Mathematics
Transition Booklet
An Introduction to Year 7

Name: _____

This booklet will help to prepare you for your maths lessons when you join us in September.

Complete as many different tasks as you can over summer and bring the booklet with you in September to show your maths teachers and you could achieve your first Pleckgate achievement points.

Try to do around 30 minutes each day. Don't forget you can use useful websites to help you such as BBC Bitesize.

Have a good summer and see you in September.

What will I be learning?

Here is an overview of all of the topics taught in maths throughout year 7. The topics in green are the ones we have chosen to cover in this booklet. To continue this course – we have booklets in other areas of maths such as algebra, statistics and measures & geometry. Some of these topics have been covered in primary school and will continue to go into more depth in year 7.

Number

- Mental Maths Strategies
- Highest common factors
- Lowest common multiples
- Square numbers
- Square number roots
- Ratio and proportion
- Rounding whole numbers
- Negative Numbers
- Calculating percentages
- Using brackets
- Comparing decimals
- Rounding decimals
- Simplifying fractions
- Adding and subtracting fractions

Algebra

- Representation of number by using letters
- Number sequences and patterns
- Plotting graphs using co-ordinates
- Solving equations
- Simplifying equations
- Input, output and mapping diagrams

Mental Maths Strategies

What does it mean?

Mental maths is the skill of working out calculations in your head quickly and without writing them down. You'll encounter **mental maths tests** in secondary school, just as you did in primary school. These are designed to improve speed, accuracy and general knowledge of maths facts such as multiplication tables, shape facts and time problems.

The topics covered in mental maths include: place value, fractions, decimals and percentages; calculations: the four rules and money problems, ratio, square roots, time, metric conversion, area and perimeter, volume, angles, algebra, averages, pie charts and probability.

Use the following exercises and time yourself – you'll get quicker and more accurate with practise.

Mental Maths Skills 1

Don't forget to start your timer!

a) Multiply 5.08 by one thousand _____

b) Write $\frac{2}{5}$ as a decimal _____

c) 15% of a number is 7. What is 30%? _____

d) How many centimetres are there is 4.5 metres? _____

e) One book costs £17.20. What do 5 cost? _____

f) Write two tenths as a fraction _____

g) 3t is equal to 15. What is the value of 7t? _____

h) Simplify this expression: y + y + y + y _____

Mental Maths Skills 2

Don't forget to start your timer!

a) Multiply 0.67 by one hundred _____

b) Write 0.25 as a fraction _____

c) Each side of a square is 17cm. What is its perimeter? _____

d) 30% of a number is 90. What is the number? _____

e) What is the cost of 8 blankets at £3.99 each? _____

f) In a group, children are aged 12, 11, 13, 14 and 10. What is the mean? _____

g) How many metres in 2.7 kilometres? _____

Mental Maths Skills 3

Don't forget to start your timer!

a) In a group of 87 children, 54 are boys. How many are girls? _____

b) Round 9.27 to one decimal place _____

c) 7 out of 50 pupils were absent. What percentage were present? _____

d) A TV programme starts at 6:50pm and ends at ten to nine. What is the duration of the programme? _____

e) What is 20% of £35.60? _____

f) Subtract 349 from 500 _____

Number: Highest Common Factors (HCF)

What does it mean?

The **highest common factor** or **HCF** is the largest number that divides exactly into two or more numbers.

When we find all of the factors of two or more numbers, some factors are the same. These are known as **common factors**. The **highest common factor** is the highest factor that both or all of the numbers have in common.

For example:

What is the **highest common factor** of **12** and **16**?

Factors of 12: (1) (2) 3 (4) 6 and 12

Factors of 16: (1) (2) (4) 8 and 16

The numbers 1, 2 and 4 are all common factors but **4** is the **highest**. Therefore, **4** is the **highest common factor** of 12 and 16.

Find the **highest common factor** for each pair of numbers below

a) 20 and 8 _____

b) 30 and 8 _____

c) 20 and 24 _____

d) 6 and 12 _____

e) 6 and 15 _____

f) 12 and 20 _____

g) 5 and 20 _____

h) 24 and 30 _____

i) 12 and 60 _____

j) 48 and 72 _____

k) 18 and 30 _____

l) 16 and 36 _____

Find the **highest common factor** for each group of numbers below

a) 8, 24 and 64 _____

b) 15, 30 and 60 _____

c) 16, 24 and 40 _____

d) 8, 48 and 52 _____

e) 60, 90 and 120 _____

f) 24, 36 and 78 _____

g) 14, 28 and 42 _____

h) 18, 30 and 48 _____

i) 8, 12 and 16 _____

j) 45, 63 and 108 _____

k) 10, 40 and 60 _____

l) 28, 32 and 140 _____

Colour in **all** of the **factors** of **72** to reveal a hidden number

5	**7**	**17**	**10**	**15**	**68**	**42**	**34**	**71**	**32**
13	**28**	**2**	**18**	**34**	**17**	**2**	**28**	**5**	**48**
68	**1**	**7**	**14**	**24**	**13**	**36**	**30**	**13**	**7**
48	**5**	**42**	**3**	**15**	**10**	**4**	**15**	**10**	**68**
14	**70**	**12**	**10**	**28**	**48**	**12**	**7**	**1**	**32**
31	**36**	**32**	**7**	**70**	**17**	**18**	**6**	**8**	**36**
10	**3**	**72**	**6**	**9**	**31**	**14**	**42**	**4**	**11**

Number: Lowest Common Multiples (LCM)

What does it mean?

The **lowest common multiple** or **LCM** is the smallest positive number that is a multiple of two or more numbers.

When we find **multiples** of two or more numbers, some **multiples** are the same. These are known as **common multiples**. The **lowest common multiple** is the lowest multiple that both or all of the numbers have in common.

For example:

What is the **lowest common multiple** of **3** and **5**?

Multiples of 3: 3 6 9 12 (15) 18 21

Multiples of 5: 5 10 (15) 20 15

There are many **common multiples** of 3 and 5 such as: 45 and 60 but **15** is the **lowest**. Therefore, **15** is the **lowest common multiple** of 3 and 5.

Find the **lowest common multiple** for each pair of numbers below

a) 6 and 8 _____

b) 4 and 10 _____

c) 4 and 14 _____

d) 2 and 9 _____

e) 8 and 10 _____

f) 6 and 14 _____

g) 4 and 9 _____

h) 2 and 19 _____

i) 3 and 14 _____

j) 5 and 12 _____

k) 2 and 25 _____

l) 3 and 4 _____

Find the **lowest common multiple** for each group of numbers below

a) 2, 3 and 5 _____

b) 2, 4 and 5 _____

c) 2, 5 and 8 _____

d) 6, 7 and 14 _____

e) 3, 6 and 9 _____

f) 2, 5 and 20 _____

g) 2, 5 and 14 _____

h) 2, 4 and 14 _____

i) 4, 15 and 30 _____

j) 2, 8 and 12 _____

k) 3, 4 and 8 _____

l) 2, 8 and 9 _____

Find your way through the maze by shading in multiples of **4.** You can travel horizontally ←→ or vertically ↑↓ but **not** diagonally. ↗↙↖↘

Start	**4**	**18**	**31**	**33**	**27**	**45**	**21**	**65**	**12**
54	**64**	**32**	**92**	**100**	**28**	**4**	**74**	**123**	**73**
67	**99**	**97**	**55**	**81**	**65**	**20**	**76**	**60**	**52**
94	**27**	**83**	**21**	**67**	**98**	**18**	**49**	**98**	**44**
49	**68**	**88**	**4**	**80**	**16**	**76**	**36**	**24**	**28**
54	**48**	**87**	**102**	**33**	**7**	**47**	**97**	**54**	**13**
94	**12**	**36**	**20**	**16**	**36**	**40**	**28**	**8**	**End**

Number: Square Numbers

What does it mean?

A **Square number** is the product of a number multiplied by itself. Visually, if you drew a square number, it would create a square!

For example:

4 x 4 = **16**. Therefore, **16** is a **square number.**

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Other **square numbers** are: **25** (5 x 5), **36** (6 x 6) and **49** (7 x 7)

Square numbers can also be written like this $\mathbf{7^2}$ (meaning 7 x 7, which is **49**)

Identify the **square numbers.** The first one has been done for you.

a) 6^2 **36**

b) 8^2 _____

c) 10^2 _____

d) 14^2 _____

e) 4^2 _____

f) 12^2 _____

g) 21^2 _____

h) 5^2 _____

i) 9^2 _____

j) 15^2 _____

k) 20^2 _____

l) 17^2 _____

Number: Square Roots

What does it mean?

A **square root** is a value than can be multiplied by itself to give a square number. It's just like a **square number** but the opposite way around. When we ask what the **square root** is, we are simply asking – **what number multiplied by itself, gives this answer?**

For example:

4 x 4 = **16**. Therefore, **16** is a **square number.**

So, when a question asks what the **square root** of 16 is, **the answer is 4.**

What is the **square root** of **64? (What number, multiplied by itself, gives the answer 64?)**

8 x 8 = 64

So, the **square root** of 64 is **8**.

Identify the **square roots.** The first one has been done for you.

a) 81 **9**

b) 4 _____

c) 169 _____

d) 49 _____

e) 529 _____

f) 144 _____

g) 16 _____

h) 256 _____

i) 121 _____

j) 576 _____

k) 25 _____

l) 100 _____

Number: Ratio

What does it mean?

Ratio is the comparison of two or more quantities, expressed as the quotient: one divided by another.

For example:

When we make orange juice from a cordial mixture added to water, it may suggest – one part juice to four parts water.

This can be written as the ratio of juice to water as 1:4.

It doesn't matter how big your glass or jug is, the ratio will still need to be 1:4.

Write the following **ratios** in their simplest form.
The first one has been done for you.

a) 10 : 50 = **1 : 5**

b) 63 : 18 = _____

c) 25 : 10 = _____

d) 64 : 32 = _____

e) 400 : 300 = _____

f) 8 : 16 = _____

g) 52 : 39 = _____

h) 18 : 30 = _____

i) 66 : 88 = _____

j) 10 : 90 = _____

k) 90 : 75 = _____

l) 49 : 35 = _____

Number: Proportion

What does it mean?

Proportion is simply two or more quantities increasing or decreasing in the same ratio. For instance, we could double or halve, but we need to do the same to both numbers.

A typical 'real life' question would be:

Notebooks cost 36p each. Find the cost of 50.

0.36 x 50 = £18 (Mental maths – (0.36 x 100) ÷ 2

Following on from **ratio** – see if you can make the ratios below **EQUIVALENT** or the same.

Remember – whatever you do to one side – you must do to the other and you can use your inverse to help you figure out the blank spaces!

Fill in the missing number to make these equivalent ratios correct. One has been done for you

a) 1 : 3 = **2** : 6

b) 5 : 10 = 6 : __

c) 5 : 2 = 15 : __

d) 8 : 10 = __ : 20

e) 2 : 3 = 12 : __

f) 9 : 10 = __ : 40

g) 16 : 4 = ___ : 16

h) 3 : 9 = 24 : __

i) 12 : 21 = __ : 63

j) 4 : 6 = 84 : __

k) 19 : 3 = 38 : __

l) 17 : 12 = 68 : __

Number: Rounding Whole Numbers

What does it mean?

In year 7 you will recap on rounding to 10, 100 and 1000. You could be asked to round from a whole or decimal number and the same rules apply.

5 or above ↑ **round up**

4 or below ↓ **remain the same/round down**

For example: Round 1239 to the nearest 1000.

1 2 3 9 ← The blue number is the thousands, the red number (hundreds), tells us what to do.

2 is below **5** **so we round down.**

1239 rounded to the nearest 1000 = 1000 (rounded down)

Round the following whole numbers to the nearest **10, 100 and 1000.**

a) **3541**
Nearest 10: _____
Nearest 100: _____
Nearest 1000: _____

b) **9435**
Nearest 10: _____
Nearest 100: _____
Nearest 1000: _____

c) **2112**
Nearest 10: _____
Nearest 100: _____
Nearest 1000: _____

d) **8767**
Nearest 10: _____
Nearest 100: _____
Nearest 1000: _____

e) **5912**
Nearest 10: _____
Nearest 100: _____
Nearest 1000: _____

f) **4920**
Nearest 10: _____
Nearest 100: _____
Nearest 1000: _____

Number: Rounding Whole Numbers: A puzzle

What do I do?

In the squares below, you are going to round the numbers to the nearest 1000. If they round up – colour them in, if not, leave them blank!

You will reveal a hidden picture.

Recap:

ROUND UP → **colour in**

ROUND DOWN → leave blank

You are rounding to the **nearest 1000.**

Ready? Steady? GO!

Rounding Puzzle

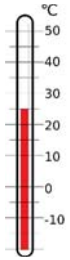
1401	2398	8221	8291	2365	4390	6111	9355	4218	8312
7409	9191	6363	8319	1534	4905	9287	6449	6309	3389
7399	7342	6411	5501	8810	3776	9816	2301	6471	4501
8274	5333	7711	5690	8665	9743	4866	6377	7561	6500
9266	6791	6389	3798	2729	2691	3788	2856	1699	2809
9176	8552	7568	3689	2668	1600	9600	1576	6888	1667
3222	8602	6599	2621	1592	2863	3942	8567	3710	2626
4100	4177	9623	2954	3911	4801	2843	4128	9557	1623
3176	4109	3465	1844	9861	8513	7722	3400	4108	8777
2112	2402	2499	7222	7605	3587	9123	6487	4155	2313
4307	9333	2387	7290	7386	9165	3487	3496	2391	3399

Number: Negative Numbers

What does it mean?

Negative numbers, also known as **minus numbers,** are seen in a range of real-life situations.

Temperature, elevators (floors below ground) and bank accounts!



Your bank balance: -£354.09

It's true – we use them every day and that's why we need to know about them!

Calculate these real-life problems, involving **negative numbers**

a) In Cyprus, the temperature was 26°C. On the same day, Antarctica recorded a temperature of -18°C. What was the difference in temperature between Cyprus and Antarctica on that day?

_____

_____

b) Mr Green lived on the 57th floor and needed to get his car from the underground car park on floor -5. How many floors did he travel through?

_____

_____

c) On Monday, Emma booked a holiday that cost £1876. Unfortunately, she only had £356 in her bank. What was her new bank balance?

_____

_____

d) Mr and Mrs Thompson were sports fanatics! Mrs Thompson loved sky-diving whereas Mr Thompson preferred deep-sea diving. On Saturday, Mrs Thompson measured a height of 1392m above ground with her parachute and Mr Thompson dived to a depth of -20m below sea level. What is their total distance in metres?

_____

_____

Number: Calculating percentages

What does it mean?

Percentage means out of 100.

We use it in everyday life such as: shopping, facts and figures, including results in school.

You will learn about **percentages of whole numbers, percentage increase and decrease and also, adding and subtracting percentage amounts from whole numbers.**

The following activity focuses on **percentages of whole numbers.**

The key amounts are:

10% - Dividing by 10	**1% - Dividing by 100**
50% - Half	**5% - Half of 10%**
25% - A quarter	**20% - Double 10%**

Using the hints above, see if you can calculate the **percentage** amounts of the following numbers.

a) 10% of 32 _____

b) 15% of 78 _____

c) 5% of 60 _____

d) 20% of 80 _____

e) 50% of 64 _____

f) 60% of 50 _____

g) 11% of 32 _____

h) 34% of 48 _____

i) 25% of 200 _____

j) 75% of 40 _____

k) 70% of 90 _____

l) 30% of 60 _____

m) 5% of 68 _____

n) 16% of 74 _____

o) 50% of 15 _____

p) 45% of 52 _____

q) 4% of 25 _____

r) 90% of 27 _____

s) 10% of 750 _____

t) 99% of 62 _____

Number: Using Brackets

What does it mean?

When **brackets** appear in a calculation, you need to work that part out first. If they don't, then the rules of **BODMAS** apply. (Also known as **BIDMAS** where the 'I' means **integers**)

B – Brackets (work those out first) ( )

O – Orders – Square roots, square numbers, cube numbers & numbers to the power of. ($\sqrt{64}$ or 8^2)

D – Division

M – Multiplication

A – Addition

S – Subtraction

Solve the following questions, using the rules of **BODMAS.**
The first one has been done for you.

a) (4 x 2) + (10 ÷ 2) = ____

b) 40 – (9 x 3) = ____

c) (16 ÷ 4) x 100 = ____

d) (14 + 20) – 10 = _____

e) 2 x 4 + (50 ÷ 2) = _____

f) 10^2 + (120 x 2) = _____

g) 21 + (14 x 6) = ____

h) (9 x 2) + 20 = ____

i) 16 – 2 + (2 x 8) = ____

j) 23 + 14 (20 ÷ 4) = _____

k) (15 ÷ 2) x 100 = _____

l) (2 x 3) + $\sqrt{25}$ = _____

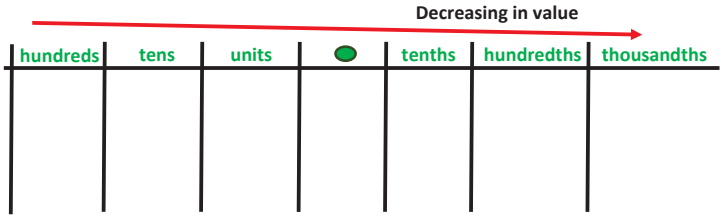
Number: Comparing Decimals

What does it mean?

We use **decimal** numbers every day with money, measurement and many more situations where we need to express an amount out of 10 that is in between or less than a whole number. **Decimals** are closely related to percentages – 0.52 → 52%, 0.01 → 1%.

In Key Stage Three, you will learn a lot about decimals including:

- Ordering
- Adding and Subtracting
- Multiplying and Dividing by 10, 100 and 1000
- Multiplying and Dividing by a whole number
- **Comparing decimals – larger and smaller.**



Use the signs **< and >** to **compare** the pairs of decimals.
The first one has been done for you.

a) 3.2 **>** 3.02

b) 4.23 ___ 4.32

c) 11.01 ___ 11.1

d) 8.03 ___ 8.003

e) 21.2 ___ 21.12

f) 10.77 ___ 10.707

g) 9.09 ___ 9.9

h) 0.86 ___ 0.861

Number: Rounding Decimals

What does it mean?

In Key Stage 3, you will recap on rounding to 10, 100 and 1000. You could be asked to round from a whole or decimal number and the same rules apply.

5 or above ↑ round up

4 or below ↓ remain the same/round down

Rounding decimals have the added question of rounding to a number of **decimal places**, which simply means **'the amount of numbers after the decimal'**.

Round to **two decimal places:**

23.4810 → 23.48 – The blue number is in the hundredths position

The red number is our 'indicator' and it tells us what to do

Round to **one decimal place:**

23.48 → 23.5

Round the following whole numbers to **one** and **two decimal places.**

a) **75.9255**
1dp: _____
2dp: _____

b) **614.5612**
1dp: _____
2dp: _____

c) **3.9187**
1dp: _____
2dp: _____

d) **12.3872**
1dp: _____
2dp: _____

e) **290.7254**
1dp: _____
2dp: _____

f) **11.1927**
1dp: _____
2dp: _____

Number: Simplifying Fractions

What does it mean?

When we **simplify** a fraction, we make it as **simple as possible**.

We do this by dividing both the **denominator** and **numerator** by the **highest** number that **both** will divide into exactly.

For example:

$\frac{4}{8} \rightarrow \frac{2}{4} \rightarrow \frac{1}{2}$ $\quad$ $\frac{12}{27} \rightarrow \frac{4}{9}$

÷ 2 ÷ 2 $\quad$ ÷ 3

Simplify the following fractions.
The first one has been done for you.

a) $\frac{20}{50} \rightarrow \frac{2}{5}$

b) $\frac{15}{40} \rightarrow$

c) $\frac{63}{81} \rightarrow$

d) $\frac{160}{200} \rightarrow$

e) $\frac{35}{49} \rightarrow$

f) $\frac{60}{100} \rightarrow$

g) $\frac{16}{18} \rightarrow$

h) $\frac{2}{8} \rightarrow$

i) $\frac{21}{70} \rightarrow$

j) $\frac{45}{80} \rightarrow$

k) $\frac{2}{64} \rightarrow$

l) $\frac{14}{50} \rightarrow$

m) $\frac{18}{81} \rightarrow$

n) $\frac{23}{100} \rightarrow$

o) $\frac{33}{88} \rightarrow$

p) $\frac{3}{60} \rightarrow$

Number: Fractions Puzzle

What do I need to do?

Every letter of the alphabet relates to a **fraction.**

Simplify the fractions to find the matching letter to solve the puzzle and find the hidden message!

Make sure you present the fraction in its simplest form and write the co-ordinating letters above.

Good Luck!

Find the secret message

$\frac{1}{2}$ A	$\frac{1}{4}$ B	$\frac{1}{3}$ C	$\frac{1}{10}$ D	$\frac{1}{5}$ E	$\frac{1}{6}$ F	$\frac{1}{7}$ G	$\frac{1}{8}$ H	$\frac{1}{9}$ I	$\frac{2}{3}$ J
$\frac{2}{5}$ K	$\frac{3}{5}$ L	$\frac{1}{12}$ M	$\frac{1}{13}$ N	$\frac{1}{15}$ O	$\frac{1}{25}$ P	$\frac{1}{50}$ Q	$\frac{3}{100}$ R	$\frac{3}{4}$ S	$\frac{4}{5}$ T
		$\frac{1}{30}$ U	$\frac{1}{40}$ V	$\frac{1}{60}$ W	$\frac{1}{70}$ X	$\frac{1}{80}$ Y	$\frac{1}{90}$ Z		

___ ___ ___ ‘ ___ ___ $\quad$ ___ ___ ___ ___ ___ ___ ___ ___ ___!

$\frac{3}{240}$ $\frac{6}{90}$ $\frac{2}{60}$ $\frac{9}{300}$ $\frac{7}{35}$ $\quad$ $\frac{6}{36}$ $\frac{25}{50}$ $\frac{2}{26}$ $\frac{16}{20}$ $\frac{30}{60}$ $\frac{75}{100}$ $\frac{40}{50}$ $\frac{8}{72}$ $\frac{21}{63}$

Number: Adding and Subtracting Fractions

What does it mean?

When **adding** and **subtracting** fractions, the important thing to remember is to ensure that the **denominators** are the same.

You can calculate them in three steps:

1. Make sure the denominators are the same
2. Adjust the numerators accordingly
3. Add or subtract
4. Simplify your answer – be aware – if your answer is an improper fraction, convert to a mixed number.

For example:

$$\frac{3}{5} + \frac{1}{3} = \frac{9}{15} + \frac{5}{15} = \frac{14}{15}$$

Original Calculation → **Multiply the denominators to find a common denominator** → **Answer – finally add the numerators**

Add or subtract the following fractions.
☺ Don't forget to find a common denominator first! ☺

Convert any answers that are improper fractions into mixed numbers!

a) $\frac{1}{3} + \frac{3}{7} =$

b) $\frac{2}{5} + \frac{7}{8} =$

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

d) $\frac{10}{12} - \frac{1}{2} =$

e) $\frac{4}{5} - \frac{1}{4} =$

f) $\frac{3}{4} - \frac{1}{8} =$

What will I be learning?

Here is an overview of all of the topics taught in maths throughout year 7. The topics in green are the ones we have chosen to cover in this booklet. To continue this course, we have booklets in other areas of maths such as number, statistics and measures & geometry. Some of these topics have been covered in primary school and will continue to go into more depth in year 7.

Number

Mental maths strategies
Highest common factors
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Square numbers
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Letters as Numbers

What does it mean?

Algebra is the representation of letters and other symbols, as **numbers.**

Once we have a letter, we can perform a number of calculations around that letter, as long as we know its value.

Can you guess the value of ***t***?

$3t = 15$ $t + 34 = 39$ $(3 \times 4) - t = 7$

That's right!

$t = 5$

See if you can calculate these…

Each letter **stands for a number** in each group of questions. See if you can calculate them based on each letter having a certain value. The first one has been done for you.

a) $s = 10$

$4s + 17 =$ **57**

$(2 \times 12) - s =$ **14**

b) $v = 4$

$20v - v^2 =$

$(3v + 6v) + 2v =$

c) $f = 2$

$(2f \times 5) - 2f =$

$f + (5f \div 2) =$

d) $g = 36$

$\sqrt{g} + g =$

$4g + (g + 10) =$

e) $y = 9$

$6y - y =$

$(y^2 + 4) \div 5 =$

f) $p = 5$

$2p + (p - 1) =$

$(p + 5p) \div 3 =$

Letters as numbers

Copy and complete each table so that the letters have the correct value from the rule given above.

a) $g = f - 2$

f	g
2	
4	
6	
8	
10	

b) $j = h + 6$

h	j
3	
6	
9	
	18
	21

c) $l = k^2$

k	l
3	
	25
7	
	81
	121

d) $n = 2m + 1$

m	n
12	
	29
21	

e) $r = 4s - 7$

s	r
15	
	69
24	

f) $t = y + 3.5$

y	t
16	
	21.5
22	

Number Sequences and Patterns

What does it mean?

Sequences can be numbers or shapes that follow a **pattern**. The pattern of the numbers or shapes are known as the **rule.**

When you are given a series of numbers, you need to be able to find the **rule**.

How do I do that?

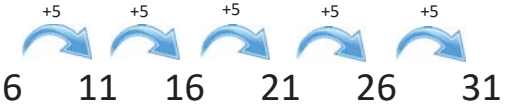
To find the rule: look at how the numbers move from one to the next. A good way of doing this is to write down, in between each number, what is happening.

There are two types of sequences to watch out for:

1) **Geometric** Sequences – Multiplying and dividing to get from one number to the next.

2) **Arithmetic** Sequences – Adding and Subtracting to get from one number to the next.

For example:

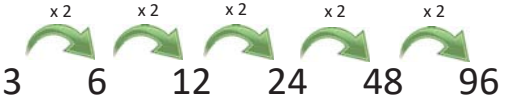


The rule is: **add 5**

This is because there is a 'jump' of 5 in between each of the numbers.

This is an example of an **arithmetic sequence.**

Another example:



The rule is: **multiply by 2**

This is because each number moves to the next by multiplying the previous number by 2.

This is an example of a **geometric sequence.**

Once you know the rule, you may be asked to describe, in words, what the rule is or find the next number in the sequence. Some sequences and patterns have more than one rule.

Number Sequences and Patterns

Look at the following number sequences carefully and write down the next two numbers in the sequence. Then, describe the rule. The first one has been done for you.

a) 2, 9, 16, 23, 30, 37 44 Rule: Add 7

b) 87, 76, 65, 54, 43, ___ ___ Rule: _____

c) 2, 6, 18, 54, 162, ____ ____ Rule: _____

d) 8000, 4000, 2000, 1000, 500, ____ ____ Rule:_____

e) 99, 93, 87, 81, 75, ___ ___ Rule: _____

f) 17, 21, 25, 29, 33, ___ ___ Rule: _____

g) 8, 20, 32, 44, 56, ___ ___ Rule: _____

h) 27, 24, 21, 18, 15, ___ ___ Rule: _____

The following sequences have more than one rule…

i) 25, 27, 24, 26, 23, ____ ____ Rule: _____

j) 81, 69, 76, 64, 71, ____ ____ Rule: _____

k) 10, 20, 15, 30, 25, ____ ____ Rule: _____

l) 60, 30, 40, 20, 30, ____ ____ Rule: _____

Number Sequences and Patterns – Hidden Number

Puzzle Time!

Take a look at the number sequence below.

Calculate the **next 5 numbers** and describe the rule in your own words.

3, 18, 33, 48, ___ ___ ___ ___ ___

What is the rule?

_____

_____

Now, colour in ANY NUMBER from the sequence above in the grid below, to reveal a hidden number.

2	49	4	27	17	39	30	28	20	19
84	3	63	108	19	79	3	78	18	97
29	78	17	62	110	39	108	32	49	4
100	48	108	63	84	32	18	33	93	132
23	123	31	18	132	62	17	25	123	99
32	93	33	78	24	2	48	63	108	39
17	39	122	4	7	122	19	26	109	2

Number Sequences and Patterns – Patterns

Number Patterns

You will see many types of number patterns in Year 7, many of which you will have studied before in Year 6. You will learn all about:

- Even and odd numbers
- Square numbers
- Cube numbers
- Triangle numbers
- Multiples
- Number patterns in diagrams

We will be looking at some of these topics in this section of this booklet.

Cube Numbers

Cube numbers are made by multiplying any digit by itself three times.

Example:

3 cubed (3^3) is 3 x 3 x 3 = 27

You could calculate it by thinking about these sums: 3 x 3 = 9, 9 x 3 = 27 (3 x 3 x 3)

Think of a Rubik's Cube and try to count all of the individual cubes. Even the ones you can't see! **3 x 3 x 3 = 27**

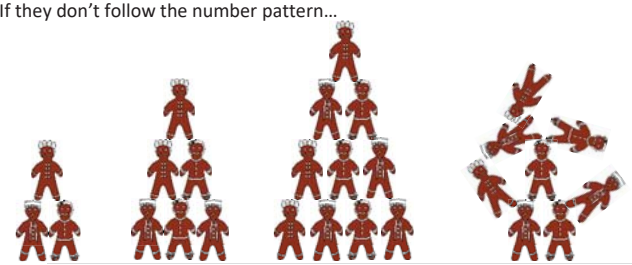
Triangle Numbers

Triangle numbers are often visually represented by a triangle shape. They follow the pattern: 1+2, 1+2+3, 1+2+3+4, just like the rows in a triangle.

Think about these acrobatic gingerbread men…

Every time they want to build their pyramid taller, they need another complete row.

If they don't follow the number pattern…



…oops!

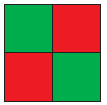
Number Sequences and Patterns – Patterns in Diagrams

Number patterns in diagrams

Number patterns within a diagram usually involve counting shapes to find the overall rule. The shape grows in the same way per step and can often involve colours.

For example…

Pattern 1

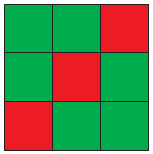


Red squares = 2

Green squares = 2

Total squares = 4

Pattern 2

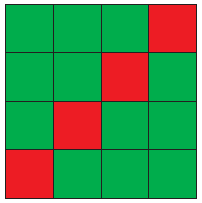


Red squares = 3

Green squares = 6

Total squares = 9

Pattern 3

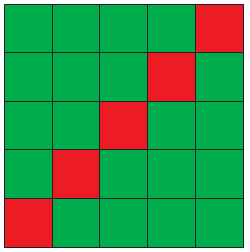


Red squares = 4

Green squares = 12

Total squares = 16

Pattern 4



Red squares = 5

Green squares = 20

Total squares = 25

Use the diagrams above to determine the next five steps in the number pattern. Think about what is happening in each step for both the red and green squares.

Pattern	Red squares	Green squares	Total squares
Pattern 1	2	2	4
Pattern 2	3	6	9
Pattern 3	4	12	16
Pattern 4	5	20	25
Pattern 5			
Pattern 6			
Pattern 7			
Pattern 8			
Pattern 9			

Number Sequences and Patterns – Triangle Numbers

Puzzle Time! The Triangle Number Maze.

Work your way through the triangle maze, colouring in triangle numbers to find the end!

Start at the mouse and help him find the cheese. You can only move from one triangle to the next if one of the sides are touching. You cannot move if only the corners are touching.

Good Luck!

Start	3	55	45	21	10	44	17	95	7
34	20	99	79						
7	16	95	11	36	28	99	82	20	5
54	40	4	95						
12	46	17	79	15	78	46	16	54	11
95	9	12	82	29					
20	54	44	21	15	82	34	12	40	20
4	40	79	17	46					
5	4	28	66	79	99	29	4	78	91
66	3	28	44	95					
40	91	10	44	95	15	21	55	10	17
40	46	55	36	16					
17	15	78	55	3	6	46	9	12	44
54	16	15	6	7					
99	12	34	17	54	40	82	11	7	95
34	11	10	21	12					
29	95	9	11	99	29	82	20	5	79
17	7	46	3						

Plotting Graphs using Co-ordinates

What do I need to know?

You will have previously learned in Year 6 that the graphs you use in maths are built upon **axis.** The **x axis** is **horizontal (across – A CROSS – get it?)** and the **y axis** is vertical **(like a yo-yo)**. The coordinates grids that we will be looking at, will be in four **quadrants.** Point (0,0) is known as the **origin.**

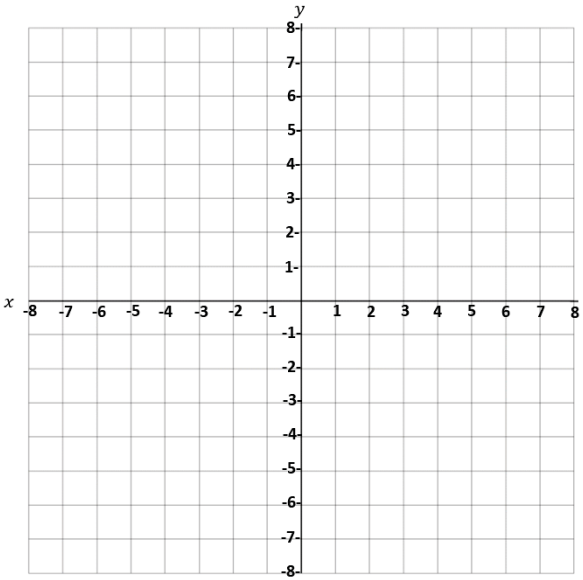
Coordinates are written within **brackets.** The **first** number refers to the **x axis** and the **second** number refers to the **y axis.**

For example:

(3, 6) → 3 ACROSS and 6 UP

(-2, -4) → -2 ACROSS and -4 DOWN

Plot the following points in the grid below and name the shape that you have made.
Remember, across first and then up or down.



Plot the following points and join each point to the next, using a ruler.

(0, 6)

(2, 3)

(6, 3)

(2, 0)

(4, -5)

(0,-2)

(-5, -5)

(-2, 0)

(-6, 3)

(-2, 3)

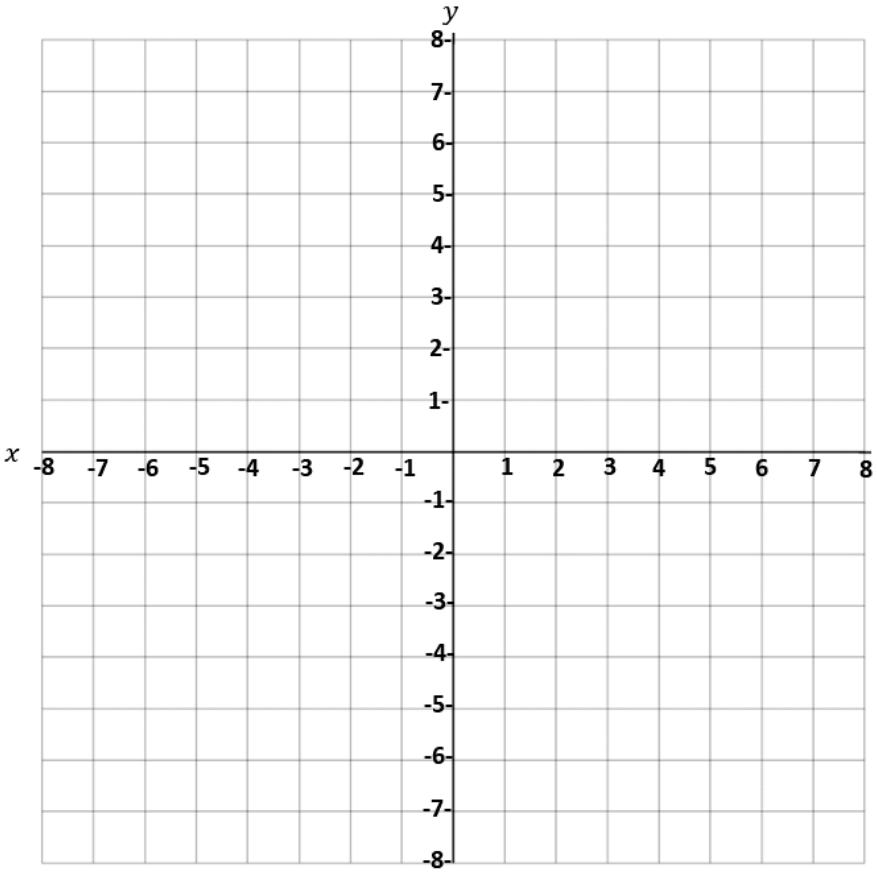
(0, 6)

Shape: _____

Plotting Graphs using Co-ordinates

Follow the instructions on the following page to create a picture on this coordinates grid in four quadrants.

Coordinates Picture



Plotting Graphs using Co-ordinates

Use these instructions to create a picture on the previous page. Plot the points, as before, and join the dots one after another. **Remember to join in order.**

Part 1
BEGIN JOINING
(-4, 4)
(0, 6)
(4, 4)
(4, -4)
(-4, -4)
(-4, 4)
(4, 4)
(4, 6)
(3, 6)
(3, 4)
FINISH JOINING

Part 2
BEGIN JOINING
(-3, 3)
(-1, 3)
(-1, -1)
(-3, -1)
(-3, 3)
FINISH JOINING

Part 3
BEGIN JOINING
(1, 1)
(3, 1)
(3, 3)
(1, 3)
(1, 1)
FINISH JOINING

Part 4
BEGIN JOINING
(-1, -4)
(-1, -1)
(1, -1)
(1, -4)
(-1, -4)
FINISH JOINING

Solving Equations

What do I need to know?

When you see an **equation,** you'll notice that each letter represents a missing number and it's up to you to figure out what that letter represents.

We can solve equations by:

- Using inverses
- Using both sides of the equation
- Multiplying out of brackets

Using Inverses

Using the inverse allows you to work backwards through a sum to find the solution.

Remember that the pairs of inverse are: addition & subtraction and multiplication & division

For example:

Addition & Subtraction	Multiplication & Division
3 + 2 = 5	3 x 2 = 6
2 + 3 = 5	2 x 3 = 6
5 – 3 = 2	6 ÷ 3 = 2
5 – 2 = 3	6 ÷ 2 = 3

To solve an equation, you must do the same to both sides of the equation.

For example:
z + 7 = 12

Get 'z' on its own by using the inverse and repeat on the other side of the equation.
z + 7 – 7 = 12 – 7 z = 5
In other words, work backwards, using the inverse. z + 7 = 12 becomes 12 – 7 = z

Calculate the value of 'z' in the following equations by using the inverse. Good Luck!
A small space has been left for working out.

a) z + 10 = 21 **b) z - 4 = 16** **c) z x 7 = 35** **d) z ÷ 8 = 4**

z = _____ **z = _____** **z = _____** **z = _____**

Solving Equations

Something a little more tricky…

Now that you have tried solving simple equations using the inverse, now we'll try something a little more challenging. Following the same principles as the last time – using the inverse and doing the same to both sides of the equation, we can try more trickier calculations.

SOLVE: 4a – 6 = 6

Step 1: Use your inverse – undo the '-6' by '+6'
Step 2: 4a – 6 + 6 = 6 + 6
Step 3: 4a = 12 (Don't forget – 4a MEANS 4 x a)
Step 4: Use your inverse – undo the 'x4' by '÷4'
Step 5: 4a ÷ 4 = 12 ÷ 4
Step 6: a = 3

So… 4a – 6 = 6 becomes 6 + 6 ÷ 4 = 3 (a = 3)

Puzzle time!

Every letter of the alphabet relates to a value of **'a'** within an equation.
Solve each calculation on the following page to reveal the **secret message** below.

Find the secret message

A a = 12	B a = 1	C a = 10	D a = 13	E a = 2	F a = 9	G a = 15	H a = 19	I a = 5	J a = 22
K a = 18	L a = 6	M a = 24	N a = 3	O a = 7	P a = 17	Q a = 8	R a = 11	S a = 20	T a = 4
		U a = 16	V a = 23	W a = 21	X a = 26	Y a = 25	Z a = 14		

Secret Message:

_____

Solving Equations

Puzzle time!

Solve the equations below and find the matching letter on the previous page, to reveal a secret message.

First Word – 9 letters

1. 6a + 2 = 14 a = _____ letter = _____
2. 2a - 4 = 12 a = _____ letter = _____
3. 3a - 6 = 42 a = _____ letter = _____
4. 5a + 1 = 61 a = _____ letter = _____
5. 7a + 7 = 35 a = _____ letter = _____
6. 10a - 6 = 44 a = _____ letter = _____
7. 7a - 18 = 31 a = _____ letter = _____
8. 12a + 2 = 38 a = _____ letter = _____
9. 4a + 7 = 87 a = _____ letter = _____

Second Word – 3 letters

1. 4a - 8 = 40 a = _____ letter = _____
2. 8a + 13 = 101 a = _____ letter = _____
3. 10a + 7 = 27 a = _____ letter = _____

Third Word – 3 letters

1. 3a + 14 = 41 a = _____ letter = _____
2. 5a – 7 = 73 a = _____ letter = _____
3. 14a + 3 = 45 a = _____ letter = _____

Simplifying Equations

What do I need to know?

When we simplify equations, we are just collecting all of the information together. Any equations with a + or a – sign are attached to the front of the expression.

For example:

4a + 5a ← There is only 1 letter here (a) and we can gather the information up together. We know that 4 + 5 = 9, so the answer is **9a**

6a – 2a ← Minus works in the same way. 6 – 2 = 4, so the answer is **4a**

a + b + a + b ← Here we have letters (a and b). Count up how many of each and write it down. The answer to this one is **2a + 2b**

5a + 3a – 2a ← Here we have a mixture of + and -. Treat it as a simple calculation… 5 + 3 – 2 = 6. The answer to this one is **6a.**

3a + 2b – 3a + 4b ← This one can be made easier by grouping the letters together. We have two calculations, highlighted by colour. Remember, the + or – always appears before the algebraic expression.

3a – 3a = 0
2b + 4b = 6b
The answer is 6b

Simplify the following equations.

a) p + p + p + p = _____

b) 7z + z = _____

c) 10a – 6a = _____

d) 6y + 3b – 2y + 7b = _____

e) $c^2 + c^2 + c^2$ = _____

f) 7a + 3a – 5a = _____

Input, Output and Mapping Diagrams

What do I need to know?

In year 7, you will become familiar with the words:

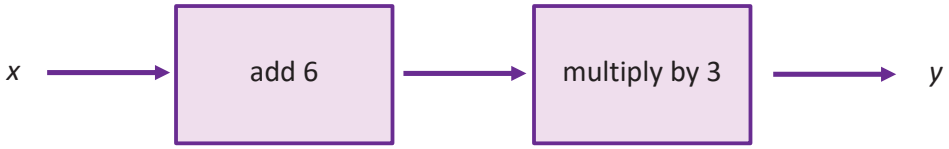
Input, output, rule, function, function machine & mapping

You will be expected to express simple function, at first, using words and symbols.

You will

- Find outputs for different inputs
- Find inputs for different outputs
- Read and interpret mapping diagrams
- Produce a table to show your results
- Describe the effect (rule) that happens when orders are changed

This is an example of a function machine:



x represents the input and y is the output. If x = 3, our calculation would be:

3 + 6 x 3 = 27

With questions asking for the input, use your knowledge of inverse.

Complete the table below by using the rule generated by the function machine above. The first one has been done for you.

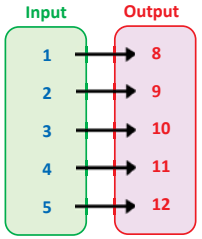
Input X	**3**	**5**	**8**	**12**		
Output Y	**27**				**69**	**84**

Mapping Diagrams

What do I need to know?

Mapping diagrams can be presented in lots of different ways. Here is one example.

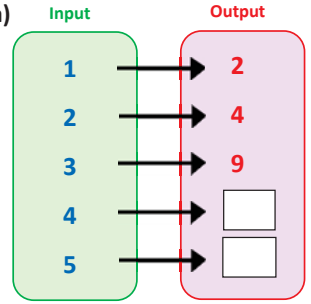
You will see two columns – input and output, as before.



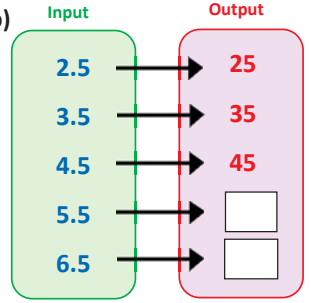
By looking at the input and output values carefully, you should try to work out what rule has been applied to the input, to produce the output. In this diagram, the pattern is + 7. Some mapping diagrams will have values missing and you will need to find the pattern and fill them in. You will need your knowledge of how inverse works to help you out!

Complete the mapping diagrams below. If an output is missing, use your knowledge of inverse to work it out.

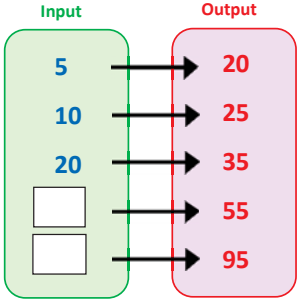
a)



b)



c)



d)