
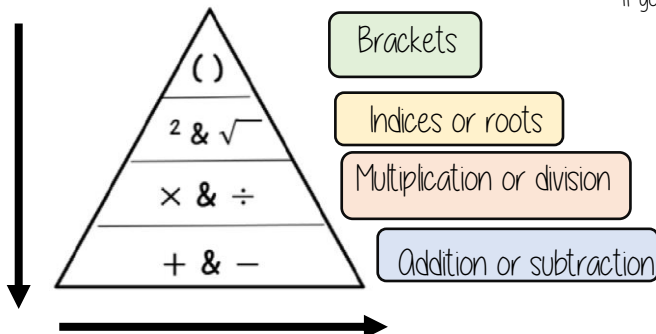
If you have multiple operations from the same tier work from left to right
e.g. $10 - 3 + 5 \longrightarrow 10 - 3 \longrightarrow 7 + 5$

$6 \times 4 + 8 \times 2$
$24 + 16 = 40$

BIDMAS/BODMAS

Retrieval Practice

1) Write 0.07 as a fraction.

2) Simplify $\frac{28}{50}$

3) What is the value of the 6 in the number 361,829?

4) Solve the equation $\frac{b}{5} = 10$

Career Focus - Where could this take you?

As an auditor, I have to make sure I understand lots of number skills and Identify patterns to make sure accounts make sense and comply with the law

Topic Links

This topic links to:
- Fraction, decimals and percentages

Additional Resources

To further practice and develop your knowledge see:
- https://corbettmaths.com/contents/
  Number: 121-128

Self quizzing

Work out the answers to these calculations.

| $407 - 126$ | $407 - 12.6$ | $407 - 1.26$ |

| $6.7 - \frac{1}{5}$ | $6.7 - \frac{3}{5}$ | $6.7 - \frac{1}{4}$ | $6.7 - \frac{3}{4}$ |

Put the results of these calculations in order, starting with the smallest.

| 82×0.1 | $802 \div 10$ | $80.2 \div 100$ |

| 8.2×10 | $82 \div 100$ | 80.2×0.01 |

Challenge Activities

Work out the value of each symbol.

$$\triangle + \star + \diamond = 100$$

$$\triangle + \diamond = 67$$

$$\star - \diamond = 18$$

Sparx Maths

Step 1: Calculate Mode — M841
Step 2: Calculate Mean — M940
Step 3: Calculate Median — M934
Step 4: Calculate Range — M328
Step 5: Solve problems with averages and range — M440

What do I need to be able to do?

Step 1 Calculate Mode
Step 2 calculate Mean
Step 3 Calculate Median
Step 4 calculate Range
Step 5 Solve problems with averages and range

Keywords

Mode – Most frequent value
Mean – Sum ÷ number of values
Median – Middle value when ordered
Range – Difference between highest and lowest
Average – General term for typical value
Data set – Group of numbers to analyse
Frequency – How often a value appears
Outlier – A value far from others
Sum – The result of addition
Value – A number in the data set

Mean, Median, Mode

The Mean
A measure of average to find the central tendency… a typical value that represents the data

24, 8, 4, 11, 8,

Find the sum of the data (add the values)   55
Divide the overall total by how many pieces of data you have   55 ÷ 5

Mean = 11

The Median
The value in the center (in the middle) of the data

24, 8, 4, 11, 8,

Put the data in order   4, 8, 8, 11, 24
Find the value in the middle   4, 8, 8, 11, 24

NOTE: If there is no single middle value find the mean of the two numbers left

Median = 8

The Mode (The modal value)
This is the number OR the item that occurs the most (it does not have to be numerical)

24, 8, 4, 11, 8,

This can still be easier if it the data is ordered first

Mode = 8

Choosing the appropriate average

The average should be a representative of the data set — so it should be compared to the set as a whole - to check if it is an appropriate average

Here are the weekly wages of a small firm

| £240 | £240 | £240 | £240 | £240 |
| £260 | £260 | £300 | £350 | £700 |

Which average best represents the weekly wage?

The Mean = £307
The Median = £250
The Mode = £240

Put the data back into context
Mean/Median — too high (most of this company earn £240)
Mode is the best average that represents this wage

It is likely that the salaries above £240 are more senior staff members — their salary doesn't represent the average weekly wage of the majority of employers

Range
Difference between the biggest and smallest

3 9 8 12

Range: Biggest value – Smallest value
12 – 3 = 9
Range = 9

~It is a measure of spread — it is not an average

Mean problems

Lilly, Annie and Ezra have the following cubes

Lilly
Annie
Ezra

24 in total

Finding the mean amount is the average amount each person would have if shared out equally

Lilly   Annie   Ezra

The mean number of blocks would be 8 each

Comparing distributions

Comparisons should include a statement of average and central tendency, as well as a statement about spread and consistency

Here are the number of runs scored last month by Lucy and James in cricket matches
Lucy: 45, 32, 37, 41, 48, 35
James: 60, 90, 41, 23, 14, 23

Lucy
Mean: 39.6 (1dp), Median: 38 Mode: no mode, Range: 16
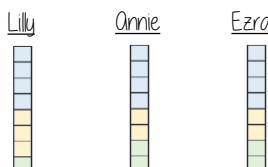James
Mean: 41.8 (1dp), Median: 32, Mode: 23, Range: 76

James has two extreme values that have a big impact on the range

"James is less consistent that Lucy because his scores have a greater range.
Lucy performed better on average because her scores have a similar mean and a higher median"

S1 - AVERAGES AND RANGE

Retrieval Practice

1) Compare the ranges of the boys' and girls' test scores.

Boys: 10, 12 , 15, 18, 20
Girls: 8, 16, 18, 18, 20

2) Would you use a bar chart or a frequency diagram to represent continuous data?

3) The table shows the time taken to complete a puzzle. How many people took less than 10 minutes?

Time (minutes)	Frequency
$0 \le t < 5$	4
$5 \le t < 10$	6
$10 \le t < 15$	12
$15 \le t < 20$	18
$20 \le t < 25$	10

4) Round 0.356 to 1 significant figure.

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:

Click on 'Independent Learning' on home page then enter code in search box

Step 1: Calculate Mode – M841
Step 2: Calculate Mean – M940
Step 3: Calculate Median – M934
Step 4: Calculate Range – M328
Step 5: Solve problems with averages and range – M440

Careers Focus – Where could this take you?

I am a scientist who works for a **government agency**. I will analyse and interpret data to gain information on a variety of different subjects and problems. I will then produce papers for ministers to read to influence policies that are made by the government.

Topic Link

This topic links to:
Find the median and the range, find the mean

Additional Resources

To further practice and develop your knowledge see Sparx clips above or https://corbettmaths.com/contents/

Self quizzing

Tommy checks the weights, in grams, of 10 packets of crisps.

| 25.7 | 25.9 | 26.1 | 25.2 | 24.8 |
| 25.6 | 51.2 | 24.3 | 25.9 | 25.8 |

🔺 Find median and mean weights of the packets of crisps both with and without the outlier value.

🔺 What effect does removing the outlier have on the mean?

🔺 What effect does removing the outlier have on the median?

Challenge Activities

Dora and Jack do a spelling test every week.
The table summarises their performances over a term.

	Dora	Jack
Mean	7.5	7.4
Range	6	2

I'm better than Jack at spelling, as both my mean and range are higher.

Do you agree with Dora?
Why or why not?

CRAWSHAW MATHEMATICS

Sparx Maths

Step 1: Round to 1 significant figure — M915
Step 2: Round to 2 or more significant figures — M916
Step 3: Estimate answers to calculations — M917
Step 4: Solve problems with estimation — M918
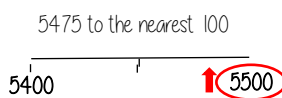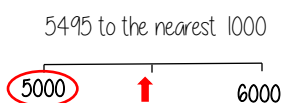Step 5: Understand and use error interval notation (E) — M919

What do I need to be able to do?

Step 1 Round to 1 significant figure
Step 2 Round to 2 or more significant figures
Step 3 Estimate answers to calculations
Step 4 Solve problems with estimation
Step 5 Understand and use error interval notation (E)

Keywords

Significant figure — The digits in a number that carry meaning contributing to its precision (starting from the first non-zero digit).
Rounding — Reducing the digits in a number while keeping its value close to the original.
Approximation — A value or quantity that is nearly but not exactly correct.
Estimate — A rough calculation of the value, number, or quantity.
Error interval — A range within which a number lies after rounding.
Upper bound — The highest possible value in an error interval.
Lower bound — The lowest possible value in an error interval.
Accuracy — How close a measured or calculated value is to the true value.

Round to powers of 10 and 1 sig. figure

If the number is halfway between we "**round up**"

5495 to the nearest 1000

5000 ⬆ 6000

5475 to the nearest 100

5400 ⬆ **5500**

5475 to the nearest 10

5470 ⬆ **5480**

Round to the first non-zero number

Round to decimal places

2.46192 ← Focus on the numbers **after** the decimal point

"To 1dp" – to one number after the decimal
"To 2dp" – to two numbers after the decimal

2.46192 (to 1dp) - Is this closer to 2.4 or 2.5

2.4 ⬆ **2.5**
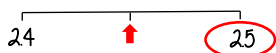
$2.4 | 6192$ — This shows the number is closer to 2.5

2.46192 (to 12dp) - Is this closer to 2.46 or 2.47

2.46 ⬆ 2.47

$2.46 | 192$ — This shows the number is closer to 2.46
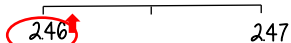
Estimate the calculation

Round to 1 significant figure to estimate

$4.2 + 6.7 \approx 4. + 7 \approx 11$ — This is an **overestimate** because the 6.7 was rounded up more

The equal sign changes to show it is an estimation

$21.4 \times 3.1 \approx 20 \times 3 \approx 60$ — This is an **underestimate** because both values were rounded down

It is good to check all calculations with an estimate in all aspects of maths — it helps you identify calculation errors.

Limits of accuracy

A width **w** has been <u>rounded</u> to 6.4cm correct to 1dp.

6.3 6.31 6.32 6.33 6.34 6.35 6.36 6.37 6.38 6.39 6.4 6.41 6.42 6.43 6.44 6.45 6.46 6.47 6.48 6.49 6.5

< 6.35 the values would round to 6.3
Error interval
≥ 6.45 the values would round to 6.5

The error interval $6.35 \leq w < 6.45$

Any value within these limits would round to 6.4 to 1dp

A width **w** has been <u>truncated</u> to 6.4cm correct to 1dp.

6.3 6.31 6.32 6.33 6.34 6.35 6.36 6.37 6.38 6.39 6.4 6.41 6.42 6.43 6.44 6.45 6.46 6.47 6.48 6.49 6.5

< 6.4 the values would truncate to 6.3
Error interval
≥ 6.5 the values would truncate to 6.5

$6.4 \leq w < 6.5$

Any value within these limits would **truncate** to 6.4 to 1dp

Solve problems with estimation

Estimating a Sum

Question: Estimate the total cost of items costing £9.85, £3.20, and £7.60.

Round £9.85 → £10
Round £3.20 → £3
Round £7.60 → £8
Estimated total = 10 + 3 + 8 = **£21**

Estimating Per Person Cost

Question: A group meal costs £187.65, shared between 9 people. Estimate the cost per person.

Solution:
Round £187.65 → £200
Round 9 → 10   (9 is close to 10, so it's a good enough estimate, although it should be 1sf)

200÷10=**£20**

Sparx Maths

Retrieval Practice

1) List the factors of 12

2) Dora has £365 in the bank
   She pays a £94 bill. What is her new bank balance?

3) What number is 0.2 less than $\frac{1}{2}$?

4) Round 7645 to one significant figure.

Vocabulary check: Difference

Career Focus - Where could this take you?

As an auditor, I have to make sure I understand lots of number skills and Identify patterns to make sure accounts make sense and comply with the law

Topic Links

This topic links to:
- Place value, rounding, inequalities

Additional Resources

To further practice and develop your knowledge see:
- https://corbettmaths.com/contents/
  Number: 95

Self quizzing

Round these numbers to one significant figure:

- 37
- Thirty-seven million
- 0.37
- 0.000037
- 4.37
- 4.0037
- Four million and thirty seven

Challenge Activities

To one significant figure, the population of Scotland is given as five million.

What is the greatest possible population of Scotland?

What is the least possible population?

A googol is the number formed by writing 1 followed by one hundred zeros.

Write a googol as a power of ten

How many times bigger than a billion is a googol?

Mathematics Department Vision:

Mathematics provides students with powerful ways to describe, analyse, change and improve the world. The mathematics department at Crawshaw Academy aims to spark a passion in mathematics for all students, no matter what their starting point is, through the beauty of discovering patterns, making connections and looking for the 'why' behind mathematical formulae.

We want our students to:

EXCELLENCE:

•Strive to improve and progress each lesson, allowing themselves to achieve their personal best in mathematics.
•Develop the skills to understand science, technology and engineering as well as everyday tasks essential for keeping safe and healthy and maintaining their own economic well-being.

PURPOSE:

•Tackle rich and diverse problems fluently and make reasoned decisions based on their deep understanding.
•Share our passion for mathematics and have the belief that by working hard at mathematics they can succeed and that making mistakes is to be seen not as a failure but as a valuable opportunity for new learning.
•Apply reason to all that they do, determined to achieve their goals.

AMBITION:

•Strive to develop a curiosity for mathematics through our passion for the subject by having access to mathematics that is both challenging and relevant to everyday life, with an emphasis on problem solving.
•Become fully participating citizens in an ever-changing society who are able to think mathematically, reason and solve problems, and assess risks in a range of contexts.
•Access high quality teaching and learning, so they are encouraged to develop into thinking individuals who are mathematically literate and can achieve their potential.
•Have the desire and enthusiasm to aim higher, with motivation to succeed in our plans for the future.

Year 7 HALF TERM 3:

S2 - GRAPHING DATA

N4 - FRACTIONS, DECIMALS AND PERCENTAGES

What do I need to be able to do?

Step 1 Pictograms
Step 2 Bar charts
Step 3 Dual bar charts
Step 4 Composite bar charts
Step 5 Coordinates in the first quadrant
Step 6 Scatter graphs
Step 7 Correlation
Step 8 Lines of best fit
Step 9 Time-series graphs
Step 10 Non-linear relationships

Keywords

Hypothesis: an idea or question you want to test
Sampling: the group of things you want to use to check your hypothesis
Primary Data: data you collect yourself
Secondary Data: data you source from elsewhere e.g. the internet/ newspapers/ local statistics
Discrete Data: numerical data that can only take set values
Continuous Data: numerical data that has an infinite number of values (often seen with height, distance, time)
Composite Bar Chart — A bar chart where each bar is split into parts to show sub-categories within a total
Coordinate — A pair of numbers (x, y) that shows a position on a graph.
Scatter Graph — A graph that shows individual points plotted using coordinates, often to observe trends or patterns.
Correlation — A measure of how strongly two variables are related; can be positive, negative, or none.

Set up a statistical enquiry

Write a suitable hypothesis → Design a data collection sheet → Pros/ Cons of sampling → Pros/ Cons primary or secondary data → Discrete or continuous data?
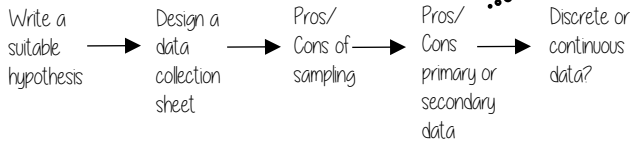
Features of a data collection sheet

Grouped or ungrouped categories

Data Title	Tally	Frequency
	IIII I	

Total number of that group observed

Design and criticise a questionnaire

The Question - be clear with the question - don't be too leading/ judgemental

e.g. How much pocket money do you get a week?

Responses — do you want closed or open responses? — do any options overlap? — Have you an option for all responses?

Zero option → ☐ £0   ☐ £0.01 - £2   ☐ £2.01 - £4   ☐ more than £4 ← More option

NOTE: For responses about continuous data include inequalities $< x \leq$

Pictograms, bar and line charts

Represents quantitative data

Pictogram

Language	
French	⊙⊙⊙⊙
Spanish	⊙⊙⊙
German	⊙

⊙ = 4 people

- Need to remember a key
- Visually able to identify mode

Bar Chart

How Y8 travel to school
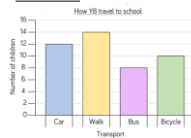
- Gaps between the bars
- Clearly labelled axes
- Scale for the axes
- Title for the bar chart
- Discrete Data

Line Chart
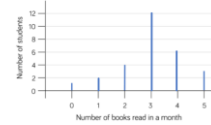
- Gaps between the lines
- Clearly labelled axes
- Scale for the axes
- Discrete Data

Multiple Bar chart

Compares multiple groups of data

Key/ Colour code for separate groups of information

Average temperatures

Key: London, Moscow, Seoul

- Clearly labelled axes
- Scale for axes
- Comparable data bars drawn next to each other
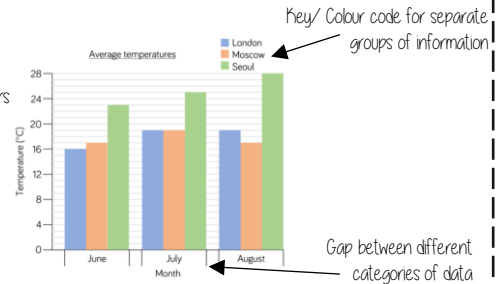
Gap between different categories of data

Time-Series

This time-series graph shows the total number of car sales in £1000 over time
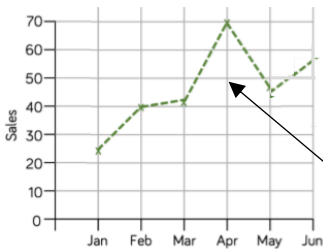
Look for general trends in the data. Some data shows a clear increase or a clear decrease over time.

Readings in-between points are estimates (on the dotted lines). You can use them to make assumptions.

Draw and interpret line graphs

Playground Temperature

- Commonly used to show changing over time
- The points are the recorded information and the lines join the points.
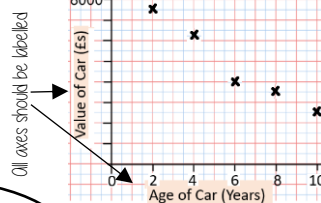
Line graphs do not need to start from 0
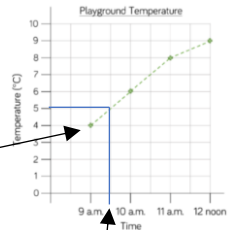
More than one piece of data can be plotted on the same graph to compare data

It is possible to make estimates from the line e.g. temperature at 9.30am is 5°C

Draw and interpret a scatter graph.

Age of Car (Years)	2	4	6	8	10
Value of Car (£s)	7500	6250	4000	3500	2500

All axes should be labelled

- This data may not be given in size order
- The data forms information pairs for the scatter graph
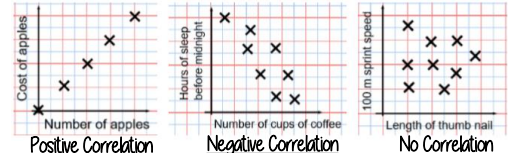- Not all data has a relationship

"This scatter graph show as the age of a car increases the value decreases"

The axis should fit all the values on and be equally spread out

The link between the data can be explained verbally

Linear Correlation

Positive Correlation (Cost of apples vs Number of apples)

Negative Correlation (Hours of sleep before midnight vs Number of cups of coffee)

No Correlation (100 m sprint speed vs Length of thumb nail)

As one variable increases so does the other variable

As one variable increases the other variable decreases

There is no relationship between the two variables

CRAWSHAW MATHEMATICS

Sparx Maths

Retrieval Practice

1) Reflect the shape in the mirror line.

2) Sketch the line $y = -x$.

3) What is the height of a triangle with an area of 48 cm^2 and a base of 8 cm?

4) Round 85 678 to 1 significant figure.

Careers Focus – Where could this take you?

I am a scientist who works for a **government agency**. I will analyse and interpret data to gain information on a variety of different subjects and problems. I will then produce papers for ministers to read to influence policies that are made by the government.

Topic Link

This topic links to:
Solve problems with line charts and bar charts, construct and interpret pie charts

Additional Resources

To further practice and develop your knowledge see Sparx clips above or **https://corbettmaths.com/contents/**

Self quizzing

Dora wants to use a diagram to represent the number of students that attended each after school sports club.
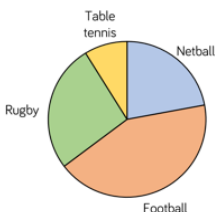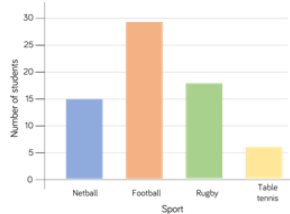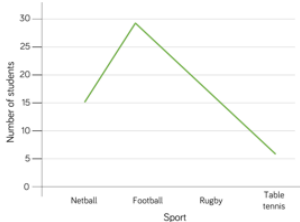
Which diagram best represents the information?
Why?

Challenge Activities

Dexter and Annie throw 20 rounds of 3 darts each.
They both have the same average score.
Dexter's scores have a range of 23
Annie's scores have a range of 8

Who is the more consistent player? Why?

YEAR 7 — SPRING
N4 - FRACTIONS, DECIMALS AND PERCENTAGES

CRAWSHAW MATHEMATICS

What do I need to be able to do?

Step 1 Represent tenths and hundredths
Step 2 Number lines with fractions and decimals
Step 3 Tenths, hundredths, fifths and quarters
Step 4 Eighths and thousandths
Step 5 Understand percentages
Step 6 Convert simple FDPs
Step 7 Fractions as diagrams
Step 8 Fractions on a number line
Step 9 Equivalent fractions
Step 10 Fractions as division
Step 11 Convert FDP
Step 12 FDP greater than 1 (E)

Keywords

Tenths – One part when a whole is divided into ten equal pieces (0.1).
Hundredths – One part when a whole is divided into 100 equal parts (0.01).
Fraction – A number expressing parts of a whole, written as numerator/denominator.
Decimal – A way to write fractions using a decimal point and place value (e.g. 0.25).
Percentage – A fraction out of 100, shown with a "%" (e.g. 25% = 25/100 = 0.25).
Number line – A straight line where numbers are placed in order, used to compare/visualise values.
Equivalent – Two expressions representing the same value (e.g. ½ = 0.5 = 50%).
Mixed number – A whole number plus a fraction (e.g. 1¾).
Diagram – Visual representations (e.g. pie, bar, shaded models) to show fractions.
Division – The operation of splitting into equal parts; fractions can represent division results.

Tenths and hundredths

One **hundredth** (one whole split into 100 equal parts) = $\frac{1}{100}$ = 0.01

One Whole = 1

One **tenth** (one whole split into 10 equal parts) = $\frac{1}{10}$ = 0.1

| ones | tenths | hundredths |

0 ones, 5 tenth and 2 hundredths
0 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.01 + 0.01
= 0 + 0.5 + 0.02
= 0.52

On a number line

One whole – split into 10 equal parts
One tenth = $\frac{1}{10}$ = 0.1

One tenth – split into 10 equal parts
One hundredth = $\frac{1}{100}$ = 0.01

Fifths

Twenty hundredths

One Whole = 1

One Whole = 1
One tenth
Two tenths = one fifth

One **fifth** (one whole split into 5 equal parts) = $\frac{1}{5}$ = 0.2

Percentages on a hundred grid

100% = a whole = 100 hundredths

7 hundredths

7 hundredths
7 out of 100
7%

6 tenths

3 hundredths

6 tenths and 3 hundredths
63 hundredths
63%

Quarters

One **quarter** (one whole split into 4 equal parts) = $\frac{1}{4}$ = 0.25

Twenty five hundredths

One Whole = 1

One whole
One half = 0.5
One quarter = 0.25

Simple pie charts

Split into 10 parts
= 10% = 36°

Split into 2 parts
= 50% = 180°

Split into 5 parts
= 20% = 72°

A pie chart has 360° so all FDP calculations are out of 360

Equivalent fractions

Represent equivalence with fraction walls

Whole	$\frac{1}{1}$
$\frac{1}{2}$		$\frac{1}{2}$
$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

Fractions – on a diagram

The denominator is represented by EQUALLY sized parts – this is split into quarters

Fractions – on a number line

This point is at the 6th part
6 is the **numerator**

One whole split into 18 equal parts
18 is the **denominator**

$\frac{6}{18}$ ← $\frac{3}{9}$ ← $\frac{1}{3}$

Convert FDP

$\frac{70}{100}$

This also means
70 ÷ 100

70 out of 100 squares
70 "hundredths"
= 7 "tenths"
0.7

70 hundredths
= 70%

Using a calculator

$\frac{\blacksquare}{\square}$ → S⇄D Convert to a decimal

This will give you the answer in the simplest form

× 100 converts to a percentage

Be careful of recurring decimals
e.g. $\frac{1}{3}$ = 0.3333333
$\frac{1}{3}$ = 0.3̇
The dot above the 3

N4 - FRACTIONS, DECIMALS AND PERCENTAGES

Sparx Maths

Retrieval Practice

1) Round 23.72 to 1 significant figure

2) Which is greater 300 million or 30 billion?

3) Work out the size of each interval on the number line.

0   1,000

4) The range of a set of numbers is 30
   The greatest number in the set is 60
   Find the smallest number in the set.

Extension work

Codes for related Independent Learning tasks on SPARX maths:

Click on 'Independent Learning' on home page then enter code in search box

Represent tenths & hundredths – U600
Number lines with fractions & decimals – M958
Tenths, hundredths, fifths & quarters – M264, M553
Eighths & thousandths – U692, M939
Understand percentages – M553
Convert simple FDP – M264
FDP as diagrams – U874
FDP on a number line – M235
Equivalent FDP – M410
FDP as division – M939
Convert FDP – U888
FDP greater than 1 (E) – U888, M264 *(Extension content)*

Career Focus - Where could this take you?

A data analyst is like a detective for numbers. They look at lots of information and find hidden patterns or secrets that help companies and people make better decisions.

Topic Links

This topic links to:
- Fraction, decimals and percentages

Additional Resources

To further practice and develop your knowledge see:
- https://corbettmaths.com/contents/
  Number: 121-128

Self quizzing

On a number line, draw arrows to show the approximate position of:

- 0.65
- Three tenths
- Three hundredths

- $\frac{9}{10}$
- $\frac{9}{100}$
- $\frac{99}{100}$

Sort these cards into matching groups.

Sam has 12 dog treats and shares them out between his 5 dogs.

$5 \div 12$

$12 \div 5$

$\frac{5}{12}$

$2\frac{5}{2}$

$\frac{12}{5}$

$2\frac{2}{5}$

Julie has 5 pizzas and she shares them between 12 children.

Challenge Activities

What are the missing numbers?

$6.4 = 1 + \boxed{}$

$3\frac{2}{5} = 1 + \dfrac{\boxed{}}{5}$

Mathematics Department Vision:

Mathematics provides students with powerful ways to describe, analyse, change and improve the world. The mathematics department at Crawshaw Academy aims to spark a passion in mathematics for all students, no matter what their starting point is, through the beauty of discovering patterns, making connections and looking for the 'why' behind mathematical formulae.

We want our students to:

EXCELLENCE:

•Strive to improve and progress each lesson, allowing themselves to achieve their personal best in mathematics.
•Develop the skills to understand science, technology and engineering as well as everyday tasks essential for keeping safe and healthy and maintaining their own economic well-being.

PURPOSE:

•Tackle rich and diverse problems fluently and make reasoned decisions based on their deep understanding.
•Share our passion for mathematics and have the belief that by working hard at mathematics they can succeed and that making mistakes is to be seen not as a failure but as a valuable opportunity for new learning.
•Apply reason to all that they do, determined to achieve their goals.

AMBITION:

•Strive to develop a curiosity for mathematics through our passion for the subject by having access to mathematics that is both challenging and relevant to everyday life, with an emphasis on problem solving.
•Become fully participating citizens in an ever-changing society who are able to think mathematically, reason and solve problems, and assess risks in a range of contexts.
•Access high quality teaching and learning, so they are encouraged to develop into thinking individuals who are mathematically literate and can achieve their potential.
•Have the desire and enthusiasm to aim higher, with motivation to succeed in our plans for the future.

Year 7 HALF TERM 4:

N5 - DIRECTED NUMBER

N6 - FRACTIONS AND PERCENTAGES OF AMOUNTS

G1 - PERIMETER AND AREA

What do I need to be able to do?

Step 1 Directed number and number lines
Step 2 Compare, and order directed numbers
Step 3 Calculations that cross zero
Step 4 Directed number and zero pairs
Step 5 Add directed numbers
Step 6 Subtract directed numbers
Step 7 Multiply and divide directed numbers
Step 8 Order of operations with directed numbers
Step 9 Use a calculator with directed numbers

Keywords

Directed number: A number that has both size and direction — it can be positive (above zero) or negative (below zero).
Integer A whole number that can be positive, negative, or zero.
Number line: A visual line used to show numbers in order, including negative numbers, zero, and positives.
Zero pair: A positive and negative number that cancel each other out to make zero (e.g. +3 and −3).
Additive inverse: A number that, when added to another, makes zero (e.g. the additive inverse of +5 is −5).
Compare: To decide if one number is greater than, less than, or equal to another.
Order: To arrange numbers from smallest to largest (ascending) or largest to smallest (descending).
Crossing zero: A calculation (like subtraction) that moves from positive to negative or vice versa.
BIDMAS/BODMAS : The rule for order of operations: Brackets, Indices, Division/Multiplication, Addition/Subtraction used when calculating with directed numbers.

Perform calculations that cross zero

Number lines are useful to help you visualise the calculation crossing 0

$4 - 6 = -2$
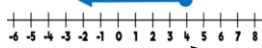
Use the number line to guide subtraction of 6

Start at 4

Find the difference between 6 and -4

From 6 to 0
6
From 0 to -4
4

10 beads between them

$-5 + 5 = 0$ Rearrangements of the same equation $5 - 5 = 0$

Add directed numbers

● = −1
● = 1
Representations

$2 + -4 = -2$
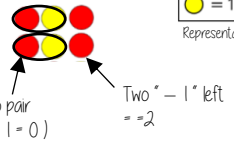
Zero pair
$(-1 + 1 = 0)$

Two " − 1 " left
= -2

$8 + -3 = 5$

Partitioning

$8 + -3 = 5$

$5 + 3 + -3 = 5$

Partition the value to create a zero pair calculation

Generalisation
$+ - = -$

Subtract directed numbers

● = −1
● = 1
Representations

Representation for calculation
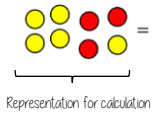
"Subtract" — means take away or remove

$2 - -1 = 3$

Take away one ●

Start with the representation of 2

= 3

$2 - -3 = 5$

= 5

Generalisation
$- - = +$

Multiply/ Divide directed numbers

| -3 | -3 |

Two representations of the same calculation

$2 \times -3 = -6$

Negative, Negative calculation

-2×-3

This is the negative of 2×-3

The act of making counters into their negative is turning them over

$-2 \times -3 = 6$

Divisions are the inverse operations

Evaluate algebraic expressions

$a = 5$ $b = -4$

$a^2 = 5^2$ $b^2 = (-4)^2$
$a^2 = 25$ $b^2 = 16$

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

Brackets around negative substitutions helps remove calculation errors

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

$3b - 2a = 3(-4) - 2(5) = -12 - 10 = \underline{-22}$

Two-step equations

Bar Model
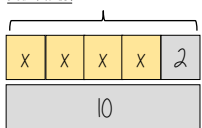
$4x + 2 = 10$

Representing the same question (use fact families)

$10 - 4x = 2$

| x | x | x | x | 2 |

10

Function machine

$x \rightarrow \boxed{x4} \rightarrow \boxed{+2} \rightarrow 10$

| x | x | x | x |

8

| x |
| 2 |
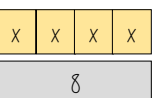
Inverse operations to find x

Use order or operations

Brackets
Indices or roots
Multiplication or division
Addition or subtraction

Brackets around negative substitutions helps remove calculation errors

Remember square roots have a positive and negative value

×	−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

CRAWSHAW MATHEMATICS

Sparx Maths

Retrieval Practice

1) What temperature is closer to 0, $3°C$ or $-2°C$?

2) Work out $33\frac{1}{3}\%$ of 600.

3) Find the length of the missing side of the rectangle.

   | Area = 52.2 mm^2 | 3 mm |

4) Complete: $p + 7p \equiv 10p - \boxed{}$

Career Focus - Where could this take you?

A data analyst is like a detective for numbers. They look at lots of information and find hidden patterns or secrets that help companies and people make better decisions.

Topic Links

This topic links to:
Order of operations
Four operations
Powers and roots

Additional Resources

To further practice and develop your knowledge see :
https://corbettmaths.com/contents/
Negative numbers 205

Anagrams

e s l r v n e

o c u m t t i v e m a

P c r t u o d

X e o n p s i e r s

Self quizzing

Calculate. Show each step of your working.

◆ $21 + 18 \div -3$

◆ $-6^2 + 14 \times 2$

◆ $\dfrac{21 + 18}{-3}$

◆ $(-6)^2 + 14 \times 2$

◆ $-3 \times 5 + 8 - 7$

◆ $-3 + 4^2$

◆ $3(5 + 8) - 7$

◆ $(-3 + 4)^2$

Challenge Activities

The value in the rectangle is the total of the expressions in the circles on either side.

Complete the missing numbers in the rectangles.

$3x - 7$

-15

$-5x$

$-x + 12$
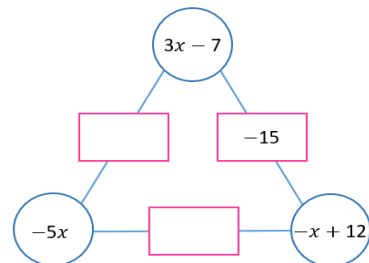
Sparx Maths

Fraction of an amount — M548
Use a fraction to find the whole — M549
Percentage of an amount (non-calculator) — M550
Percentage of an amount (calculator) — M551
Percentage increase and decrease — M552
Use a percentage to find the whole (E) — M553
Solve problems with fractions and percentages greater than 1 (E) — M554

What do I need to be able to do?

Step 1 Fraction of an amount
Step 2 Use a fraction to find the whole
Step 3 Percentage of an amount (non-calculator)
Step 4 Percentage of an amount (calculator)
Step 5 Percentage increase and decrease
Step 6 Use a percentage to find the whole
Step 7 Solve problems with fractions and percentages greater than 1 (E)

Keywords

Fraction – Part of a whole, written as numerator/denominator.
Whole – The total amount or complete quantity.
Percentage – A fraction out of 100, shown with "%".
Increase – When a quantity gets larger.
Decrease – When a quantity gets smaller.
Calculator – Using a device to perform calculations quickly.
Mental – Doing calculations in your head without tools.
Reverse – Finding the original amount from a given fraction or percentage.
Greater – Values larger than one whole (e.g., >100%).
Amount – The quantity or total being worked with.

Fraction of a given amount

Find $\frac{2}{5}$ of £205

The bar represents the whole amount

£205

| £41 | £41 | £41 | £41 | £41 |
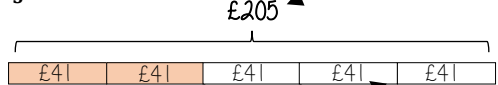
2 out of the 5 equal parts
$2 \times £41 = \underline{£82}$

£205 ÷ 5 = £41
Each part of the bar model represents £41

90

| 30 | 30 | 30 |
| 15 | 15 | 15 |

45
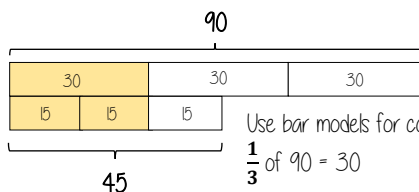
Use bar models for comparisons
$\frac{1}{3}$ of 90 = 30

$\frac{2}{3}$ of 45 = 30

$$\therefore \frac{1}{3} \text{ of } 90 = \frac{2}{3} \text{ of } 45$$

Use a fraction of amount

$\frac{2}{3}$ of a value is 70. What is the whole number?

70 ÷ 2 = 35
Each part of the bar model represents 35.

70

| 35 | 35 | 35 |
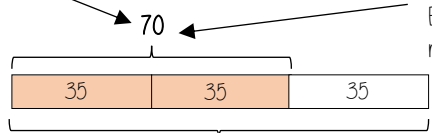
35 x 3 = 105
The whole number is 105

The wording of the question is important to setting up the bar model

63

| 21 | 21 | 21 | 21 |

Find the whole

$\frac{3}{4}$ of a number is 63.
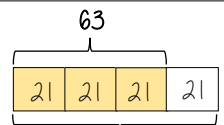
What is $\frac{1}{6}$ of the number?

= 14

84

| 14 | 14 | 14 | 14 | 14 | 14 |
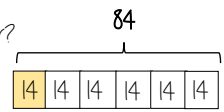
Use the whole to find a given part

Find the percentage of an amount (Mental methods)

The **whole** represents 100%

$10\% = \frac{1}{10}$ of the whole

0%   20%   40%   60%   80%   100%
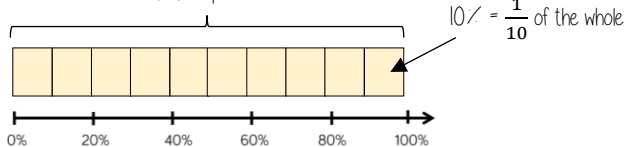
$10\% = \frac{1}{10}$ of the whole $50\% = \frac{5}{10} = \frac{1}{2}$ of the whole

$20\% = \frac{2}{10} = \frac{1}{5}$ of the whole $5\% = \frac{1}{20}$ of the whole

Find 65% of 80

80

| 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

For bigger percentages it is sometimes easier to take away from 100%
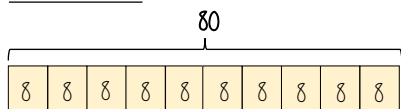
Method 1:
65% = 10% x 6 + 5%
= (8 x 6) + 4
= 52

Method 2:
65% = 50% + 10% + 5%
= 40 + 8 + 4
= 52

Find the percentage of an amount (Calculator methods)

Using a multiplier

Find 65% of 80

Fraction, decimal, percentage conversion

$65\% = \frac{65}{100} = 0.65$ ← The multiplier

0.65 x 80 = **52**

Using the percent button

Find 65% of 80

Type **65**

Press [SHIFT] [( ] (%)

Press [X] **80** and then press =

This brings up the % button on screen
You will see 65%

You can also use the calculator to support non calculator methods and find 1% or 10% then add percentages together

"of" can represent 'x' in calculator methods

Sparx Maths

Retrieval Practice

1) The area of a triangle is 40 cm^2.

   Work out its perpendicular height if the base is 20 cm.

2) Work out 68 × 47

3) Find the sum of 86, 97 and 74

4) Simplify $3a^2 + 4a + 4a^2 - 2a$

Extension work

Codes for related Independent Learning tasks on SPARX maths:

Click on 'Independent Learning' on home page then enter code in search box

Fraction of an amount – M548
Use a fraction to find the whole – M549
Percentage of an amount (non-calculator) – M550
Percentage of an amount (calculator) – M551
Percentage increase and decrease – M552
Use a percentage to find the whole (E) – M553
Solve problems with fractions and percentages greater than 1 (E) – M554

Careers Focus – Where could this take you?

As a **mortgage advisor** I use percentages when calculating how much a mortgage will cost a potential to repay each month in order to pay back the full loan. These calculations are important to ensure the bank earns money and we don't lend people more money than they can afford to repay.

Topic Links

This topic links to:
Equivalent fractions

Some students will progress further and be able to:
Solve problems with fractions greater than 1 and percentages greater than 100%

Self quizzing

100%	
50%	50%

100%			
25%	25%	25%	25%

100%		
$33\frac{1}{3}$%	$33\frac{1}{3}$%	$33\frac{1}{3}$%

Use the bar models to explain how you work out:

- 50% of 30
- 50% of 80
- $33\frac{1}{3}$% of 90
- 50% of 24
- 50% of 120
- $66\frac{2}{3}$% of 18

Draw a bar model that shows you how to work out 10% of a number.
What other percentages can you then work out?

Challenge Activities

Mo works out 17% of £84.10 on his calculator.

It says 14.297
Does this mean £14, £14.29 or £14.30?

Which answer would you choose?

What do I need to be able to do?

Step 1 Convert metric units of length
Step 2 Perimeter of a polygon
Step 3 Perimeter of a compound shape
Step 4 Area of rectangles and parallelograms
Step 5 Area of a triangle
Step 6 Area of a trapezium
Step 7 Solve problems with perimeter and area
Step 8 Form expressions with perimeter and area (E)

Keywords

Convert – Changing units from one metric measurement to another.
Length – The measurement of how long something is.
Perimeter – The total distance around a shape.
Polygon – A flat shape with straight sides.
Compound – A shape made by combining two or more simple shapes.
Area – The amount of space inside a 2D shape.
Rectangle – A four-sided shape with opposite sides equal and all angles 90°.
Triangle – A three-sided polygon.
Trapezium – A four-sided shape with one pair of parallel sides.
Expression – A mathematical phrase involving numbers and/or variables.

Area – rectangles, triangles, parallelograms

Rectangle
Base x Height
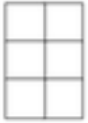
Parallelogram/ Rhombus
Base x Perpendicular height
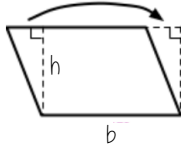
Triangle
½ x Base x Perpendicular height

A triangle is half the size of the rectangle it would fit in
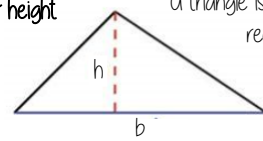
Perimeter and Area

Area: The amount of square units that fit inside the shape.
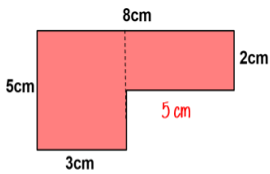
$Area = (5 \times 3) + (2 \times 5)$
$= 25cm^2$

Tip- Always remember units. These units are squared for area. mm², cm², m², etc

Perimeter: The distance around the outside of the shape.

Find the perimeter
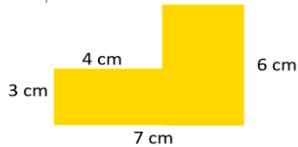
Step 1 — Find the missing lengths.
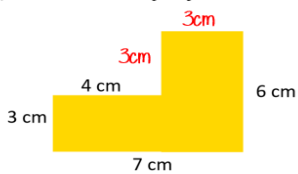
Step 2 — Add the lengths
3 + 4 + 3 + 3 + 6 + 7 = **26 cm**

Solve problems with perimeter

Perimeter is the length around the outside of a polygon

8 cm   8 cm

x cm

Isosceles Triangle notation

The triangle has a perimeter of 25cm. Find the length of x

8cm + 8cm + $x$cm = 25cm
16cm + $x$cm = 25cm
$x$cm = **9cm**

Area of a trapezium

Area of a trapezium
$$\frac{(a + b) \times h}{2}$$
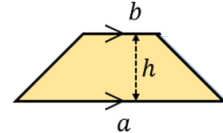
Why?
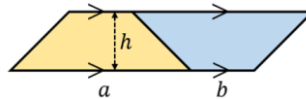
- Two congruent trapeziums make a parallelogram
- New length (a + b) x height
- Divide by 2 to find area of one

Compound shapes

To find the area compound shapes often need splitting into more manageable shapes first. Identify the shapes and missing sides etc. first.

Shape A - Isosceles trapezium

Shape B- nonstandard trapezium
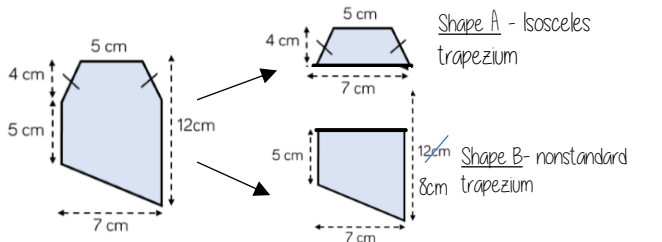
Units

Shape A + Shape B = total area
$$\frac{(5 + 7) \times 4}{2} + \frac{(5 + 8) \times 7}{2} = 24 + 45.5 = 69.5cm^2$$

Metric conversions   Useful Conversions

ml — x1000 → L
L — ÷1000 → ml

g — x1000 → kg
kg — ÷1000 → g

mm — x10 → cm — x100 → m — x1000 → km
cm — ÷10 → mm
m — ÷100 → cm
km — ÷1000 → m
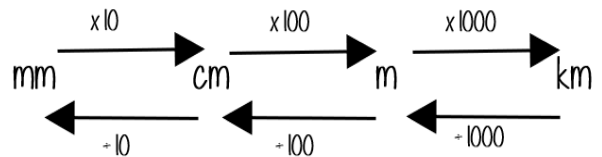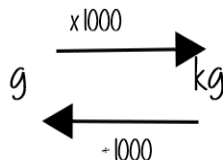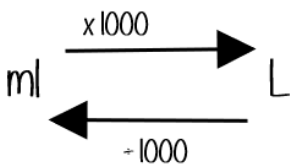
Retrieval Practice

1) Write three other facts equivalent to $18 \times 8 = 144$

2) Work out the missing numbers.

125, a, b, 31, 42

3) Write 70% as a fraction in its lowest terms.

4) How many sides has a hexagon?

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:

Click on 'Independent Learning' on home page then enter code in search box

Convert metric units of length – U284
Perimeter of a polygon – U285
Perimeter of a compound shape – U286
Area of rectangles and parallelograms – U287
Area of a triangle – U288 Area of a trapezium – U289
Solve problems with perimeter and area – U290
Form expressions with perimeter and area (E) – U291

Career Focus - Where could this take you?

As an auditor, I have to make sure I understand lots of number skills and Identify patterns to make sure accounts make sense and comply with the law

Topic Links

This topic links to:
- Fraction, decimals and percentages

Additional Resources

To further practice and develop your knowledge see:
- https://corbettmaths.com/contents/
Number: 121-128

Self quizzing

Find the area of each of these shapes.
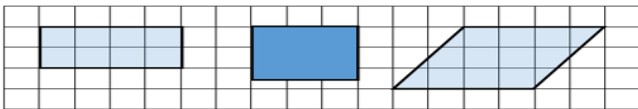
Match the sets of cards that show equivalent expressions

$48d \div 4$ $\dfrac{36d^2}{3}$

$4d^2 \times 3d$ $3d \times 4$

$\dfrac{24de}{2e}$ $12d^3$ $6d^2 + 6d^2$

$2d \times 6d$ $d \times 3 \times 4d$

Challenge Activities

All these shapes have the same area.
Find the lengths of the missing sides.

80 mm

4 cm

6 cm

1.2 cm

12 cm

Mathematics Department Vision:

Mathematics provides students with powerful ways to describe, analyse, change and improve the world. The mathematics department at Crawshaw Academy aims to spark a passion in mathematics for all students, no matter what their starting point is, through the beauty of discovering patterns, making connections and looking for the 'why' behind mathematical formulae.

We want our students to:

EXCELLENCE:

•Strive to improve and progress each lesson, allowing themselves to achieve their personal best in mathematics.
•Develop the skills to understand science, technology and engineering as well as everyday tasks essential for keeping safe and healthy and maintaining their own economic well-being.

PURPOSE:

•Tackle rich and diverse problems fluently and make reasoned decisions based on their deep understanding.
•Share our passion for mathematics and have the belief that by working hard at mathematics they can succeed and that making mistakes is to be seen not as a failure but as a valuable opportunity for new learning.
•Apply reason to all that they do, determined to achieve their goals.

AMBITION:

•Strive to develop a curiosity for mathematics through our passion for the subject by having access to mathematics that is both challenging and relevant to everyday life, with an emphasis on problem solving.
•Become fully participating citizens in an ever-changing society who are able to think mathematically, reason and solve problems, and assess risks in a range of contexts.
•Access high quality teaching and learning, so they are encouraged to develop into thinking individuals who are mathematically literate and can achieve their potential.
•Have the desire and enthusiasm to aim higher, with motivation to succeed in our plans for the future.

Year 7 HALF TERM 5:

R1 - SPEED, DISTANCE AND TIME

N7 - PROPERTIES OF NUMBER

What do I need to be able to do?

Step 1 Convert between milliseconds, seconds, minutes, and hours
Step 2 Convert between hours, days, and years
Step 3 Fractions of time
Step 4 Solve problems with tables and timetables
Step 5 Solve problems with time and the calendar
Step 6 Calculate speed
Step 7 Calculate time and distance
Step 8 Solve problems with speed, distance, and time
Step 9 Interpret distance-time graphs
Step 10 Draw distance-time graphs
Step 11 Calculate speed from a distance-time graph (E)

Keywords

Convert — Changing between different units of time.
Milliseconds — One thousandth of a second.
Seconds — Basic unit of time.
Minutes — 60 seconds.
Hours — 60 minutes.
Days — 24 hours.
Years — 365 or 366 days.
Fraction — Part of a whole, here used to describe parts of time.
Speed — How fast something moves (distance divided by time).
Distance — How far something travels.
Time — Duration of an event or process.
Graph — A visual way to show data, e.g. distance-time graph.

Conversions

Convert between milliseconds, seconds, minutes, and hours

Unit	Conversion
1 second	= 1,000 milliseconds
1 minute	= 60 seconds
1 hour	= 60 minutes
	= 3,600 seconds
	= 3,600,000 milliseconds

Tips:
To convert **up**
ms → s divide.

To convert **down**
s → ms multiply

Convert between hours, days, and years

Unit	Conversion
1 day	= 24 hours
1 week	= 7 days
1 year	= 365 days (or 366 in a leap year)
	= 52 weeks + 1 day
	= 8,760 hours (non-leap year)

Examples:
48 hours = 2 days
1 year = 8,760 hours

Speed, Distance, Time
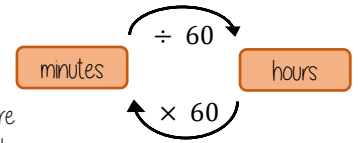
Before calculations — make sure you are working in the same units as the speed

$$\div 60$$
minutes → hours
$$\times 60$$

Learn or learn how to rearrange the formular for speed, distance and time

Substitute in the variables given

$$time = \frac{distance}{speed}$$

$$distance = speed \times time$$

Distance — Time graphs

Gradient = speed

The steeper a gradient the faster the speed

$\frac{10}{5} = 2$ metres per min

Horizontal lines represent staying still

The distance coming closer to home shows the return journey
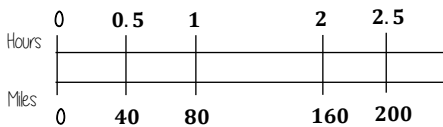
Units are important. Meters per minute
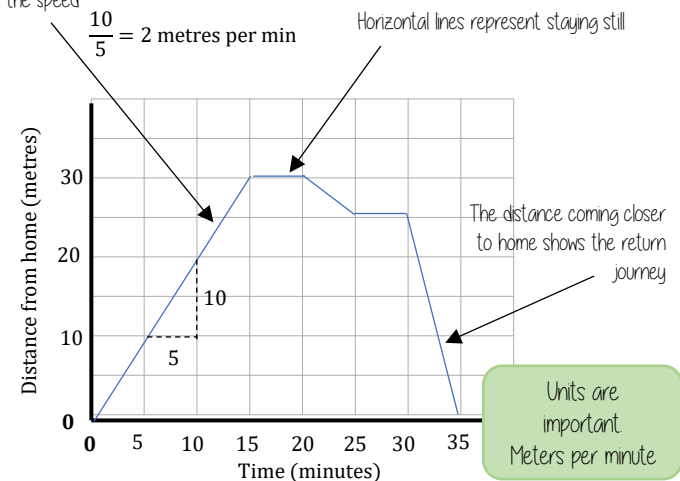
Speed, Distance, Time

"per" for every
e.g. 80 miles per hour (mph)
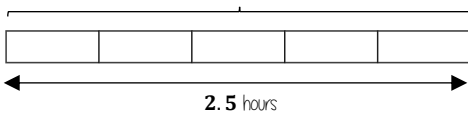Travel 80 miles every hour

$$speed = \frac{distance}{time}$$

You can use a double number line to help you calculate distance

Hours	0	0.5	1		2	2.5
Miles	0	40	80		160	200

e.g. A boat travels at a constant speed for **2.5** hours
It travels 300 miles.

Bar models can help to calculate mph
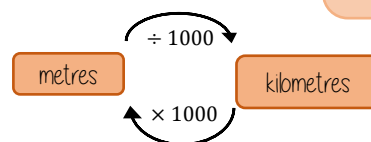
300 miles

2.5 hours

Each part is half an hour
Each part is 60 miles

Rates of change & units

Common rates of change relationships

Revisit your conversions between units of length and capacity

Speed: miles **per** hour
Exchange rates: euros **per** pounds
Density: mass **per** volume

$$\div 1000$$
metres → kilometres
$$\times 1000$$

Sparx Maths

Retrieval Practice

1) What is the fourth multiple of 7?

2) Whitney rolls a six-sided dice. What is the probability she rolls a number greater than 4?

3) Work out 7.5 x 16

4) Write the number two hundred and five thousand, six hundred and twenty in figures.

Vocabulary check: Significant figure

Career Focus - Where could this take you?

As an auditor, I have to make sure I understand lots of number skills and Identify patterns to make sure accounts make sense and comply with the law

Topic Link

This topic links to:

Additional Resources

To further practice and develop your knowledge see :
https://corbettmaths.com/contents/

Anagrams

s e y a r

a t n c s i d e

s e p e d

m n o h t s

Self quizzing

Tom sets off from his house. Sometimes he walks, sometimes he runs and at one point he stops for a break.
Match the line segment to the activity.
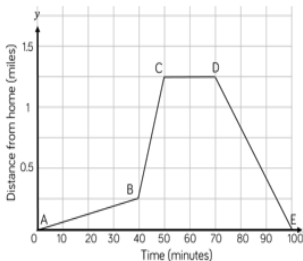
AB	Running
BC	Stop for a break
CD	Walking at a quick speed
DE	Walking very slowly

Dani says, "Tom travels for 1.25 miles".
Is Dani correct? Explain your answer.

Challenge Activities

A machine fills 200 bottles in 8 minutes.
At what rate is the machine filling bottles?
How many bottles can the machine fill in 2 and a half hours?
How long will it take for the machine to fill 1500 bottles?
After a service, the machine operates 10% more efficiently.
How does this change your answers?

What do I need to be able to do?

Step 1 Multiples
Step 2 Factors
Step 3 Prime numbers
Step 4 Write a number as a product of prime factors
Step 5 Square, cube and triangular numbers
Step 6 Square roots and cube roots
Step 7 Explore higher powers and roots (E)
Step 8 Highest common factor (HCF)
Step 9 Lowest common multiple (LCM)
Step 10 HCF and LCM from a Venn diagram (E)
Step 11 Use factors to simplify calculations (E)

Keywords

Multiples — Numbers obtained by multiplying a number by an integer.
Factors — Numbers that divide exactly into another number.
Prime — A number with only two factors: 1 and itself.
Prime factorisation — Writing a number as a product of prime numbers.
Square — A number multiplied by itself (e.g., $4 = 2^2$).
Cube — A number raised to the power of three (e.g., $8 = 2^3$).
Root — The inverse operation of powers (square root, cube root).
HCF — Highest Common Factor; largest factor shared by two numbers.
LCM — Lowest Common Multiple; smallest multiple shared by two numbers.
Venn diagram — A diagram showing common and distinct factors/multiples.
Simplify — Making calculations easier by reducing numbers using factors.

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

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

Non example of a multiple

45 is not a multiple of 3 because it is 3 x 15
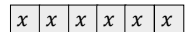
Not an integer

Factors

Arrays can help represent factors

5×2 or 2×5

Factors of 10
1, 2, 5, 10

10×1 or 1×10

The number itself is always a factor

Factors and expressions

x x x x x x

$6x \times 1$ OR $6 \times x$

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

$2x \times 3$

$3x \times 2$

Prime numbers

2

- Integer
- Only has 2 factors
- 1 and itself

The first prime number
The only even prime number

Learn or how-to quick recall...

$2, 3, 5, 7, 11, 13, 17, 19, 23, 29...$

Square and triangular numbers

Square numbers

odd   even   odd

Representations are useful to understand a square number n^2

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

Triangular numbers

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

Add two consecutive triangular numbers and get a square number

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

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

HCF of 18 and 30

18   1, 2, 3, (6), 9, 18

30   1, 2, 3, 5, (6), 10, 15, 30

Common factors
(factors of both numbers)
1, 2, 3, 6

HCF = 6

6 is the biggest factor they share

Common multiples and LCM

Common multiples are multiples two or more numbers share

LCM — Lowest common multiple

LCM of 9 and 12

9   9, 18, 27, (36) 45, 54

12   12, 24, 36, 48, 60

LCM = 36

The first time their multiples match

Comparing fractions

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

Compare fractions using a LCM denominator

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

Product of prime factors

Multiplication part-whole models

30 → 2, 15 → 5, 3

30 → 3, 10 → 2, 5

30 → 5, 6 → 2, 3
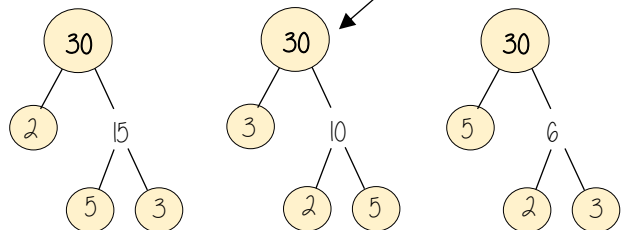
All three prime factor trees represent the same decomposition

30 = 2 x 3 x 5

Multiplication is commutative
Multiplication of prime factors

Using prime factors for predictions

eg 60   30 x 2   2 x 3 x 5 **x 2**
150   30 x 5   2 x 3 x 5 **x 5**

Venn diagrams

The LCM is the numbers in both circles

Remember: you must multiply the numbers together

The HCF would be the number in overlap

Sparx Maths

Retrieval Practice

1) The probability of winning and losing a game are shown. What is the probability of a draw?

Win	Draw	Lose
0.5	?	0.2

2) Write the sample space for this spinner.

3) Work out 327 + 296

4) Calculate – 4 – 9

Career Focus - Where could this take you?

A data analyst is like a detective for numbers. They look at lots of information and find hidden patterns or secrets that help companies and people make better decisions.

Topic Links

This topic links to Factors and multiples and Powers and roots

Some students will progress further and be able to Use prime factors to find HCF's and LCM's

To further practice and develop your knowledge see:

https://corbettmaths.com/contents/

worksheets: 216, 218, 219, 220

Self quizzing

State whether the statements are true or false.
Explain why each time.

| 4.5 is a multiple of 3 | 1002 is a multiple of 3 | 0 is a multiple of 3 |

Write down the highest common factor of 12 and 18
Use this fact to help work out the highest common factors of these pairs of numbers.

| 120 and 180 | 6 and 9 |
| 24 and 36 | 18 and 27 |

Challenge Activities

Ali works out the perimeter and area of this square.
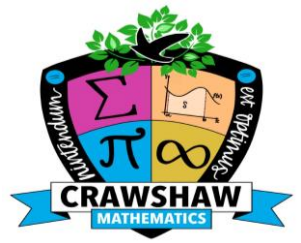Perimeter = 24 cm
Area = 36 cm^2
He thinks "The perimeter of a square can never be equal to its area".
Do you agree? Justify your answer.

6 cm

6 cm

Mathematics Department Vision:

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Year 7 HALF TERM 6:

N8 - ADD AND SUBTRACT FRACTIONS

G2 - ANGLES AND POLYGONS

What do I need to be able to do?

Step 1 Simplify a fraction
Step 2 Convert between mixed numbers and improper fractions
Step 3 Add and subtract fractions with the same denominator
Step 4 Add and subtract with fractions and integers
Step 5 Add and subtract fractions where denominators share a simple common multiple
Step 6 Add and subtract fractions with any denominator
Step 7 Add and subtract improper fractions and mixed numbers
Step 8 Use equivalence to add and subtract decimals and fractions (E)
Step 9 Add and subtract simple algebraic fractions (E)
Step 10 Substitution and solving equations with fractions (E)

Keywords

Simplify — Reducing a fraction to its lowest terms.
Mixed number — A whole number combined with a fraction (e.g., $1\frac{3}{4}$).
Improper fraction — A fraction where the numerator is greater than or equal to the denominator (e.g., 7/4).
Denominator — The bottom number of a fraction, showing the total parts.
Add/Subtract — Combining or taking away amounts.
Common multiple — A number that is a multiple of two or more denominators.
Equivalence — Different fractions or decimals that represent the same value.
Decimal — A number expressed with a decimal point (e.g., 0.5).
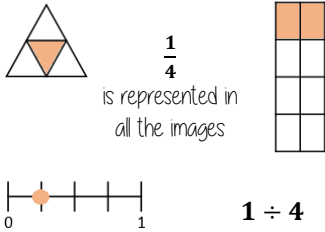**Algebraic fraction** — A fraction with variables in numerator and/or denominator.
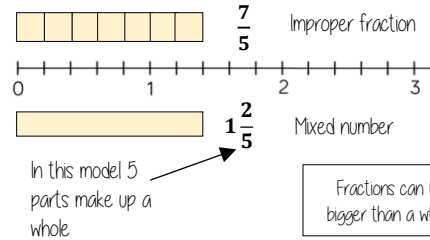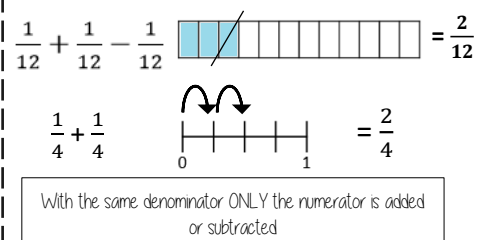**Substitution** — Replacing variables with numbers to solve equations.
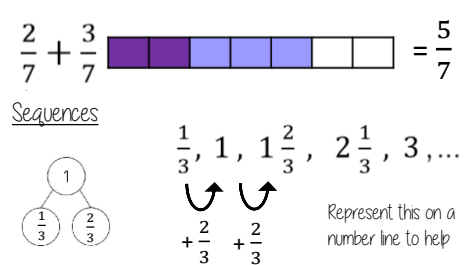
Representing Fractions

$\frac{1}{4}$ is represented in all the images

$1 \div 4$

Mixed numbers and fractions

$\frac{7}{5}$ Improper fraction

$1\frac{2}{5}$ Mixed number

In this model 5 parts make up a whole

Fractions can be bigger than a whole

Add/Subtract unit fractions
Same denominator

$\frac{1}{12} + \frac{1}{12} - \frac{1}{12} = \frac{2}{12}$

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

With the same denominator ONLY the numerator is added or subtracted

Add/Subtract fractions
Same denominator

$\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$

Sequences

$\frac{1}{3}, 1, 1\frac{2}{3}, 2\frac{1}{3}, 3, ...$

$+\frac{2}{3}$ $+\frac{2}{3}$

$1 = \frac{1}{3} + \frac{2}{3}$

Represent this on a number line to help

Add/Subtract from integers

$1 - \frac{2}{6} = \frac{4}{6}$

$3 + \frac{1}{6} = 3\frac{1}{6}$

The denominator indicates the number of parts a whole is made up of

Equivalent fractions
Numerator and denominator have the same multiplier

$\frac{2}{3} = \frac{4}{6}$

$\frac{1}{3} = \frac{2}{6}$
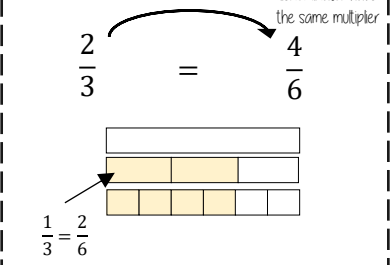
Add/Subtraction fractions (common multiples)

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

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

Addition/Subtraction needs a common denominator
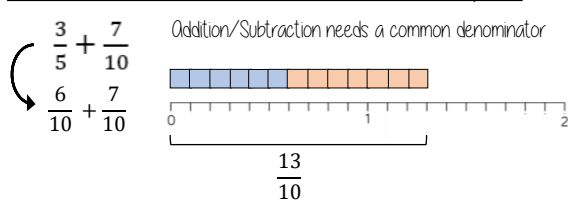
$\frac{13}{10}$

Add/Subtraction any fractions

$\frac{4}{5} - \frac{2}{3}$

$\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$

Use equivalent fractions to find a common multiple for both denominators
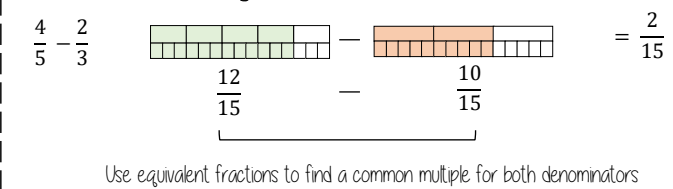
Add/Subtraction fractions (improper and mixed)

$2\frac{1}{5} - 1\frac{3}{10}$

$2\frac{2}{10}$

$\frac{22}{10} - \frac{13}{10} = \frac{9}{10}$

- Convert to an improper fraction
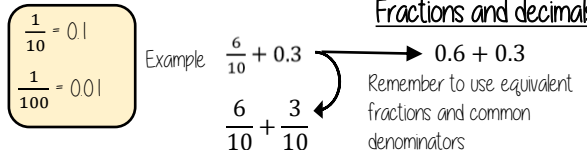- Calculate with common denominator
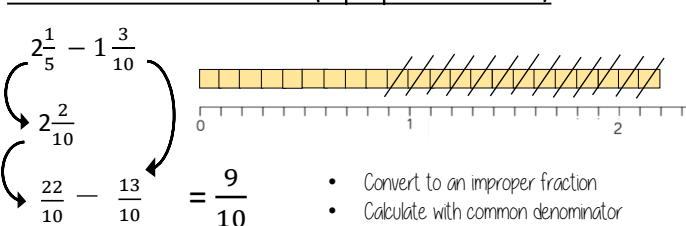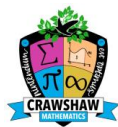
Partitioning method

$2\frac{1}{5} - 1\frac{3}{10} = 2\frac{2}{10} - 1\frac{3}{10} = 2\frac{2}{10} - 1 - \frac{3}{10} = 1\frac{2}{10} - \frac{3}{10} = \frac{9}{10}$

Fractions in algebraic contexts

$p = 5$ $m = 2$

$k - \frac{5}{8} = 2$

Apply inverse operations

$k = 2 + \frac{5}{8}$

Form expressions with fractions

$b + \frac{7}{9} \longrightarrow b + \frac{7}{9}$

$\frac{p}{8} + \frac{1}{m}$

Substitution

$\frac{5}{8} + \frac{1}{2}$

Fractions and decimals

$\frac{1}{10} = 0.1$

$\frac{1}{100} = 0.01$

Example $\frac{6}{10} + 0.3 \longrightarrow 0.6 + 0.3$

$\frac{6}{10} + \frac{3}{10}$

Remember to use equivalent fractions and common denominators

CRAWSHAW MATHEMATICS

Sparx Maths

Retrieval Practice

1) Work out $20 + 10 \div -2$

2) Solve the equation $8 = 2x + 3$

3) 80% of a number is 24. What is the number?

4) Find the next two terms in the linear sequence.

    0.79   0.75   0.71   ...

Career Focus - Where could this take you?

As a pharmacist, I need to have a good understanding of fractions and negative numbers when making and storing pharmaceutical drugs.

Topic Links

This topic links to: Fractions, decimals and percentages equivalence

Additional Resources

To further practice and develop your knowledge see :
https://corbettmaths.com/contents/

Fractions 132-136

Anagrams

N e a r o t r m u

n e d a o r t i n m o

m i p e r p r o

Self quizzing

Work out the missing fractions.

$4 + \dfrac{\square}{\square} = 4\dfrac{2}{5}$ $4 - \dfrac{\square}{\square} = 3\dfrac{3}{5}$ $6 + \dfrac{\square}{\square} + \dfrac{\square}{\square} = 6\dfrac{5}{7}$

$7 - \dfrac{\square}{\square} - \dfrac{\square}{\square} = 5\dfrac{5}{8}$ $6 + \dfrac{\square}{\square} - \dfrac{\square}{\square} = 5\dfrac{8}{9}$

Challenge Activities

$11\dfrac{3}{4} + 5\dfrac{7}{8}$

$11\dfrac{3}{4} - 5\dfrac{7}{8}$

Is it more efficient to convert the mixed numbers to improper fractions before adding/subtracting? Or, should I add/subtract my integers first, before the fractions?

Use Whitney's methods to calculate the answers. What would your advice to Whitney be?

Teddy thinks the difference between the answers is 11.68

Is Teddy right? Explain your answer.

YEAR 7 — SUMMER

G2 - ANGLES AND POLYGONS

What do I need to be able to do?
Step 1 Draw and measure lines and angles
Step 2 Understand and use geometric notation
Step 3 Angles around a point
Step 4 Angles on a straight line
Step 5 Vertically opposite angles
Step 6 Recognise and name polygons
Step 7 Angles in a triangle
Step 8 Angles in a quadrilateral
Step 9 Solve problems with angles
Step 10 Parallel and perpendicular lines
Step 11 Angles in parallel lines (E)
Step 12 Angles in a polygon (E)
Step 13 Simple proofs (E)

Keywords

Line — A straight continuous extent with length but no thickness.
Angle — The figure formed by two rays meeting at a common endpoint.
Notation — Symbols used to represent geometric figures and angles.
Point — The common endpoint where angles meet.
Straight line — A line with an angle of $180°$.
Vertically opposite — Angles opposite each other when two lines cross, always equal.
Polygon — A closed shape with straight sides.
Triangle — A polygon with three sides.
Quadrilateral — A polygon with four sides.
Parallel — Lines that never meet and are always the same distance apart.
Perpendicular — Lines that intersect at a $90°$ angle.
Proof — A logical argument that shows a statement is true.
Interior angles — Angles inside a polygon.

Letter and labelling convention

The letter in the middle is the angle
The arc represents the angle
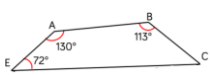
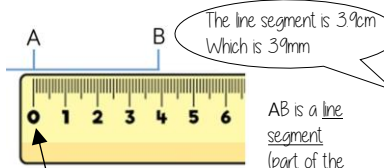Angle Notation: three letters ABC
This is the angle at B = $113°$

Line Notation: two letters EC
The line that joins E to C.

Draw and measure line segments

Conversions 1cm = 10mm, 1m = 100cm

The line segment is 3.9cm
Which is 39mm

AB is a line segment (part of the line)

Make sure the start of the line is at 0;

Angles as measures of turn

East to South is a quarter turn clockwise

Clockwise   Anti-Clockwise

Quarter Turn $90°$ Clockwise
Half Turn $180°$
Three-quarter Turn $270°$ Anti-Clockwise
Full Turn $360°$

Classify angles

Acute Angles
$0° <$ angle $< 90°$

Right Angles
$90°$

Obtuse
$90° <$ angle $< 180°$

Right angle notation

Reflex
$180° <$ angle $< 360°$

Straight Line
$180°$

Measure angles to 180°

This is the angle being measured

Read from $0°$ on the base line. Remember to use estimation. This is an obtuse angle so between $90°$ and $180°$
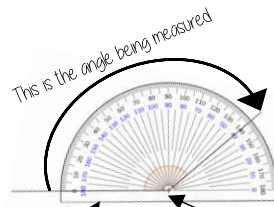
The base line follows the line segment

Make sure the cross is at the point the two lines meet

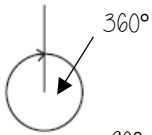### Draw angles up to 180°

Draw a $35°$ angle

Make a mark at $35°$ with a pencil And join to the angle point (use a ruler)
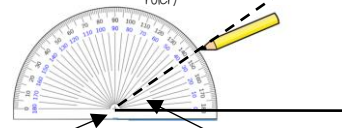
Make sure the cross is at the end of the line (where you want the angle)

The angle

Sum of angles at a point

$360°$

Find angle BOE

$90° + 33° + 92° = 205°$
$360° - 205°$
BOE = $155°$

Angle notation — $90°$
C
$33°$
$92°$

Angle notation — find this missing angle
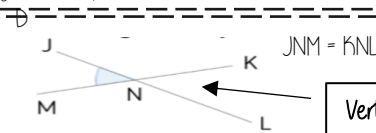
$67°$
$x°$

$360° - 67°$
$= 293°$
The sum of angles around a point is $360°$

Angles over 180°
Use your knowledge of straight lines $180°$ and angles around a point $360°$

$360°$ - smaller angle = reflex angle

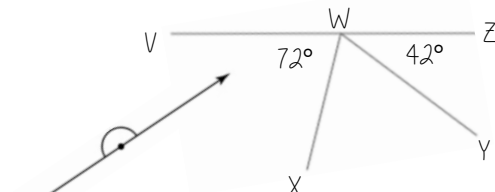Measure the smaller angle first (less than $180°$)

Vertically opposite angles

JNM = KNL

Vertically opposite angles are the same

Sum of angles on a straight line

Adjacent angles that share a common point on a line add up to $180°$

V   W   Z
$72°$ $42°$
X   Y

Find angle XWY

$72° + 42° = 114°$
$180° - 114° = \underline{66°}$

Parallel and Perpendicular lines

Parallel lines
Straight lines that never meet
(Have the same gradient)

Perpendicular lines
Straight lines that meet at $90°$

Polygons

3 - Triangle
4 - Quadrilateral
5 - Pentagon
6 - Hexagon
7 - Heptagon
8 - Octogen
9 - Nonagon
10 - Decagon

If all the sides and angles are the same, it is a **regular** polygon

Retrieval Practice

1) Add $\frac{3}{5}$ to 0.3

2) Solve the equation $3x = \frac{1}{5}$

3) Change $\frac{47}{7}$ to a mixed number.

4) Simplify $8ab + 6ab - ab$

Sparx Maths

Careers Focus – Where could this take you?

Navigation is one of the oldest mathematical practices. Used by sailors and, relatively speaking, more recently by aircraft navigators. The practice relies heavily on geometry and angles.

Topic Links

This topic links to using a ruler, using a pair of compasses and names of angles
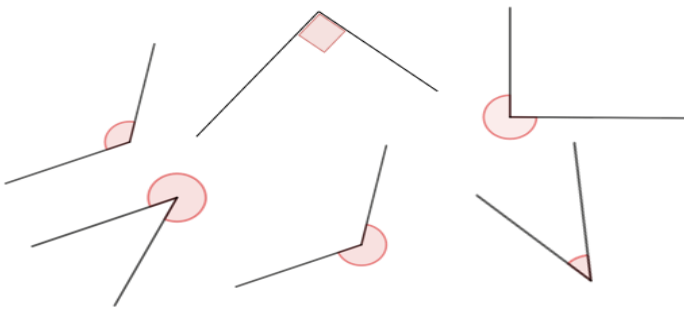
Additional Resources
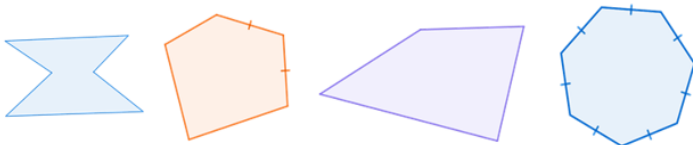To further practice and develop your knowledge see :
https://corbettmaths.com/contents/

Videos 28, 31, 38, ; Worksheets 28, 31, 38

Self quizzing

Classify the angles as acute, obtuse, reflex or right-angles.

Write the name of each polygon and decide whether it is **regular** or **irregular**.

_____   _____   _____   _____

_____   _____   _____   _____

Challenge Activities

WXYZ is a square. Side XY is 5 cm long.

Draw the square and find the lengths of its diagonals WY and XZ.
Is there more than one way to draw this square?
Investigate if WXYZ were a rhombus instead.

The table contains information about the colour of students eyes in class 8a. There are 30 students in class 8a. Complete the table and draw a pie chart to represent the data.

Manufacturer	Frequency	Angle of sector
Brown	6	
Hazel	8	
Blue		60°
Green		48°
Silver	2	
Amber		