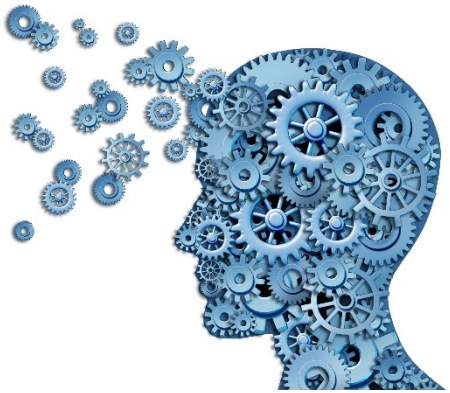
Kettlethorpe
HIGH SCHOOL

MATHS

Year 7 | Delta

Name:

Set:



Unit	Topic	Complete
1	Number Skills	
2	Transformations	
3	Expressions, Functions and Formulae	
4	Fractions	
5	Decimals and Percentages	
6	Probability	
7	Angles and Shapes	
8	Ratio and Proportion	
9	Sequences	
10	Averages	

Delta Unit 1: Number Skills

Order of Operations

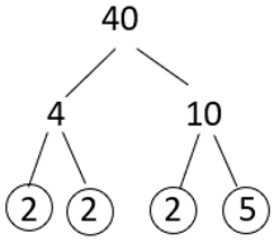
- Use BIDMAS to help you remember the order you need to complete the operations.

E.g. $3 \times (5 + 6) - 2^2$
$= 3 \times 11 - 2^2$
$= 3 \times 11 - 4$
$= 33 - 4$
$= \underline{29}$

B	Brackets
I	Indices (powers)
D	Division
M	Multiplication
A	Addition
S	Subtraction

Products of Prime Factors

To write a number as a product of prime factors, you need to find the prime numbers that multiply together to make that number.
e.g. Write 40 as a product of prime factors:



$40 = 2 \times 2 \times 2 \times 5$

$40 = 2^3 \times 5$

Highest Common Factor and Lowest Common Multiple

- **Factors** divide a number exactly.

e.g. factors of 40 = 1, 2, 4, 5, 8, 10, 20, 40

- **Highest Common Factor (HCF)** is the largest number that is a factor of both.

e.g. Find the HCF of 40 and 24:
factors of 40 = 1, 2, 4, 5, 8, 10, 20, 40

HCF = 8

factors of 24 = 1, 2, 3, 4, 6, 8, 12, 24

- **Multiples** are the multiplication table of a number.

e.g. multiples of 8 = 8, 16, 24, 32, 40, 48, 56, …

- **Lowest Common Multiple (LCM)** is the smallest number that is a multiple of both.

e.g. Find the LCM of 8 and 10:
multiples of 8 = 8, 16, 24, 32, 40, 48, 56, …

LCM = 40

multiples of 10 = 10, 20, 30, 40, 50, 60, …

Directed Numbers

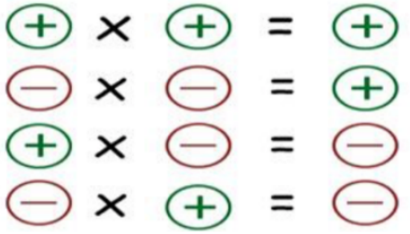
Adding and Subtracting:
If you add a negative number it gets smaller:

$- 3 + - 4 = - 3 - 4 = - 7$

If you subtract a negative number it gets bigger:

$5 - - 3 = 5 + 3 = 8$ $\quad\quad$ $- 2 - - 6 = - 2 + 6 = 4$

For Multiplying follow the rules below, Dividing is the same.



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Year 7 | Half-term 1: *Number Skills*

Literacy

a) Write down the definition for multiple.

b) Write down the definition for prime.

c) Explain why 1 is not a prime number.

Fluency

1) Write the following numbers as a product of their primes.

a) 42 b) 70

2) Find the Highest Common Factor of 64 and 48.

3) Find the Lowest Common Multiple of 12 and 18.

Problem Solving

1) Bus A and bus B both leave Leeds at 6am.
Bus A leaves every 12 minutes.
Bus B leaves every 9 minutes.
At what time will both busses next leave at the same time?

Reasoning

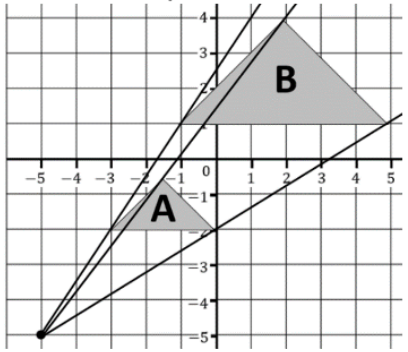
John is having a party for 25 people and is going to buy some burgers and buns.
Burgers come in packs of 8 and buns come in packs of 5.
He needs to have exactly the same number of burgers as buns.
How many packs of each will John have to buy to make sure everyone has a burger?

Delta Unit 2: Transformations

Enlargement

- A scale factor bigger than 1 makes the shape bigger.
- A scale factor less than 1 makes the shape smaller.

E.G. Enlarge shape A by scale factor 2 about the centre (-5, -5). Label it shape B.



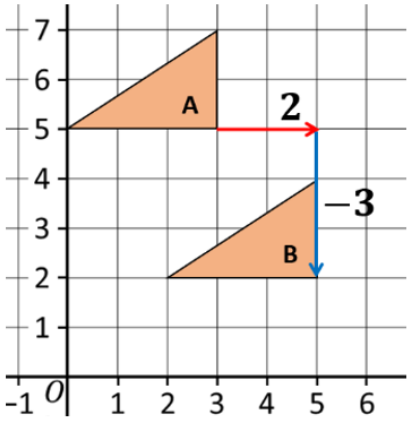
Translation

Slide the shape by the given directions. For a vector:

- The top number is how many we move horizontally. Positive right, Negative left.
- The bottom number is how many we move vertically. Positive up, Negative down.

E.G. Translate triangle A by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

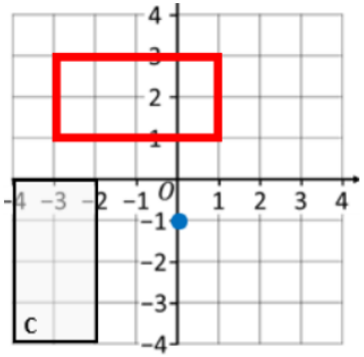
This means move the triangle 2 squares right and 3 squares down.



Rotation

- Plot the centre point.
- Use tracing paper to turn the shape the correct angle in the given direction keeping the point still.

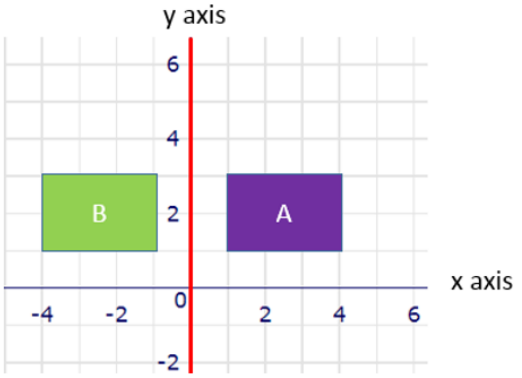
E.G. Rotate shape C 90° clockwise about the centre (0, -1).



Reflection

- Reflect (flip) the shape in the given mirror line.
- You may have to draw the mirror line first.

E.G. Reflect shape A in the y axis.



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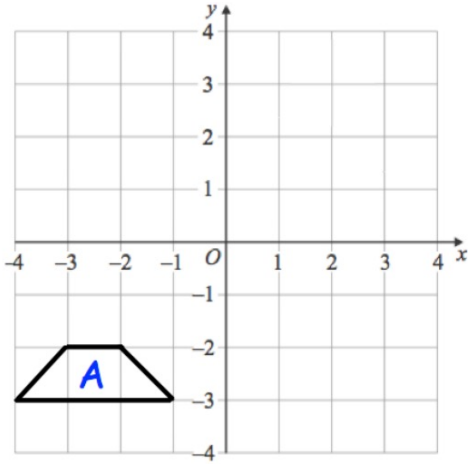
Year 7 | Half-term 1: *Transformations*

Literacy

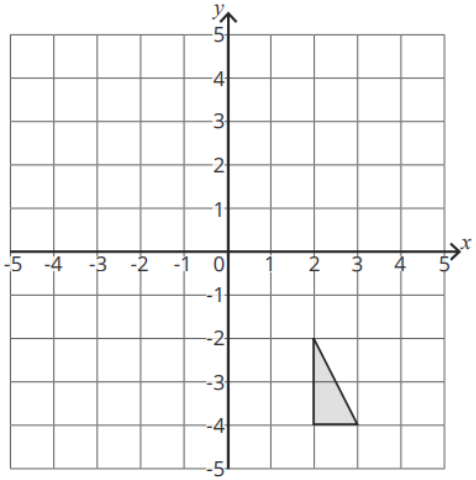
Write down the 4 key command words in transformations and the definition for one of them.

Fluency

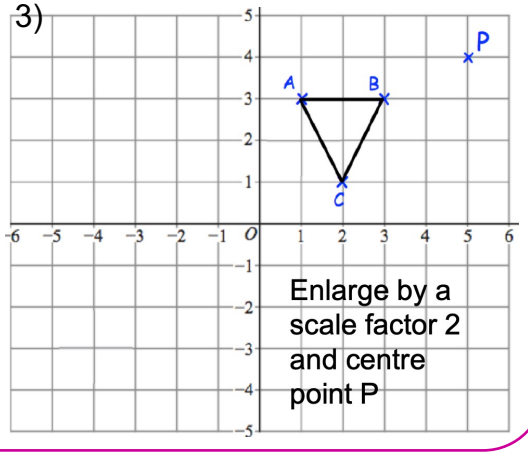
1) Translate triangle A by the vector $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$



2) Rotate 90° clockwise about (1, 0)



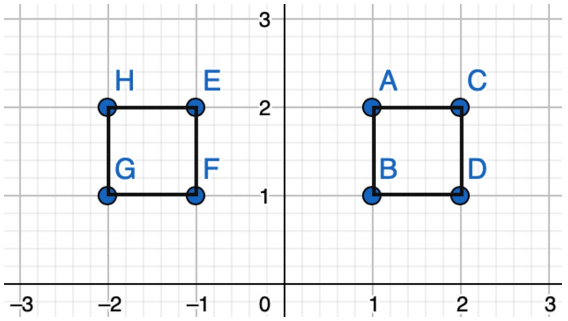
3)



Enlarge by a scale factor 2 and centre point P

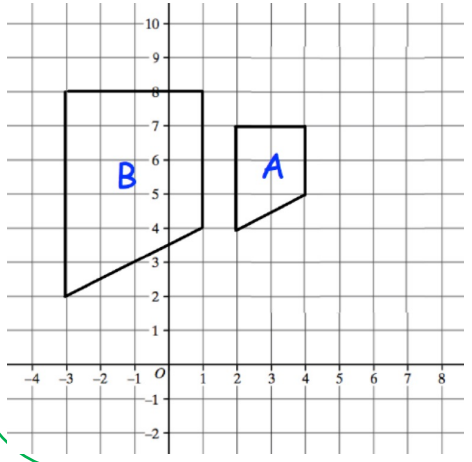
Problem Solving

The square ABCD has been transformed into the shape EFGH.
Describe fully 2 possible transformations that it could be.



Reasoning

Describe fully the transformation.



Delta Unit 3: Expressions, Functions and Formulae

Simplifying Expressions (adding/subtracting)

'Collect like terms', you cannot collect terms that are not the same e.g. x and y.
Always include the sign in front of the term.

7h + 2m – 3h + 4m = 4h + 6m

Substitution

Substitution is replacing a letter with a value.
Remember when a letter and number are written next to one another it means they are multiplied together.
Remember to use BIDMAS.

E.G. if a = 3 and b = 5, find the value of 9a + 2b.

9a = 9 x 3 = 27 2b = 2 x 5 = 10

9a + 2b = 27 + 10 = 37

Factorising into a Single Bracket

Factorising is the inverse of expanding a bracket.
Start by finding the Highest Common Factor of both terms.

E.G. Factorise fully 20a + 12 = 4(5a + 3)

E.G. Factorise fully $9x^2 - 15x = 3x(3x - 5)$

Expanding a Single Bracket

Expanding means to multiply. For a single bracket you multiply each term inside of the bracket by the term in front of the bracket. Use a grid to multiply.

E.G. Expand 6(8v – 2) = 48v - 12

X	8v	–	2
6	48v	-	12

E.G. Expand $2x(4x + 5) = 8x^2 + 10x$

X	$4x$	$+ 5$
$2x$	$8x^2$	$+ 10x$

Expanding Double Brackets

Use a grid to multiply out the brackets.
Remember to put the multiplication sign in the corner to remind you to multiply.

E.G. Expand and simplify $(x + 5)(x + 8)$

X	x	$+ 5$
x	x^2	$+ 5x$
$+8$	$+8x$	$+ 40$

Now collect the like terms:

$x^2 + 5x + 8x + 40$

$= x^2 + 13x + 40$

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Year 7 | Half-term 2: *Expressions, Functions and Formulae*

Literacy

Write down the definition for:

Expand

Factorise

Fluency

1) Expand:

a) $4(x + 3)$ b) $5y(y - 2)$ c) $6a(2b + 1)$

2) Factorise fully:

a) $12x + 6$ b) $5x^2 + 15x$ c) $12x^2 - 16xy$

3) Expand and simplify $(x + 9)(x + 2)$

Problem Solving

Expand and Simplify:

a) $4x(x + 5) - 2x(x + 20)$

b) Can this be factorised?

Reasoning

Jimmy is factorising $15x^2y + 10xy$.

He gets the answer $5x(3xy + 2y)$.

Explain why his answer is not correct.

Delta Unit 4: Fractions

Fractions of Amounts

To find a fraction of an amount you divide by the denominator then multiply by the numerator.

E.G. Find $\frac{3}{8}$ *of* £72

$$= £72 \div 8 \times 3$$
$$= £9 \times 3$$
$$= £27$$

Adding and Subtracting Fractions

Remember you need to make a common denominator.
Do not add/subtract the common denominators, this will stay the same.

E.G. $\frac{2}{3} + \frac{1}{5} = \frac{10}{15} + \frac{3}{15} = \frac{13}{15}$

E.G. $\frac{7}{10} - \frac{1}{2} = \frac{7}{10} - \frac{5}{10} = \frac{2}{10} = \frac{1}{5}$

If you have mixed numbers, convert them to improper fractions first, then calculate as above.
Remember to check if your answer can be converted back into a mixed number.

Fractions, Decimals and Percentages Equivalence

Here are some common equivalences to know.

Fraction	Decimal	Percentage
$\frac{1}{2}$	0.5	50%
$\frac{1}{4}$	0.25	25%
$\frac{1}{5}$	0.2	20%

Multiplying Fractions

You **do not** need common denominators.
Multiply numerators and multiply denominators.

E.G. $\frac{3}{8} \times \frac{2}{5} = \frac{6}{40} = \frac{3}{20}$

If you have mixed numbers, convert them to improper fractions first, then calculate as above.

Dividing Fractions

Make a common denominator.
Your answer is the first numerator over the second numerator.

E.G. $\frac{3}{4} \div \frac{4}{5} = \frac{15}{20} \div \frac{16}{20} = \frac{15}{16}$

If you have mixed numbers, convert them to improper fractions first, then calculate as above.

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MATHS

Year 7 | Half-term 3: *Fractions*

Literacy

Write down the definition for:

Numerator

Denominator

Fluency

1a) $\frac{2}{5}+\frac{4}{7}=$

1b) $3\frac{1}{4}-1\frac{3}{5}=$

2a) $\frac{5}{8}\times\frac{2}{7}=$

2b) $3\frac{2}{5}\times\frac{2}{3}=$

3a) $\frac{8}{11}\div\frac{1}{5}=$

2b) $2\frac{1}{3}\div1\frac{4}{5}=$

Problem Solving

Calculate the area and perimeter of the rectangle below

$2\frac{1}{4}$

$1\frac{2}{3}$

Reasoning

Explain how you know which of these fractions is the greatest.

$2\frac{2}{3}$ $\frac{7}{3}$ $\frac{9}{4}$ $2\frac{1}{5}$ $2\frac{5}{8}$

Delta Unit 5: Decimals and Percentages

Multiply Decimals

To multiply with a decimal:

- Multiply by 10/100/1000 to get rid of the decimals.
- Multiply the numbers normally in a column without the decimal place.
- Divide by 10/100/1000 to cancel the original multiplication.

E.G. 13.7 x 42
(**x10** for integers)
Work out:
137 x 42

	1	3	7
x		4	2
	2	7	4
5	4	8	0
5	7	5	4

5754 ÷ **10** = 575.4

Dividing Decimals

Use your short division to divide, think about the place value:

E.G. 32.7 ÷ 3 = 1.09

		1	0 ·	9
3	3	2	·	7

Reverse Percentages

Find the percentage you have.
Divide to find 1% or 10%.
Multiply to find 100%.
E.G. After a 20% increase I get paid £540. What did I originally earn? 100% + 20% = 120%
120% = £540
10% = £45
100% = £450

Percentages of amounts

50% = ÷2 10% = ÷10 1% = ÷100

E.G. Find 21% of 600:
10% = 600 ÷ 10 = 60 1% = 600 ÷ 100 = 6
21% = 60 x 2 + 6 = 126

Using a multiplier:
CHANGE THE PERCENTAGE TO A DECIMAL THEN MULTIPLY
E.G. Find 21% of 600
21% ÷ 100 = 0.21 600 x 0.21 = 126

Percentage Increase/decrease

Non-calculator:
FIND THE PERCENTAGE THEN ADD/SUBTRACT
Increase 450 by 10%: 10% = 450 ÷ 10 = 45
450 + 45 = 495

Decrease 700 by 28%: 10% = 700 ÷ 10 = 70
1% = 700 ÷ 100 = 7
28% = 70 x 2 + 7 x 8 = 196
700 – 196 = 504

Using a multiplier:
ADD/SUBTRACT THE PERCENTAGE TO/FROM 100, CHANGE TO A DECIMAL AND MULTIPLY
Increase 450 by 10%: 100% + 10% = 110%
110% ÷ 100 = 1.1
450 x 1.1 = 495

Decrease 700 by 28%: 100% - 28% = 72%
72% ÷ 100 = 0.72
700 x 0.72 = 504

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MATHS

Year 7 | Half-term 3: *Decimals and Percentages*

Literacy

Write down a definition for:
Ascending

Descending

Multiplier

Fluency

1) Work out the following:

a) 4.6 x 0.8

b) 3.72 x 4.9

2) Work out the following:

a) Increase £3800 by 20%

b) Decrease £720 by 18%

Problem Solving

1) The price of a Tv is reduced by 20% in a sale.
The sale price is £520.
How much was the TV full price?

2) A pair of jeans have 15% off in a sale.
They are reduced by £9.
What was the full price of the jeans?

Reasoning

Max is calculating 1.65 x 0.05.
He gets an answer of 17.3250.
Explain why this answer must be wrong.

Delta Unit 6: Theoretical Probability

Mutually exclusive events

Mutually exclusive events cannot happen at the same time and so the total of their probabilities is 1.

E.G. The table shows the probability of scoring goals:

No. goals	0	1	2	3
probability	0.3	0.35	0.2	0.15

Probability of scoring 3 = 1 – 0.3 – 0.35 – 0.2 = 0.15

You can find expected outcomes by working out:
Probability x number of trials
E.G. in 50 matches, how many times do you expect 2 goals? 0.2 x 50 = 10

Sample Space

A sample space is used to record the possible outcomes of 2 joint events.
E.G. The table shows the possible outcomes of rolling 2 dice and finding the total of the scores.

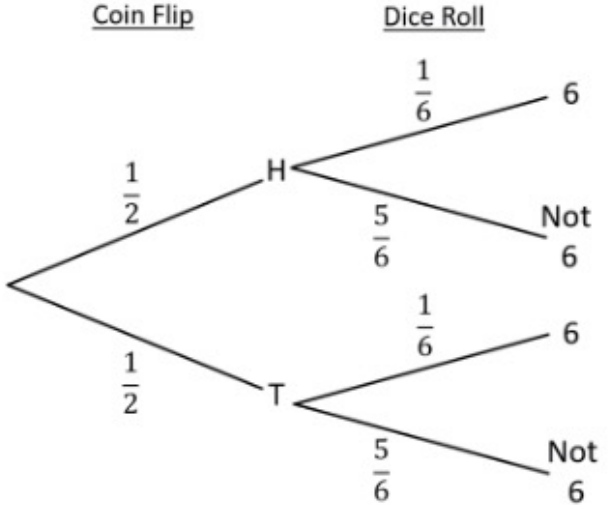
+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

a) The probability of scoring 8 is $\frac{5}{36}$.

b) The probability of scoring less than 7 is $\frac{15}{36}$.

Tree Diagrams

A tree diagram is used to show all of the possibilities from multiples outcomes.
You multiply across the branches, then add probabilities up.
E.G. John flips a coin and rolls a dice.
The tree diagram shows John's results:



a) The probability of Heads and 6 is:

$$\text{H and 6} = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$$

b) The probability of not getting 6 is:

$$\text{H and not 6} = \frac{1}{2} \times \frac{5}{6} = \frac{5}{12}$$

$$\text{T and not 6} = \frac{1}{2} \times \frac{5}{6} = \frac{5}{12}$$

$$\text{not 6} = \frac{5}{12} + \frac{5}{12} = \frac{10}{12}$$

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MATHS

Year 7 | Half-term 4: *Probability*

Literacy

Write down the definition of the following key probability language:

Even chance

Impossible

Certain

Fluency

1) Two fair spinners are spun.
Spinner 1 has four equal sections labelled 1, 3, 4 and 5.
Spinner 2 has three equal sections labelled 5, 6 and 7.
Each spinner is spun once. The numbers are added together to get a score. Complete the table to show all possible scores.

Spinner 2 \ Spinner 1	1	3	4	5
5				
6				
7				

(a) What is the probability of scoring 8?

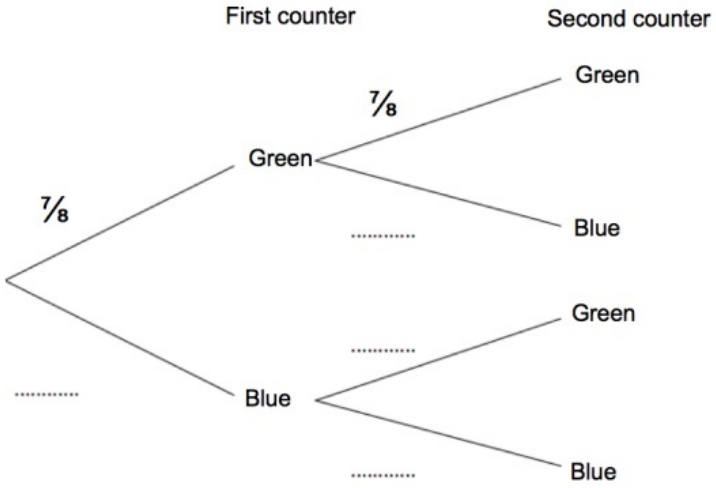
(b) What is the probability of scoring an odd number?

Reasoning

Derek rolls a die 10 times.
It lands on an even number 7 times and an odd number 3 times.
Derek says this is a biased die.
Comment on Derek's statement.

Problem Solving

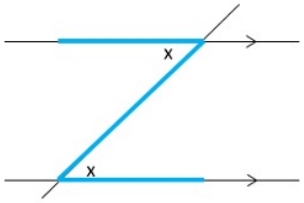
There are green and blue counters in a container.
Kevin takes at random a counter from the container.
He replaces the counter.
Kevin takes at random a second counter from the container.
(a) Complete the probability tree.



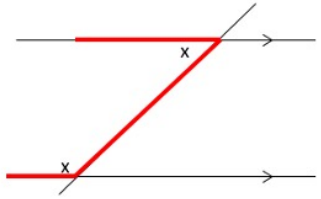
(b) Work out the probability that Kevin takes at least one blue counter.

Delta Unit 7: Angles and Shapes

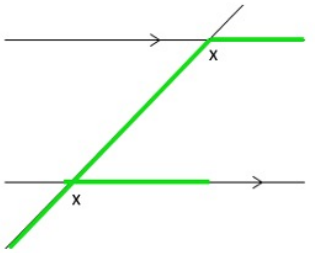
Angles on Parallel lines



Alternate angles (Z shape) are equal.



Co-interior angles (C shape) sum to 180°.



Corresponding angles (F shape) are equal.

Angles in irregular Polygons

Irregular polygons are made up of many straight edges, but angles and sides may be different sizes to each other.

Sum of interior angles:

(number of sides – 2) x 180°.

E.G. a pentagon has 5 sides.

The sum of the interior angles = (5 – 2) x 180°

= 3 x 180°

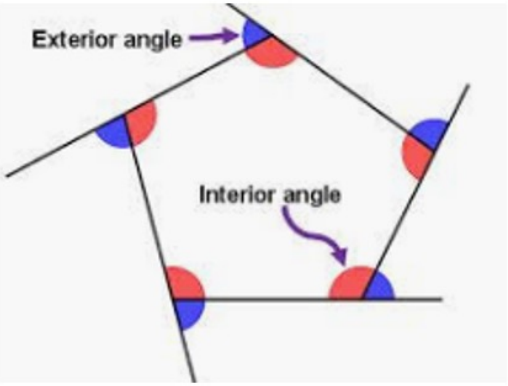
= 540°

To find a missing angle, add up all the angles you know, then subtract this from the total of the interior angles.

Angles in Regular Polygons

Regular means all sides and angles equal.

- Exterior angles of any polygon sum to 360°.
- Each exterior angle = 360° ÷ number of sides.
- Exterior + interior = 180° (straight line)
- Interior angle = 180° - exterior angle.



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MATHS

Year 7 | Half-term 4: *Angles and Shapes*

Literacy

Write down the definition for:

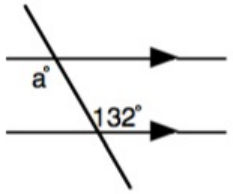
Regular polygon

Parallel lines

Fluency

Find the missing angles and state below the angle fact you used to find it.

1



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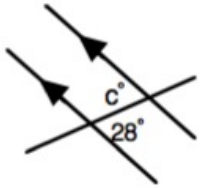

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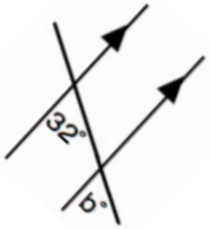

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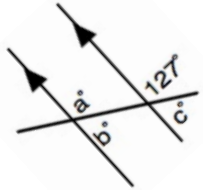

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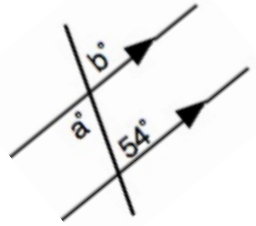

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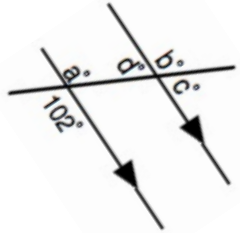
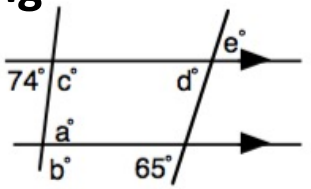


Problem Solving

Calculate all the missing angles, you **must** give reasons for each angle you find.

Reasoning



Iliya says that angle a must be 65° because it is an alternate angle. Comment on Iliya'sanswer.

Delta Unit 8: Ratio and Proportion

Fractions and Ratio

The denominator of the fraction is the total number of parts added together.

E.G. $4 : 3 = \frac{4}{7} : \frac{3}{7}$

Ratio – when you know the difference

E.G. Jenny and Cleo share some money in the ratio 5 : 8.
Given that Cleo gets £360 more than Jenny, how much do they each get?

8 – 5 = 3
£360 ÷ 3 = £120
5 x £120 : 8 x £120
£600 : £960
Jenny = £600, Cleo = £960

You may also use a method of drawing boxes.

Best Buys

Use the unitary method.
THINK: How much will 1 of each cost?

Price ÷ Size

E.G. 4 toilet rolls cost £1.84, 9 toilet rolls cost £4.23.
Which pack size is better value for money?

4 pack: £1.84 ÷ 4 = £0.46
9 pack: £4.23 ÷ 9 = £0.47
The 4 pack is cheaper so better value.

Sharing into a Ratio

Find the total for the all parts added together.
Find the amount for 1 part by dividing the total by the total number of parts.
Find the amount for the number of parts needed by multiplying the amount for 1 part by the number of parts.

E.G. Share 120 in the ratio 3 : 5.

3 + 5 = 8
120 ÷ 8 = 15
3 x 15 : 5 x 15
45 : 75

You may also use a different method (drawing boxes or using fractions of amounts).

Exchange Rates

You will be given an exchange rate.
To convert to a different currency, multiply by the exchange rate.
To convert into GBP (£), divide by the exchange rate.

E.G. You are told that £1 = $1.21.

a) Convert £500 into dollars.
£500 x 1.21 = $605

b) Convert $150 into GBP (£).
$150 ÷ 1.21 = £123.966942 = £123.97

Literacy

Write down the definition for:
Ratio

Best buy

Fluency

1) Simplify these ratios.

4:6 27:12 24 : 18 : 12

2hours : 40 minutes £3 : 90p

2 Share £25 in the ratio 2:3

3) In a tennis club the ratio of adults to children is 5:2.
There are 27 more adults than children.
How many adults and children are there?

Problem Solving

1) The exchange rate is £1 = $1.18.
Leon buys trainers for £115 in Leeds.
Sean buys the same trainers for $130 in NYC.
Who pays less for the trainers?

2) The ratio of A:B is 2:5.
The ratio of B:C is 10:4.
What is the ratio of A:B:C?

Reasoning

Abi can buy 215g of beans for 40p or 450g of beans for 74p.
Which size beans should Abi buy? Explain your answer.

Delta Unit 9: Sequences

Nth Term

The nth term is the rule that tells us how to find any term in the arithmetic sequence (**position – to – term rule**).

Step 1: find what amount the sequence is increasing (or decreasing) by from term-to term. The sequence is linked to this multiplication table and is the start of your rule.

Step 2 : Write this multiplication table above the sequence.

Step 3: Find how to get from the multiplication table to the sequence for each term, this is the end of your rule.

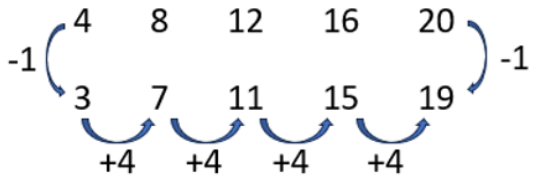
E.G. find the nth term for 3, 7, 11, 15, 19, …

1: Sequence goes up by 4 so the nth term starts 4n.

2: Write out 4, 8, 12, 16, 20, … above the sequence.

3: The sequence is 1 less than the 4 times table so the nth term ends -1.

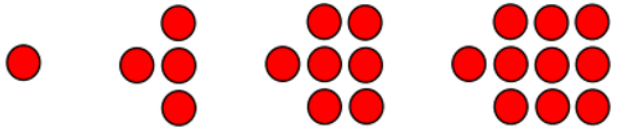
So the nth term = 4n - 1



Pattern sequences

Pattern sequences are a sequence of diagrams that follow a pattern. You can find the next pattern in the sequence, or the nth term for the sequence.

E.G.



Generating a Sequence

You generate a sequence from by substituting into the nth term (**position – to – term rule**).

1st term n = 1, 2nd term n = 2, etc.

E.G. Generate the sequence 2n + 4.

1st term = 2 x 1 + 4 = 6 2nd term = 2 x 2 + 4 = 8

3rd term = 2 x 3 + 4 = 10 4th term = 2 x 4 + 4 = 12

Sequence = 6, 8, 10, 12, …

Arithmetic and Geometric sequences

Arithmetic sequences are sequences of numbers that add (or subtract) the same amount each time.

E.G. 2, 7, 12, 17, 22, … (add 5 each time).

Geometric sequences are sequences that are multiplied by the same amount each time.

E.G. 2, 4, 8, 16, 32, … (multiply by 2 each time).

Kettlethorpe HIGH SCHOOL

MATHS

Year 7 | Half-term 6: *Sequences*

Literacy

Write down the definition for:
Arithmetic sequence

Geometric sequence

Fluency

1) Find the n^{th} term of the following sequences:

a) 4, 7, 10, 13, 16...

b) 5, 9, 13, 17, 21....

c) 2, 6, 10, 14, 18...

d) 27, 25, 23, 21, 19...

2) Find the first 3 terms of the following sequences:

a) 3n + 5

b) 10n - 2

Problem Solving

Draw the next term and find the nth term of this picture sequences involving dots.

Reasoning

1) Is 50 in the the sequence 4n + 3?

2) Is 200 in the the sequence 3n - 6?

Delta Unit 10: Averages

Range

Range: Biggest value subtract smallest value.
E.G. Find the range for the following numbers:
5, 9, 3, 4, 11, 6, 8, 5
Range = 11 – 3 = 8

Mode

Mode: The most common value.
E.G. Find the mode for the following numbers:
5, 9, 3, 4, 11, 6, 8, 5
Mode = 5

Median

Median: The middle number, when in size order.
If there are 2 middle numbers, add them and divide by 2.
E.G. Find the median for the following numbers:
5, 9, 3, 4, 11, 6, 8, 5

Median = 3, 4, 5, 5, 6, 8, 9, 11. = (5 + 6)/2 = 5.5

Mean

Mean: Add the values together then divide by how many values there are.
E.G. Find the mean of 5, 9, 3, 4, 11, 6, 8, 5
5 + 9 + 3 + 4 + 11 + 6 + 8 + 5 = 51
51 ÷ 8 = 6.375

Comparing Data

1) Compare the range to see which set of data is more spread out.

2) Compare an average (mean or median).

E.g. Looking at these test scores, compare the boys and girls.

	mean	range
Boys	54	11
Girls	60	15

1) Boys have a smaller range showing their data is less spread out and more consistent.

2) Girls have a higher mean, showing they score more marks on average.

Types of Data

Primary data is data collected first hand for a specific purpose. E.g. a survey or questionnaire.

Secondary data is data that has already been collected previously. E.g. from the internet or census.

Quantitative data is data that can be counted or measured and given a numerical value. E.g. heights, wages, ages.

Qualitative data is non-numerical based on qualities. E.g. hair colour or favourite meal.

Literacy

What is the difference between primary and secondary data?

What is the difference between quantitative and qualitative data?

Fluency

Find the mean, mode, median and range for each of the following:

a) 1, 1, 2, 4, 6, 7, 8, 10, 15

b) 12, 13, 12, 13, 20

c) 19, 20.2, 15.4, 29, 18.7, 14.2, 19, 17.5, 21, 21.9

Problem Solving

1) Find a set of seven numbers that have a mean, mode, median and range of 10.

2) A 5-a-side football team have an average height of 1.82m but when their substitute is included the team's average increases by 2cm. What height is the substitute?

Reasoning

Smith's PPI Claims Company boast that they manage to win their clients £3,500 on average. Four customers received

£10,500, £1,050, £2,000 and £750.

Have the company been honest with their statement?