Retrieval Practice

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

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 8

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 8 HALF TERM 1 (Autumn 1) :

R2 - RATIO

R3 - PROPORTION AND SCALE

A4 - ALGEBRAIC MANIPULATION

YEAR 8 — AUTUMN

R2 - RATIO

Sparx Maths

Understand ratio – M885, M801
Ratio problems (whole given) – M801, M525 Ratio problems (part given) – M801, U753
Ratio problems (difference given) – U753, U865 Simplify ratios – M885, U687
Express ratios in the form 1:n and n:1 (E) – M543
Compare ratios and fractions – M267, U176 Solve problems with ratio – M801, U577, U676

What do I need to be able to do?

Step 1 Understand ratio
Step 2 Ratio problems (whole given)
Step 3 Ratio problems (part given)
Step 4 Ratio problems (difference given)
Step 5 Simplify ratios
Step 6 Express ratios in the form 1:n and n:1 (E)
Step 7 Compare ratios and fractions
Step 8 Solve problems with ratio

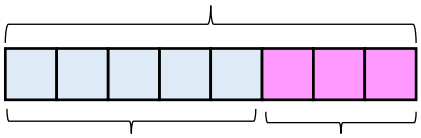
Keywords

Ratio: a statement of how two numbers compare
Equal Parts: all parts in the same proportion, or a whole shared equally
Proportion: a statement that links two ratios
Order: to place a number in a determined sequence
Part: a section of a whole
Equivalent: of equal value
Factors: integers that multiply together to get the original value
Scale: the comparison of something drawn to its actual size.

Representing a ratio

"For every 5 boys there are 3 girls"

This is the "whole" – boys and girls together

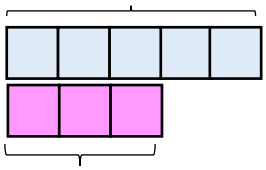


This represents the 5 boys | This represents the 3 girls

5:3

Double Number Line

This represents the 5 boys



This is the "whole" – boys and girls together

This represents the 3 girls

Order is Important

"For every dog there are 2 cats"

Dogs: Cats

1:2

The ratio has to be written in the same order as the information is given.
e.g. 2:1 would represent 2 dogs for every 1 cat ✗

Simplifying a ratio

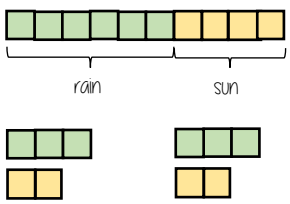
Cancel down the ratio to its lowest form

"For every 6 days of rain there are 4 days of sun"

6:4

÷ by 2

3:2



Find the biggest common factor that goes into all parts of the ratio

For **6** and **4** the biggest factor (number that multiples into them is **2**)

"For every 3 days of rain there are 2 days of sun" – when this happens twice the ratio becomes 6:4

Ratio 1:n (or n:1)

This is asking you to cancel down until the part indicated represents 1

Show the ratio 4:20 in the ratio of 1:n

The question states that **this part has to be** 1 unit Therefore **Divide by 4**

4 : 20

1 : 5

This side has to be divided by 4 too – to keep in **proportion**

H the n part does not have to be an integer for this type of question

Units are important:

When using a ratio – all parts should be in the same units

Useful Conversions

mm ⇄ cm ⇄ m ⇄ km (×10, ×100, ×1000 / ÷10, ÷100, ÷1000)

g ⇄ kg (×1000 / ÷1000)

ml ⇄ L (×1000 / ÷1000)

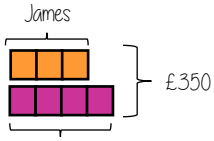
Sharing a whole into a given ratio

James and Lucy share £350 in the ratio 3:4
Work out how much each person earns

Model the Question

James: Lucy

3 : 4



Find the value of one part

Whole: £350
7 parts to share between
(3 James, 4 Lucy)

£350 ÷ 7 = £50

□ = one part = £50

Put back into the question

James: Lucy

(×50) 3 : 4 (×50)

£150 : £200

James = 3 x £50 = £150

Lucy = 4 x £50 = £200

Finding a value given 1:n (or n:1)

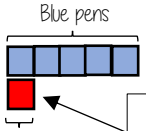
Inside a box are blue and red pens in the ratio 5:1
If there are 10 red pens how many blue pens are there?

Model the Question

Blue : Red

5 : 1

□ = one part = 10 pens



One unit = 10 pens

Put back into the question

Blue : Red

(×10) 5 : 1 (×10)

50 : 10

Blue pens = 5 x 10 = 50 pens

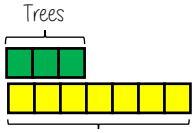
Red pens = 1 x 10 = 10 pens

There are 50 Blue Pens

Ratio as a fraction

Trees: Flowers

3 : 7



Ratio

There are **3** parts for trees

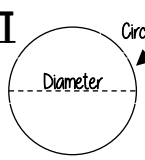
Fraction of trees

Fraction

Number of parts of in group / Total number of parts = 3 / 10

Tree parts **3** + Flower parts **7** = 10

Pi π



The ratio of a circles circumference to its diameter

R2 - RATIO

Retrieval Practice

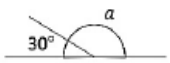
1) Which of the numbers are prime?

2, 4, 5, 9, 21

2) What is the Highest Common Factor of 12 and 18?

3) A bag contains 3 red and 4 blue counters.
A counter is taken at random.
What is the probability the counter is red?

4) Work out the value of a.



Vocabulary check: Regular

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:

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Solve problems with ratio – M801, U577, U676

Career Focus - Where could this take you?

I'm a baker. I adjust ingredient ratios to create recipes and bake goods with the right taste and texture.

Topic Links

This topic links to:

- Similar shapes, enlargements, vector geometry.

Additional Resources

Corbettmaths

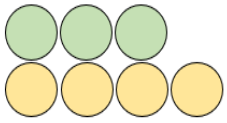
To further practise and develop your knowledge see:

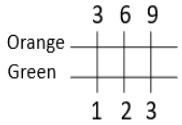
- Videos: 269-271

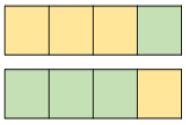
Self quizzing

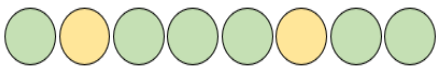
Match each ratio card to its corresponding representation.

3 : 1 | 3 : 4 | 1 : 3









Challenge Activities

Which of these ratios are the same?

$8a : 10a$

$\frac{28}{45} : \frac{35}{45}$

$16 : 20$

$4 : 5$

$0.8 : 1$

$4 \times 10^3 : 5 \times 10^2$

YEAR 8 — AUTUMN

R3 - PROPORTION AND SCALE

Sparx Maths

Direct proportion – U721, U640 Conversion graphs – U652, U741
Convert between currencies – U610 Direct proportion graphs – U721, U238
Similar shapes – U551, U578, U630 Convert metric units – M774, U388
Scale diagrams – M112 Interpret maps using scale and ratios – M112, M801, U577

What do I need to be able to do?

Step 1 Direct proportion
Step 2 Conversion graphs
Step 3 Convert between currencies
Step 4 Direct proportion graphs
Step 5 Similar shapes
Step 6 Convert metric units
Step 7 Scale diagrams
Step 8 Interpret maps using scale and ratios

Keywords

Ratio: a statement of how two numbers compare
Equal Parts:: all parts in the same proportion, or a whole shared equally
Proportion: a statement that links two ratios
Order: to place a number in a determined sequence
Part: a section of a whole
Equivalent: of equal value
Factors: integers that multiply together to get the original value
Scale: the comparison of something drawn to its actual size.

Direct Proportion

As one variable changes the other changes at the same rate

This is a multiplicative change

4 cans of pop = £2.40

4 cans of pop = £2.40 → 2 cans of pop = £1.20 (× 0.5)

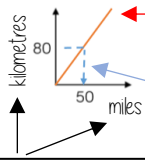
4 cans of pop = £2.40 → 12 cans of pop = £7.20 (× 3)

This multiplier is the same in the same way that this would be for ratio

Sometimes this is easiest if you work out how much one unit is worth first
e.g. 1 can of pop = £0.60

Conversion Graphs

Compare two variables



This is always a straight line because as one variable increases so does the other at the same rate

To make conversions between units you need to find the point to compare – then find the associated point by using your graph
Using a ruler helps for accuracy
Showing your conversion lines help as a "check" for solutions

Labelling of both axes is vital

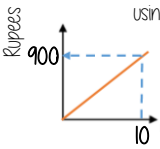
Conversion between currencies

£1 = 90 Rupees ← Currency is directly proportional

For every £1 I have 90 Rupees

£1 = 90 Rupees → £10 = 900 Rupees (× 10)

Currency can be converted using a conversion graph



Convert 630 Rupees into Pounds

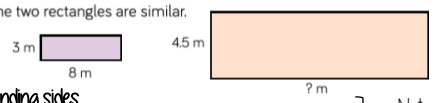
£1 = 90 Rupees → £7 = 630 Rupees (× 7)

630 ÷ 90 = 7

Ratio between similar shapes

Angles in similar shapes do not change
e.g. if a triangle gets bigger the angles can not go above 180°

The two rectangles are similar.



Corresponding sides

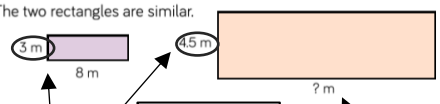
3m : 4.5m → 1m : 1.5m (÷ 3)

8m : 12m → 1m : 1.5m (÷ 8)

Note
Simplify to the same ratio

Understand Scale Factor

The two rectangles are similar.



3 x 1.5 = 4.5

This is a multiplicative change

Missing length
8 x 1.5 = 12m

Use **corresponding** sides to calculate a scale factor

Scale factor can also be calculated by: **Bigger corresponding side ÷ Smaller corresponding side**

Small corresponding side → Big corresponding side (× SF)
Big corresponding side → Small corresponding side (÷ SF)

Draw and interpret scale diagrams

A picture of a car is drawn with a scale of 1:30

For every 1cm on my image is 30cm in real life

The car image is 10cm

Image	Real life
1cm	30cm
10cm	300cm

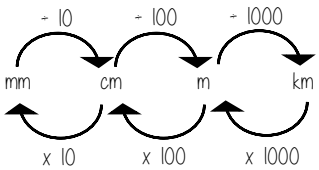
(× 10 / × 10)

The car in real life is 210cm

Image	Real life
1cm	30cm
7cm	210 cm

(× 7 / × 7)

Interpret maps with scale factors



1 cm : 250 m

Ratios need to be in the same units

1 cm : 250m
1 cm : 25000cm

250 x 100 = 25000

For every 1cm on my map is 25000cm in real life

R3 - PROPORTION AND SCALE

Retrieval Practice

1) What is the ratio of green to red?

2) Work out $2 \times 2 \times 2 \times 3$

3) A bag contains 3 red and 4 blue counters.
A counter is taken at random.
What is the probability the counter is blue?

4) What is $\frac{3}{5}$ of 20?

Vocabulary check: Commutative

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:

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Conversion graphs – U652, U741
Convert between currencies – U610
Direct proportion graphs – U721, U238
Similar shapes – U551, U578, U630
Convert metric units – M774, U388
Scale diagrams – M1121
Interpret maps using scale and ratios – M1112, M801, U577

Career Focus - Where could this take you?

I am a manufacturing engineer: I determine production rates and resource requirements by analysing conversion graphs.

Topic Links

This topic links to:

- Best Value, Recipes, Equivalent ratios and fractions

Additional Resources

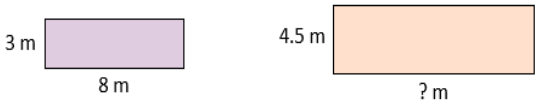
Corbettmaths

To further practise and develop your knowledge see:

- Videos:151, 152, 254, 255, 349

Self quizzing

The two rectangles are similar.



The height has gone up by 1.5 m, so the width of the orange rectangle is 9.5 m.

The ratio of the height of the purple to orange rectangle is 2 : 3

Do you agree with Rosie or Tommy?
Explain your answer.

Challenge Activities

A toy train costs three times as much as a rocket.

The total cost of the train and rocket is £52

How much does the train cost?

YEAR 8 — AUTUMN

A4 - ALGEBRAIC MANIPULATION

Sparx Maths

Form algebraic expressions – M813, M830 Simplify expressions – M795, M531, M949
Identify and use formulae, expressions, identities and equations – M813, M208, M521, M957
Use directed number with algebra – M106, M288
Substitution with directed number – M417, M327, M208
Expand a single bracket – M237 Factorise into a single bracket – M100
Expand single brackets and simplify – M792 Expand double brackets of the form (x±a)(x±b) (E) – U768
Factorise quadratic expressions (E) – U178, U858, U960 Expand double brackets (E) – U768, U606

What do I need to be able to do?

Step 1 Form algebraic expressions
Step 2 Identify and use formulae, expressions, identities and equations
Step 3 Simplify expressions
Step 4 Use directed number with algebra
Step 5 Substitution with directed number
Step 6 Expand a single bracket
Step 7 Factorise into a single bracket
Step 8 Expand single brackets and simplify
Step 9 Expand double brackets of the form (x±a)(x±b) (E)
Step 10 Factorise quadratic expressions (E)
Step 11 Expand double brackets (E)

Keywords

Expression – A combination of numbers, variables, and operations without an equal sign.
Equation – A mathematical statement showing two expressions are equal, often solved to find unknown values.
Formula – A rule or relationship written using symbols, often used to calculate values
Identity – An equation that is always true for all values of the variables .
Simplify – To reduce an expression to its simplest form by combining like terms or performing operations.
Substitution – Replacing a variable with a number to evaluate an expression or solve an equation.
Expand – Removing brackets by multiplying terms
Factorise – Writing an expression as a product of its factors
Directed Number – A number with a sign (positive or negative), used in algebra to handle operations with negatives

Form expressions

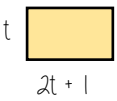
For unknown variables, a letter is normally used in its place

More than – **ADD**
Less than/ difference – **SUBTRACT**

e.g 4 more than t → t + 4
8 less than k → k - 8

Only similar terms can be grouped together

e.g Find the perimeter of this shape
(Perimeter = length around outside of shape)



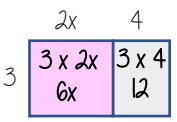
t + 2t + 1 + t + 2t + 1 → 6t + 2

Directed numbers

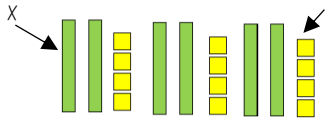
+ + → +
- - → +
+ - → -
- + → -

e.g a = -5 and b = 2
a^2 = a x a = -5 x – 5 = 25
b + a = 2 + - 5 = -3

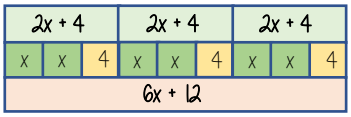
Multiply single brackets 3 (2x + 4)



6x + 12

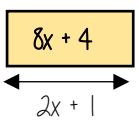


6x + 12



Different representations of 3(2x+4) = 6x + 12

Factorise into a single bracket 8x + 4



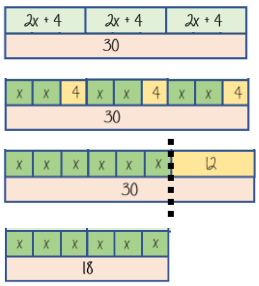
Try and make this the **highest common factor**

The two values **multiply** together (also the area) of the rectangle

8x + 4 ≡ 4 (2x + 1)

Note:
8x + 4 ≡ 2(4x + 2)
This is factorised but the HCF has not been used

Solve equations with brackets 3 (2x + 4) = 30



3 (2x + 4) = 30

Expand the brackets

6x + 12 = 30
-12 -12

6x = 18
÷ 6 ÷ 6

x = 3

Substitute to check your answer. This could be negative or a fraction or decimal

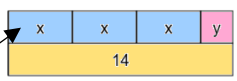
Substituting known variables

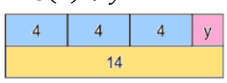
A line has the equation 3x + y = 14

Two different variables, two solutions

Stephanie knows the point x = 4 lies on that line. Find the value for y

$x = 4$





12 + y = 14
-12 -12
y = 2

Algebraic constructs

Expression A sentence with a minimum of two numbers and one maths operation
Equation A statement that two things are equal
Identity An equation where both sides have variables that cause the same answer includes ≡
Formula A rule written with all mathematical symbols e.g area of a rectangle A = b x h

Expanding double brackets

Double: Where each term in the first bracket is multiplied by all terms in the second bracket. A double bracket will be a quadratic equation.

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

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

Factorising Quadratics

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

Factorise:

$x^2 + 6x + 8$ = $(x + 2)(x + 4)$

Add to find the middle term 2+4

Multiply to find the end term
1 x 8 2 x 4

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

Add to find the middle term -3 + 1

Multiply to find the end term 1 x 3

A4 - ALGEBRAIC MANIPULATION

Retrieval Practice

1) List the possible outcomes from flipping two coins.

2) Is "height in cm" discrete or continuous data?

3) Does (4, 5) lie on the line $y = x$?

4) Share £80 in the ratio 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

Form algebraic expressions – M813, M830
Simplify expressions – M795, M531, M949
Identify and use formulae, expressions, identities and equations – M813, M208, M521, M957
Use directed number with algebra – M106, M288
Substitution with directed number – M417, M327, M208
Expand a single bracket – M237 Factorise into a single bracket – M100
Expand single brackets and simplify – M792
Expand double brackets of the form (x±a)(x±b) (E) – U768
Factorise quadratic expressions (E) – U178, U858, U960
Expand double brackets (E) – U768, U606

Career Focus - Where could this take you?

Mathematics plays a crucial role in many criminal investigations.

Topic Link

This topic links to:
Solving Linear Equations and Basic Inequalities

Additional Resources

To further practice and develop your knowledge see Sparx clips above or Videos 111, 111a
https://corbettmaths.com/contents/

Anagrams

ftcnfeceiio

veaeinlutq

tocudrp

Self quizzing

Simplify the expressions on the cards.

$3p + 4p - 8p$

$-3p - 4p - 8p$

$-3p + 4p - 8p$

$3 \times -4p$

$-3 \times -4p$

$-3 \times 4p$

$-3 \times -4p \times -2$

Expand these brackets.

$3(x + 5)$

$3(x - 5)$

$-3(x - 5)$

$3(5 - x)$

$-3(x + 5)$

$x(x + 5)$

$3(5 + x)$

$2x(5 - x + y)$

Challenge Activities

Dora and Amir are both given the same starting number.

Dora: I triple the number and add on seven

Amir: I add two to the number and then multiply by 4

Dora's answer is less than Amir's.
Is it possible that the starting number was negative?
If so, give an example.

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 8 HALF TERM 2 (Autumn 2) :

A5 - COORDINATES AND GRAPHS

N8 - MULTIPLYING & DIVIDING FRACTIONS

G3 - SYMMETRY AND REFLECTIONS

YEAR 8 — AUTUMN

A5 - COORDINATES AND GRAPHS

What do I need to be able to do?

Step 1 Coordinates in all four quadrants
Step 2 Lines parallel to the axes
Step 3 Table of values
Step 4 Recognise and use the line y=x
Step 5 Lines of the form y=mx
Step 6 Link y=mx to direct proportion (E)
Step 7 Introduce gradient (y=mx)
Step 8 Lines with a negative gradient
Step 9 Lines of the form y=x+c
Step 10 Lines of the form y=mx+c
Step 11 Find the midpoint of a line segment (E)
Step 12 Solve problems with coordinates and graphs
Step 13 Quadratic graphs (E)

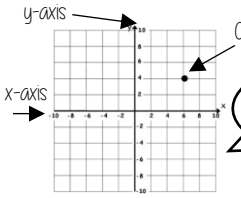
Sparx Maths

Coordinates in all four quadrants – M618, U789
Lines parallel to the axes – M797 Table of values – M932, U741
Recognise and use the line y = x – M932, U741 Lines of the form y = mx – U741, U315
Link y = mx to direct proportion (E) – U721, U640 Introduce gradient (y = mx) – U315, U477
Lines with a negative gradient – U741, U315 Lines of the form y = x + c – U741, U315
Lines of the form y = mx + c – U315, U669 Find the midpoint of a line segment (E) –
M622, M311 Solve problems with coordinates and graphs (E) – M230, U741, U315
Quadratic graphs (E) – U989, U667, U601

Keywords

Gradient: the steepness of a line
Intercept: where two lines cross. The y-intercept: where the line meets the y-axis.
Parallel: two lines that never meet with the same gradient.
Co-ordinate: a set of values that show an exact position on a graph.
Linear: linear graphs (straight line) – linear common difference by addition/ subtraction
Asymptote: a straight line that a graph will never meet.
Reciprocal: a pair of numbers that multiply together to give 1.
Perpendicular: two lines that meet at a right angle.

Coordinates in four quadrants

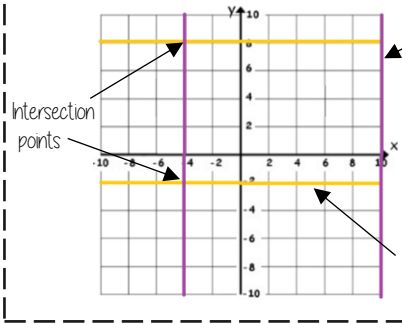


From the origin this coordinate is 6 places along the positive x axis and 4 places up the positive y axis

(x, y)
Always the position on the x axis first
Always the position on the y axis second

(0, a) Will be always be a point on the y axis (a can be any number)
(a, 0) Will be always be a point on the x axis (a can be any number)

Lines parallel to the axes



All the points on this line have a x coordinate of 10

'a' can be ANY positive or negative value including 0

Lines parallel to the **y axis** take the form **x = a** and are **vertical**

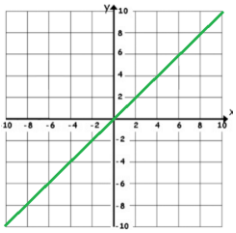
Lines parallel to the **x axis** take the form **y = a** and are **horizontal**

All the points on this line have a y coordinate of -2

e.g. (3, -2) (7, -2) (-2, -2) all lay on this line because the y coordinate is -2

Recognise and use the line y=x

This means the x and the y coordinate have the same value

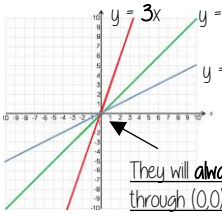


Examples of coordinates on this line: (0, 0) (-3, -3) (8, 8)

The axes **scale is important** – if the scale is the same y = x will be a straight line at 45°

Recognise and use the lines y=kx

The value of **k** changes the steepness of the line



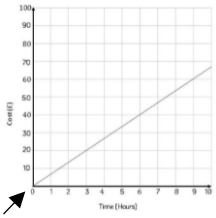
Note: y =x is the same as y= 1x

The bigger the value of k the **steeper** the line will be.

They will **always** go through (0,0)

The closer to 0 the value of k the closer the line will be to the x axis.

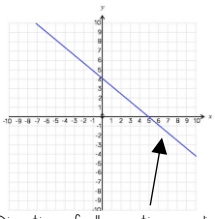
Direct Proportion using y=kx



The line must be straight to be directly proportional – variables increase at the same rate **k**

Direct proportion graphs always start at (0,0) as they are describing relationships between two variables

Lines with negative gradients

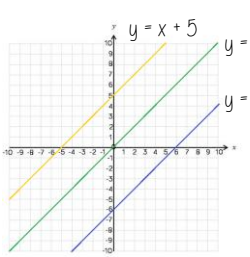


Any straight-line graph with a negative x value has a negative gradient

E.g. y = -2x
y = -x y + x = 12

Direction of all negative gradients

Lines in the form y = x + a



All the lines are **parallel** because the gradients are the same

y = x + a

This is the line y=x when the y and x coordinate are the same

This shows the translation of that line
e.g. y = x + 5
Is the line y=x moved 5 places up the graph

5 has been added to each of the x coordinates

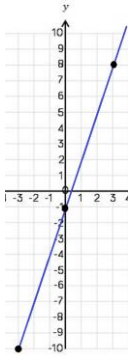
Plotting y = mx + c graphs

$y = 3x - 1$ → 3 x the x coordinate then – 1

x	-3	0	3
y	-10	-1	8

Draw a table to display this information

This represents a coordinate pair (-3, -10)



You only need two points to form a straight line

Plotting more points helps you decide if your calculations are correct (if they do make a straight line)

Remember to join the points to make a line

A5 - COORDINATES AND GRAPHS

Retrieval Practice

1) Work out $\frac{1}{2} \div \frac{1}{8}$

2) Find the product of 7 and $\frac{2}{3}$

3) A rectangle is 20 cm long and 8 cm wide.
The rectangle is enlarged by scale factor 2
Write down the dimensions of the enlarged rectangle.

4) What is the highest common factor of 60 and 84?

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

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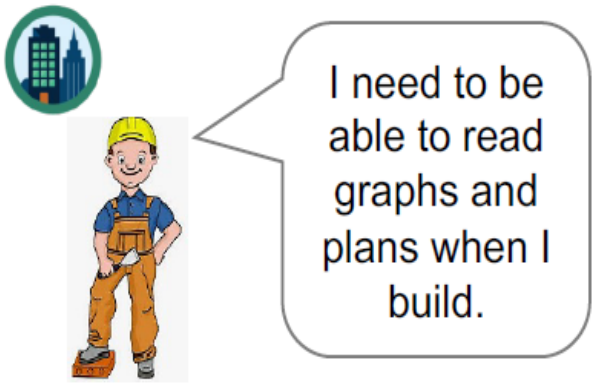
Lines with a negative gradient – U741, U315
Lines of the form y = x + c – U741, U315
Lines of the form y = mx + c – U315, U669
Find the midpoint of a line segment (E) – M622, M311
Solve problems with coordinates and graphs (E) – U741, U315
Quadratic graphs (E) – U989, U667, U601

Career Focus - Where could this take you?



Topic Links

This topic links to:

- Drawing conversion graphs, scatter graphs and correlation.

Additional Resources

Corbettmaths

To further practise and develop your knowledge see:

- Videos: 84 - 88

Self quizzing

On the same axes, draw the graphs of the following equations by completing the table of values.
Discuss key features of each graph.

$y = 3x - 1$

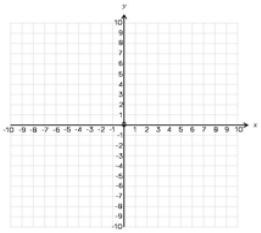
x	−3	0	3
y			

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

x	−6	0	6
y			

$y = -2x + 6$

x	−2	0	2
y			

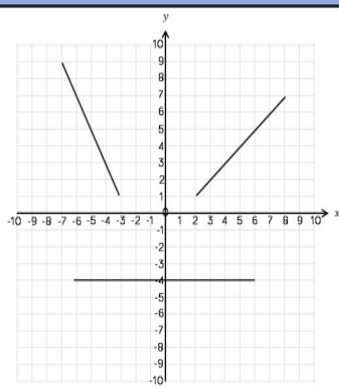


Plotting the graphs can help identify any errors in your table.

Alex

Comment on Alex's statement. What does she mean?

Challenge Activities



Work out the midpoint of the following line segments.

Using the same coordinate grid, draw a line with a midpoint of (0, 1)

What are the end points? How many different pairs of end points could there be?

YEAR 8 — AUTUMN

N8 - MULTIPLYING & DIVIDING FRACTIONS

Sparx Maths

Divide a fraction by an integer – M110
Multiply a fraction by an integer – M157 Multiply fractions – M157, U475
Understand reciprocals – M216 Divide an integer by a fraction – M110
Divide a fraction by a unit fraction – M110 Divide fractions – M110, U544
Multiply and divide mixed numbers – M197, M265, U224, U538
Multiply and divide algebraic fractions (E) – U457, U824

What do I need to be able to do?

Step 1 Divide a fraction by an integer
Step 2 Multiply a fraction by an integer
Step 3 Multiply fractions
Step 4 Understand reciprocals
Step 5 Divide an integer by a fraction
Step 6 Divide a fraction by a unit fraction
Step 7 Divide fractions
Step 8 Multiply and divide mixed numbers
Step 9 Multiply and divide algebraic fractions (E)

Keywords

Numerator : the number above the line on a fraction. The top number. Represents how many parts are taken
Denominator: the number below the line on a fraction. The number represent the total number of parts.
Whole: a positive number including zero without any decimal or fractional parts.
Commutative: an operation is commutative if changing the order does not change the result.
Unit Fraction: a fraction where the numerator is one and denominator a positive integer.
Non-unit Fraction: a fraction where the numerator is larger than one.
Dividend : the amount you want to divide up.
Divisor: the number that divides another number.
Quotient: the answer after we divide one number by another. e.g. dividend÷ divisor = quotient
Reciprocal: a pair of numbers that multiply together to give 1.

Representing a fraction

Numerator / Denominator

$\frac{3}{5}$

Number of parts represented
Numerator

Number of parts to make up the whole
Denominator

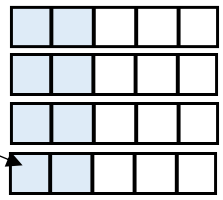
ALL PARTS of a fraction are of equal size

Repeated addition = multiplication by an integer

$4 \times \frac{2}{5} \rightarrow \frac{2}{5} + \frac{2}{5} + \frac{2}{5} + \frac{2}{5}$

Integer (Whole number)

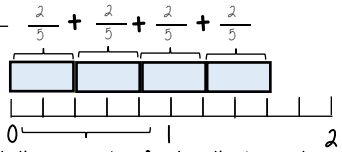
Each part represents $\frac{1}{5}$



How many parts are shaded?
What each part represents

$= \frac{8}{5}$

$= 1\frac{3}{5}$



Each whole is split into the same number of parts as the denominator

Revisit
When adding fractions with the same denominator = add the numerators

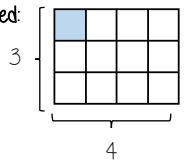
Multiplying unit fractions

$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

Parts shaded

Total number of parts in the diagram

Modelled:



Multiplying non-unit fractions

Shade in 3 parts

Repeat it on this many rows

$\frac{3}{4} \times \frac{2}{3}$

This many columns

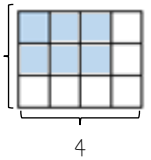
This many rows

$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$

Parts shaded

Total number of parts in the diagram

Modelled:



Quick Multiplying and Cancelling down

$\frac{\cancel{3}^{1}}{5} \times \frac{4}{\cancel{9}_{3}}$

The 3 and the 9 have a common factor and can be simplified

Quick Solving
Multiply the numerators
Multiply the denominators

$\frac{1 \times 4}{5 \times 3} = \frac{4}{15}$

The reciprocal *When you multiply a number by its reciprocal the answer is always 1*

$3 \times \frac{1}{3} = 1$

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

The reciprocal of 3 is $\frac{1}{3}$ and vice versa

Reciprocals for division

e.g $5 \div \frac{1}{4} = 20$

$5 \times 4 = 20$

Multiplying by a reciprocal gives the same outcome

Dividing an integer by an unit fraction

$1 \div \frac{1}{4} = 4$

How many quarters are in 1?

"There are 4 quarters in 1 whole. Therefore, there are 20 quarters in 5 wholes"

$5 \div \frac{1}{4} = 20$

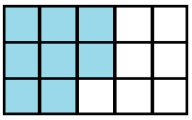
Dividing any fractions *Remember to use reciprocals*

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

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

Multiplying by a reciprocal gives the same outcome

Represented



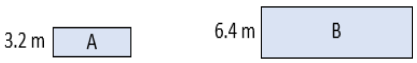
$= \frac{8}{15}$

N8 - MULTIPLYING & DIVIDING FRACTIONS

Retrieval Practice

1) A map is drawn to a scale of 1 : 200
What distance is represented by 4 cm on the map?

2) Shapes A and B are similar.
What is the scale factor of the enlargement from A to B?



3) Write the ratio 120 : 200 in its simplest form.

4) Solve the equation $3a + 7 = 82$

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

Divide a fraction by an integer – M110
Multiply a fraction by an integer – M157
Multiply fractions – M157, U475
Understand reciprocals – M216
Divide an integer by a fraction – M110
Divide a fraction by a unit fraction – M110
Divide fractions – M110, U544
Multiply and divide mixed numbers – M197, M265, U224, U538
Multiply and divide algebraic fractions (E) – U457, U824

Career Focus - Where could this take you?

I also adjust recipe quantities by multiplying or dividing fractions for accurate ingredient measurements.

Topic Links

This topic links to:

- Finding fractions of an amount, algebraic fractions, percentages

Additional Resources

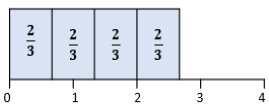
Corbettmaths

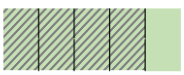
To further practise and develop your knowledge see:

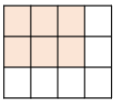
- Videos: 22, 23

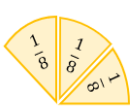
Self quizzing

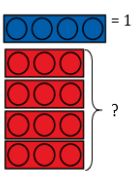
What multiplication do each of the diagrams show?





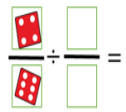






Challenge Activities

Eva and Rosie are playing a game with 4 dice arranged in a calculation. If the answer is a whole number you win a point.



What numbers could Eva roll to score a point?

Here is Rosie's roll. Can she score a point?

YEAR 8 — AUTUMN

G3 - SYMMETRY AND REFLECTIONS

Sparx Maths

Line symmetry – M523
Reflect a shape in a horizontal or vertical line – M290
Reflect a shape in a diagonal line – M290
Reflect a shape given equation of a line (E) – U799
Describe a reflection (E) – U799

What do I need to be able to do?

Step 1 Line symmetry
Step 2 Rotational symmetry
Step 3 Reflect a shape in a horizontal or vertical line
Step 4 Reflect a shape in a diagonal line
Step 5 Reflect a shape given equation of a line (E)
Step 6 Describe a reflection (E)

Keywords

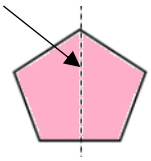
Mirror line: a line that passes through the center of a shape with a mirror image on either side of the line
Line of symmetry: same definition as the mirror line
Reflect: mapping of one object from one position to another of equal distance from a given line.
Vertex: a point where two or more-line segments meet.
Perpendicular: lines that cross at 90°
Horizontal: a straight line from left to right (parallel to the x axis)
Vertical: a straight line from top to bottom (parallel to the y axis)

Rotational Symmetry – A shape has rotational symmetry if it looks the same after being rotated around a central point.

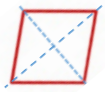
Describing Transformations – Clearly stating the type of transformation, the line of reflection, and the direction or position of the image

Lines of symmetry

Mirror line (line of reflection)



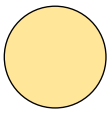
Shapes can have more than one line of symmetry…
This regular polygon (a regular pentagon has 5 lines of symmetry)



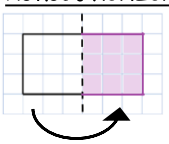
Rhombus
two lines of symmetry

Parallelogram
No lines of symmetry

A circle has an infinite amount of lines of symmetry

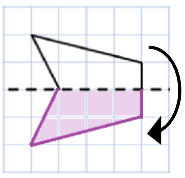


Reflect horizontally/ vertically (1)



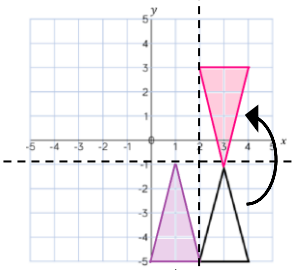
Note: a reflection doubles the area of the original shape

Reflection in a vertical line



Reflection in a horizontal line

Reflection on an axis grid

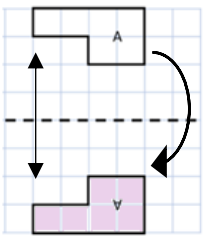


Reflection in the line y=-2

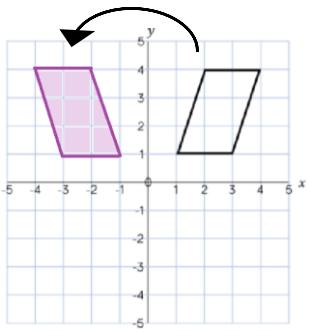
Reflection in the line x=2

Reflect horizontally/ vertically (2)

All points need to be the same distance away from the line of reflection



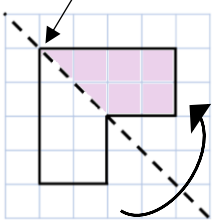
Reflection in the line y axis – this is also a reflection in the line x=0



Lines parallel to the x and y axis
REMEMBER
Lines parallel to the x-axis are y = ____
Lines parallel to the y-axis are x = ____

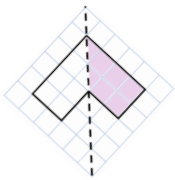
Reflect Diagonally (1)

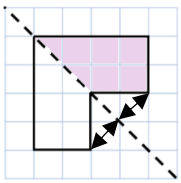
Points on the mirror line don't change position



Fold along the line of symmetry to check the direction of the reflection

Turn your image
If you turn your image it becomes a vertical/ horizontal reflection (also good to check your answer this way)



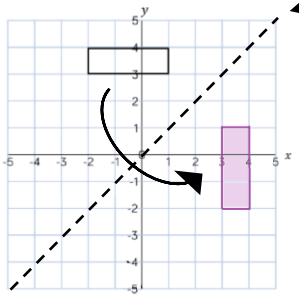


Drawing perpendicular lines

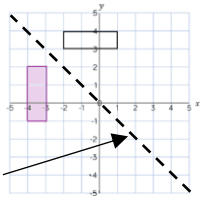
Perpendicular lines to and from the mirror line can help you to plot diagonal reflections

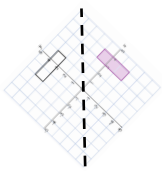
Reflect Diagonally (2)

This is the line **y = x** (every y coordinate is the same as the x coordinate along this line)



This is the line **y = - x**
The x and y coordinate have the same value but opposite sign





Turn your image
If you turn your image it becomes a vertical/ horizontal reflection (also good to check your answer this way)

G3 - SYMMETRY AND REFLECTIONS

Retrieval Practice

1) Find the shaded area.
Give your answer terms of π.

2) Estimate the area of a circle with a radius of 6 m.

3) What is the height of a triangle with an area of 32 cm^2 and a base of 8 cm?

4) Round 85 678 to the nearest hundred.

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

Line symmetry – M523
Reflect a shape in a horizontal or vertical line – M290
Reflect a shape in a diagonal line – M290
Reflect a shape given equation of a line (E) – U799
Describe a reflection (E) – U799

Career Focus - Where could this take you?

I am an architect who builds design plans for offices, buildings and homes. My key responsibilities include using the client's preferences, needs and ideas to create well-designed structures, providing clients with cost estimates, designing construction plans using specifications and scaled drawings

Topic Link

This topic links to Properties of shapes, Cartesian grid, draw and measure lines and angles.

Additional Resources

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

Anagrams

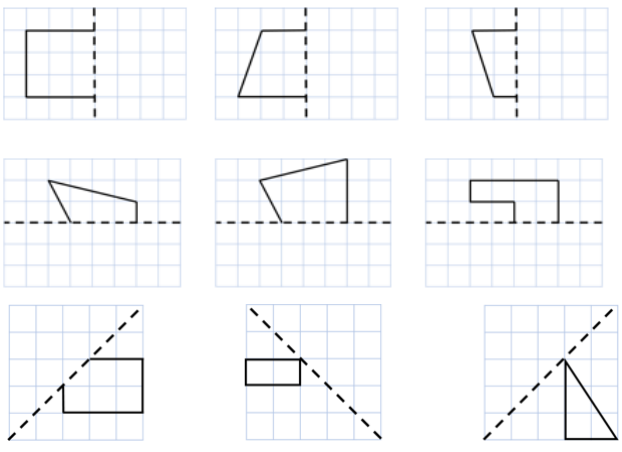
exertv

felrtce

syrtemmy

Self quizzing

Reflect the shapes in the given lines.



Challenge Activities

Draw a pair of axes and draw a square whose opposite corners are at the points $(-3, 3)$ and $(5, -1)$.

What are the equations of the vertical and horizontal lines of symmetry of the square?
Can you generalise?

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 8 HALF TERM 3 (SPRING 1) :

G4 - AREA, VOLUME AND DENSITY

A6 - EQUATIONS AND INEQUALITIES

N9 - PERCENTAGES

YEAR 8 — SPRING

G4 - AREA, VOLUME AND DENSITY

Sparx Maths

Name 2-D and 3-D shapes – M276, M767
Area of a 2-D shape – M390, M610, M291, M705, M231
Area of a compound shape – M269, M996 Recognise prisms M767, M276, M661
Volume of cubes and cuboids – M765, U786
Convert metric units of mass and capacity – M774, U388
Understand the units of mass/density/volume – U910, U527, U256
Solve problems with density, mass and volume – U910, U527, U256, U181
Area and volume in similar shapes (E) – U630, U110

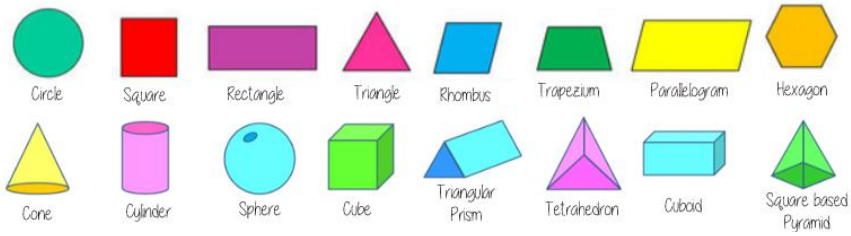
What do I need to be able to do?

Step 1 Name 2-D and 3-D shapes
Step 2 Area of a 2-D shape
Step 3 Area of a compound shape
Step 4 Recognise prisms (including language of edges and vertices)
Step 5 Volume of cubes and cuboids
Step 6 Convert metric units of mass and capacity
Step 7 Understand the units of mass/density/volume
Step 8 Solve problems with density, mass and volume
Step 9 Area and volume in similar shapes (E)

Keywords

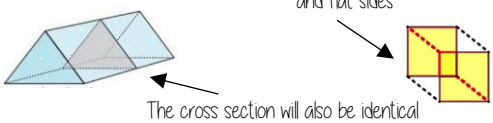
2-D and 3-D Shapes – 2-D shapes are flat (like squares and circles); 3-D shapes have depth (like cubes and spheres).
Area – The amount of space inside a 2-D shape, measured in square units (e.g., cm^2).
Compound Shape – A shape made from two or more simple shapes; area is found by splitting into parts.
Prism – A 3-D shape with identical cross-sections along its length, described using faces, edges, and vertices.
Volume – The amount of space a 3-D object occupies, measured in cubic units (e.g., cm^3).
Metric Units – Standard units for measuring mass (grams, kilograms), capacity (millilitres, litres), and volume (cm^3, m^3).
Density – A measure of mass per unit volume.
Mass – The amount of matter in an object, usually measured in grams (g) or kilograms (kg).
Similar Shapes – Shapes that have the same shape but different sizes; areas and volumes scale by square and cube of the scale factor.

Name 2D & 3D shapes



Recognise prisms

A solid object with two identical ends and flat sides



The cross section will also be identical to the end faces.

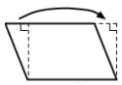
A cylinder although with very similar properties does not have flat faces so is not categorised as a prism

Area of 2D shapes

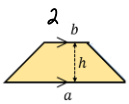
Rectangle
Base x Height

Triangle
½ x Base x Perpendicular height

Parallelogram/ Rhombus
Base x Perpendicular height



Area of a trapezium
$\frac{(a+b) \times h}{2}$



Area of a circle
$\pi \times radius^2$

Surface area - cylinders

The area of the circle
$\pi \times radius^2$

The width of this face is the same as the circumference
$\pi \times diameter \times height$

$2 \times \pi \times radius^2 + \pi \times diameter \times height$

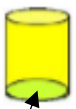
Volumes

Volume is the 3D space it takes up – also known as capacity if using liquids to fill the space

Counting cubes
Some 3D shape volumes can be calculated by counting the number of cubes that fit inside the shape.

Cubes/ Cuboids = base x width x height

Remember multiplication is commutative



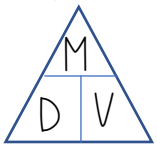
Cross section

Cross section

Prisms and cylinders = area cross section x height

Height can also be described as depth

Compound Measures



Density/Mass/Volume formula

Speed/Distance and Time formula

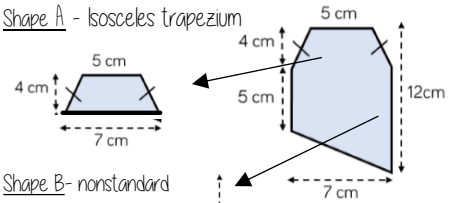
Areas – square units
Volumes – cube units

Areas and volumes can be left in terms of pi π

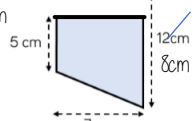
Compound shapes

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



Shape A + Shape B = total area

$\frac{(5+7) \times 4}{2} + \frac{(5+8) \times 7}{2}$

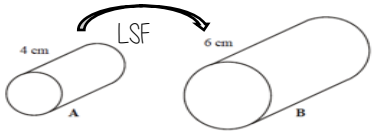
= 24 + 45.5
= 69.5cm^2

Units

similar shapes

Similar shapes are an enlargement of one another.
Length, area and volume scale factors are all linked.

Example:
Length scale factor = 2
Area scale factor = 2^2
Volume scale factor = 2^3



The volume of cylinder A is 80 cm^3.
Calculate the volume of cylinder B.

$$Length\ scale\ factor = \frac{6}{4} = 1.5$$

$$Volume\ of\ B = 80 \times 1.5^3 = 270cm^3$$

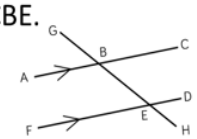
G4 - AREA, VOLUME AND DENSITY

Retrieval Practice

1) What is the size of the angle made when two perpendicular lines intersect?

2) Find the sum of the interior angles of an octagon.

3) Name the angle alternate to ∠CBE.



4) Estimate the answer to 826 × 19.7

Vocabulary check: Circumference

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

Name 2-D and 3-D shapes – M276, M767
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Career Focus - Where could this take you?

I am an architect who builds design plans for offices, buildings and homes. My key responsibilities include using the client's preferences, needs and ideas to create well-designed structures, providing clients with cost estimates, designing construction plans using specifications and scaled drawings

Topic Link

This topic links to: Properties of shapes, Recognise types of 2D shapes, substitution, order of operations

Additional Resources

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

Anagrams

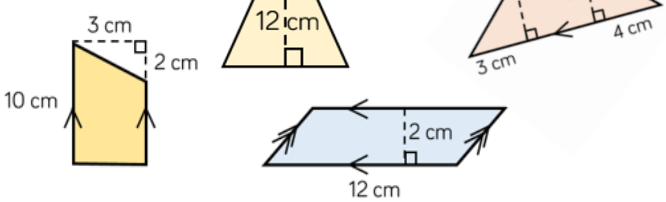
eralucidneprp

ralumof

tiynifni

Self quizzing

Give the mathematical name of each shape.

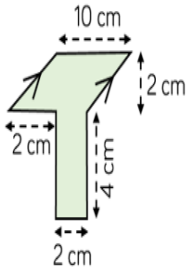


Find the areas of the shapes.
Did you use the same method for each one?

Challenge Activities

Show that the area of the shape is 28 cm².

What smaller shapes did you split the shape into?



YEAR 8 — SPRING

A6 - EQUATIONS AND INEQUALITIES

Sparx Maths

Solve simple 1 and 2-step equations – M707, M634, U755, U325
Solve more complex equations – M401, M647, M902, U325
Solve fractional equations – M401, M647, U505Form and solve equations – M957, U599, U137
Solve equations with unknowns on both sides – M554, U870
Understand and use inequalities – U759, U738, U145
Inequalities on a number line – M384, U509 Solve simple inequalities – M118, U759
Form and solve inequalities – U337 Solve inequalities with unknowns on both sides (E) – U738

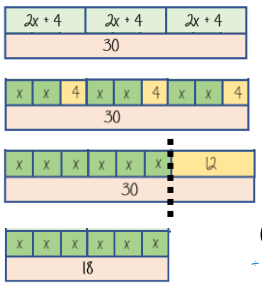
What do I need to be able to do?

Step 1 Solve simple 1 and 2-step equations
Step 2 Solve more complex equations
Step 3 Solve factional equations
Step 4 Form and solve equations
Step 5 Solve equations with unknowns on both sides
Step 6 Understand and use inequalities
Step 7 Inequalities on a number line
Step 8 Solve simple inequalities
Step 9 Form and solve inequalities
Step 10 Solve inequalities with unknowns on both sides (E)

Keywords

Solution: a value we can put in place of a variable that makes the equation true
Variable: a symbol for a number we don't know yet
Equation: an equation says that two things are equal – it will have an equals sign =
Expression: numbers, symbols and operators grouped together to show the value of something
Identity: An equation where both sides have variables that cause the same answer includes ≡
Linear: an equation or function that is the equation of a straight line
Intersection: the point that two lines meet
Inequality: an inequality compares two values showing if one is greater than, less than or equal to another.

Solve equations with brackets



3 (2x + 4) = 30

Expand the brackets

6x + 12 = 30

-12 -12

6x = 18

÷6 ÷6

x = 3

Form and solve inequalities

Two more than treble my number is greater than 11

Find the possible range of values

3x + 2 > 11

Solve

x ← -3 ← -2 ← 11

x > 3

Inequalities with negatives

Method 1 Make x positive first

2 – 3x > 17
+3x +3x
2 > 17 + 3x
-17 -17
-15 > 3x
÷3 ÷3
-5 > x

x is true for any value smaller than -5

Smaller ← → Bigger
-7 -5 -3

✓ CHECK IT!
2 – 3(-6) = 20
TRUE/ CORRECT

Method 2 Keep the negative x

2 – 3x > 17
-2 -2
– 3x > 15
÷-3 ÷-3
x > -5

x is true for any value bigger than -5

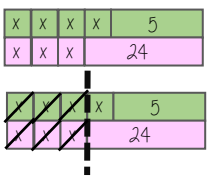
This cannot be true...

x < -5

When you multiply or divide x by a negative you need to reverse the inequality

Equations with unknown on both sides

4x + 5 = 3x + 24
-3x -3x
x + 5 = 24
-5 -5
x = 19



Inequalities with unknown on both sides

Solving inequalities has the same method as equations

5 (x + 4) < 3 (x + 2)
5x + 20 < 3x + 6
2x + 20 < 6
2x < - 14
x < - 7

Check it!

5 (-8 + 4) < 3 (-8 + 2)
5 (-4) < 3 (-6)
-20 < -18

✓ -20 IS smaller than -18

Formulae and Equations

Formulae – all expressed in symbols → **Substitute** in values → **Equations** – include numbers and can be solved

Solutions on a number line

Both represent values less than 1

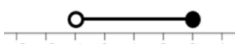
Includes the value 1

Both represent values more than 1

Includes the value 1

● Includes the value it sits above
○ Does NOT include the value it sits above

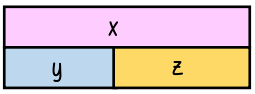
Values less than or equal to 3 but also more than -1



−1 < x ≤ 3

This includes the integer values 0,1,2,3

Rearranging Formulae (one step)



x = y + z

Rearrange to make y the subject.

y = x - z

y → +z → x

y ← -z ← x

Using inverse operations or fact families will guide you through rearranging formulae

Rearranging can also be checked by substitution

Language of rearranging....

Make XXX the subject

Change the subject

Rearrange

A6 - EQUATIONS AND INEQUALITIES

Retrieval Practice

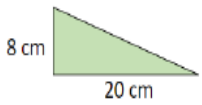
1) A graph of the sequence $5n - 2$ is drawn.
Will the points lie in a straight line? How do you know?

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.



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

Solve simple 1 and 2-step equations – M707, M634, U755, U325
Solve more complex equations – M401, M647, M902, U325
Solve fractional equations – M401, M647, U505
Form and solve equations – M957, U599, U137
Solve equations with unknowns on both sides – M554, U870
Understand and use inequalities – U759, U738, U145
Inequalities on a number line – M384, U509
Solve simple inequalities – M118, U759
Form and solve inequalities – U337
Solve inequalities with unknowns on both sides (E) – U738

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:

- Sequences, Algebra, bar moddeling

Additional Resources

To further practice and develop your knowledge see:

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

Self quizzing

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

Substitute $x = 7$ into each of these expressions

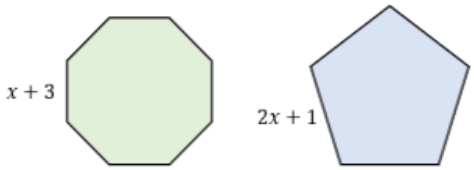
$5x$	$2x$	$8x - 3x$	$x + x$
$2 + 4x$	$3x + 2x$	$6x - x$	$4x + 2$

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

Challenge Activities

The perimeter of the regular octagon is less than the perimeter of the regular pentagon.

- Show this information as an inequality in terms of x
- Find the smallest possible integer value of x



YEAR 8 — SPRING

N9 - PERCENTAGES

Sparx Maths

Percentage of an amount – M437, M905, U554, U349 Convert between percentages and decimals – M264, U888
Use multipliers to find percentages – M905, U349 Percentages using a multiplier – M533, U671
Percentage increase and decrease using a multiplier – M533, U671
Express one number as a fraction or a percentage of another (calculator) – U554, U349
Express one number as a fraction or a percentage of another (non-calculator) – M235, M264
Percentage change – M476, M533, U773, U671 Find the original value given a percentage – U286
Choose appropriate methods to solve percentage problems – U717

What do I need to be able to do?

Step 1 Percentage of an amount
Step 2 Convert between percentages and decimals
Step 3 Use multipliers to find percentages
Step 4 Convert between decimals and percentages greater than 1
Step 5 Percentage increase using a multiplier
Step 6 Percentage decrease using a multiplier
Step 7 Percentage increase and decrease using a multiplier
Step 8 Express one number as a fraction or a percentage of another (calculator)
Step 9 Express one number as a fraction or a percentage of another (non-calculator)
Step 10 Percentage change
Step 11 Find the original value given a percentage
Step 12 Choose appropriate methods to solve problems

Keywords

Percent: parts per 100 — written using the % symbol
Decimal: a number in our base 10 number system. Numbers to the right of the decimal place are called decimals.
Fraction: a fraction represents how many parts of a whole value you have.
Equivalent: of equal value.
Reduce: to make smaller in value.
Growth: to increase/ to grow.
Integer: whole number, can be positive, negative or zero.
Invest: use money with the goal of it increasing in value over time (usually in a bank).
Multiplier: A number you multiply by to increase or decrease another number.
Change: The difference between two values, often used when something increases or decreases.
Value: The amount something is worth or represents in a calculation.
Profit: The amount of money gained after subtracting costs from income.

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: $\frac{\square}{\square}$ → S⇔D → Convert to a decimal

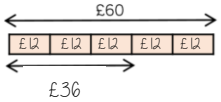
This will give you the answer in the simplest form

× 100 converts to a percentage

Be careful of recurring decimals
e.g. $\frac{1}{3} = 0.3333333 = 0.\dot{3}$
The dot above the 3

Fraction/ Percentage of amount

Find $\frac{3}{5}$ of £60



Remember $\frac{3}{5} = 60\%$

10% of £60 = £6
50% of £60 = £30
60% of £60 = £36

Remember $\frac{3}{5} = 60\% = 0.6$
60% of £60
= 0.6 × 60
= £36

Convert FDP < and > 100%

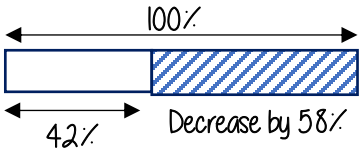
100 hundredths
10 tenths
100%

40 hundredths
4 tenths
40%

140 hundredths
14 tenths
140%

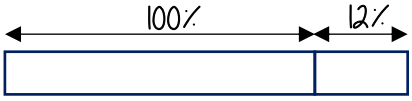
100% + 40%
1 + 0.40
= 1.40

Percentage decrease: Multipliers



100% - 58% = 42%
100 − 0.58 = 0.42 ← Multiplier: Less than 1

Percentage increase: Multipliers



100% + 12% = 112%
100 + 0.12 = 1.12 ← Multiplier: More than 1

Express as a % - Non-calculator

Percent — per hundred

7 per every 10 are orange → $\frac{7}{10}$ → This means that 70 per every 100 are orange → $\frac{70}{100}$ → 70%

27 per every 50 shaded → $\frac{27}{50}$ → 54 per every 100 shaded → $\frac{54}{100}$ → 54%

Denominator 100 | Equivalent fractions

Express as a % - Calculator

$\frac{13}{30}$ → $\frac{\square}{\square}$ → $\frac{13}{30}$ → × 100 → 43.3333...% → 43%

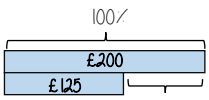
This the same as 13 ÷ 30

Can't use equivalence easily to find 'per hundred'

Decimal percentages are still a percentage

Percentage change

I bought a phone for £200. A year later sold it for £125.

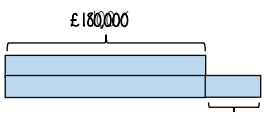


All values of change compare to the ORIGINAL value

Percentage loss
$\frac{75}{200} \times 100 = 37.5\%$

$\frac{\text{Difference in value}}{\text{Original value}} \times 100$

I bought a house for £180,000, I later sold it for £216,000



Percentage profit
Money made (profit value) → $\frac{36000}{180000} \times 100 = 20\%$

Choose appropriate method

The language and wording of the question is the key

Have you represented the question in a bar model?
Can you use a calculator?

N9 - PERCENTAGES

Retrieval Practice

1) Simplify the expression $k^8 \div k^4$

2) Find the 6th term of the sequence given by $\frac{n}{2}(n+3)$

3) Expand $a(7+b+a)$

4) What is the area of a square with sides 12 m?

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

Percentage of an amount – M437, M905, U554, U349
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Express one number as a fraction or a percentage of another (calculator) – U554, U349
Express one number as a fraction or a percentage of another (non-calculator) – M235, M264
Percentage change – M476, M533, U773, U671
Find the original value given a percentage – U286
Choose appropriate methods to solve percentage problems – U717

Careers Focus – Where could this take you?

As a **small business owner** I need to be aware of the percentage profit or loss I make on each transaction. I need to carefully consider my mark up and how much I sell my products for to ensure I stay profitable. My percentage profit is key to understanding whether or not I can afford the charges from third party sellers.

Topic Link

This topic links to:
Fractions, decimals and percentages

Additional Resources
To further practice and develop your knowledge see Sparx clips above or Videos 233, 391 : https://corbettmaths.com/contents/

Self quizzing

Match the multiplier with the correct percentage statement.

92% decrease	0.08
40% increase	1.4
30% increase	0.65
140% increase	0.8
20% decrease	2.4
35% decrease	1.3

Challenge Activities

Annie has some sweets.
Teddy gives her some sweets and she now has 50% more.

Rosie gives her some sweets and she now has an extra 40%. Annie now has 63 sweets.

How many did she have originally?

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 8 HALF TERM 4 (Spring 2):

A7 - INDICES

N10 - STANDARD FORM

S3 - INTERPRET AND REPRESENT DATA

YEAR 8 — SPRING

A7 - INDICES

Sparx Maths

Add and subtract expressions with indices – U662, U105
Multiply and divide expressions with indices – U235, U694
Addition law for indices – U235 Subtraction law for indices – U694
Addition and subtraction laws for indices – U662
Powers of powers (E) – U662, U772
Negative indices (E) – U694, U985 Fractional indices (E) – U772

What do I need to be able to do?

Step 1 Add and subtract expressions with indices
Step 2 Multiply and divide expressions with indices
Step 3 Addition law for indices
Step 4 Subtraction law for indices
Step 5 Addition and subtraction laws for indices
Step 6 Powers of powers (E)
Step 7 Negative indices (E)
Step 8 Fractional indices (E)

Keywords

Base: The number that gets multiplied by a power
Power: The exponent – or the number that tells you how many times to use the number in multiplication
Exponent: The power – or the number that tells you how many times to use the number in multiplication
Indices: The power or the exponent
Coefficient: The number used to multiply a variable
Simplify: To reduce a power to its lowest term
Product: Multiply

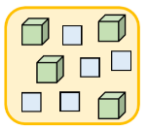
Addition/ Subtraction with indices

Coefficient, Power

$5x^2 + 4x^4$

Term, Term

Expression



Each square represents x^2 and each cube represents x^4

Only similar terms can be simplified
If they have different powers, they are unlike terms

$5x^2 + 2x^2 \rightarrow 7x^2$

$5x^2 + 6x^4 - 3x^2 + x^4 \rightarrow 2x^2 + 7x^4$

Multiply expressions with indices

$4b \times 3a$
$\equiv 4 \times b \times 3 \times a$
$\equiv 4 \times 3 \times b \times a$
$\equiv 12ab$

$5t \times 9t$
$\equiv 5 \times t \times 9 \times t$
$\equiv 5 \times 9 \times t \times t$
$\equiv 45t^2$

$2b^4 \times 3b^2$
$\equiv 2 \times b \times b \times b \times b \times 3 \times b \times b$
$\equiv 2 \times 3 \times b \times b \times b \times b \times b \times b$
$\equiv 6b^6$

There are often misconceptions with this calculation but break down the powers

Divide expressions with indices

$\frac{24}{36} \rightarrow \frac{2 \times 2 \times 2 \times 3}{2 \times 3 \times 2 \times 3} \rightarrow \frac{2}{3}$

$\frac{5a^3b^2}{15ab^6} \rightarrow \frac{5 \times a \times a \times a \times b \times b}{3 \times 5 \times a \times b \times b \times b \times b \times b} \rightarrow \frac{a^2}{3b^4}$

Cross cancelling factors shows cancels the expression

$\frac{23a^7y^2}{5db^6}$

This expression cannot be divided (cancelled down) because there are no common factors or similar terms

Addition/ Subtraction laws for indices

$3^5 \times 3^2 = (3 \times 3 \times 3 \times 3 \times 3) \times (3 \times 3) \rightarrow 3^7$

The base number is all the same so the terms can be simplified

Addition law for indices

$a^m \times a^n = a^{m+n}$

$3^5 \div 3^2 \rightarrow 3^3$

$\frac{3 \times 3 \times 3 \times 3 \times 3}{3 \times 3} \rightarrow \frac{3^3}{3^0} \rightarrow \frac{3^3}{1}$

Subtraction law for indices

$a^m \div a^n = a^{m-n}$

FRACTIONAL INDICES

Square root

$a^{\frac{m}{n}} = \sqrt[n]{a^m}$

$25^{\frac{1}{2}} = \sqrt{25} = 5$

Cube root

$8^{\frac{1}{3}} = \sqrt[3]{8} = 2$

$25^{\frac{3}{2}} = (\sqrt[2]{25})^3 = 5^3 = 125$

Remember that this is the same as $(25^{\frac{1}{2}})^3$

NEGATIVE FRACTIONAL INDICES

$8^{-\frac{1}{3}} = \frac{1}{8^{\frac{1}{3}}} = \frac{1}{2}$

Remember this means the cube root of 8!

$a^{-m} = \frac{1}{a^m}$

$25^{-\frac{3}{2}} = \frac{1}{25^{\frac{3}{2}}} = \frac{1}{5^3} = \frac{1}{125}$

Remember this is the same as $\frac{1}{(25^{\frac{1}{2}})^3}$

A7 - INDICES

Retrieval Practice

1) Find the rule for the n^{th} term of the sequence.

7, 10, 13, 16...

2) Solve the equation $1 = 2 + 4n$

3) Expand $3b(2a - 4b + 1)$

4) Work out $(9 - 3 \times 4) \div 2$

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

Add and subtract expressions with indices – U662, U105
Multiply and divide expressions with indices – U235, U694
Addition law for indices – U235 Subtraction law for indices – U694
Addition and subtraction laws for indices – U662
Powers of powers (E) – U662, U772
Negative indices (E) – U694, U985 Fractional indices (E) – U772

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:
Square and cube numbers, collecting like terms

Additional Resources

To further practice and develop your knowledge see Sparx clips above or

https://corbettmaths.com/contents/

Anagrams

easb

orewp

netenopx

dsencii

Self quizzing

Expand the brackets and simplify as far as possible.

$3x(y + z) + 5y(z + 2x)$

$5pq(p + q) - 2q^2(p + p^2)$

$6a \times 3b \times 2a + 5ab(3b - 2a)$

Work out the divisions.

$18 \div 3$

$18a \div 3$

$18a \div 3a$

$18ab \div 3$

$18ab \div 3b$

$36ab \div 3ab$

Challenge Activities

Solve the equations.

$2^x \times 2^4 = 2^{12}$

$2^{12} \div 2^y = 2^3$

$(2^2)^z = 2^{12}$

$3^5 \times 3^6 \div 3^a = 3^{20}$

$3^{14} \div (3^b)^3 = 3 \times 3^3 \times 3$

YEAR 8 — SPRING

N10 - STANDARD FORM

Positive and negative powers of 10 – U330, U534
Numbers greater than 1 in standard form – U330
Numbers between 0 and 1 in standard form – U534
Standard form on a calculator – U161

What do I need to be able to do?

Step 1 Positive and negative powers of 10
Step 2 Numbers greater than 1 in standard form
Step 3 Numbers between 0 and 1 in standard form
Step 4 Standard form on a calculator

Keywords

Standard (index) Form: A system of writing very big or very small numbers
Commutative: an operation is commutative if changing the order does not change the result.
Base: The number that gets multiplied by a power
Power: The exponent – or the number that tells you how many times to use the number in multiplication
Exponent: The power – or the number that tells you how many times to use the number in multiplication
Indices: The power or the exponent.
Negative: A value below zero.

Positive powers of 10

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

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

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

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
0.8×10^4
5.3×10^{07}

Negative powers of 10

	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
0.001	10^1	10^0	10^{-1}	10^{-2}	10^{-3}
$1 \times \frac{1}{1000}$	0	0	0	0	1
1×10^{-3}					

Any value to the power 0 always = 1

Negative powers do not indicate negative solutions

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

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

Mental calculations

$6.4 \times 10^2 \times 1000$ Not in Standard Form
$= 6.4 \times 10^2 \times 10^3$ Use addition for indices rule
$= 6.4 \times 10^5$

$(2 \times 10^3) \div 4$ Divide the values
$= (2 \div 4) \times 10^3$
$= 0.5 \times 10^3$

$8 \times 10^5 \times 3$
$= 24 \times 10^5$ Not in Standard Form
$= 2.4 \times 10^1 \times 10^5$ Use addition for indices rule
$= 2.4 \times 10^6$

Remember the layout for standard form
Any number between 1 and less than 10 → $A \times 10^n$ ← Any integer

Addition and Subtraction

Tip: Convert into ordinary numbers first and back to standard from at the end

$6 \times 10^5 + 8 \times 10^5$

Method 1
$= 600000 + 800000$
$= 1400000$
$= 1.4 \times 10^5$

More robust method
Less room for misconceptions
Easier to do calculations with negative indices
Can use for different powers

Method 2
$= (6 + 8) \times 10^5$
$= 14 \times 10^5$
This is not the final answer
$= 1.4 \times 10^1 \times 10^5$
$= 1.4 \times 10^5$

Only works if the powers are the same

Multiplication and division

$\frac{1.5 \times 10^5}{0.3 \times 10^3}$ Division questions can look like this

$(1.5 \times 10^5) \div (0.3 \times 10^3)$

$1.5 \div 0.3 \times 10^5 \div 10^3$

$= 5 \times 10^2$

For multiplication and division you can look at the values for A and the powers of 10 as two separate calculations

Revisit addition and subtraction laws for indices – they are needed for the calculations

Addition law for indices: $a^m \times a^n = a^{m+n}$

Subtraction law for indices: $a^m \div a^n = a^{m-n}$

Using a calculator

$1.4 \times 10^5 \times 3.9 \times 10^3$

Use a calculator to work out this question to a suitable degree of accuracy

Input 1.4 and press [×10^x] Then press 5 (for the power)
Press [×]
Input 3.9 and press [×10^x] Then press 3 (for the power)
Press [=]
This gives you the solution

Click calculator for video tutorial

To put into standard form and a suitable degree of accuracy
Press [SHIFT] [SETUP] and then press 7 for sci mode.
Choose a degree of accuracy so in most cases press 2

Answer: 5.5×10^8

N10 - STANDARD FORM

Retrieval Practice

1) Express "3 out of 20" as a percentage.

2) Write down the decimal multiplier to increase a number by 85%.

3) Simplify the expression $m^{18} \div m^3$

4) Simplify the ratio 18 : 24 : 30

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

Positive and negative powers of 10 – U330, U534
Numbers greater than 1 in standard form – U330
Numbers between 0 and 1 in standard form – U534
Standard form on a calculator – U161

Career Focus - Where could this take you?

Being an astronomer needs standard form, because you're working with such enormous numbers as planets are so far away. also being a scientist needs standard form because you're working with small numbers too.

Topic Link

This topic links to:
Powers of 10
Commutativity and distributivity

Additional Resources

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

Anagrams

werop

eaevitgn

decini

seab

Self quizzing

Match the cards of equal value.

4.05×10^{-3}	4.05×10^{-3}	0.045	0.00405
0.054	4.05×10^{-2}	5.4×10^{-1}	5.04×10^{-2}
0.54	0.0504	0.0405	4.5×10^{-2}

Challenge Activities

The average human body can produce 3 million red blood cells every second.

How many red blood cells does the average human body produce in one year?

Give your answer in standard form.

YEAR 8 — SPRING

S3 - INTERPRET AND REPRESENT DATA

Sparx Maths

Types of data – U322 Averages and range – U526, U456, U260, U291
Choose the most appropriate average – U717
Compare distributions using average and the range – U507, U717
Averages from an ungrouped frequency table – U569
Represent and interpret grouped discrete data – U312, U981
Represent and interpret continuous data grouped into equal classes – U877, U840
Mean and mode from a grouped frequency table (E) – U877, U260

What do I need to be able to do?

Step 1 Types of data
Step 2 Outliers and errors
Step 3 Averages and range
Step 4 Choose the most appropriate average
Step 5 Compare distributions using averages
Step 6 Averages from frequency tables
Step 7 Represent and interpret grouped discrete data
Step 8 Represent and interpret continuous data grouped into equal classes
Step 9 Mean and mode from a grouped frequency table (E)

Keywords

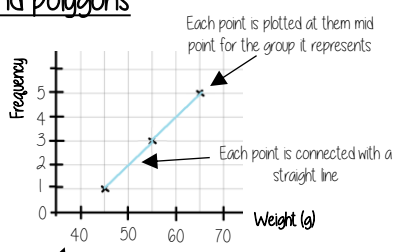
Data – Information collected for analysis; can be qualitative (words) or quantitative (numbers).
Outlier – A value that is much higher or lower than the rest of the data.
Error – A mistake in data collection or recording.
Mean – The average, found by adding all values and dividing by the number of values.
Median – The middle value when data is in order.
Mode – The most frequent value in a data set.
Range – The difference between the highest and lowest values.
Frequency Table – A table showing how often each value or group of values occurs.
Grouped Data – Data that is organized into intervals or classes.
Distribution – The way data is spread out, often compared using averages and range.

Frequency tables and polygons

x Weight(g)	Frequency
$40 < x \leq 50$	1
$50 < x \leq 60$	3
$60 < x \leq 70$	5

We do not know from grouped data where each value is placed so have to use an estimate for calculations

MID POINTS
Mid-points are used as estimated values for grouped data. The middle of each group



Mid-point
Start point + End point
2

Averages from lists

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 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

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
Median = 8

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

For Grouped Data

The modal group – which group has the highest frequency

Averages from a table

Non-grouped data

Number of Siblings	0	1	2
Frequency	6	8	6
Subtotal	0	8	12

Overall Frequency: 20
Total number of siblings: 20

The data in a list: 0,0,0,0,0,0, 1,1,1,1,1,1,1,1, 2,2,2,2,2,2

Mean: total number of siblings / Total frequency = 1

Grouped data

x Weight(g)	Frequency	Mid Point	MP x Freq
$40 < x \leq 50$	1	45	45
$50 < x \leq 60$	3	65	195
$60 < x \leq 70$	5	65	325

Overall Frequency: 9
Overall Total: 565
Mean: 62.8g

The data in a list: 45, 55, 55, 55, 65, 65, 65, 65, 65

Comparing distributions

Comparisons should include a statement of average and central tendency, as well as a statement about spread and consistency.
Calculate an average … Either **mean, mode or median**
Also calculate the **range** which is used for consistency.
This shows how spread out the data is

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

S3 - INTERPRET AND REPRESENT DATA

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

Types of data – U322
Averages and range – U526, U456, U260, U291
Choose the most appropriate average – U717
Compare distributions using average and the range – U507, U717
Averages from an ungrouped frequency table – U569
Represent and interpret grouped discrete data – U312, U981
Represent and interpret continuous data grouped – U877, U840
Mean and mode from a grouped frequency table (E) – U877, U260

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?

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 8 HALF TERM 5 (summer 1):

G5 - ANGLES IN PARALLEL LINES AND POLYGONS

P1 - TABLES AND PROBABILITY

YEAR 8 — SUMMER

G5 - ANGLES IN PARALLEL LINES AND POLYGONS

Sparx Maths

Basic angle rules and notation – M502, M818, M163, M331
Angles between parallel lines and a transversal – M606, U826
Alternate and corresponding angles – M606, U826
Alternate, corresponding and co-interior angles – U826
Solve complex problems with angles in parallel lines – M319, U655, U826
Properties of special quadrilaterals and their diagonals – M679, U732, U329
Find sides and angles in special quadrilaterals – M393, U329, U732
Exterior angles of a polygon – M653, U427 Interior angles of a polygon – M653, U427
Interior angles in a regular polygon – M653, U427 Prove simple geometric facts (E) – U471, U887

What do I need to be able to do?

Step 1 Basic angles rules and notation
Step 2 Angles between parallel lines
Step 3 Alternate and corresponding angles
Step 4 Alternate, corresponding and co-interior angles
Step 5 Solve complex problems with angles in parallel lines
Step 6 Properties of special quadrilaterals and their diagonals
Step 7 Find sides and angles in special quadrilaterals
Step 8 Exterior angles of a polygon
Step 9 Interior angles of a polygon
Step 10 Interior angles in a regular polygon
Step 11 Prove simple geometric facts (E)

Keywords

Parallel: Straight lines that never meet
Angle: The figure formed by two straight lines meeting (measured in degrees)
Transversal: A line that cuts across two or more other (normally parallel) lines
Isosceles: Two equal size lines and equal size angles (in a triangle or trapezium)
Polygon: A 2D shape made with straight lines
Sum: Addition (total of all the interior angles added together)
Regular polygon: All the sides have equal length, all the interior angles have equal size.

Basic angle rules and notation

Acute Angles
0°< angle <90°

Right Angles
90°

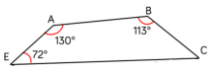
Right angle notation

Obtuse
90°< angle <180°

Reflex
180°< angle <360°

Straight Line
180°

The letter in the middle is the angle
The arc represents the part of 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

Vertically opposite angles
Equal

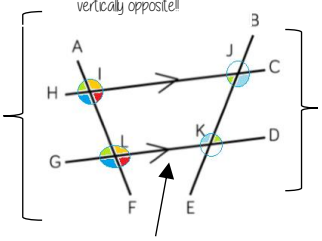
Angles around a point
360 °

Parallel lines

Still remember to look for angles on straight lines, around a point and vertically opposite!!

Lines QF and BE are **transversals** (lines that bisect the parallel lines)

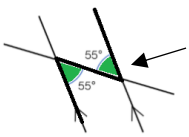
Corresponding angles often identified by their **"F shape"** in position



Alternate angles often identified by their **"Z shape"** in position

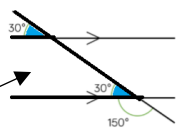
This notation identifies parallel lines

Alternate/ Corresponding angles

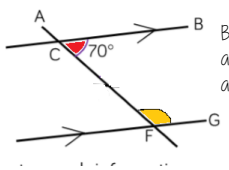


Because alternate angles are equal the highlighted angles are the same size

Because corresponding angles are equal the highlighted angles are the same size



Co-interior angles

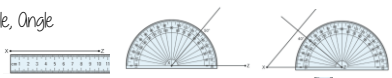


Because co-interior angles have a sum of 180° the highlighted angle is 110°

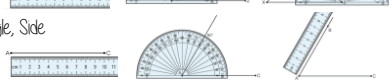
Os angles on a line add up to 180° co-interior angles can also be calculated from applying alternate/ corresponding rules first

Triangles & Quadrilaterals

Side, Angle, Angle



Side, Angle, Side



Side, Side, Side

Properties of Quadrilaterals

Square
All sides equal size
All angles 90°
Opposite sides are parallel

Rectangle
All angles 90°
Opposite sides are parallel

Rhombus
All sides equal size
Opposite angles are equal

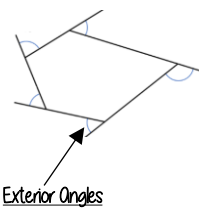
Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles

Trapezium
One pair of parallel lines

Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles

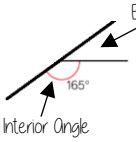
Sum of exterior angles

Exterior angles all add up to 360°



Exterior Angles
Are the angle formed from the straight-line extension at the side of the shape

Using exterior angles



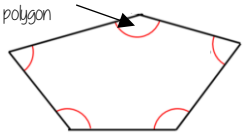
Interior angle + Exterior angle = straight line = 180°
Exterior angle = 180 – 165 = 15°

Number of sides = 360° ÷ exterior angle
Number of sides = 360 ÷ 15 = 24 sides

Sum of interior angles

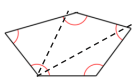
(number of sides – 2) x 180

Interior Angles
The angles enclosed by the polygon



This is an **irregular** polygon – the sides and angles are different sizes

Sum of the interior angles = (5 – 2) x 180

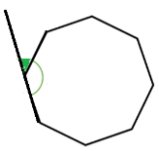


This shape can be made from three triangles
Each triangle has 180°

Sum of the interior angles = 3 x 180
= 540°

Remember this is **all** of the interior angles added together

Missing angles in regular polygons



Exterior angle = 360 ÷ 8 = 45°

Interior angle = $\frac{(8-2) \times 180}{8} = \frac{6 \times 180}{8}$ = 135°

Exterior angles in regular polygons = 360° ÷ number of sides

Interior angles in regular polygons = $\frac{(\text{number of sides} - 2) \times 180}{\text{number of sides}}$

G5 - ANGLES IN PARALLEL LINES AND POLYGONS

Retrieval Practice

1) How many days are there in August?

2) Add together 3.6 kg and 850 g.

3) Write 140 000 in standard form.

4) Factorise fully $12x - 3xy$.

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

Basic angle rules and notation – M502, M818, M163, M331
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Exterior angles of a polygon – M653, U427
Interior angles of a polygon – M653, U427
Interior angles in a regular polygon – M653, U427
Prove simple geometric facts (E) – U471, U887

Careers Focus – Where could this take you?

A **CAD technician** uses software to create technical drawings and plans. They work alongside architects and design engineers to turn designs into accurate and detailed technical drawings in 2D and 3D models.

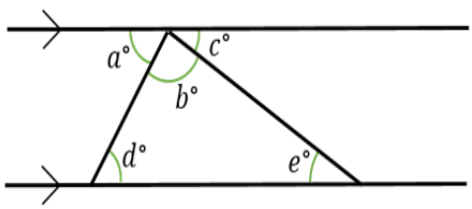
Topic Link

This topic links to:
Angles in triangles and quadrilaterals, Angles around a point, Angles on a straight line, vertically opposite angles.
Solving equations

Additional Resources

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

Self quizzing



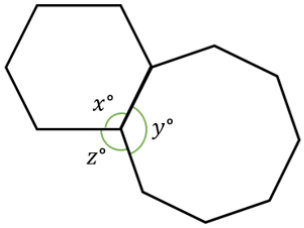
Complete the proof that angles in a triangle add to 180°

$a + b + c = 180°$ (Angles on a _____ add up to 180°)
$a = d$ (Alternate angles are _____)
$c =$ __ (_____ angles are _____)
So $a + b + c = d + b +$ __
So $d + b + e = 180°$

Challenge Activities

The diagram shows a regular hexagon and a regular octagon that meet at a common point.

Work out the values of x, y and z.



YEAR 8 — SUMMER

P1 - TABLES AND PROBABILITY

Sparx Maths

Probability vocabulary – M655 The probability scale – M655, M938
Probability of a single event – M941, M938 Use the sum of probabilities being equal to 1 – M755
Probability experiments – U580, U166 Sample spaces for 1 or more events – M718, U104
Probabilities from sample space diagrams – M718, U104 Two-way tables – M899, U981
Probabilities from two-way tables – U981, U246Frequency trees – U280
Probabilities from frequency trees – U280

What do I need to be able to do?

Step 1 Probability vocabulary
Step 2 The probability scale
Step 3 Probability of a single event
Step 4 sum of probabilities being equal to 1
Step 5 Probability experiments
Step 6 Sample spaces for 1 or more events
Step 7 Probabilities from sample space diagrams
Step 8 Two-way tables
Step 9 Probabilities from two-way tables
Step 10 Frequency trees
Step 11 Probabilities from frequency trees

Keywords

Probability – A measure of how likely an event is to happen, between 0 (impossible) and 1 (certain).
Event – A specific outcome or set of outcomes in a probability experiment.
Outcome – A possible result of a trial or experiment.
Sample Space – The complete set of all possible outcomes.
Experiment – A situation involving chance, used to observe outcomes.
Relative Frequency – The ratio of the number of times an event occurs to the total number of trials.
Two-Way Table – A table that displays data for two categories and helps calculate probabilities.
Frequency Tree – A diagram showing how often outcomes occur at each stage of a process.
Complementary Events – Two events that together cover all possibilities; their probabilities add up to 1.
Probability Scale – A visual scale from 0 to 1 used to show how likely events are.

Probability of a single event

Probability = number of times event happens

P(Blue) = $\frac{4}{10}$ ← There are 4 blue sectors; There are 10 sectors overall

Probability notation P (event)

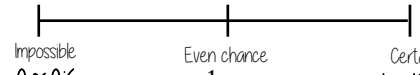
$= \frac{2}{5}$

Probability can be a fraction, decimal or percentage value

$\frac{4}{10} = \frac{40}{100} = 0.40 = 40\%$ total number of possible outcomes

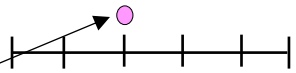
Probability is always a value between 0 and 1

The probability scale



The more likely an event the further up the probability it will be in comparison to another event (It will have a probability closer to 1)

There are 2 pink and 2 yellow balls, so they have the same probability



There are 5 possible outcomes So 5 intervals on this scale, each interval value is $\frac{1}{5}$

Sum of probabilities

Probability is always a value between 0 and 1

The probability of getting a blue ball is $\frac{1}{5}$
∴The probability of NOT getting a blue ball is $\frac{4}{5}$
The sum of the probabilities is 1

The table shows the probability of selecting a type of chocolate

Dark	Milk	White
0.15	0.35	

P(White chocolate) = 1 – 0.15 – 0.35
= 0.5

Construct sample space diagrams

Sample space diagrams provide a systematic way to display outcomes from events

The possible outcomes from rolling a dice

The possible outcomes from tossing a coin

	1	2	3	4	5	6
H	1,H	2,H	3,H	4,H	5,H	6,H
T	1,T	2,T	3,T	4,T	5,T	6,T

This is the set notation to list the outcomes S =

In between the { } are a; the possible outcomes

S = { 1H, 2H, 3H, 4H, 5H, 6H, 1T, 2T, 3T, 4T, 5T, 6T}

Probability from sample space

The possible outcomes from rolling a dice

The possible outcomes from tossing a coin

	1	2	3	4	5	6
H	1,H	2,H	3,H	4,H	5,H	6,H
T	1,T	(2,T)	3,T	(4,T)	5,T	(6,T)

What is the probability that an outcome has an even number and a tails?

This is the set notation that represents the question P

P (Even number and Tails) = $\frac{3}{12}$

There are three even numbers with tails

There are twelve possible outcomes

Numerator: the event

Denominator: the total number of outcomes

In between the ( ) is the event asked for

	Car	Bus	Walk	Total
Boys	15	24	14	53
Girls	6	20	(21)	47
Total	21	44	35	(100)

Probability from two-way tables

P (Girl walk to school) = $\frac{21}{100}$

21 ← The event
100 ← The total in the set
The total number of items

Product Rule

The number of items in event a **X** The number of items in event b

P1 - TABLES AND PROBABILITY

Retrieval Practice

1) Work out the missing values in the two-way table.

	Left-handed	Right-handed	Total
Girls	25	160	185
Boys	85		205
Total		280	

2) The table shows the ages of people in a golf club.

Age	18 – 29	30 – 49	50 – 69	70 +
Number of people	28	47	59	82

How many people are aged 50 or over?

3) $y = 5x$. Find y when $x = 40$

4) Work out the square of 16

Sparx Maths

Extension work

Codes for related Independent Learning tasks on SPARX maths:
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Two-way tables – M899, U981
Probabilities from two-way tables – U981, U246
Frequency trees – U280
Probabilities from frequency trees – U280

Career Focus - Where could this take you?

I need to be able to read tables so I can build to specification

Topic Links

This topic links to:
- Listing outcomes, fractions.

Additional Resources

Corbettmaths

To further practise and develop your knowledge see:
- Videos: 245, 246, 319, 380

Self quizzing

Continue completing the table for rolling two regular dice and adding the numbers together.

+	1	2	3	4	5	6
1	2	3				7
2						
3						
4						
5						
6						

Work out,
- P(total is even)
- P(6 or 7)
- P(Number>4)
- P(0)
- P(prime number)
- P(square number)

These probabilities should be out of 36 as that's the total.

Challenge Activities

In a group of 45 people, 15 belong to a cricket club, 18 belong to a tennis club and 9 belong to both a cricket and a tennis club.
Draw a Venn diagram to represent this information.
A person is chosen at random from this group.
Find the probability that this person:
- belongs to a cricket and a tennis club
- belongs to a cricket or tennis club
- does not belong to a cricket club
- does not belong to either a cricket or a tennis club
- belongs to a tennis club but not a cricket club.

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 8 HALF TERM 6 (Summer 2):

G6 - CIRCLES

S4 - GRAPHS AND CHARTS

A8 - SEQUENCES

CONSOLIDATION

YEAR 8 — SUMMER
G6 - CIRCLES

What do I need to be able to do?

Step 1 Circle vocabulary
Step 2 Pi as a ratio
Step 3 Circumference of a circle
Step 4 Perimeter of parts of a circle
Step 5 Area of a circle
Step 6 Area of parts of a circle
Step 7 Area and circumference of a circle
Step 8 Perimeter of compound shapes with circles
Step 9 Perimeter and area of compound shapes with circles

Sparx Maths

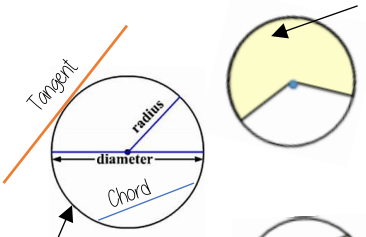
- Circle vocabulary – M595, U767
- Circumference of a circle – M169, U604
- Perimeter of parts of a circle – U221
- Area of a circle – M231, U950
- Area of parts of a circle – U373
- Area and circumference of a circle – M169, M231, U604, U950
- Perimeter of compound shapes with circles – U604, U221
- Perimeter and area of compound shapes with circles – U604, U221, U373, U950

Keywords

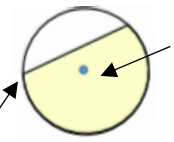
Radius – The distance from the centre of a circle to any point on its edge.
Diameter – A straight line passing through the centre of a circle, touching both sides; twice the radius.
Circumference – The distance around the edge of a circle.
Pi (π) – A special number (approximately 3.14159) representing the ratio of a circle's circumference to its diameter.
Arc – A part of the circumference of a circle.
Sector – A 'slice' of a circle, like a piece of pie.
Area of a Circle – The space inside a circle, calculated using $\pi r2\pi r2$.
Perimeter – The total distance around a shape, including curved and straight edges.
Compound Shape – A shape made from two or more simple shapes, such as rectangles and circles.
Segment – A part of a circle separated by a chord (a straight line between two points on the circle).

Parts of a circle

Sector (part of the circle made from two radii)



Circumference



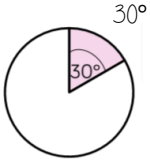
Segment (part of the circle made from a chord)

An arc is a part of the circumference

Fractional parts of a circle

A circle is made up of 360°

Formula to remember:
Area of a circle = πr^2
Circumference of a circle = πd or $2\pi r$

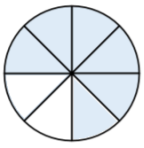


30° represents $\frac{30}{360}$ of a full circle

$\frac{30}{360} = \frac{1}{12}$

The fraction of the circle is as $\frac{\theta}{360}$

θ represents the degrees in the sector



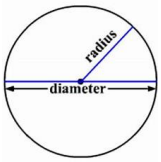
$\frac{270}{360}$ of a full circle (in degrees)
$\frac{6}{8}$ of a full circle (in equal parts)

$\frac{3}{4}$ of a full circle

Area of a circle (Non-Calculator)

Read the question – leave in terms of π or if $\pi \approx 3$ (provides an estimate for answers)

Area of a circle
π x radius^2



Diameter = 8cm
∴ Radius = 4cm

π x radius^2
= π x 4^2
= π x 16
= 16π cm^2

Find the area of one quarter of the circle

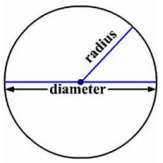
Radius = 4cm

Circle Area = 16π cm^2
Quarter = 4π cm^2

Area of a circle (Calculator)

How to get π symbol on the calculator

Area of a circle
π x radius^2



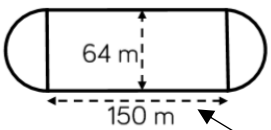
It is important to round your answer suitably – to significant figures or decimal places. This will give you a decimal solution that will go on forever!

Compound shapes including circles

Circumference
π x diameter

Compound shapes are not always area questions.
For Perimeter you will need to use the circumference

Spotting diameters and radii



This dimension is also the diameter of the semi circles.

Arc lengths = π x 64
= 64 π

Don't need to halve this because there are 2 ends which make the whole circle

Arc lengths + Straight lengths = total perimeter

= 64 π + 150 + 150
= (300 + 64 π) m
OR = 501.1 m

Still remember to split up the compound shape into smaller more manageable individual shapes first

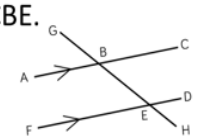
G6 - CIRCLES

Retrieval Practice

1) What is the size of the angle made when two perpendicular lines intersect?

2) Find the sum of the interior angles of an octagon.

3) Name the angle alternate to ∠CBE.



4) Estimate the answer to 826 × 19.7

Vocabulary check: Circumference

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

Circle vocabulary – M595, U767
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Career Focus - Where could this take you?

I am an architect who builds design plans for offices, buildings and homes. My key responsibilities include using the client's preferences, needs and ideas to create well-designed structures, providing clients with cost estimates, designing construction plans using specifications and scaled drawings

Topic Link

This topic links to: Properties of shapes, Recognise types of 2D shapes, substitution, order of operations

Additional Resources

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

Anagrams

e c n e r e f m u c r i c

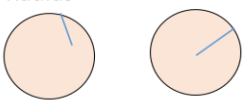
u i s d a r

c e t s o r

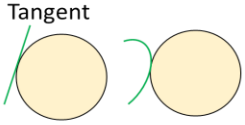
Self quizzing

Give reasons for why each diagram is/is not an example of the keyword.

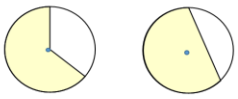
Radius



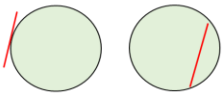
Tangent



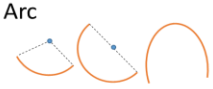
Sector



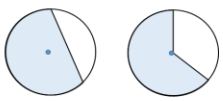
Chord



Arc



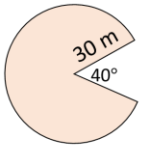
Segment



Challenge Activities

Explain each term of the following calculation to find the perimeter of this shape.

$$\frac{320}{360} \times 2\pi \times 30 + 30 + 30$$



Calculate the answer to 1 decimal place.

YEAR 8 — SUMMER

S4 - GRAPHS AND CHARTS

Sparx Maths

Pictograms and bar charts – M644, M460, M738
Vertical line charts – M140, M183
Draw pie charts – M574
Interpret pie charts – M165
Line graphs – M140, M183
Choose the most appropriate graph or chart – M440
Compare distributions using graphs – U507, U520

What do I need to be able to do?

Step 1 Pictograms and bar charts
Step 2 Vertical line charts
Step 3 Draw pie charts
Step 4 Interpret pie charts
Step 5 Line graphs
Step 6 Choose the most appropriate graph or chart
Step 7 Compare distributions using graphs
Step 8 Misleading graphs and charts

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)
Spread: the distance/ how spread out/ variation of data
Average: a measure of central tendency – or the typical value of all the data together
Proportion: numerical relationship that compares two things

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
	𝍸	

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?

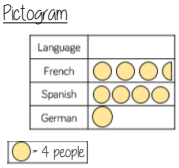
Zero option → ☐ £0 ☐ £0.01 - £2 ☐ £2.01 - £4 ☐ more than £4 ← More option

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

Pictograms, bar and line charts

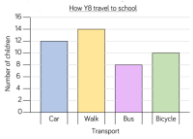
Represents quantitative data

Pictogram



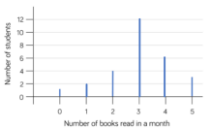
- Need to remember a key
- Visually able to identify mode

Bar Chart



- Gaps between the bars
- Clearly labelled axes
- Scale for the axes
- Title for the bar chart
- Discrete Data

Line Chart



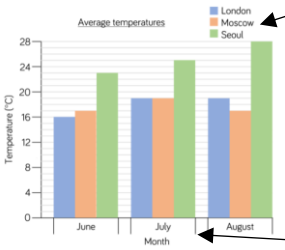
- Gaps between the lines
- Clearly labelled axes
- Scale for the axes
- Discrete Data

Multiple Bar chart

Compares multiple groups of data

- Clearly labelled axes
- Scale for axes
- Comparable data bars drawn next to each other

Key/ Colour code for separate groups of information



Gap between different categories of data

Draw and interpret Pie Charts

Remember a circle has 360°

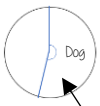
Type of pet	Dog	Cat	Hamster
Frequency	32	25	3

There were 60 people asked in this survey (Total frequency)

$\frac{32}{60}$ "32 out of 60 people had a dog"

This fraction of the 360 degrees represents dogs

$\frac{32}{60} \times 360 = 192°$



Use a protractor to draw This is 192°

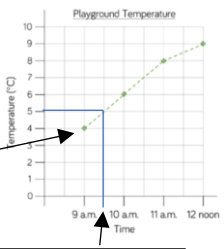
Multiple method
Os 60 goes into 360 – 6 times
Each frequency can be multiplied by 6 to find the degrees (proportion of 360)

Represents quantitative, discrete data

Draw and interpret line graphs

- 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

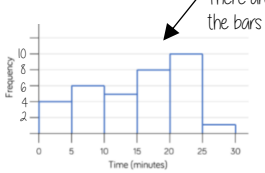
It is possible to make estimates from the line e.g. temperature at 9.30am is 5°C

Grouped quantitative data

Time (minutes)	Frequency
$0 \leq t < 5$	4
$5 \leq t < 10$	6
$10 \leq t < 15$	5
$15 \leq t < 20$	8
$20 \leq t < 25$	10
$25 \leq t < 30$	1

"More than or equal to 25 and less than 30 minutes"

This is a frequency diagram There are no gaps between the bars



The use of inequalities shows that this will be a frequency diagram

Grouping the data is useful if there is a large spread of data to begin with

Find and interpret the range

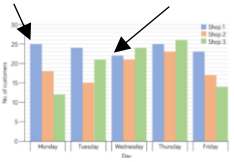
The range is a measure of **spread**

Difference between the biggest and smallest values

Shop 1 highest value – Shop 1 lowest value

A smaller range means there is less variation in the results – it is more consistent data

A range of 0 means all the data is the same value



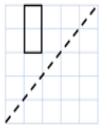
Shop 1 has the smallest range – this indicates it has a more consistent flow of customers each week

Range of customers = 25 – 22 = 3 (Shop 1)

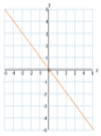
S4 - GRAPHS AND CHARTS

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.

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

Pictograms and bar charts – M644, M460, M738
Vertical line charts – M140, M183
Draw pie charts – M574
Interpret pie charts – M165
Line graphs – M140, M183
Choose the most appropriate graph or chart – M440
Compare distributions using graphs – U507, U520

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

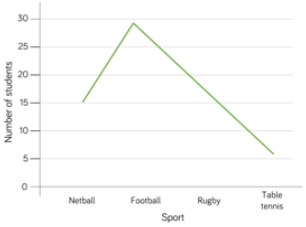
This topic links to:
Solve problems with line charts and bar charts, construct and interpret pie charts

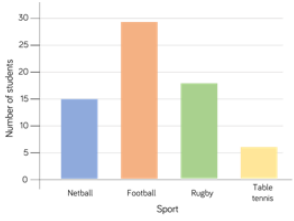
Additional Resources

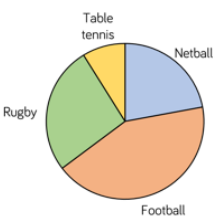
To further practice and develop your knowledge see Sparx clips above or https://corbettmaths.com/contents/

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 8 — SUMMER

A8 - SEQUENCES

Sparx Maths

Generate and describe a sequence given a rule in words – M381, M241
Generate a sequence given a simple algebraic rule – M166, M991
nth term of a linear sequence – M991, U498
Generate a sequence given a complex algebraic rule (E) – U530, U958

What do I need to be able to do?

Step 1 Generate and describe a sequence given a rule in words
Step 2 Generate a sequence given a simple algebraic rule
Step 3 nth term of a linear sequence
Step 4 Generate a sequence given a complex algebraic rule (E)

Keywords

Sequence: items or numbers put in a pre-decided order
Term: a single number or variable
Position: the place something is located
Linear: the difference between terms increases or decreases (+ or -) by a constant value each time
Non-linear: the difference between terms increases or decreases in different amounts, or by x or ÷
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 non zero number

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

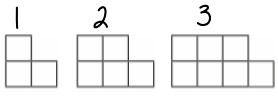
Fibonacci Sequence – look out for this type of sequence

0 1 1 2 3 5 8 ...

Each term is the sum of the previous two terms

Sequence in a table and graphically

Position: the place in the sequence



3 5 7

"The **term** in **position** 3 has 7 squares"

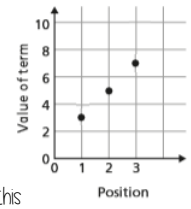
Term: the number or variable
(the number of squares in each image)

In a table

Position	1	2	3
Term	3	5	7

+2 +2

Graphically



Because the terms increase by the same addition each time this is **linear** – as seen in the graph

Sequences from algebraic rules

This is substitution!

$3n + 7$ — This will be linear - note the single power of n. The values increase at a constant rate

$3n^2 + 7$ — This is not linear as there is a power for n

$2n - 5$ → Substitute the number of the term you are looking for in place of 'n'

eg
1st term = 2 (1) – 5 = -3
2nd term = 2 (2) – 5 = -1
100th term = 2 (100) – 5 = 195

Checking for a term in a sequence

Form an equation

Is 201 in the sequence 3n – 4?

$3n - 4 = 201$ ← Term to check

Algebraic rule

Solving this will find the position of the term in the sequence
ONLY an integer solution can be in the sequence

Complex algebraic rules

Misconceptions and comparisons

$2n^2$ — 2 times whatever n squared is

eg
1st term = 2 x 1^2 = 2
2nd term = 2 x 2^2 = 8
100th term = 2 x 100^2 = 2000

$(2n)^2$ — 2 times n then square the answer

eg
1st term = $(2 \times 1)^2$ = 4
2nd term = $(2 \times 2)^2$ = 16
100th term = $(2 \times 100)^2$ = 40000

$n(n + 5)$

eg
1st term = 1 (1 + 5) = 6
2nd term = 2 (2 + 5) = 14
100th term = 100 (100 + 5) = 10500

You don't need to expand the expression

Finding the algebraic rule

This is the 4 times table → 4, 8, 12, 16, 20....

4n

7, 11, 15, 19, 22 ← This has the same constant difference – but is 3 more than the original sequence

4n + 3

$4n + 3$

This is the constant difference between the terms in the sequence

This is the comparison (difference) between the original and new sequence

A8 - SEQUENCES

Retrieval Practice

1) Which is an expression?

$12 = a + b$ $\quad v = u + at$ $\quad 3n + 7$

2) Solve the equation $12 = 4(x - 1)$

3) List the possible outcomes when three coins are flipped.

4) Share £300 in the ratio 1 : 2 : 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

Generate and describe a sequence given a rule in words – M381, M241
Generate a sequence given a simple algebraic rule – M166, M991
nth term of a linear sequence – M991, U498
Generate a sequence given a complex algebraic rule (E) – U530, U958

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, Science and Multiplication.

Additional Resources

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

Self quizzing

Match these sequences and rules, working out the missing number.

Sequence A 6, 10, 14, 18...	$4n - 2$
Sequence B 1, 5, 9, 13...	$4n + 2$
Sequence C 9, 13, 17, 13...	$4n + 5$
Sequence D 2, 6, 10, 14...	$4n -$ ___

Challenge Activities

The rule for the number of sticks needed to make the n^{th} triangle in this pattern is $2n + 1$

Why does the number of sticks go up two each time you add a triangle? Why is there a "+1" in the rule?