Kettlethorpe
HIGH SCHOOL

MATHS
Year 7 | Theta

Name:

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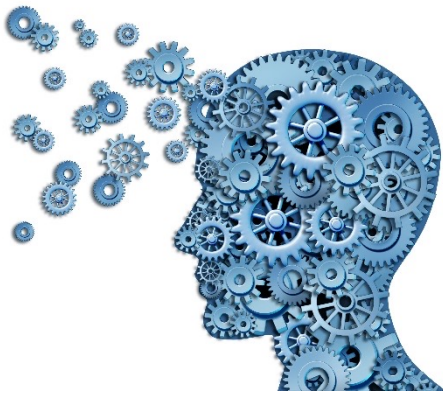
Unit	Topic	Complete
1	Number Skills	
2	Transformations	
3	Equations, Functions and Formulae	
4	Fractions	
5	Decimals and Percentages	
6	Probability	
7	Lines, Angles and Measures	
8	Ratio and Proportion	
9	Sequences	
10	Averages	

Theta Unit 1: Number Skills

Rounding

Rounding is making a number simpler but keeping it close to its original value.

You can round to significant figures or decimal places.
   e.g. Round 3.1476 to 2 decimal places.

3 . 1 4 | 7 6

Remember:

5 or above rounds up.
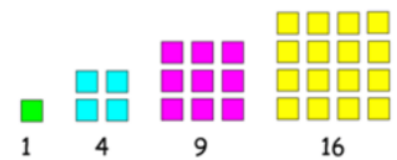
Below 5 stays the same.

Answer: 3.15

Prime Numbers

A **prime number** is a number that has exactly two different factors, which are 1 and the number itself. The prime numbers up to 30:

2	3	5	7	11	13	17	19	23	29

Square Numbers

A **square number** is the product of a number multiplied by itself e.g. 2 x 2 = 4

1   4   9   16

Multiples

A **multiple** is the result of multiplying a number by an integer.

E.g. a multiple of 8 could be, 8, 16, 24, 32, …

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, …

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

LCM = 40

Factors

A factor is a number that divides into another number exactly, leaving no remainder.

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

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

HCF = 8

Literacy

Write down a definition for each of the following:

Prime number

Multiple

Factor

Fluency

Complete the following calculations showing your working

a) 24 x 36

b) 39 x 27

c) 301 ÷ 7

d) 492 ÷ 3

List all the factors of the following numbers

e) 16

f) 24

Problem Solving

1) Mr Pearson buys 12 Shirts at £17 and sells them for £25. How much profit does he make?

2) A number divided by 4 is 19. A different number divided by 4 is 23. What is the difference between the numbers?
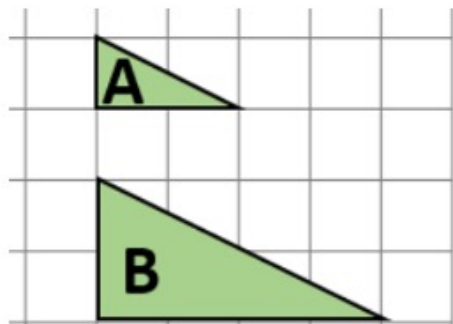
Reasoning

Mr Jones is saving up for a new TV that costs £600. He says if he saves £35 for 17 weeks he will have enough. Is he correct?

Theta Unit 2: Transformations

Enlargement

A scale factor bigger than 1 makes the shape bigger. Multiply the length of each side by the given scale factor.

E.G. enlarge triangle A by scale factor 2.

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.

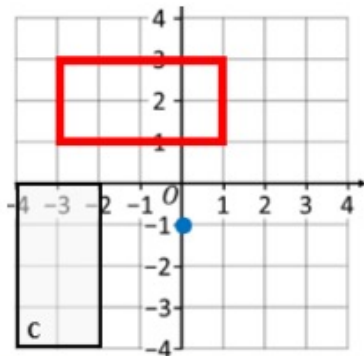E.G. Translate triangle A by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

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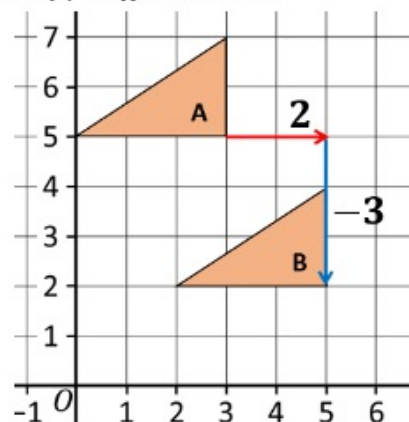
Rotation

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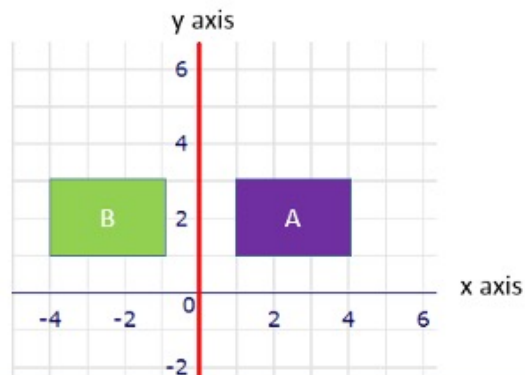- Use tracing paper to turn the shape the correct angle in the given direction keeping the point still.

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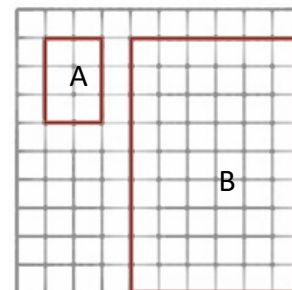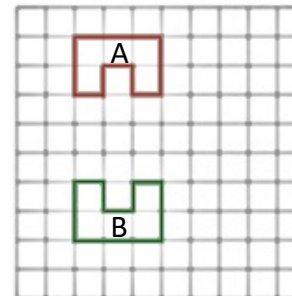
E.G. Reflect shape A in the y axis.

Literacy

Write down a definition for each of the following words:

Rotation

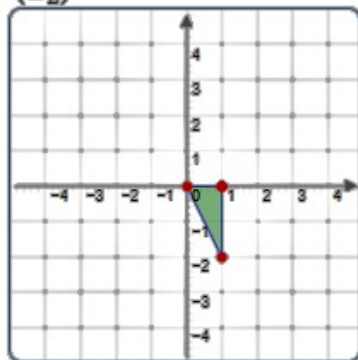Enlargement

Problem Solving

What transformation has been applied to transform shape A to shape B in each
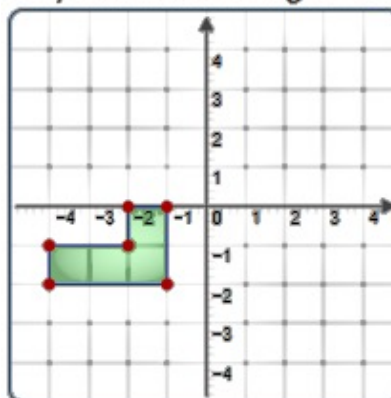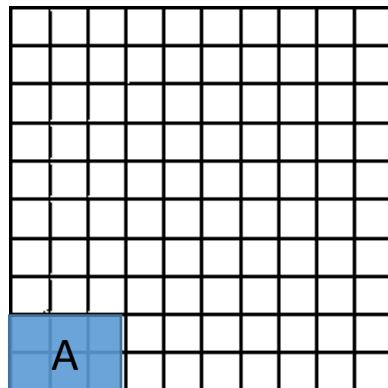

Fluency

Q1) Translate using the vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$

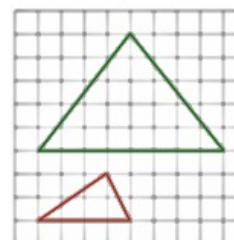**Q2) Reflect in the y axis**

Q3) Enlarge shape A by a scale factor of 3. Label it shape B.

Reasoning

Charlie has enlarged a triangle by scale factor 2. Can you explain any mistakes?

Theta 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.

$$7h + 2m - 3h + 4m = 4h + 6m$$

Simplifying expressions (multiplying)

Multiply the coefficients (numbers in front), then list the letters.
E.G. 3a x 5b = 15ab

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

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

Function Machines

Input are the numbers that go into the machine.

Output are the numbers that come out of the machine.

If you are given the output, you need to use inverse operations to find the input.

E.G. Find the output when the input is 6.

Input → [x 2] → [+ 5] → Output

6 x 2 + 5 = 12 + 5 = 17

Literacy

Write a definition for each of the following:

Term

Substitution

Fluency

Simplify the following expressions

1) $3a + 4a + a$

2) $4b + 3c + 2c + b$

3) $5d + 2e - 3d + 3e$

4) Expand each of the following:

$3(2h + 5)$ $6(3k - 2)$

Problem Solving

1) Write 3 expressions that simplify to give $8x + 3y$.

2) If $a = 5$, which of the following is bigger:

$5a - 7$ $4a + 1$

Reasoning

Phoebe answers the following question. Explain what mistake she has made.

Simplify the following:

$3x + 2y + 4x + 3y = 12xy$

Theta 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

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

Percentages

- To find 10%, divide the original by 10.
- To find 50% divide the original by 2.
- To find 1% divide the original by 100.

E.G. Find 20% of 300.
10% = 300 ÷ 10 = 30.
20% = 30 x 2 = 60.

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.

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.

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.

Literacy

Fill in the definition of the following key words:

Denominator

Numerator

Improper

Problem Solving

Zoe has a carton of orange that has $\frac{6}{10}$ of a litre of orange left.

She pours a glass of orange and there is only $\frac{2}{5}$ of a litre of orange left.

How much orange did she pour out?

Fluency

Write in the equivalent fractions

1) $\frac{2}{3} = \frac{}{9}$

2) $\frac{3}{7} = \frac{12}{}$

3) $\frac{4}{} = \frac{16}{20}$

Calculate the following

1) $\frac{3}{5} + \frac{1}{3}$

2) $\frac{1}{4} + \frac{3}{7}$

3) $\frac{7}{9} - \frac{3}{4}$

Work out each of the following:

1) $\frac{1}{2}$ of 30

2) $\frac{3}{4}$ of 24

3) $\frac{2}{5}$ of 80

Reasoning

Sian has answered the following question. Comment on her mistake.

$$\frac{7}{12} + \frac{2}{3} = \frac{9}{15}$$

Theta Unit 5: Decimals

Add/subtract Decimals

Use column method - make sure you line up the decimal point for the correct place value.

2.35 + 4.5:

```
  2 . 3   5
  4 . 5
 ─────────
  6 . 8   5
 ─────────
```

9.67 – 6.2:

```
  9 . 6   7
- 6 . 2
 ─────────
  3 . 4   7
 ─────────
```

Rounding

A **significant figure** is each of the digits of a number that are used to express it to the required degree of accuracy, starting from the first non-zero digit:

Remember: 5 or more and the number rounds up, 4 or less and the number rounds down (stays the same).

E.G. round 32.483 to 3 significant figures

$$3\,2\,.\,4\,|\,8\,3$$

Answer: 32.5

3rd significant figure

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
```

Literacy

Write down a definition for:
Ascending

Descending

Significant figure

Fluency

1) Round each of the following numbers to 1 significant figure:

387   4120   1.819   0.0455
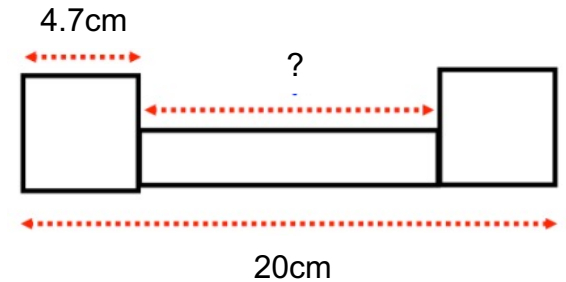
2) Work out each of the following:

2.67 + 1.8   9.84 – 2.39   2.7 x 14

Problem Solving

Two identical squares and a rectangle are drawn below.

Find the length of the rectangle.

4.7cm

?

20cm

Reasoning

Leo and Jay both round 3267 to 2 significant figures.
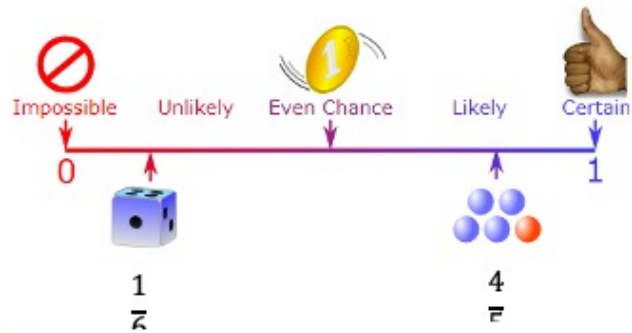
Leo says the answers is 3200.

Jay says the answer is 3300.

Who do you agree with? Why?

Theta Unit 6: Theoretical Probability

Probability Scale

The probability scale is between 0 and 1.

Impossible   Unlikely   Even Chance   Likely   Certain

0

1

$\frac{1}{6}$

$\frac{4}{5}$

Calculating Probability

$$P \text{ (event)} = \frac{\text{Number of ways the event can occur}}{\text{Total number of outcomes}}$$

E.G. The probability of rolling a 6 on a normal dice.

Number of ways the event can occur = 1

Total number of outcomes = 6

$$P(\text{Roll } 6) = \frac{1}{6}$$

Listing Outcomes

You need to list all possible combinations (outcomes).
E.G.
You are spinning a fair spinner with red, blue, green on, and you are rolling a fair dice.

Possible Outcomes are:

Red 1	Blue 1	Green 1
Red 2	Blue 2	Green 2
Red 3	Blue 3	Green 3
Red 4	Blue 4	Green 4
Red 5	Blue 5	Green 5
Red 6	Blue 6	Green 6

There are 18 outcomes in total.

The probability of each outcome is $\frac{1}{18}$.

Question: What is the probability of rolling a 5 or 6 and spinning blue.

Answer: There are two choices we that satisfy the conditions:

Blue 5   Blue 6

So our probability is $\frac{2}{18}$ which we should simplify to $\frac{1}{9}$

Literacy

Write down the definition of the following key probability language:

Even chance

Impossible

Certain

Fluency

1) What is the probability of rolling a 4 on a dice?

2) What is the probability of flipping a coin and it being a heads?

3) In a bag there are 6 blue counters, 7 red counters and 9 green counters

a) What is the probability of picking a red counter?

b) What is the probability of picking a green counter?

4) In a bag there are 4 white marbles, 7 black marbles and 9 colored marbles, what is the probability of picking a white marble?
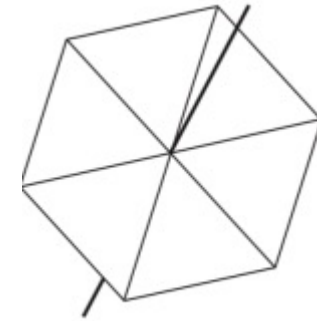
Problem Solving

Zoe has the following spinner, she wants to add the letters a, b and c so that:

The probability of getting a is $\frac{1}{2}$

The probability of getting b is $\frac{2}{6}$

The probability of getting c is $\frac{1}{6}$

Reasoning

Sam says that the probability of rolling a 2 on a dice is $\frac{1}{5}$ because there is only one 2 and five other numbers. Comment on Sam's mistake.

Theta Unit 7: Lines, Angles and Measures

Metric length

Some important conversions for you to learn:

1km = 1000m   1m = 100cm   1cm = 10mm

Metric mass

Important conversion:

1kg = 1000g

Metric capacity

Important conversion:
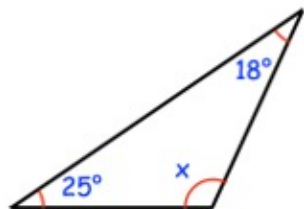
1l = 1000ml

Angles in a Triangle/Quadrilateral

The angles in a triangle add to 180°.
The angles in a quadrilateral add up to 360°.

E.G.

18° + 25° = 43°
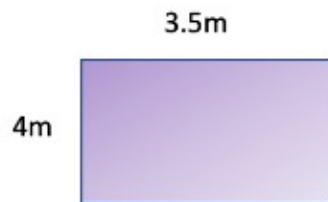
180° − 43° = 137°

18°

25°   x

Area and Perimeter

Area is the total 2D space inside a shape.
Perimeter is the total distance around the outside edge of a shape.

3.5m

4m

Area = 4 x 3.5 = 14m²

Perimeter = 4 + 4 + 3.5 + 3.5 = 15m
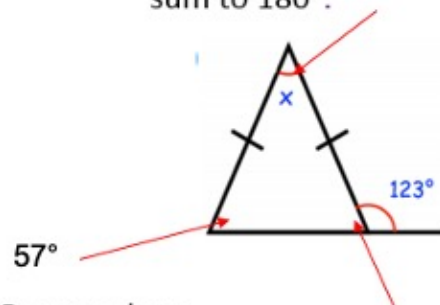
Angle Problems

You will need to use several different angle rules. You must give full reasoning.

57° + 57° = 114°

180° - 114° = 66°

Because angles in a triangle sum to 180°.

x

123°

57°

Because base angles in an isosceles triangle are equal.

180° - 123° = 57°

Because angles on a straight line add to 180°.

Literacy

Fill in the missing words in the important angle facts below:
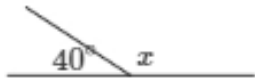
Angles on a st_____ _____ add to 180°.

Angles r_____ a p_____ add to 360°.

Angles in a _____ add to 180°.

Angles in a _____ add to 360°.

Fluency

Find the size of the missing angles. Try to write a reason for each.

Q1)

$40°$ x

Q2)

$105°$ x

Q3)

$128°$
$110°$ x

Q4)

$150°$
$65°$ x
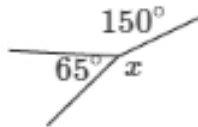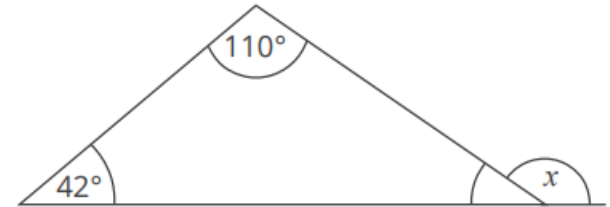
Problem Solving

Find the size of angle x below.

Write any angle reason you use.

You may need to use 2 reasons to find x.

$110°$

$42°$

x

Reasoning

Daisy calculated that the acute angle is 34°. Is she correct? Explain why.

$66°$

Theta Unit 8: Ratio and Proportion

Simplifying Ratio

- Find the Highest Common Factor (HCF) of the two sides of the ratio.
- Divide each side by the HCF to get the ratio in its simplest form.

E.G.

HCF of 15 and 21 = 3

$21 \div 3 = 7$

$$15 : 21 \ = \ 5 : 7$$

$15 \div 3 = 5$

Sharing into a Ratio

Draw boxes to represent the ratio.
Divide the total by the number of boxes (this represents 1 part).
Write your answer in each box.
Find the total for each part.

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

$120 \div 8$ boxes = 15

15	15	15

= 45

15	15	15	15	15

= 75

$$= 45 : 75$$

Direct Proportion

Use the unitary method to find 1 first (this is the unit).

Multiply the unit to calculate other amounts.

E.G. 5 pens cost 80p, find the cost of 7 of the pens.

5pens = 80p   (80p ÷ 5 = 16p)

1 pens = 16p (16p x 7 = 112p)

7 pens = 112p or £1.12

Fractions and Ratio

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

E.G.

$$4 : 3 \ = \ \frac{4}{7} : \frac{3}{7}$$

$4 + 3 = 7$

Literacy

The word **ratio**n contains the word **ratio**. What other words can you think of that contain **ratio**?

Problem Solving

The cost of 3 chocolate bars is £1.95.

Mrs Kaye wants to buy enough chocolate bars for 25 children.

Mrs Kaye has £15, does she have enough money to buy 25 of the chocolate bars?

Fluency

1) Simplify the following ratios:

4:6   15:10   27:12   24 : 18 : 12

2) Divide £24 in the ratio 1:5

3) Divide £90 in the ratio 7:2

Reasoning

Zoe try's to split £105 in the ratio 5:3.
She says that 105 ÷ 5 = 21
                      and 105 ÷ 3 = 35
So split it will be £21 and £35
Comment on her method.

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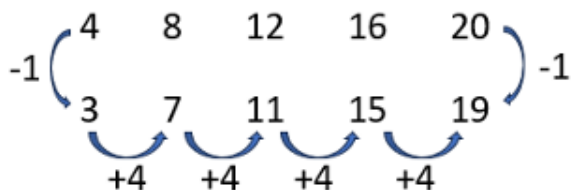
E.G. find the nth term for 3, 7, 11, 15, 19, …

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

```
    4    8    12    16    20
-1 (                        ) -1
    3    7    11    15    19
     +4   +4   +4   +4
```

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, …

Term to Term rule

A **term to term** rule describes how to get from one term to the next.

E.G. What is the term to term rule for the sequence 3, 12, 21, 30, 39, … ?

The sequence goes up by 9 each term.

The rule is +9.

Literacy

Write the definition of the following:

Term-to-term rule:

Position-to-term rule:

Problem Solving

a) Draw the next term

b) Find the nth term of this picture sequences involving dots.

Fluency

1) Find the next 2 terms in the sequence 9, 15, 21, …

2) What is the term-to-term rule for continuing the sequence 20, 16, 12, 8, …

3) Find the Nth term of the following sequence: 3, 7, 11, 15, 19

4) Find the Nth term of the following sequence: 2, 5, 8, 11, 14

Reasoning

Explain why the sequence 2n + 6 won't contain the term 33.

Theta Unit 10: Averages and data

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:
$$5, 9, 3, 4, 11, 6, 8$$
Median = 3, 4, 5, 6, 8, 9, 11. = 6

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

Write the definition for each of the following:

Mean

Median

Mode

Fluency

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

a) 2, 2, 3, 5, 7, 8, 9, 12, 13

b) 14, 17, 14, 17, 18

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

Problem Solving

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

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?