

Maths Knowledge Organiser (Set 1)

PLACE VALUE, DECIMALS & USING SCALES

Key Concept

Multiply/Divide by powers of 10

10 000	1000	100	10	1	•	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
					•			

Multiplying

X 10
X 100
X 1000

digits move LEFT 1 space
digits move LEFT 2 spaces
digits move LEFT 3 spaces



Dividing

÷ 10
÷ 100
÷ 1000

digits move RIGHT 1 space
digits move RIGHT 2 spaces
digits move RIGHT 3 spaces



Key Words

Decimal: A number that contains a point.

Metric measure: The unit used to measure length, mass etc.

Scale: The conversion to convert between drawings and real life sizes.

Examples

Ordering Decimals

0.3, 0.21, 0.305, 0.38, 0.209

Add zero's so that they all have the same number of decimal places.

0.300, 0.210, 0.305, 0.380, 0.209

Then they can be placed in order:

0.209, 0.21, 0.3, 0.305, 0.38

Multiplying/Dividing by powers of 10

3.4×100

100	10	1	•	$\frac{1}{10}$
		3	•	4
3	4	0	•	

 Sparx Learning

M704, M113,
M522, M487, M112

Tip

- Add digits when ordering decimals.
- The number of zero's tells you the number of places to move the digits.

Questions

- Order 1.52, 1.508, 1.5, 1.05, 1.51
- Work out a) 1.35×10 b) 0.6×100 c) $4.5 \div 100$
- Convert a) 36 mm to cm b) 7 cm to mm c) 450 cm to m
d) 620 g to kg e) 4.2 kg to g f) 0.7 kg to g

ANSWERS: 1) 1.05, 1.5, 1.508, 1.51, 1.52 2) a) 13.5 b) 60 c) 0.045
3) a) 3.6cm b) 70mm c) 4.5m d) 0.62kg e) 4200 f) 700g

Maths Knowledge Organiser (Set 1)

FACTORS, MULTIPLES AND PRIMES

Key Concept

Factors:

Find these in pairs

12

1, 12

2, 6

3, 4

Multiples:

Start with the number itself

7 – 7, 14, 21, 28, ...

Key Words

Factor: The numbers which fit into a number exactly.

Multiple: The numbers in the times table.

Prime: Numbers which have only two factors which are 1 and itself.

Highest Common Factor: The highest factor which is common for both numbers.

Lowest Common Multiple: The smallest multiple which is common to both numbers.

Examples

Lowest Common Multiple (LCM)

Q - Find the LCM of 6 and 7:

6 – 6, 12, 18, 24, 30, 36, **42**, 48, 54, 60, ...

7 – 7, 14, 21, 28, 35, **42**, 49, 56, ...

LCM = 42

Highest Common Factor (HCF)

Q – Find the HCF of 18 and 24

18 – 1, 2, 3, **6**, 9, 18

24 – 1, 2, 3, 4, **6**, 8, 12, 24

HCF = 6

 **Sparx Learning**

**M462, M823,
M322, M698, M227**

Tip

There is only one even prime number which is the number 2. This can be used to help solve lots of problems.

Questions

- 1) List the first 5 multiples of: a) 7 b) 12 c) 50
- 2) List the factors of: a) 12 b) 15 c) 16
- 3) a) Find the LCM of 5 and 7 b) Find the HCF of 20 and 16

ANSWERS: 1) a) 7, 14, 21, 28, 35 b) 12, 24, 36, 48, 60 c) 50, 100, 150, 200, 250
2) a) 1, 2, 3, 4, 6, 12 b) 1, 3, 5, 15 c) 1, 2, 4, 8, 16 3) a) 35 b) 4

Maths Knowledge Organiser (Set 1)

FOUR OPERATIONS WITH INTEGERS & DECIMALS

Key Words

Place Value: The value a digit takes when placed in a particular position of a number.

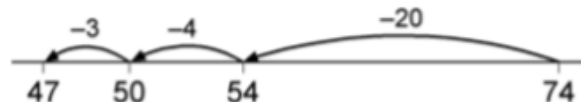
 Add Sum Total All together Plus In all	 Multiply Product Times Twice Total Multiplied by
 Subtract Remain Difference Less than Fewer How many more Minus	 Divide Quotient Goes into Split Equally Each

Examples

$$48 + 36 = 84$$



$$74 - 27 = 47 \text{ worked by counting back:}$$



$$\begin{array}{r} 97 \\ 3 \overline{)292} \end{array}$$

$$\begin{array}{r} 258 \\ + 87 \\ \hline 345 \\ 11 \end{array}$$

$$\begin{array}{r} 38 \\ \times 7 \\ \hline 266 \end{array}$$

$$56 \times 27$$

$\times$	20	7	
50	1000	350	1350
6	120	42	162
			1512
			1

* Sparx Learning

M462, M928, M347,
M187, M354, M429,
M152, M803, M262

Tip

Multiplication and addition are associative, so you can work them out in any order.

So 3×4 is the same as 4×3 .

$4 + 3$ is the same as $3 + 4$

Questions

- a) $49 + 37$ b) $125 + 69$ c) $5.6 + 24.8$
- a) $64 - 28$ b) $134 - 57$ c) $16.2 - 9.5$
- a) 7×146 b) 34×67 c) 2.9×7.2 4) a) $294 \div 7$ b) $192 \div 6$

ANSWERS : 1) a) 86 b) 194 c) 30.4
2) a) 36 b) 77 c) 6.7
3) a) 1022 b) 2278 c) 20.88
4) a) 42 b) 32

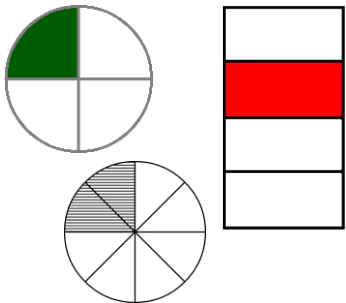
Maths Knowledge Organiser (Set 1)

UNDERSTANDING FRACTIONS

Key Concept

$$\frac{1}{4}$$

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16}$$



$$= 0.25$$

Key Words

Fraction: A fraction is made up of a numerator (top) and a denominator (bottom).

Equivalence: Two fractions are equivalent if one is a multiple of the other.

Simplify: Cancel a fraction down to give the smallest numbers possible.

Examples

Simplify $\frac{3}{24}$

$$\frac{3}{24} \xrightarrow{\div 3} \frac{1}{8}$$

Write 0.34 as a fraction

1	● $\frac{1}{10}$	● $\frac{1}{100}$	● $\frac{1}{1000}$
0	● 3	4	

$$= \frac{34}{100} = \frac{17}{50}$$

Write $\frac{6}{7}$ as a decimal

$$\frac{6}{7} \rightarrow 7 \overline{) 6.000000}$$

0 . 8 5 7 1 4

6 4 5 1 3

What is $\frac{3}{5}$ of 45

$$45 \div 5 \times 3 = 27$$

Sparx Learning

**M158, M410, M958,
M264, M922, M695,
M684**

Tip

- A larger denominator does not mean a larger fraction.
- To find equivalent fractions multiply/divide the numerator and denominator by the same number.

Questions

- 1) Simplify a) $\frac{42}{96}$ b) $\frac{64}{120}$
- 2) Write as a decimal a) $\frac{2}{7}$ b) $\frac{3}{8}$
- 3) Write as a fraction a) 0.48 b) 0.166 c) 0.308
- 4) a) $\frac{3}{5}$ of 35 b) $\frac{2}{9}$ of 45 c) $\frac{5}{11}$ of 121

ANSWERS : 1) a) $\frac{16}{7}$ b) $\frac{15}{8}$ c) $\frac{12}{7}$ 2) a) 0.2857... b) 0.375 c) $\frac{250}{77}$ 3) a) $\frac{25}{12}$ b) $\frac{500}{83}$ c) $\frac{308}{10}$ 4) a) 21 b) 10 c) 55

Maths Knowledge Organiser (Set 1)

FOUR OPERATIONS WITH FRACTIONS

Key Concept

Mixed numbers

These are made up of a whole number and a fraction.

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

$$= \frac{4 \times 5 + 3}{5}$$

$$= \frac{23}{5}$$

Key Words

Fraction: A fraction is made up of a numerator (top) and a denominator (bottom).

 Add Sum Total All together Plus In all	 Multiply Product Times Twice Total Multiplied by
 Subtract Remain Difference Less than Fewer How many more Minus	 Divide Quotient Goes into Split Equally Each

Examples

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

Make the denominators the same

$$\begin{array}{c} \frac{3}{5} + \frac{2}{7} \\ \times 7 \quad \times 5 \\ \hline \frac{21}{35} + \frac{10}{35} = \frac{31}{35} \end{array}$$

$$- \quad \frac{3}{5} - \frac{2}{7}$$

$$\begin{array}{c} \frac{3}{5} - \frac{2}{7} \\ \times 7 \quad \times 5 \\ \hline \frac{21}{35} - \frac{10}{35} = \frac{11}{35} \end{array}$$

4 Rules
Fractions

$$\times \quad \frac{3}{5} \times \frac{2}{7}$$

Just multiply the tops and bottoms

$$= \frac{3 \times 2}{5 \times 7} = \frac{6}{35}$$

$$\div \quad \frac{3}{5} \div \frac{2}{7}$$

Flip the second fraction and change to a times

$$\frac{3}{5} \times \frac{7}{2} = \frac{21}{10}$$

 Sparx Learning

M601, M835, M931,
M157, M197, M110,
M265

Tip

- A larger denominator **does not** mean a larger fraction.
- To find equivalent fractions multiply/divide the numerator and denominator by the same number.

Questions

- 1) $\frac{3}{5} + \frac{4}{15}$ 2) $\frac{2}{7} + \frac{5}{8}$ 3) $\frac{7}{9} - \frac{2}{5}$ 4) $\frac{3}{7} \times \frac{4}{9}$ 5) $\frac{3}{11} \div \frac{14}{22}$

ANSWERS: 1) $\frac{13}{15}$ 2) $\frac{51}{56}$ 3) $\frac{17}{45}$ 4) $\frac{21}{4}$ 5) $\frac{7}{3}$

Maths Knowledge Organiser (Set 1)

ORDER FRACTIONS, DECIMALS & INTEGERS

Key Concept

FDP Equivalence

F	D	P
$\frac{1}{100}$	0.01	1%
$\frac{1}{10}$	0.1	10%
$\frac{1}{5}$	0.2	20%
$\frac{1}{4}$	0.25	25%
$\frac{1}{2}$	0.5	50%
$\frac{3}{4}$	0.75	75%

Key Words

Integer: Whole number.

Ascending Order:

Place in order, smallest to largest.

Descending Order:

Place in order, largest to smallest.

Inequality: Statement that contains $<$, $>$, $\leq$, $\geq$, to show which quantity is greatest/smallest.

Tip

- Convert all numbers to the same form, either fractions, decimals or percentages.
- If using a calculator convert them all to decimals.

Examples

To order these fractions, make the denominators the same.

$$\frac{3}{4} \rightarrow \frac{6}{8} \rightarrow \frac{1}{4}$$

4

$$\frac{3}{8} \rightarrow \frac{3}{8} \rightarrow \frac{3}{8}$$

2

$$\frac{1}{2} \rightarrow \frac{4}{8} \rightarrow \frac{1}{2}$$

3

$$\frac{7}{8} \rightarrow \frac{7}{8} \rightarrow \frac{3}{4}$$

5

$$\frac{1}{4} \rightarrow \frac{2}{8} \rightarrow \frac{7}{8}$$

1

To order these, convert them all to decimals.

56%

$$\frac{3}{4}$$

0.871

23%

$$\frac{6}{7}$$

0.56

0.75

0.871

0.23

0.857...

23%

56%

$$\frac{3}{4}$$

$$\frac{6}{7}$$

0.871

Questions

- 1) $\frac{2}{3}, \frac{3}{4}, \frac{5}{6}, \frac{7}{12}$ 2) $\frac{3}{7}, \frac{1}{2}, 0.49, 0.2$ 3) $\frac{7}{32}, 25\%, 0.05, \frac{29}{100}$

 Sparx Learning

M527, M522,
M335, M264

Maths Knowledge Organiser (Set 1)

SOLVING EQUATIONS

Key Concept

Inverse Operations

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

Key Words

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

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

Inverse: The operation which will do the opposite.

Examples

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

M707, M509,
M554

Tip

Answers can be:

- Integers
- Decimals
- Fractions
- negatives

Questions

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

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

Maths Knowledge Organiser (Set 1)

PRESENTING AND INTERPRETING DATA

Key Concept

Pie Charts

There are 360 degrees in a pie chart. So you need angles that add to 360°.

Eye colour	F	
Blue	15	$\times 4 = 60$
Brown	43	$\times 4 = 172$
Other	32	$\times 4 = 128$

$$\frac{360}{90} = 4 \quad = 90 \quad = 360$$

Key Words

Frequency: Total.

Mean: Total of data divided by the number of pieces of data.

Mode: The value that occurs most frequently.

Median: Middle number when they are in order.

Range: Difference between the largest and smallest values.

Examples

5, 9, 9, 9, 11, 12, 13, 15, 16

Averages

$$\text{Mean} = \frac{5 + 9 + 9 + 9 + 11 + 12 + 13 + 15 + 16}{9} = \frac{99}{9} = 11$$

Median = 11 (The middle number shown above)

Mode = 9 (This number occurs most often)

Measure of Spread

$$\text{Range} = 16 - 5 = 11$$

(A bigger range means the data is more spread out)

* Sparx Learning

M841, M940, M934,
M328, M460, M738,
M574, M165

Tips

- There can be more than one mode.
- Range is a measure of spread, not an average.
- Bar charts have gaps between the bars.

Questions

1) Find the mean, mode, median and range of:

a) 3, 12, 4, 6, 8, 5, 4 b) 12, 1, 10, 1, 9, 3, 4, 9, 7, 9

2) For the table:

- a) Draw a pie chart to show the data.
b) Draw a bar chart to show the data.
c) Work out the mean of the data.

Age	Frequency
11	17
12	11
13	8

ANSWERS: 1) a) Mean = 6, Mode = 4, Median = 5, Range = 9 b) Mean = 6.5, Mode = 9, Median = 8, Range = 11 2) a) Angles 170°, 110°, 80° c) 11.75

Maths Knowledge Organiser (Set 1)

PERIMETER

Key Concept

2D Shapes

	Parallelogram
	Trapezium
	Right-angled triangle
	Isosceles triangle
	Equilateral triangle

Key Words

Perimeter: The distance around the outside of the shape.
Unit of measure: This could be any unit of length cm, inch, m, foot, etc.

Dimensions: The lengths which give the size of the shape.

Circumference: The perimeter of a full circle.

Tip

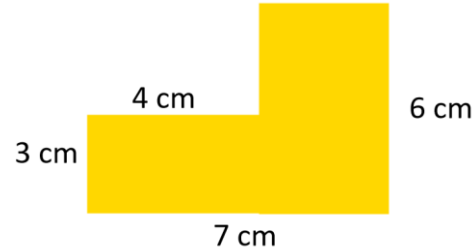
- Always include units with your answer.
- If you don't have a calculator use pi as 3.14.

Formula

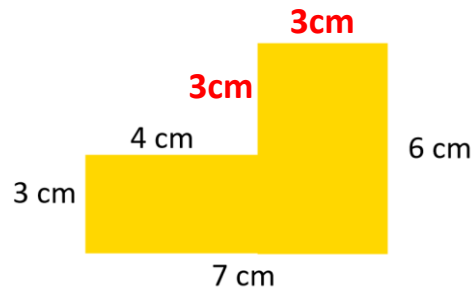
$$\text{Circumference} = \pi d$$

Examples

Find the perimeter



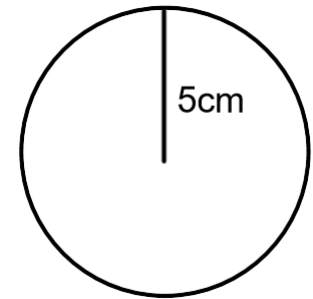
Step 1 – Find the missing lengths.



Step 2 – Add the lengths

$$3 + 4 + 3 + 3 + 6 + 7 = \underline{26 \text{ cm}}$$

Find the circumference to 1dp



Radius = 5, Diameter = 10

$$\text{Circumference} = \pi \times d$$

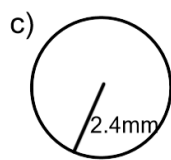
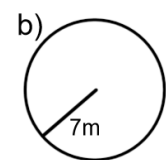
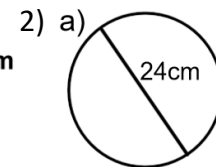
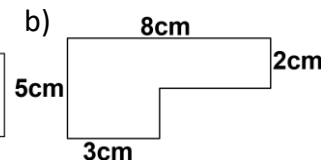
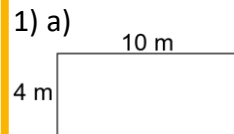
$$\text{Circumference} = \pi \times 10$$

$$\text{Circumference} = 31.4 \text{ cm}$$

 Sparx Learning

M169, M231, M27,
M635, M690,

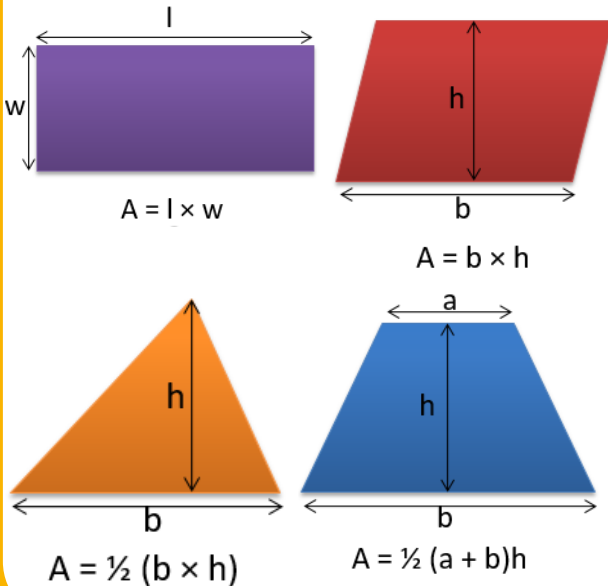
Questions – Find the perimeter of each shape to 1dp



Maths Knowledge Organiser (Set 1)

AREA AND PERIMETER

Key Concepts Area



Key Words

Area: The amount of square units that fit inside the shape.

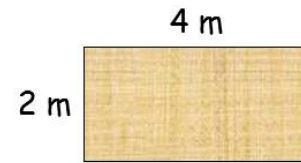
Perimeter: The distance around the outside of the shape.

Dimensions: The lengths which give the size of the shape.

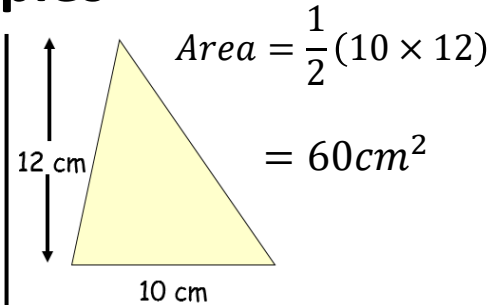
Shapes:

Rectangle, Triangle, Parallelogram, Trapezium, Kite.

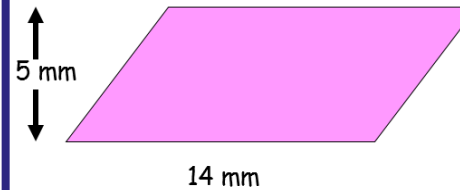
Examples



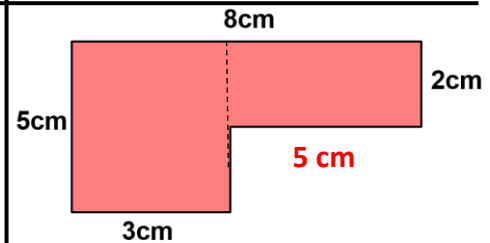
$$Area = 2 \times 4 = 8m^2$$



$$Area = \frac{1}{2} (10 \times 12) = 60cm^2$$



$$Area = 5 \times 14 = 70mm^2$$



$$Area = (5 \times 3) + (2 \times 5) = 25cm^2$$

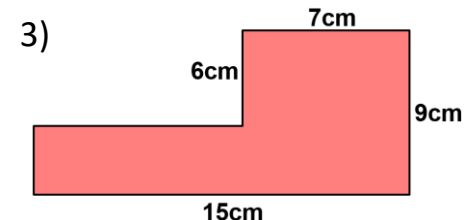
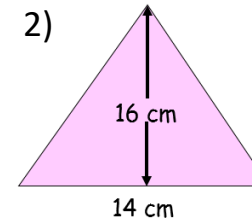
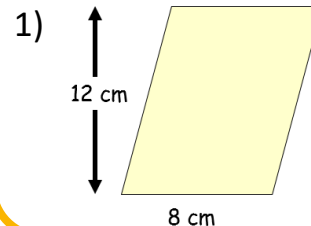
Sparx Learning

M390, M269, M291,
M610, M996, M705

Tip

Always remember units. These units are squared for area. mm^2 , cm^2 , m^2 , etc

Questions – Find the area.



ANSWERS: 1) $96cm^2$ 2) $112cm^2$ 3) $87cm^2$

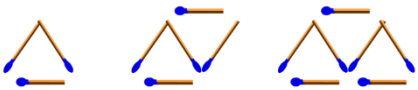
Maths Knowledge Organiser (Set 1)

SEQUENCES

Key Concept

Types of Sequence

Sequence as pictures:



Linear sequence:

4, 7, 10, 13, 16, ...

Fibonacci sequence:
 (add the previous two terms)

1, 1, 2, 3, 5, 8, ...

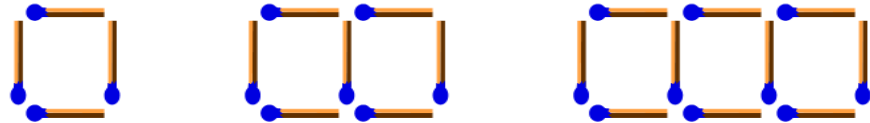
Key Words

Sequence: A list which is in a particular order following a pattern.

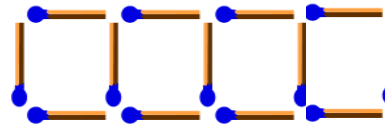
Term: Each particular part of a sequence.

Linear sequence: A sequence which is formed by adding or subtracting the same amount each time.

Examples



Next pattern is:



Sequence = 4, 7, 10, 13, ...

Term to term rule = + 3

Nth term

4, 7, 10, 13, 16, ... = $3n + 1$

Sparx Learning

M241, M381,
M991, M981

Tip

If a sequence is decreasing, the 'n' term will be negative.

Eg, 15, 11, 7, 3, ...

Nth term = $-4n + 19$

Questions

1) Find the next two terms and the term to term rule

a) 9, 13, 17, 21, ... b) 7, 12, 17, 22, ... c) 9, 7, 5, 3, ... d) 3, 4, 7, 11, 18

2) Find the nth term a) 7, 9, 11, 13, ... b) 8, 13, 18, 23, ...

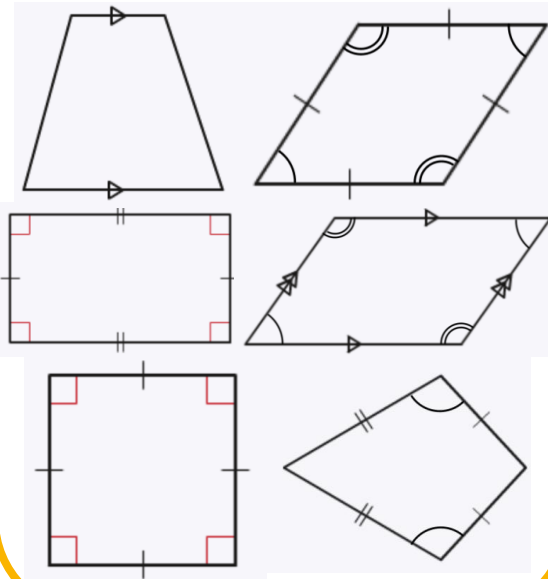
c) 15, 12, 9, 6, ... d) 1, -3, -7, -11, ...

ANSWERS: 1) a) 25, 29 Rule = +4 b) 27, 32, Rule = +5 c) 1, -1, Rule = -2 d) 29, 47, Rule = add previous 2 numbers 2) a) $2n + 5$ b) $5n + 3$ c) $-3n + 18$ d) $-4n + 5$

Maths Knowledge Organiser (Set 1)

PROPERTIES OF SHAPES

Key Concept Quadrilaterals



Key Words

Angle: This is formed by two lines, joined by a common endpoint.

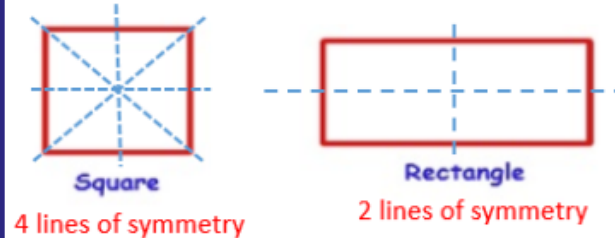
Symmetry: A shape has symmetry if there is a line which forms two equal parts which are a mirror image of each other.

Reflection: This is where a shape is flipped.

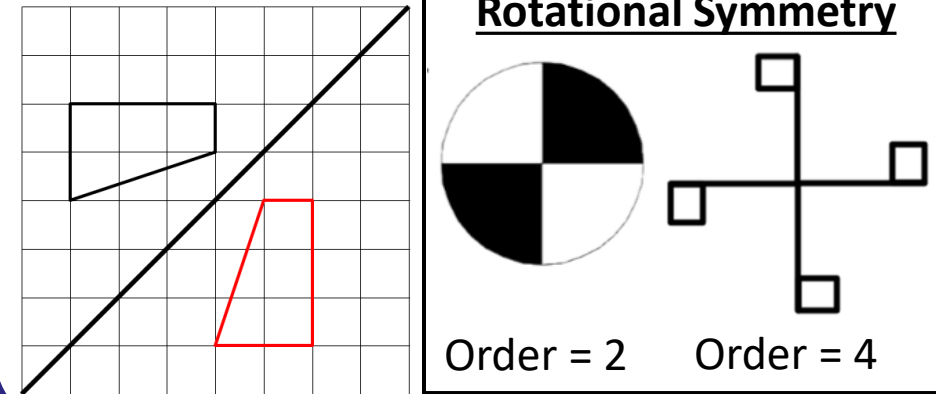
Rotation: This is where a shape is turned.

Examples

Lines of symmetry and reflection



Rotational Symmetry



Sparx Learning

M502, M541, M780,
M331, M290, M276,
M523

Tip

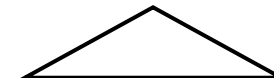
- The smallest the order of rotational symmetry can be, is 1.
- To see if a line of symmetry works fold along the line and see if the both halves lie exactly on top of each other.

Questions - For the shapes below draw on their lines of symmetry and state their order of rotational symmetry.

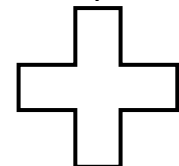
1)



2)



3)

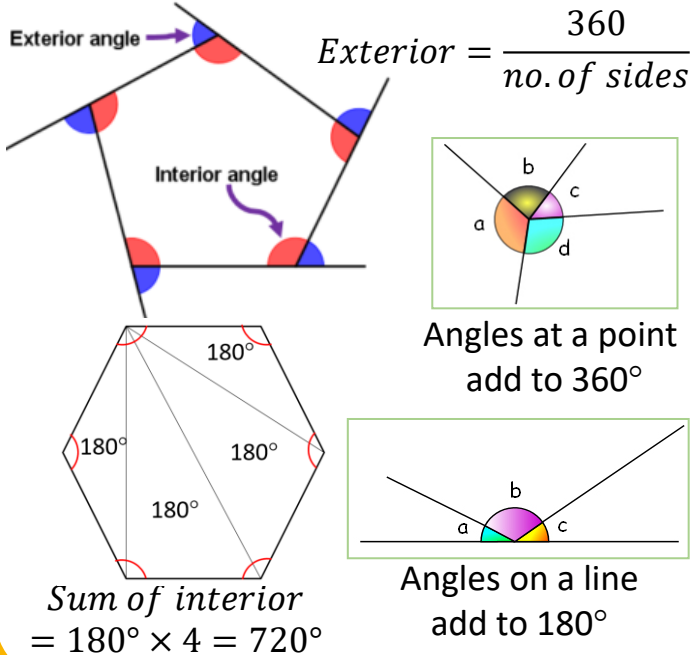


ANSWERS: 1) 2 lines of symmetry, order = 2 2) 1 line of symmetry, order = 1 3) 4 lines of symmetry, order = 4.

Maths Knowledge Organiser (Set 1)

ANGLE PROPERTIES

Key Concepts



Key Words

Angle: This is formed by two lines joined by a common endpoint.

Quadrilateral: 4 sided shape.

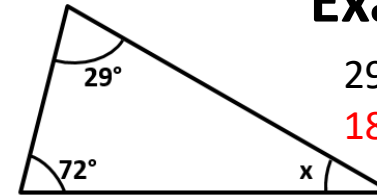
Polygon: Many sided shape.

Regular polygon: All sides and angles are equal.

Interior angle: The angle inside a polygon.

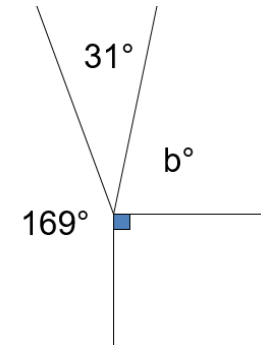
Exterior angle: The angle formed when a side length of a polygon is continued.

Examples



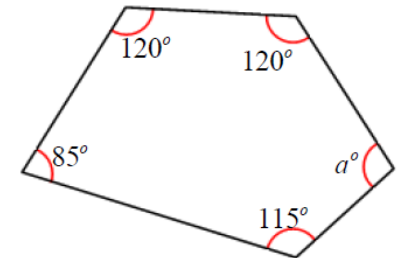
$$29^\circ + 72^\circ = 101^\circ$$

$$180^\circ - 101^\circ = 79^\circ$$



$$169^\circ + 31^\circ + 90^\circ = 290^\circ$$

$$360^\circ - 290^\circ = 70^\circ$$



$$120^\circ + 120^\circ + 85^\circ + 115^\circ = 440^\circ$$

$$540^\circ - 440^\circ = 100^\circ$$

Sparx Learning

**M818, M163,
M351, M679, M653**

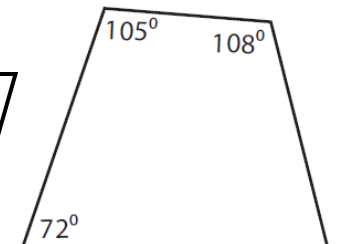
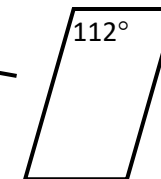
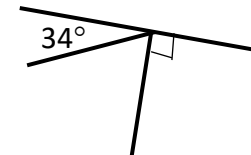
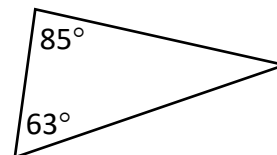
DELTA
Academies Trust

Tip

Remember isosceles triangles have two equal angles and equilateral triangles have three equal angles.

Questions

1) Find the missing angles:

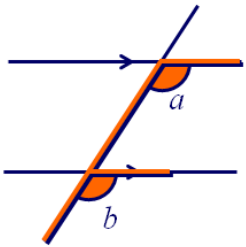


ANSWERS: 1) 32° 2) 56° 3) 68° , 112° , 68° 4) 75°

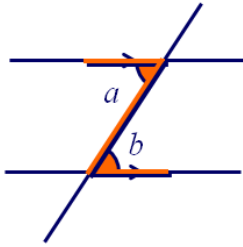
Maths Knowledge Organiser (Set 1)

PARALLEL LINES AND ANGLES

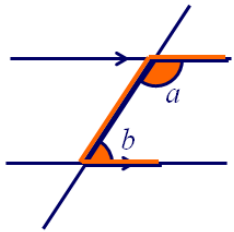
Key Concepts



Corresponding angles are equal.



Alternate angles are equal.



Co-interior angles add to 180° .

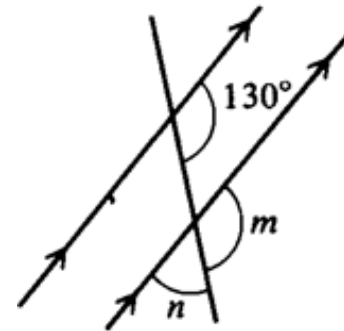
Key Words

Intersect: Two lines which cross.

Parallel: Two lines which never intersect. Marked by an arrow on each line.

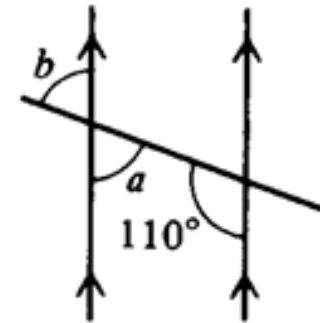
Transversal: A line which intersects two parallel lines.

Examples



$m = 130^\circ$ as corresponding angles are equal.

$n = 50^\circ$ as angles on a line add to 180°



$a = 70^\circ$ as co-interior angles add to 180°

$b = 70^\circ$ as vertically opposite angles are equal

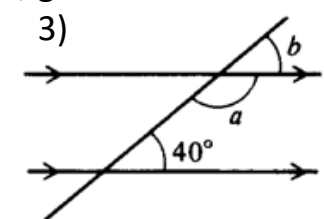
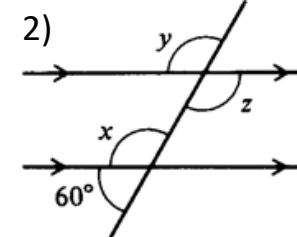
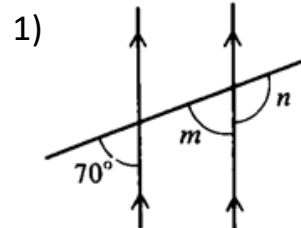
 **Sparx Learning**

M606, M319

Tip

These angle properties can be used alongside all the other angle properties that you have learnt.

Questions – Find the labelled angles, give reasons.



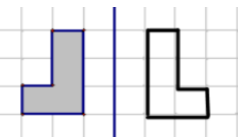
ANSWERS: 1) $m = 70^\circ$, $n = 110^\circ$, $a = 140^\circ$ 2) $x = 60^\circ$, $y = 120^\circ$, $z = 120^\circ$ 3) $a = 40^\circ$, $b = 40^\circ$

Maths Knowledge Organiser (Set 1)

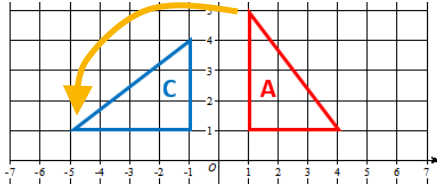
CO-ORDINATES AND TRANSFORMATIONS

Key Concept

Reflection



Rotation



Translation



Key Words

Co-ordinate: A pair of numbers which describe the position on a grid.

Transformation: This means the shape has 'changed'.

Reflection: This means a shape has been flipped.

Rotation: This means a shape has been turned.

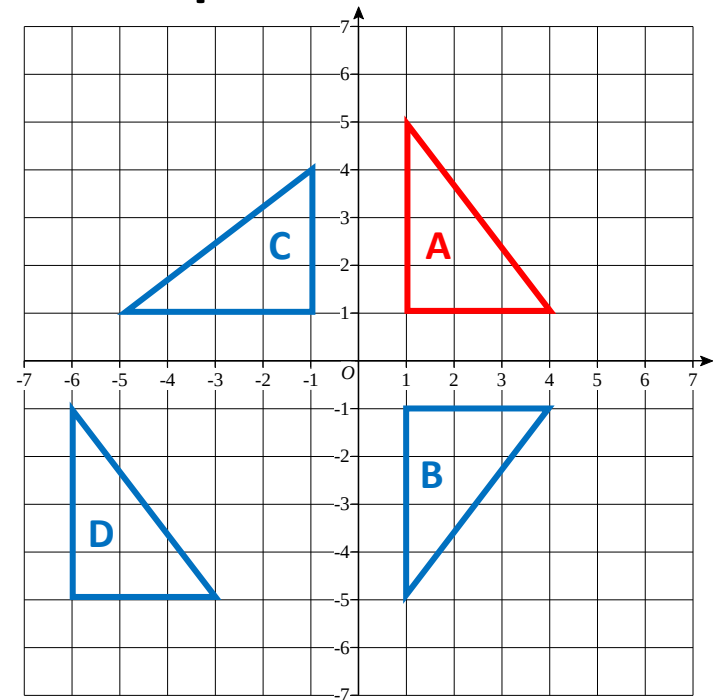
Translation: This means a *movement* of the shape.

Examples

a) Reflect A in the x-axis, label it B.

b) Rotate A 90°, anti-clockwise about (0,0), label it C.

c) Translate A in the vector $\begin{pmatrix} -7 \\ -6 \end{pmatrix}$, label it D.



 Sparx Learning

M618, M797,
M290, M139, M910

Tip

- Use **tracing paper** to avoid mistakes.
- When describing transformations, look at how many marks are available and see if you have put enough to get the marks.

Questions

Draw a grid like the one above.

Plot a triangle with vertices (6,2), (3, 2) and (4, 5).

a) Reflect the triangle in the y-axis. b) Translate the triangle $\begin{pmatrix} -3 \\ -4 \end{pmatrix}$

ANSWERS: a) (-6,2), (-3,2) and (-4,5) b) (1,1), (0,-2) and (3,-2)