



# Maths Summer 1

## Year 7

# Blended Learning Booklet

Name:

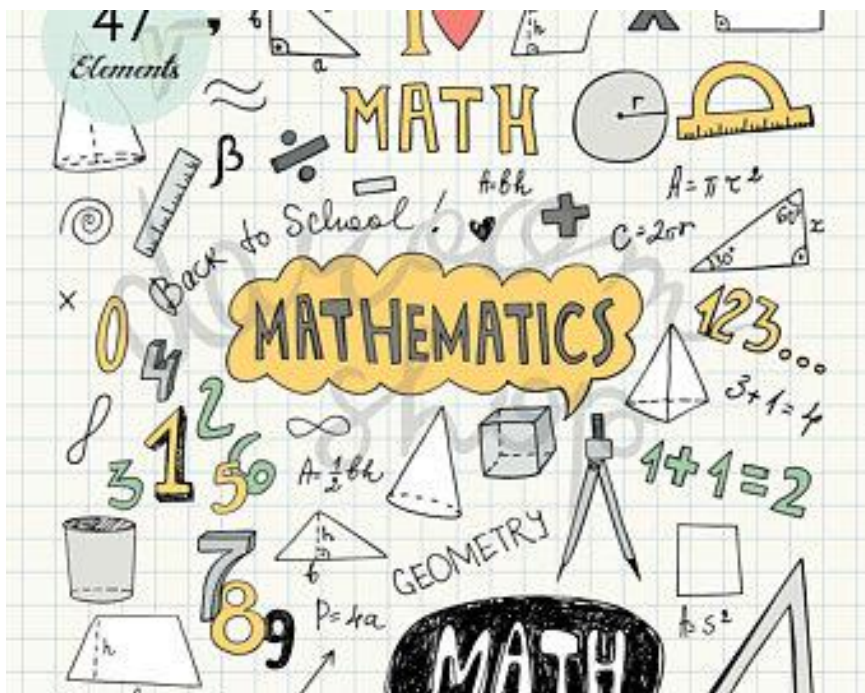
Form:

*Each week covers topics you would complete in your 3 Maths lessons that week.  
Write out the title and LI and then complete the tasks.*

*All video links are online using the ClassCharts link.*

*The Knowledge Organiser on page 4 has further practice questions and page numbers linking to your pocket revision guides for all the key information and examples to help you with this unit.*

*Upload all work onto ClassCharts for feedback.*



## Contents

Page 3: Big Picture - Year 7 Overview

Page 4: Knowledge Organiser

Page 5-10: Week 1 – Order of operations

Page 11-16: Week 2 – Order of operations including brackets and indices.  
Associativity

Page 17-22: Week 3 – Associativity and Sequences

Page 23-28: Week 4 – Function machines and Algebraic notation

Page 29-34: Week 5 – Substitution and formulae

Page 35-40: Week 6 – Collecting like terms, brackets and factorising

Page 41-42: Week 7 – Identities

Page 43: Assessment Ladder

Other useful information/websites

The school login for MyMaths.co.uk is

**stewards**

The password is

**triangle**

Every topic in this booklet is covered on MyMaths.co.uk in the online lessons for further support at home.

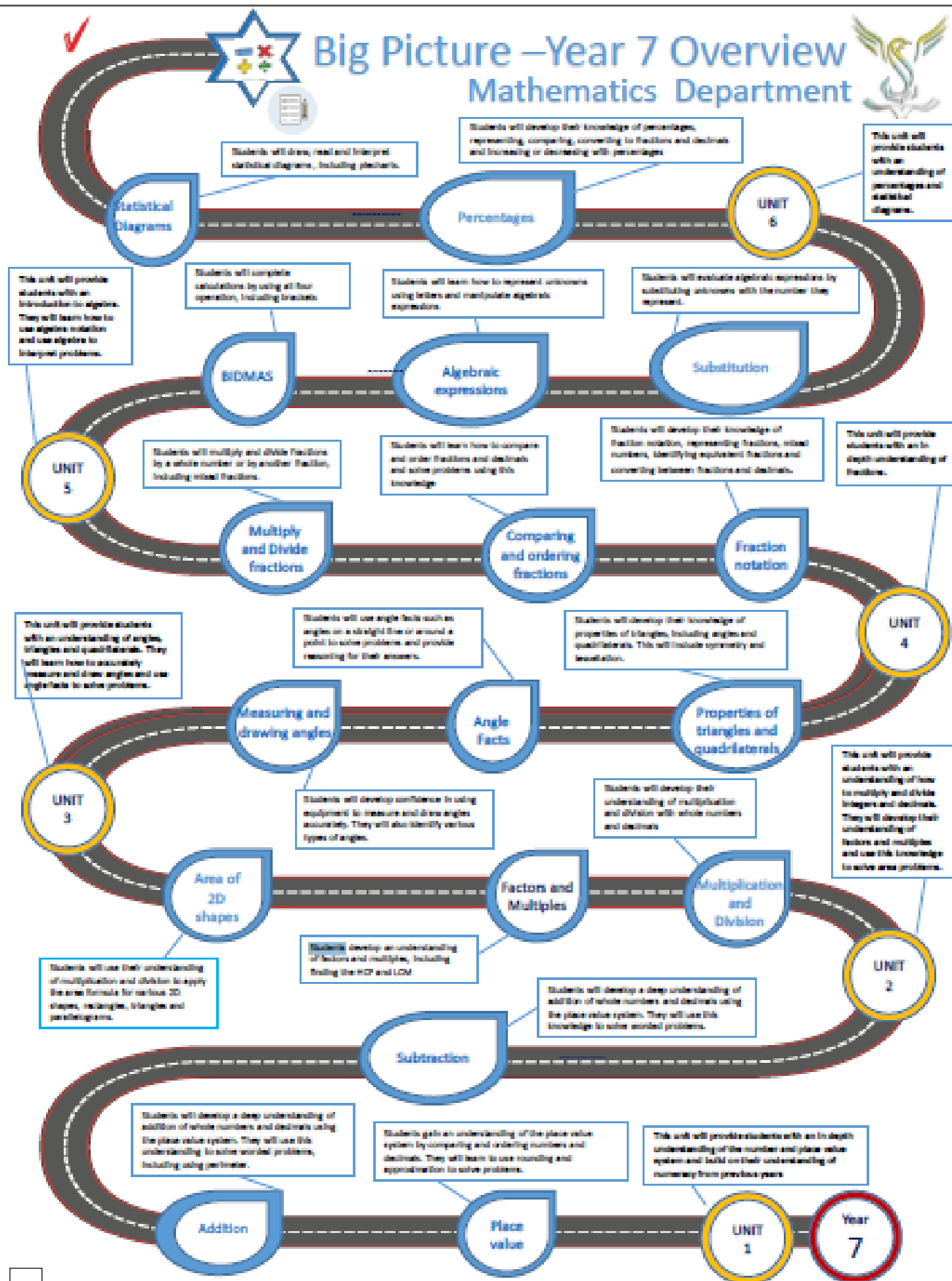
You also have a study guide (the pages you can use for each section are on your Knowledge Organiser – page 4)

Other websites you can look up information from include:

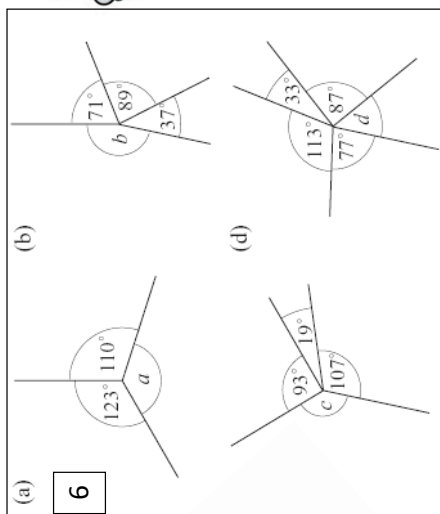
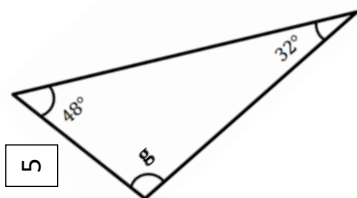
Oak National Academy

BBC Bitesize

MathsFun.com



1) The angles on a straight line add up to.....	2)	3)	4)
5)	6)	7)	8)
9)	10)	11)	12)
13)	14)	15)	16)



9 Draw an angle that measures:

60°	346°
18°	8°
96°	165°
137°	74°
242°	212°

10 Identify the type of angle:

12 Construct a triangle that has one angle of 35°, one angle of 48°, and a side of length 6 cm between these two angles.

2

I have 4 equal sides.  
But none of my angles form a right angle.  
What shape am I?

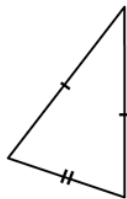
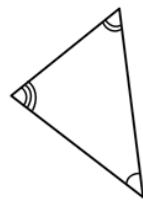
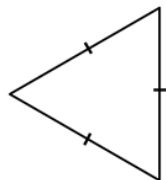
3

Can a Circle tessellate?

Can a Hexagon tessellate?

7

Give the mathematical name for each of these triangles.

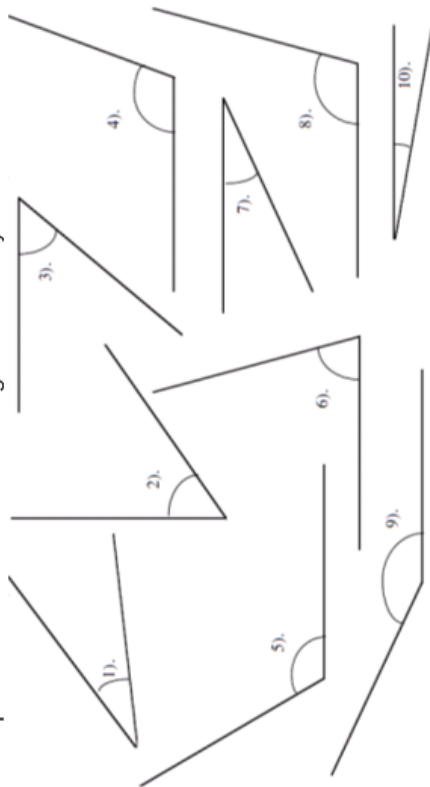


Construct a triangle that has one angle of 52°, one angle of 37°, and a side of length 8 cm between these two angles.

8

11

Use a protractor to measure these angles accurately



12



## Week 1:

- LI: I can follow an order of operations

**Demonstration Video:** <https://corbettmaths.com/2013/06/08/order-of-operations/>

### Tasks:

The order of operations tells us their priority.

1st	( )	<b>B</b> rackets
2nd	$4^2$	<b>I</b> ndices
3rd	$\div \times$	<b>D</b> ivision & <b>M</b> ultiplication
4th	$+ -$	<b>A</b> ddition & <b>S</b> ubtraction

There are no brackets or indices in these questions today, so you start at the 3<sup>rd</sup> step and go from there

**BIDMAS** helps us remember!

**Work out the answers to these calculations...**

$$W=6+3 \times 5 \quad R=3 \times 8+2 \quad G=3+8 \times 2 \quad I=4+7 \times 3$$

$$O=4 \times 7+3 \quad N=6+5 \times 9 \quad P=6 \times 5+9 \quad T=14-3 \times 2$$

$$S=16-2 \times 7 \quad Q=7+8 \times 2 \quad U=5 \times 7-8 \quad C=22-3 \times 4$$

$$M=22-3-4 \quad L=28-6 \times 2 \quad D=7 \times 2+4 \quad E=8+7 \times 4$$

$$A=32-6 \times 3 \quad H=9 \times 3+2$$

**...then decode this riddle**

21 29 14 8    29 14 39 39 36 51 36 18    8 31

8 29 36    39 16 14 51 8    25 51    8 29 36

15 14 8 29 2    10 16 14 2 2?

25 8    19 26 36 21    2 23 27 14 26 36    26 31 31 8 2



Can you spot any mistakes?

Work out  $9 + 4 \times 3 + 2$   
 $= 13 \times 3 + 2$   
 $= 39 + 2$   
 $= 41$

Matilda thinks of a number,  $n$ .  
 She adds 2 and then multiplies by 3.

Which expression below is correct?

A  
 $n + 2 \times 3$

B  
 $3n + 2$

C  
 $(n + 2) \times 3$

Once you have answered these questions, comment on what you notice

$$4 + 10 \div 2 =$$

$$4 + \frac{10}{2} =$$

$$\frac{10}{2} + 4 =$$

$$\frac{10 + 4}{2} =$$

$$\frac{10}{2} + \frac{4}{2} =$$

Work out  $5 + 2 \times 9 \div 3$

---

Work out  $2 \times 6 + 14 \div 2$

---

Work out  $4 - 3 + 2 \times 5$

---

Work out  $3 + 5 \times 7 + 2$

---

## DIGIT Puzzle

How many ways can you complete this calculation?

$$\boxed{\phantom{0}} \times \boxed{\phantom{0}} + \boxed{\phantom{0}} \div \boxed{\phantom{0}} = \boxed{\phantom{0}} \boxed{\phantom{0}}$$

- ★ Use any digits
- ★★ Use digits only once

What are the largest & smallest results you can make?

## Week 1:

- LI: I can understand and use brackets

**Demonstration Video:** <https://corbettmaths.com/2013/06/08/order-of-operations/>

### Tasks:

#### Concept corner

The order in which we evaluate calculations matters. As mathematicians we need to agree how we should do this so that everyone gets the same answers.

- We evaluate any calculations in brackets first:
  - $3 \times (4 + 5) = 3 \times \underline{\hspace{1cm}} = 27$
  - $2 \times (8 + 4) \div (2 \times 3) = \underline{\hspace{1cm}} \times 12 \div 6 = \underline{\hspace{1cm}} \div 6 = 4$
- We evaluate multiplication and division before we do addition and subtraction.
  - $3 + 8 \times 5 \div 2 = 3 + \underline{\hspace{1cm}} \div 2 = \underline{\hspace{1cm}} + 20 = 23$
  - $42 - \underline{\hspace{1cm}} \div 2 \times 4 + 5 \div 4 = 42 - 3.5 \times 4 + 5 \div 4 = 42 - \underline{\hspace{1cm}} + 1.25 = 29.25$
  - $6 \div 5 + (3 + 4 \times \underline{\hspace{1cm}}) = 6 \div 5 + (3 + 16) = 6 \div 5 + 19 = 1.2 + 19 = \underline{\hspace{1cm}}$

When working with operations of equal priority we can still work from left to right. We can still use commutativity to help us too!

#### 1. Evaluate the following:

- |  |  |
|--|--|
| a) $3 + 4 \times 5 = \underline{\hspace{1cm}}$   | e) $2 + 5 \times 6 = \underline{\hspace{1cm}}$   |
| b) $\underline{\hspace{1cm}} = 3 \times 4 + 5$   | f) $2 \times 5 + 6 = \underline{\hspace{1cm}}$   |
| c) $(3 + 4) \times 5 = \underline{\hspace{1cm}}$ | g) $(2 + 5) \times 6 = \underline{\hspace{1cm}}$ |
| d) $3 + (4 \times 5) = \underline{\hspace{1cm}}$ | h) $(2 \times 5) + 6 = \underline{\hspace{1cm}}$ |

Which calculations give the same result? Why?

#### 2. Evaluate the following:

- |  |  |
|--|--|
| a) $\underline{\hspace{1cm}} = 12 + 10 \div 4$   | e) $20 - 3.7 + 2.3 = \underline{\hspace{1cm}}$   |
| b) $12 \div 10 + 4 = \underline{\hspace{1cm}}$   | f) $20 + 3.7 - 2.3 = \underline{\hspace{1cm}}$   |
| c) $(12 + 10) \div 4 = \underline{\hspace{1cm}}$ | g) $\underline{\hspace{1cm}} = (20 - 3.7) + 2.3$ |
| d) $(12 \div 10) + 4 = \underline{\hspace{1cm}}$ | h) $20 - (3.7 + 2.3) = \underline{\hspace{1cm}}$ |

Which calculations give the same result? Why?



3. Calculate the following:

a)  $5 + 9 \times 2 - 13 =$

d)  $11 + (5 - 2) \times 4 =$

b)  $3 \times (8 + 2) \div 5 =$

e)  $2 \times (3 + 2 \times 9 \div 3) + 5 =$

c)  $20 + 3 - 2 \times 8 + 1 =$

f)  $(4 + 3 \times (7 - 2)) \times 3 =$

4

Only three of the calculations below are correct. Tick the correct statements.

Correct the others by writing brackets where they are needed.

a)  $2 \times 6 + 1 = 14$

e)  $14 - 4 \times 10 + 2 = 120$

b)  $5 = 3 + 7 \div 2$

f)  $1 = 2 \div 7 - 5$

c)  $3 \times 12 \div 4 = 9$

g)  $7 \times 2 + 1 - 5 \div 2 = 5$

d)  $14 - 2 \times 5 = 60$

h)  $4 + 3 \times 2 - 10 \div 5 = 8$

5 Evaluate the following:

a)  $4(5 + 2) =$

b)  $11(19 - 12) =$

c)  $5(4 + 8) - 3 \times 5 =$

d)  $3 + 6(2 + 9) \div 3 =$

e)  $7 \times 18 + 18 \times 3 =$

f)  $\frac{3+7-4}{2 \times 2} =$

6

Write brackets ( ) in this statement to make each statement correct.  
You may use more than one pair of brackets in each statement.

(a)  $4 \times 5 + 3 = 32$  (1)

(b)  $3 + 4 \times 5 + 6 = 47$  (1)

(c)  $2 + 7 \times 5 + 3 = 72$  (1)

(3 marks)

7

Write brackets ( ) in this statement to make each statement correct.  
You may use more than one pair of brackets in each statement.

(a)  $2 + 7 \times 3 + 4 = 51$  (1)

(b)  $4 \times 3 + 2 = 20$  (1)

(c)  $9 - 7 \times 3 + 5 = 16$  (1)

(3 marks)





## Week 1:

- LI: I can carry out combined operations involving all four operations

**Demonstration Video:** <https://corbettmaths.com/2013/06/08/order-of-operations/>

### Tasks:

1 Calculate the following mentally:

a)  $14 + 6 - 8 - 5 =$

g)  $152 - 22 - 35 + 8 =$

b)  $32 - 7 - 5 - 11 =$

h)  $207 - 99 + 44 - 75 =$

c)  $17 + 5 - 4 + 8 =$

i)  $28 + 52 - 20 + 8 =$

d)  $28 - 16 + 31 + 9 =$

j)  $0.8 - 0.5 + 0.9 + 1.2 =$

e)  $102 + 17 + 11 - 21 =$

k)  $2.3 - 0.2 - 0.3 - 0.1 + 0.6 =$

f)  $99 + 16 - 25 + 11 =$

l)  $0.64 - 0.25 + 0.31 - 0.7 =$

Calculate the following mentally:

2 a)  $3 \times 4 \div 6 =$

g)  $12 \times 9 \div 4 =$

b)  $8 \times 5 \times 2 \div 4 =$

h)  $24 \div 6 \times 3 \div 10 =$

c)  $12 \div 4 \times 9 =$

i)  $24 \times 3 \div 3 \div 10 =$

d)  $6 \times 7 \div 2 =$

j)  $80 \div 10 \times 9 \div 3 =$

e)  $24 \div 8 \times 7 =$

k)  $80 \times 9 \div 10 \div 3 =$

f)  $18 \times 5 \div 3 =$

l)  $80 \div 10 \div 3 \times 9 =$



3 Calculate the following:

a)  $5 + 9 \times 2 - 13 =$

d)  $11 + (5 - 2) \times 4 =$

b)  $3 \times (8 + 2) \div 5 =$

e)  $2 \times (3 + 2 \times 9 \div 3) + 5 =$

c)  $20 + 3 - 2 \times 8 + 1 =$

f)  $(4 + 3 \times (7 - 2)) \times 3 =$

4 True or false?

a)  $3 + 4 \times 5 \div 10 = 3 + (4 \times 5) \div 10$

e)  $14 \times 5 + 14 = 14 \times 6$

b)  $(14 - 6) \times 12 \div 4 = 14 - 6 \times 12 \div 4$

f)  $7 \times (9 + 2) = 7 \times 9 + 2 \times 7$

c)  $20 \times 3 - 8 + 9 = (20 \times 3) - (8 + 9)$



g)  $\frac{3}{5} \div 4 \times (3.5 + 2 \times 6) = \frac{3}{20} \times 15.5$

d)  $11 \times 7 + 9 - 5 = 11 \times 7 + (9 - 5)$



h)  $14 + 2 \div \frac{3}{8} - 6 = 14 + 2 \times 2\frac{2}{3} - 6$

### Extension Task

Using four number 2's try to make as many different answers as you can.  
You may use +, -,  $\times$ ,  $\div$  and brackets.

You may use one or more of the 2's as powers.

## Week 2:

- LI: I can understand and use simple index notation

**Demonstration Video:** <https://corbettmaths.com/2012/08/20/powers-indices/>

**Tasks:**

### Concept corner

To complete our order of operations we need to include indices such as  $4^2$  and  $\sqrt{25}$ .

$4^2 = 4 \times 4 = 16$  We say this as "four squared" or "four to the power of two".

$2^3 = \_\_\_ \times \_\_\_ \times \_\_\_ = 8$  "Two cubed" or "two to the power of \\_\\_\\_\\_\\_\\_".

Square and cube roots show the inverse of squaring and cubing:

$\sqrt{25} = 5$  "The square root of twenty-five is equal to five".

This is because  $\_\_\_ \times \_\_\_ = 25$ .

Roots and indices (powers) have equal priority, so they can be calculated from left to right.

**First** do the calculations in brackets

**Then** do indices

**Then** do multiplication and division

**Then** do addition and subtraction

Equal priority

Equal priority

### Remember!

If the operations have equal priority we can do the calculation from **left to right**

1. Evaluate these statements:

a)  $3^2 =$

e)  $2^3 =$

b)  $5^2 =$

f)  $3^3 =$

c)  $4^2 =$

g)  $10^4 =$

d)  $40^2 =$

h)  $3^2 + 5^2 =$

2. Calculate the following:

a)  $2 \times 3^2 =$

b)  $(2 \times 3)^2 =$

c)  $5(2 \times 3)^2 =$

3. Evaluate these square and cube roots:

a)  $\sqrt{16} =$

e)  $\sqrt{144} =$

b)  $\sqrt{1} =$

f)  $\sqrt{400} =$

c)  $\sqrt{49} =$

g)  $\sqrt[3]{8} =$

d)  $\sqrt{100} =$

h)  $\sqrt[3]{64} =$





4. Write the following in ascending order of size:

$$7^2 \quad \sqrt{36} \quad 5^3 \quad \sqrt{64} \quad 2^3 \quad 1^{10} \quad \sqrt{100} \quad \sqrt{81}$$

5. Calculate the following:

a)  $3 + 6^2 =$

c)  $5^2 - 3(2 + 4) =$

b)  $11 - 4^2 \div 8 =$



d)  $24 + (1 + 7)^2 \div 10 + 1 =$

6. Calculate the following:

a)  $5^2 \times 2 \div (5 \times 2) =$

d)  $(7 \times 3^2) + (14 \div 2) + 1 =$

b)  $(2 + 2)^2 - 3 \times 3 =$

e)  $(1 + 2)^2 + 4^2 - (5 \times 5) =$

c)  $(8 \times 2) \div 2^2 =$

7. Calculate the following:

a)  $4 + \sqrt{36} \div 3 =$

b)  $5(\sqrt{49} - 3) =$

c)  $5(\sqrt{49} - 3)^2 =$

d)  $\sqrt{3^2 + 8^2 + 8} =$

Question 1: Can you spot any mistakes?

$$6^2 = 12$$

$$1^7 = 7$$

$$10^4 = 40$$

$$2^6 = 32$$

Question 2: Fill in the boxes with possible integers.

$$\boxed{\phantom{00}}^{\boxed{\phantom{00}}} = 81$$

$$\boxed{\phantom{00}}^{\boxed{\phantom{00}}} = 81$$

Question 3: Fill in the boxes with possible integers.

$$\boxed{\phantom{00}}^{\boxed{\phantom{00}}} = 64$$

$$\boxed{\phantom{00}}^{\boxed{\phantom{00}}} = 64$$

## Week 2:

- LI: I can follow an order of operations with index notation and brackets

**Demonstration Videos:** <https://corbettmaths.com/2012/08/20/powers-indices/>  
<https://corbettmaths.com/2013/06/08/order-of-operations/>

**Tasks:**

The **order of operations** tells us their **priority**.

1st	( )	<b>B</b> rackets
2nd	$4^2$	<b>I</b> ndices
3rd	$\div \times$	<b>D</b> ivision & <b>M</b> ultiplication
4th	$+ -$	<b>A</b> ddition & <b>S</b> ubtraction

**BIDMAS** helps us remember!

$$4 + 2 \times 3^2 =$$

$$(4 + 2) \times 3^2 =$$

$$4 + (2 \times 3)^2 =$$

$$(4 + 2 \times 3)^2 =$$

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

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

$$4 \times (2 - 3)^2 =$$

$$(4 \times 2 - 3)^2 =$$

75	40	14	38	70
1	16	60	19	10
17	3	7	21	63
17	96	72	30	9
12	2	5	6	8

$$10^2 - 4 \times 10 =$$

$$(22 + 10) \div 4 =$$

$$20 - 3 \times 6 =$$

$$(2 + 5) \times 3^2 =$$

$$2 + 3^2 \times 4 =$$

$$(12 - 3^2) \times 4 =$$

$$(5 + 9) \times 5 =$$

$$2^2 + 3^2 \times 4 =$$

$$100 - 5^2 =$$

$$(4 + 2^3) \times 8 =$$

$$(6 + 2) \times 9 =$$

$$3 \times 2 + 4 =$$

$$5 + 3 \times 3 =$$

$$(9 - 3) \times 5 =$$

$$21 - 6 \div 3 =$$

$$(9 + 6) \div 5 =$$

$$33 - 4^2 \times 2 =$$

$$80 - 3 \times 5^2 =$$

$$20 - 7 \times 2 =$$

$$25 - 2^2 \times 2 =$$

TOTAL



1)  $2 + 3 \times 4$

2)  $20 \div 5 - 2$

3)  $20 - 2 \times 8$

4)  $4 \times 8 + 5$

5)  $15 - 15 \div 5$

6)  $18 - 3 \times 5$

7)  $8 \times 5 \div 2$

8)  $50 \div 5 \times 3$

1)  $(2 + 3) \times 4$

2)  $49 \div (4 + 3)$

3)  $8 - (10 - 4)$

4)  $(15 - 10) \div 5$

5)  $36 \div (6 + 3)$

6)  $4 \times (8 + 2)$

7)  $3 \times (10 - 2)$

8)  $60 \div (10 - 6)$

1)  $2 + 3^2 \times 4$

2)  $(2 + 3^2) \times 4$

3)  $8^2 \div (10 - 2)$

4)  $(2 + 3) \times 2^3$

5)  $20 - 2^2 \times 4$

6)  $5 \times (8 - 2^2)$

7)  $72 \div (5^2 - 4^2)$

8)  $2 \times 8 - 2^2 \div 4$

$$12 + 4 \times \sqrt{9} =$$

$$(12 + 4) \times \sqrt{9} =$$

$$12 + \sqrt{4 \times 9} =$$

$$\sqrt{12 + 4} \times 9 =$$

$$12 + \sqrt{4} \times 9 =$$

$$12 \times \sqrt{4} + 9 =$$

$$12 \times \sqrt{4} - 9 =$$

$$12 \times (\sqrt{4} - 9) =$$

$$12 - 9 \times \sqrt{4} =$$

$$12^2 - 9 \times \sqrt{4} =$$

$$(12^2 - 9) \times \sqrt{4} =$$

$$12^2 - \sqrt{9 \times 4} =$$



## Week 2:

- LI: I can use associativity to solve numerical problems

Demonstration Video: <https://www.youtube.com/watch?v=KBfnkUGeMvI>

Tasks:

1

### Associative Property

#### Addition

When you , you can group the numbers in any

$$a + (b + c) = (a + b) + c$$
$$2 + (\text{ }) = (2 + 5) + 3$$

#### Multiplication

When you multiply, you can  the numbers in any combination.

$$a \times (b \times c) = (\text{ }) \times c$$
$$2 \times (5 \times 3) = (2 \times 5) \times 3$$

2 Describe in your own words:

What does associativity mean?

3 Use the associative property to determine if the equations below are equal or not equal.

1.  $(9 + 6) + 8$  \_\_\_\_  $9 + (6 + 4)$

2.  $5 + (2 + 1)$  \_\_\_\_  $(5 + 2) + 1$

3.  $(7 + 3) + 4$  \_\_\_\_  $7 + (3 + 4)$

4.  $8 + (6 + 5)$  \_\_\_\_  $8 + (6 + 2)$

5.  $54 + (83 + 92)$  \_\_\_\_  $(54 + 83) + 92$

6.  $64 + (12 + 33)$  \_\_\_\_  $(64 + 12) + 45$

7.  $(31 + 97) + 2$  \_\_\_\_  $31 + (75 + 2)$

8.  $(46 + 55) + 19$  \_\_\_\_  $(19 + 55) + 46$



- 4 Use the associative property to fill in the missing numbers.

$$\begin{array}{l} 1. (33 + \underline{\quad}) + 15 = \underline{\quad} \\ 33 + (21 + 15) = \underline{\quad} \end{array}$$

$$\begin{array}{l} 2. \underline{\quad} + (9 + 2) = \underline{\quad} \\ (17 + 9) + 2 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 3. 154 + (\underline{\quad} + \underline{\quad}) = \underline{\quad} \\ (154 + 48) + 30 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 4. (\underline{\quad} + 81) + 8 = \underline{\quad} \\ 25 + (81 + 8) = \underline{\quad} \end{array}$$

$$\begin{array}{l} 5. (\underline{\quad} + 9) + 7 = \underline{\quad} \\ 13 + (\underline{\quad} + 7) = \underline{\quad} \end{array}$$

$$\begin{array}{l} 6. 4 + (\underline{\quad} + 75) = \underline{\quad} \\ (\underline{\quad} + 33) + \underline{\quad} = \underline{\quad} \end{array}$$

$$\begin{array}{l} 7. \underline{\quad} + (\underline{\quad} + 22) = \underline{\quad} \\ (99 + 44) + \underline{\quad} = \underline{\quad} \end{array}$$

$$\begin{array}{l} 8. 10 + (\underline{\quad} + \underline{\quad}) = \underline{\quad} \\ (\underline{\quad} + 15) + 20 = \underline{\quad} \end{array}$$

- 5 Find the products for each. First solve the part in parenthesis and write a new multiplication fact on the first line. Then write the product on the bottom line.

$$\begin{array}{l} \text{a. } (4 \times 2) \times 6 = 4 \times (2 \times 6) \\ \underline{\quad\quad\quad} = \underline{\quad\quad\quad} \\ \underline{\quad\quad\quad} = \underline{\quad\quad\quad} \end{array}$$

$$\begin{array}{l} \text{b. } (2 \times 5) \times 3 = 2 \times (5 \times 3) \\ \underline{\quad\quad\quad} = \underline{\quad\quad\quad} \\ \underline{\quad\quad\quad} = \underline{\quad\quad\quad} \end{array}$$

- 6 Re-write each expression with different parentheses to change the order of operations.  
Example:  $(8 \times 5) \times 12 = 8 \times (5 \times 12)$

1.  $6 \times (9 \times 2) =$

2.  $5 \times (17 \times 10) =$

3.  $(3 \times 29) \times 20 =$

4.  $(36 \times 18) \times 12 =$

5.  $64 \times (30 \times 74) =$

6.  $(8 \times 5) \times (11 \times 3) =$



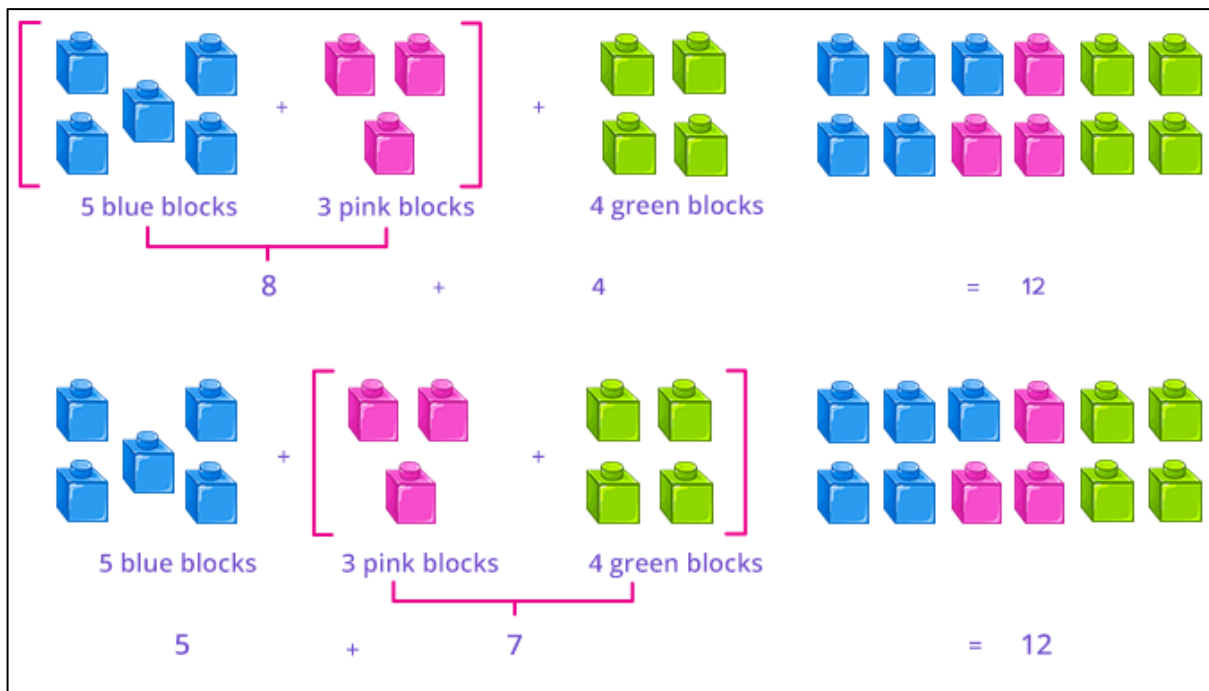
### Week 3:

- **LI:** I can use picture models for understanding associativity

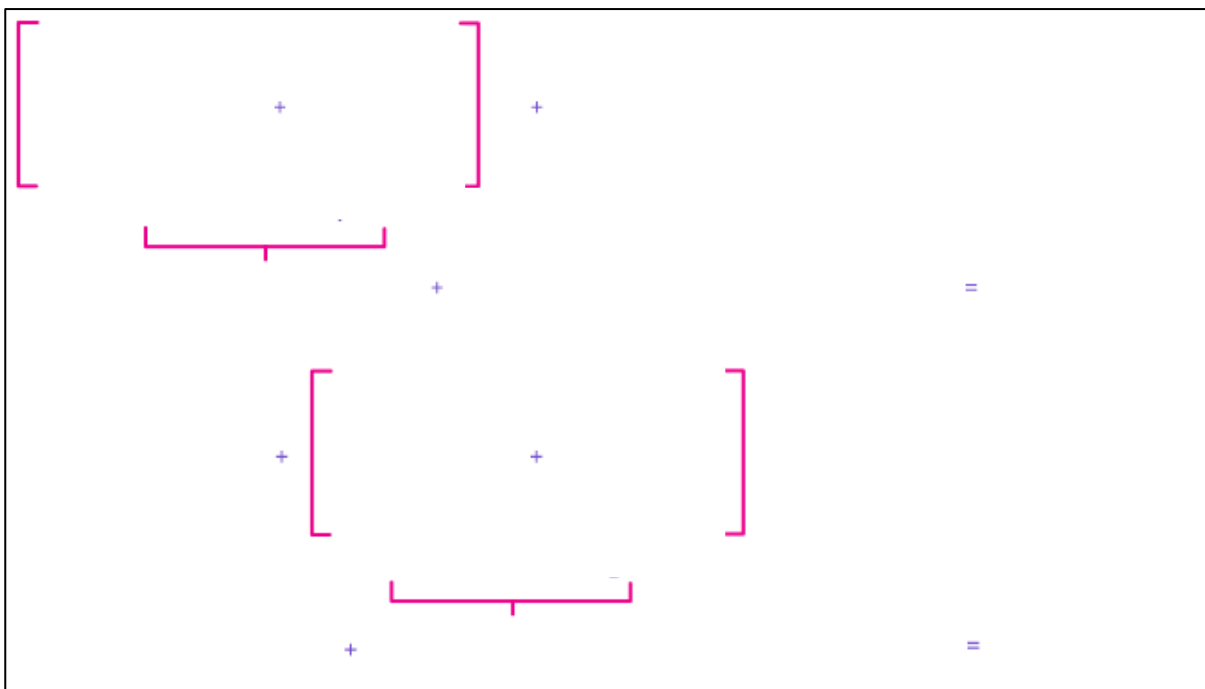
**Demonstration Video:** <https://www.youtube.com/watch?v=KBfnkUGeMvI>

### Tasks:

The following picture demonstrates that  $(5 + 3) + 4 = 5 + (3 + 4)$

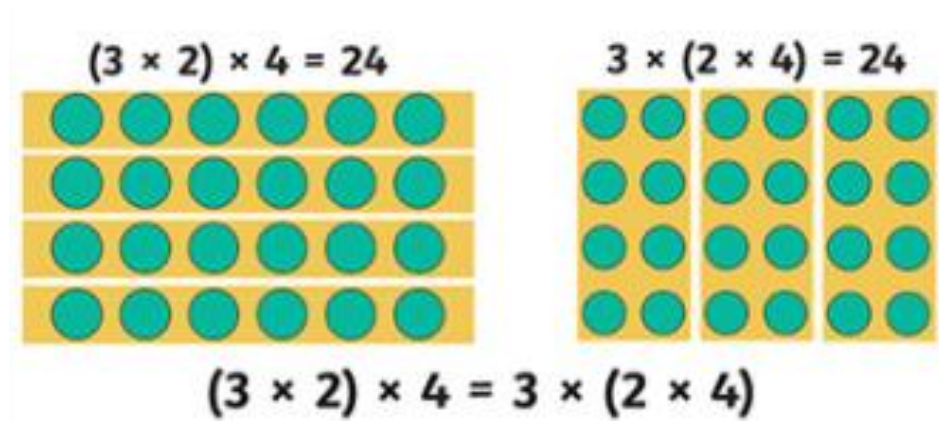


Draw a picture to demonstrate that  $(2 + 6) + 3 = 2 + (6 + 3)$





This diagram shows that multiplication is associative



Draw a diagram to show  $(2 \times 5) \times 3$

Draw a diagram to show  $2 \times (5 \times 3)$

Comment on the two answers from the diagrams above



## Week 3:

- LI: I can recognise and continue sequences of patterns

Demonstration Video: <https://corbettmaths.com/2013/11/13/patterns-and-sequences/>

Tasks:

### Section 1

1 These patterns are made from sticks



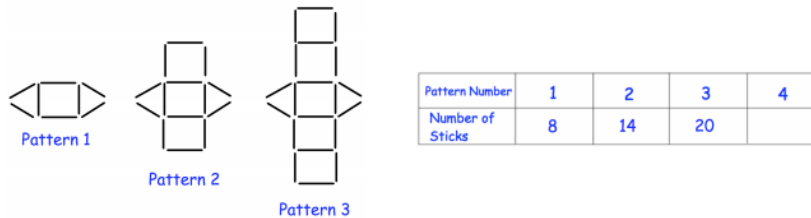
- Draw pattern 4
- Draw pattern 5
- How many sticks will there be in pattern 6?
- How many sticks will there be in pattern 10?
- Which pattern will use 31 sticks?

Theo says that he has made a pattern with exactly 100 sticks.

- Explain why Theo must be wrong.

Question 2 The patterns below are made from sticks

- Complete the table for pattern 4.



- Sketch pattern 5.

Here is a rule for working out the number of sticks

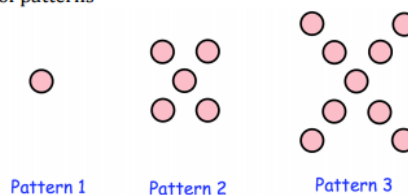
Multiply pattern number by 6 and add 2

- How many sticks will be in pattern 30?
- How many sticks will be in pattern 120?
- Which pattern will have 80 sticks?
- Which pattern will have 482 sticks?

Question 3 The diagram shows a sequence of patterns

- Draw pattern 4.

- Work out the number of circles in pattern 5.



- Write down a rule for continuing the patterns.
- Explain why you **cannot** make a pattern with exactly 66 circles.
- Complete this rule

Number of circles = Pattern number  $\times$   -



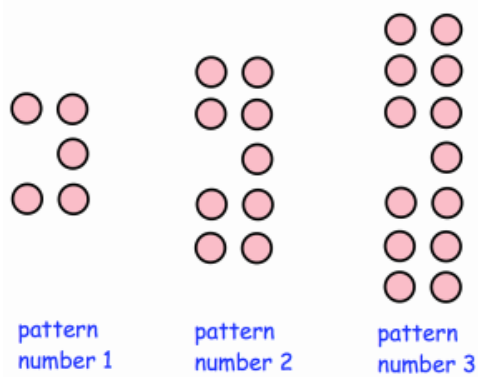
## Section 2

Question 1: Here is a pattern made with circular discs.

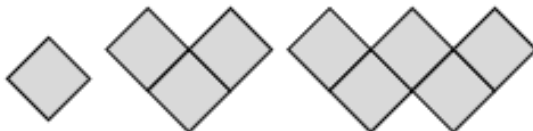
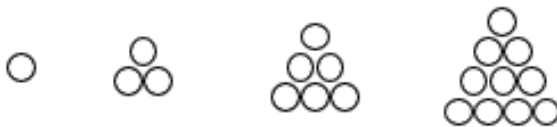
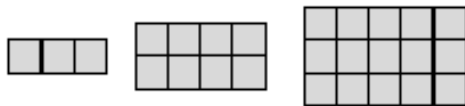
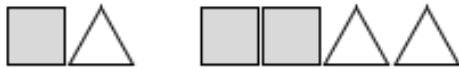
- (a) Find an expression, in terms of  $n$ , for the number of discs in pattern number  $n$ .

Olivia has 103 discs.

- (b) Can Olivia make a pattern in this sequence using exactly 103 discs?  
Explain your answer.



**Sequences:** Draw the next pattern in each sequence





## Week 3:

- **LI:** I can recognise and continue sequences of numbers

Demonstration Video: <https://corbettmaths.com/2013/11/13/patterns-and-sequences/>

Tasks:

### Section 1

Which of these are SEQUENCES & which are NOT? Can you describe the sequence rule & calculate the next two numbers?		
A	8, 16, 24, 32, 40, 48	B 20, 200, 2000, 2000000
C	4, 8, 12, 15	D 3, 3, 6, 9, 15, 24
E	1, 5, 8, 12, 15, 19	F 5, 8, 11, 14
G	5, 10, 8, 13, 11, 16, 14, 18	H 12, 7, 2
I	5, 8.5, 12	J 9, 16, 23, 30, 6
K	1, 4, 8, 13, 19, 25	L 2, 6, 18
M	100, 95, 89, 82,	N 1, 4, 9, 16



## Section 2

Question 1: Here are the first four terms of a number sequence 9, 15, 21, 27, ...

- (a) Write down the next term of the number sequence.
- (b) Explain how you found your answer to (a)
- James says that the 20th term of the sequence is 122
- (c) Explain why James must be wrong.

Question 2: Here are the first four terms of a number sequence 5, 8, 11, 14, ...

- (a) Write down the next term of the number sequence.
- (b) Find the 10th term of the sequence.
- The 100th term of the number sequence is 302
- (c) Work out the 101st term of the number sequence.
- (d) Work out the 99th term of the number sequence.

3 Write down the next three terms in each of these sequences:

- a) 3, 6, 9, 12, \_\_, \_\_, \_\_, ...
- e) 20, 18, 16, 14, \_\_, \_\_, \_\_, ...
- b) 4, 7, 10, 13, \_\_, \_\_, \_\_, ...
- f) 10, 30, 90, \_\_, \_\_, \_\_, ...
- c) 13, 23, 33, 43, \_\_, \_\_, \_\_, ...
- g) 3, 6, 12, 24, \_\_, \_\_, \_\_, ...
- d) 1204, 1208, 1212, \_\_, \_\_, \_\_, ...
- h) 3, 7, 15, 31, \_\_, \_\_, \_\_, ...



4 Fill in the gaps in each of these sequences:

- a) 7, 8, \_\_, 10, \_\_, \_\_, 13, ...
- b) 4, 8, \_\_, 16, \_\_, \_\_, 28, ...
- c) \_\_, 55, 50, \_\_, \_\_, 35, 30, ...
- d) 0.2, \_\_, 0.6, 0.8, \_\_, 1.2, ...
- e) 50, \_\_, \_\_, 62, \_\_, 70, ...
- f) \_\_, 7, \_\_, \_\_, 19, \_\_, ...
- g) \_\_, 3, \_\_, \_\_, 5.1, \_\_, ...



- h) \_\_, 3.1, \_\_, \_\_, 3.28, \_\_, ...

## Week 4:

- LI: I can represent an unknown number using a letter

Demonstration Videos: <https://corbettmaths.com/2017/09/25/function-machines/>  
<https://corbettmaths.com/2013/03/13/algebraic-notation/>

Tasks:

1

### 1 & 2 Step Function Machines

What is the **output** when we input these numbers into the function machine?  
 The first output for each has been completed for you.

$$\begin{array}{ccc} 2 & & 5 \\ 4 & \boxed{+3} \rightarrow & \underline{\quad} \\ 6 & & \underline{\quad} \end{array}$$

$$\begin{array}{ccc} 3 & & 6 \\ 4 & \boxed{\times 2} \rightarrow & \underline{\quad} \\ 7 & & \underline{\quad} \end{array}$$

1) Complete the missing gaps for these function machines.

a) 
$$\begin{array}{ccc} 2 & & \underline{\quad} \\ 5 & \boxed{+4} \rightarrow & \underline{\quad} \\ \underline{\quad} & & 11 \end{array}$$

b) 
$$\begin{array}{ccc} 2 & & \underline{\quad} \\ 5 & \boxed{\times 3} \rightarrow & \underline{\quad} \\ \underline{\quad} & & 18 \end{array}$$

c) 
$$\begin{array}{ccc} 6 & & \underline{\quad} \\ 7 & \boxed{-3} \rightarrow & \underline{\quad} \\ \underline{\quad} & & 6 \end{array}$$

d) 
$$\begin{array}{ccc} 4 & & \underline{\quad} \\ \underline{\quad} & \boxed{\div 2} \rightarrow & \underline{\quad} \\ \underline{\quad} & & 8 \end{array}$$

e) 
$$\begin{array}{ccc} 0 & & \underline{\quad} \\ 3 & \boxed{\times 4} \rightarrow & \underline{\quad} \\ \underline{\quad} & & 20 \end{array}$$

f) 
$$\begin{array}{ccc} & & 6 \\ & \boxed{+5} \rightarrow & \underline{\quad} \\ & & 16 \end{array}$$

2) What are the operations in these functions machines?  
 Work them out and complete the missing gaps.

a) 
$$\begin{array}{ccc} 3 & & 9 \\ 7 & \boxed{\quad} \rightarrow & \underline{\quad} \\ 8 & & 14 \end{array}$$

b) 
$$\begin{array}{ccc} 8 & & \underline{\quad} \\ 10 & \boxed{\quad} \rightarrow & \underline{\quad} \\ 14 & & 11 \end{array}$$

c) 
$$\begin{array}{ccc} 2 & & 8 \\ & \boxed{\quad} \rightarrow & \underline{\quad} \\ 9 & & 36 \end{array}$$

d) 
$$\begin{array}{ccc} 9 & & 3 \\ 15 & \boxed{\quad} \rightarrow & \underline{\quad} \\ 30 & & \underline{\quad} \end{array}$$

e) 
$$\begin{array}{ccc} 1 & & 5 \\ 3 & \boxed{\quad} \rightarrow & \underline{\quad} \\ & & 35 \end{array}$$

f) 
$$\begin{array}{ccc} 12 & & 2 \\ & \boxed{\quad} \rightarrow & \underline{\quad} \\ 60 & & 10 \end{array}$$

3) Can you complete these two-step function machine diagrams?

a) 
$$\begin{array}{ccccc} 2 & & & & \\ 5 & \boxed{+5} \rightarrow & \boxed{-2} \rightarrow & & \\ 7 & & & & \end{array}$$

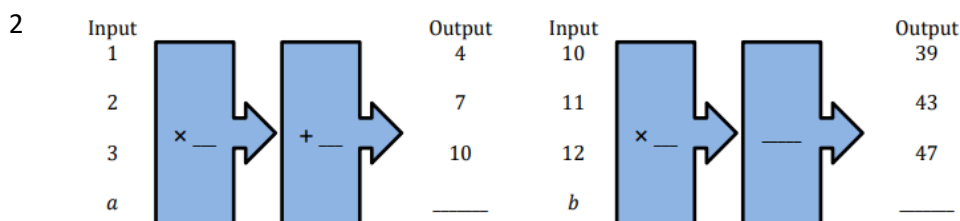
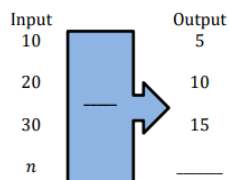
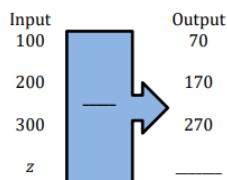
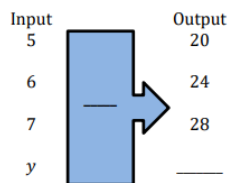
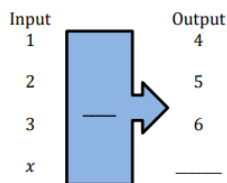
b) 
$$\begin{array}{ccccc} 1 & & & & 9 \\ 3 & \boxed{+2} \rightarrow & \boxed{\quad} \rightarrow & & 15 \\ 6 & & & & \end{array}$$

c) 
$$\begin{array}{ccccc} 5 & & & & 6 \\ 7 & \boxed{\times 2} \rightarrow & \boxed{\quad} \rightarrow & & \\ 10 & & & & 16 \end{array}$$

d) 
$$\begin{array}{ccccc} 7 & & & & 1 \\ 9 & \boxed{-} \rightarrow & \boxed{\div} \rightarrow & & 2 \\ 11 & & & & 3 \end{array}$$



- 1 Decide which operation(s) are being used in these function machines and express the output algebraically:



- 3 Match up the function machines with the algebraic notation

<b>A</b> 	<b>B</b> 	<b>C</b> 	<b>D</b> 
<b>E</b> 	<b>F</b> 	<b>G</b> 	<b>H</b> 
<b>I</b> 	<b>J</b> 	<b>K</b> 	<b>L</b> 
<b>1</b> $2x + 6$	<b>2</b> $2x + 3$	<b>3</b> $3x - 2$	<b>4</b> $\frac{x + 3}{2}$
<b>5</b> $\frac{3x}{2}$	<b>6</b> $\frac{x}{2} - 3$	<b>7</b> $\frac{2x}{3}$	<b>8</b> $2x - 6$
<b>9</b> $3x + 2$	<b>10</b> $\frac{x - 2}{3}$	<b>11</b> $\frac{x - 3}{2}$	<b>12</b> $\frac{x}{3} + 2$





## Week 4:

- LI: I can represent an unknown number using a letter

Demonstration Videos: <https://corbettmaths.com/2017/09/25/function-machines/>  
<https://corbettmaths.com/2013/03/13/algebraic-notation/>

### Tasks:

#### 1 Concept corner

When we use algebra, we write  $3g$  instead of  $3 \times g$ . This is because  $\times$  and  $x$  look similar.

We also use a vinculum to show division, for example  $\frac{y}{4} \equiv y \div 4$ .

Fill in the spaces below:

Remember  $\equiv$  means 'is equivalent to'

$$5 \times m \equiv \underline{\hspace{2cm}}$$

$$y \times 24 \equiv \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \div 20 \equiv \frac{w}{20}$$

$$19 \div \underline{\hspace{2cm}} = \frac{\hspace{1cm}}{n}$$

2

Decide if each of the statements below are true or false for this bar model:

a)  $e + w = n$

b)  $w + n = e$

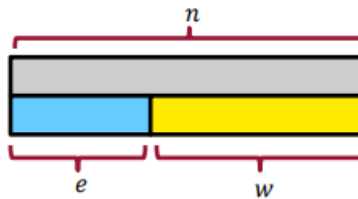
c)  $n - w = e$

d)  $n = w + e$

e)  $w = e - n$

f)  $n + e = w$

g)  $e = n - w$



3

Write down an algebraic expression for each of the following.

(a) 4 more than  $y$

(b) 3 less than  $p$

4

Explain the meaning of each of these expressions.

(a)  $4y$

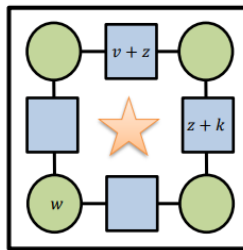
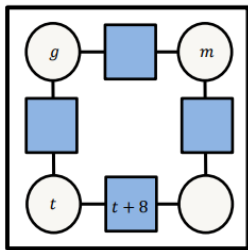
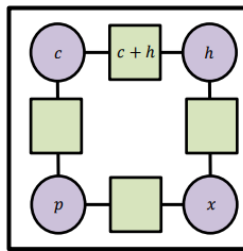
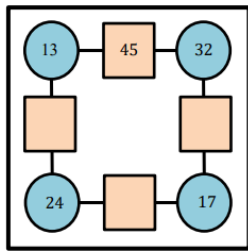
.....

(b)  $y^2$

.....



- 5 Complete these arithmagons. The number in any square must be the sum of the two circles next to it.



6

**Describing with Algebra** For each bar model, circle the **expression** that describes the length of the arrow.  $\longleftrightarrow$

①

- 1)  $3b$   
 $b + 3$   
 $3 - b$
- 2)  $kk$   
 $2 + k$   
 $2k$
- 3)  $2d + 4$   
 $d + d + 4$   
 $dd4$
- 4)  $8 - 3w$   
 $3w + 8$   
 $4w + 8$
- 5)  $3x$   
 $x - 3$   
 $x \div 3$
- 6)  $12 - s$   
 $12s$   
 $s + 6$

- 7)  $2a - 9$   
 $9 + a$   
 $a - 3$
- 8)  $7 - 2e$   
 $2e - 7$   
 $4 + 2e - 3$
- 9)  $b - a + 11$   
 $11 - ab$   
 $a + b - 11$

For these questions, the white bars are equal sizes.

- 10)  $\frac{p}{2}$   $p \div \frac{1}{2}$
- 11)  $m \div 4$   $\frac{m}{4}$   $4m$
- 12)  $\frac{a + 7}{3}$   $7a \div 3$



## Week 4:

- **LI:** I can form and use algebraic expressions

Demonstration Video: <https://corbettmaths.com/2013/03/13/algebraic-notation/>

Tasks:

## Section 1

Question 1: Write an algebraic expression for each of the following

- |                          |                    |                     |                      |
|--------------------------|--------------------|---------------------|----------------------|
| (a) 4 more than $c$      | (b) 2 lots of $a$  | (c) 3 less than $b$ | (d) $m$ divided by 5 |
| (e) 7 multiplied by $s$  | (f) $w$ subtract 1 | (g) $e$ squared     | (h) $y$ add 9        |
| (i) $m$ shared between 3 | (j) 10 times $x$   | (k) $k$ less than 8 | (l) 12 less than $g$ |

Question 2: Write an algebraic expression for each of the following

- |   |                         |                       |                           |
|---|-------------------------|-----------------------|---------------------------|
| (a) $c$ add $p$                             | (b) $f$ minus $m$       | (c) $a$ times $b$     | (d) $p$ divided by $z$    |
| (e) $b$ taken away from $u$                 | (f) $k$ add $n$ add $r$ | (g) $w$ less than $c$ | (h) $l$ multiplied by $m$ |
| (i) $y$ multiplied by $m$ multiplied by $a$ |                         |                       |                           |

Question 3: Write an algebraic expression for each of the following

- |  |  |
|--|--|
| (a) $m$ multiplied by 2 and then add 3   | (b) $h$ divided by 4 and then add 7        |
| (c) $p$ squared and then add 10          | (d) $t$ add 2 and then multiplied by 5     |
| (e) 9 times $e$ and then add 1           | (f) $h$ divided by 3 then add 1            |
| (g) $m$ subtract 6 and then divided by 3 | (h) $y$ squared and then multiplied by 4   |
| (i) $k$ multiplied by 4 and then squared | (j) $a$ squared and then multiplied by $b$ |



## Section 2




Question 1: An orange costs  $y$  pence, an apple costs  $z$  pence and a banana costs 17 pence.  
Write an expression for the total cost of:

- (a) 3 oranges                      (b) 5 apples                      (c) 2 oranges and 3 apples  
(d) 2 apples and 1 banana      (e)  $m$  bananas                      (f) 3 oranges and 3 bananas  
(g) 20 apples, 10 oranges and 2 bananas      (h) 4 oranges, 3 apples and  $n$  bananas

Question 2: A taxi driver charges  $\pounds m$  per mile.  
Write an expression for the total cost of:

- (a) A 2 mile journey                      (b) A 15 mile journey                      (c) A journey of  $x$  miles

Question 3: Write an expression for the perimeter of each shape below.

- (a)  (b)  (c) 

Question 4: Alan is  $y$  years old and has 8 sisters.  
Write an expression for how old each sister is.

- (a) Beth is 3 years old than Alan.  
(b) Clara is 2 years younger than Alan.  
(c) Donna is three times Alan's age.  
(d) Emma is half Alan's age.  
(e) Fiona is two years younger than Donna.  
(f) Georgia is twice Beth's age.  
(g) Hannah is 4 years older than Fiona.  
(h) Isabelle is three times Clara's age.

Question 5: Guy, Eric and Luke go Christmas shopping.  
Write an expression for how much money each man has left after shopping.

- (a) Guy had  $\pounds 20$  and spends  $\pounds y$  on presents.  
(b) Eric had  $\pounds m$  and spends  $\pounds 12$  on presents.  
(c) Luke had  $\pounds a$  and spends  $\pounds b$  on presents.

Question 6: A TV costs  $\pounds x$ . A DVD player costs  $\pounds 45$  less than the TV.  
Write an expression for the total cost of the TV and DVD player.

Question 7: A plumber charges  $\pounds 15$  per hour plus a  $\pounds y$  initial callout charge.  
Write an expression for the total cost of:

- (a) A job lasting 3 hours      (b) A job lasting 8 hours      (c) A job lasting  $n$  hours



## Week 5:

- LI: I can evaluate simple algebraic expressions by substitution

Demonstration Video: <https://corbettmaths.com/2012/08/20/substitution-into-expressions/>

Tasks:

## Section 1

Question 1: If  $a = 7$   $b = 10$   $c = 3$   $d = 8$  and  $e = 15$   
Find the value of each expression.

- |                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| (a) $a + 5$       | (b) $b - 4$       | (c) $c + d$       | (d) $e - d$       |
| (e) $2a$          | (f) $4b$          | (g) $3e$          | (h) $5c$          |
| (i) $\frac{b}{2}$ | (j) $\frac{e}{5}$ | (k) $\frac{d}{4}$ | (l) $\frac{a}{2}$ |
| (m) $a^2$         | (n) $b^2$         | (o) $c^2$         | (p) $d^2$         |
| (q) $2a + 1$      | (r) $3b - 7$      | (s) $9c + 11$     | (t) $4e - 45$     |
| (u) $2a + 3c$     | (v) $4d - b$      | (w) $5a + 2d$     | (x) $e - 4c$      |
| (y) $30 - 4a$     | (z) $15 - 3c$     |                   |                   |

Question 2: If  $f = 5$   $g = 6$   $h = 4$  and  $i = 2$   
Find the value of each expression.

- |                |               |               |               |
|----------------|---------------|---------------|---------------|
| (a) $fg$       | (b) $hi$      | (c) $gh$      | (d) $i^3$     |
| (e) $\sqrt{h}$ | (f) $3f + 2g$ | (g) $5h + 7i$ | (h) $9h - 7i$ |

Question 3: If  $a = -2$   $b = 5$   $c = -6$   $d = 10$  and  $e = 9$   
Find the value of each expression.

- |                   |                   |                |               |
|-------------------|-------------------|----------------|---------------|
| (a) $a + 4$       | (b) $b - 8$       | (c) $c + e$    | (d) $a - d$   |
| (e) $d - c$       | (f) $2c$          | (g) $7a$       | (h) $-7b$     |
| (i) $2d + 3c$     | (j) $6e + 3a$     | (k) $5a + 7$   | (l) $20 + 4a$ |
| (m) $ac$          | (n) $40 - d$      | (o) $2e - a$   | (p) $bd + a$  |
| (q) $\frac{a}{2}$ | (r) $\frac{d}{4}$ | (s) $\sqrt{e}$ | (t) $c^2$     |

Question 4: If  $a = 1.5$   $b = 4$   $c = 6$   $d = 0.5$  and  $e = -3$   
Find the value of each expression.

- |                     |                      |                        |                |
|---------------------|----------------------|------------------------|----------------|
| (a) $4(a + d)$      | (b) $5(c + b)$       | (c) $3(10 - e)$        | (d) $abc$      |
| (e) $e^3$           | (f) $d^2$            | (g) $5b^2$             | (h) $8e^2 + 3$ |
| (i) $\frac{b+2}{3}$ | (j) $\frac{2c-e}{4}$ | (k) $\frac{10d+4b}{7}$ |                |

Question 5:  $P = 2L + 2W$ , work out  $P$  if  $L = 8$  and  $W = 3$ .

Question 6:  $C = 15h + 30$ , work out  $C$  if  $h = 6$ .



## Section 2

Question 1: The cost of hiring a car for a number of days is calculated using the formula

$$\text{Hire Cost} = 30 \times \text{Number of Days} + 50$$



- (a) Calculate the cost of hiring a car for 4 days.
- (b) Calculate the cost of hiring a car for 9 days.
- (c) The hire cost is £110, how many days was the car hired for?
- (d) The hire cost is £380, how many days was the car hired for?

Question 2: The cost of photocopying is given as:

$$\text{Cost in pence} = 3 \times \text{number of black \& white pages} + 15 \times \text{number of colour pages}$$

- (a) Ella orders 20 black & white pages and 6 colour pages, work out the cost.
- (b) Tom orders 400 black & white pages and 70 colour pages, work out the cost.

Question 3: The time in minutes, taken to cook a chicken is given by the formula

$$\text{Time} = 40 \text{ minutes per kilogram plus } 20 \text{ minutes}$$



- (a) Work out the time taken to cook a 5kg chicken.
- (b) Work out the time taken to cook a 2.5kg chicken.

Question 4: This formula is used to calculate the weekly pay of a letting agent.

$$\text{Weekly pay} = \text{basic pay} + \text{number of houses rented} \times \text{bonus}$$

The basic pay is £400 and a bonus of £75 is paid for each house rented.  
Mrs Lewis rents out 5 houses in one week.  
Calculate her pay.





## Week 5:

- LI: I can understand and use formulae

Demonstration Video: <https://www.youtube.com/watch?v=C2xJbUIC5AA>

Tasks:

1

4. Match up sets of three statements:

To find $y$ , multiply $x$ by 2 and subtract 4	$y = 4x + 2$	When $x = 5$ , $y = 6$
To find $y$ , multiply $x$ by 4 and add 2	$y = 4(x - 2)$	When $x = 5$ , $y = 36$
To find $y$ , add 4 to $x$ then multiply by 4	$y = 2x - 4$	When $x = 5$ , $y = 22$
To find $y$ , subtract 2 from $x$ then multiply by 4	$y = 4(x + 4)$	When $x = 5$ , $y = 12$

2

a) Given that  $c = 4a - 5$ , find:

$c$  when  $a = 3$

$c$  when  $a = 1.2$

b) Given that  $p = 2(q + 3)$ , find:

$p$  when  $q = 1$

$p$  when  $q = 0.5$

c) Given that  $m = 7.2n + 4.89$ , estimate the value of:

$m$  when  $n = 0.9$

$m$  when  $n = 4.2$

3

$$A = 2W + 2L$$

Find  $A$  if  $W = 3$  and  $L = 9$

4

$$A = 2W + 2L$$

Find  $W$  if  $A = 30$  and  $L = 11$





5 This formula can be used to convert between Celsius and Fahrenheit:

$$F = 1.8C + 32$$

- (a) Work out the value of F when C = 10
- (b) Work out the value of F when C = 20
- (c) Work out the value of F when C = 4
- (d) Work out the value of C when F = 35.6
- (e) Work out the value of C when F = 41
- (f) Work out the value of C when F = 112
- (g) Find a temperature when F and C are the same value.

6 The amount of medicine, s ml, to give to a child can be worked out using the formula.

$$s = \frac{am}{150}$$

s is the amount of medicine, in ml.  
a is the adult dose, in ml.  
m is the age of the child, in months.

A child is 20 months old.  
An adult's dose is 45ml.

Work out the amount of medicine the child should be given.

7

$$v = u + at$$

- (a) Work out v when u = 23, a = 4 and t = 3

- (b) Work out u when v = 30, a = 2 and t = 8

8

The cost in pounds, C, of hiring a car is given by  
 $C = 25d + 45$

where d is the number of days the car is hired.

- (a) Find C if d = 4.

- (b) Find d if C = 245





## Week 5:

- LI: I can multiply out brackets

Demonstration Video: <https://corbettmaths.com/2013/12/23/expanding-brackets-video-13/>

### Tasks:

1 **Concept Corner**

Fill in the spaces below:

The distributivity law tells us that:

$$3(4 + 5) = 3 \times 4 + 3 \times 5$$

$$= 12 + 15 = 27.$$

We can use this property with algebraic expressions too. It is called **multiplying out** or **expanding**.

When **expanding brackets**, each term \_\_\_\_\_ the brackets is \_\_\_\_\_ by the term outside.

$3(x + 2) \equiv 3 \times x + \underline{\quad} \times \underline{\quad} \equiv \underline{\quad} + \underline{\quad}$   
 $5(p - \underline{\quad}) \equiv 5 \times p - 5 \times 1 \equiv \underline{\quad} - \underline{\quad}$   
 $2(3m + 5) \equiv \underline{\quad} \times \underline{\quad} + \underline{\quad} \times \underline{\quad} \equiv 6\underline{\quad} + \underline{\quad}$

$\begin{array}{|c|} \hline 3 \\ \hline \end{array}$

Area = 12

Area = 15

$\begin{array}{|c|} \hline 3 \\ \hline \end{array}$

3x

6

4
5

x
2

divide
inside
inverse

multipled
above

common
outside

- 2 Multiply out the brackets in the following expressions:

$3(x + 5) \equiv \underline{\hspace{2cm}}$

$9(2p + 3q) \equiv \underline{\hspace{2cm}}$

$5(y + 2) \equiv \underline{\hspace{2cm}}$

$\frac{1}{3}(3r + 12) \equiv \underline{\hspace{2cm}}$

$4(2y - 1) \equiv \underline{\hspace{2cm}}$

$d(2e - f) \equiv \underline{\hspace{2cm}}$

- 3
- |                  |                   |                  |                       |
|------------------|-------------------|------------------|-----------------------|
| (a) $5(y + 3)$   | (b) $4(a + 2)$    | (c) $8(w + 10)$  | (d) $3(x - 7)$        |
| (e) $9(s - 1)$   | (f) $2(8 - t)$    | (g) $7(4 + h)$   | (h) $10(a + 2b + 3c)$ |
| (i) $4(3y + 2)$  | (j) $5(2p - 1)$   | (k) $3(7a + 2)$  | (l) $9(2x - 5)$       |
| (m) $5(4 + 3t)$  | (n) $7(9 - 2c)$   | (o) $8(3w + 1)$  | (p) $9(1 - 4p)$       |
| (q) $11(2k - 5)$ | (r) $20(6a + 5c)$ | (s) $3(15w - 7)$ | (t) $3(9 - 2a)$       |

- 4 Can you spot any mistakes in the questions below.

Expand  $3(2y - 1)$

$$6y - 1$$

Multiply out  $x(x + 3)$

$$2x + 3x = 5x$$

Expand and simplify  $6(w + 3) - 2(w - 5)$

$$6w + 18 - 2w - 10$$

$$= 4w + 8$$



- 5
- |                  |                  |                  |                   |
|------------------|------------------|------------------|-------------------|
| (a) $a(c + 2)$   | (b) $c(d - 3)$   | (c) $a(b + c)$   | (d) $w(8 - y)$    |
| (e) $c(5 + a)$   | (f) $w(a - 9)$   | (g) $y(s + t)$   | (h) $2a(c - 3)$   |
| (i) $5x(y + 8)$  | (j) $3a(2c + 9)$ | (k) $6g(2c - 1)$ | (l) $9k(2 + d)$   |
| (m) $5(2f + 9w)$ | (n) $3y(5p + 2)$ | (o) $2s(t + 1)$  | (p) $-4a(8x - 3)$ |

- 6
- |                 |                  |                  |                   |
|-----------------|------------------|------------------|-------------------|
| (a) $a(a + 2)$  | (b) $y(y - 5)$   | (c) $w(a + w)$   | (d) $c(9 - c)$    |
| (e) $p(2p + 5)$ | (f) $2w(3w - 1)$ | (g) $9y(2y + 3)$ | (h) $4c(2a + 5c)$ |

- 7 Correct the mistakes in the questions below:

a)  $3(p + 6) \equiv 3p + 6$

b)  $7(2y + 10) \equiv 72y + 70$

c)  $11(3c - 5) \equiv 33c + 55$

d)  $20(4p + 5) \equiv 20(9p) \equiv 180p$

e)  $4(11c - 5) \equiv 44c - 20 \equiv 24c$

- 8 Multiply out the brackets in the following expressions and collect like terms:

$$2(x + 7) + 3(2x + 1) \equiv \underline{\hspace{4cm}}$$
$$\equiv \underline{\hspace{4cm}}$$

$$5(2r + 3) + 2(5 + r) \equiv \underline{\hspace{4cm}}$$
$$\equiv \underline{\hspace{4cm}}$$

$$3(2b + c) + 2(3b + 2c) \equiv \underline{\hspace{4cm}}$$
$$\equiv \underline{\hspace{4cm}}$$



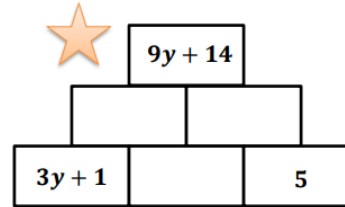
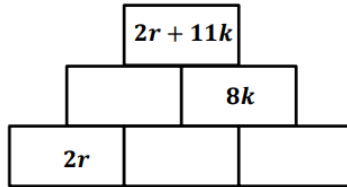
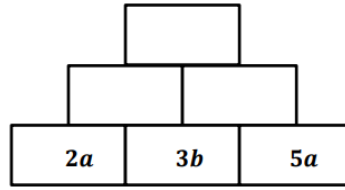
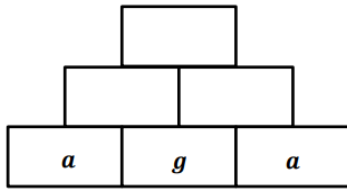
- **L:** I can collect like terms

### Tasks:

35



3. Complete these pyramids. Each brick is the sum of the two bricks below it.



4

Match up equivalent expressions:

$$6p + 2t - 3p$$

$$2 + 2t + 2p + 2 + t$$

$$5 + 4t - 2 + 2t$$

$$3p + 2t + 2 - 2t$$

$$3p + 2$$

$$5t + 1 + t + 2$$

$$3t + p + p + 4$$

$$t + p + t + 2p$$

5 Simplify these expressions by collecting like terms:

a)  $4x + 3x + 2x \equiv$  \_\_\_\_\_

j)  $3x + 7y + 8x + 5y =$  \_\_\_\_\_

b)  $7y - 3y + 5y \equiv$  \_\_\_\_\_

k)  $4m + 3e + 7m + 2e + 4e + m =$  \_\_\_\_\_

c)  $6p + p + p + p \equiv$  \_\_\_\_\_

l)  $8q + 7x - 3q + 2x - 5x =$  \_\_\_\_\_

d)  $3 \times h + 2h + 7 \times h \equiv$  \_\_\_\_\_

m)  $g + 3g + 8 + 4g + 11 =$  \_\_\_\_\_

e)  $11r - r \equiv$  \_\_\_\_\_

n)  $8f - 3f + 4 + f - 3 - 1 =$  \_\_\_\_\_

f)  $c + c \equiv$  \_\_\_\_\_

o)  $10t + 9d + 5 - 8t + 2d - 5 - 2t - 11d =$  \_\_\_\_\_

g)  $k + k + k \equiv$  \_\_\_\_\_

h)  $k \times k \times k \equiv$  \_\_\_\_\_

i)  $2m - 2m \equiv$  \_\_\_\_\_



## Week 6:

- LI: I can multiply out brackets and collect like terms

Demonstration Video: <https://corbettmaths.com/2013/12/28/collecting-like-terms-video-9/>  
<https://corbettmaths.com/2013/12/23/expanding-brackets-video-13/>

Tasks:

### DEMO

### Expanding Single Brackets

### YOUR TURN

Expand & Simplify:

$$2(x + 6) + 4(x + 2)$$



$$2x + 12 + 4x + 8$$



$$6x + 20$$

$$2(x + 4) + 3(x + 5)$$

→

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

→

$$3(4x + 2) - 2(x + 2)$$

→

$$7(x - 5) - 2(3x + 5)$$

→

$$5(4x + 2) - 6(3x - 1)$$

→

$$3x(4x - 5) - 4(x^2 + 2) + 2x$$

→

Expand the brackets and simplify

a)  $3(a + 5) + 2a$

b)  $5(2a + 3) - 3a$

c)  $4(3a + 2) + 6a$

d)  $5(2a - 4) + a + 4$

e)  $2(3a + 5) - 5a - 9$

f)  $5(3a + 5) + 5a - 5$

g)  $3(x + 4) + 5(x + 2)$

h)  $2(x + 5) + 3(x - 2)$

i)  $4(2x + 4) + 3(x - 1)$

j)  $6(2x - 3) + 3(a + 1)$

k)  $2(8a - 2) + 4(a + 1)$

l)  $4(2x - 1) + 3(3x - 2)$

Show that  $2(4a + 1) - 4(a - 3) = 4a + 14$



Name

Simplifying

$11x + 3$	$13x + 7$	$11x + 10$	$9x - 14$	$8x + 7$
$13x - 1$	$9x + 8$	$13x + 12$	$17x - 2$	$13x - 4$
$2x - 9$	$13x + 5$	$14x + 1$	$11x - 8$	$12x + 11$
$13x + 12$	$11x + 8$	$18x + 2$	$18x - 2$	$12x - 1$
$13x + 1$	$13x + 14$	$17x + 8$	$12x + 7$	$17x - 14$

$$4(4x + 2) - 3(x + 1)$$

$$5(x + 2) + 2(4x + 1)$$

$$5(3x + 2) + 2(x - 1)$$

$$3(4x + 2) + 2(3x - 2)$$

$$5(2x + 1) + 2(x + 1)$$

$$5(3x + 1) - 2(2x + 1)$$

$$5(x + 2) + 2(4x + 2)$$

$$5(3x - 2) - 2(2x - 1)$$

$$5(2x + 1) + 2(2x - 2)$$

$$4(2x - 2) + 3(3x - 2)$$

$$5(x + 1) + 2(4x - 2)$$

$$5(2x - 1) + 2(x + 2)$$

$$4(4x + 1) - 3(x - 1)$$

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

$$3(x + 2) + 2(4x + 1)$$

$$5(2x - 1) - 4(2x + 1)$$

$$5(3x - 2) - 2(3x + 2)$$

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

$$4(2x + 1) + 3(3x - 2)$$

$$3(4x - 2) + 2(3x + 2)$$

The target is the expression needed to complete the pattern

TARGET



- 1)  $4(x + 3) + 2(x + 2)$
- 2)  $3(4x - 1) + 2(x + 2)$
- 3)  $2(x + 2) + 3(2x - 1)$
- 4)  $3(2x - 1) + 2(2x + 3)$
- 5)  $4(1 - 2x) + 3(2x - 3)$
- 6)  $2(5x + 1) + 3(x - 4)$
- 7)  $4(x - 5) + 2(4x - 3)$
- 8)  $2(3 - 2x) + 3(2x + 1)$



- 1)  $3(x + 1) - 2(x - 1)$
- 2)  $2(3x + 1) - 2(x + 2)$
- 3)  $4(x + 2) - 3(2x - 1)$
- 4)  $3(2x + 3) - 2(2x + 3)$
- 5)  $3(1 + 2x) - 2(2x - 3)$
- 6)  $2(5x + 3) - 2(x - 4)$
- 7)  $3(x + 5) + 2(x - 3)$
- 8)  $5(3 + 2x) + 4(2x - 1)$



- 1)  $3(x - 3) - 2(x + 2)$
- 2)  $2(4x + 1) - 3(x - 2)$
- 3)  $5(x - 2) + 3(2x - 1)$
- 4)  $4(2x + 1) - 2(2x - 3)$
- 5)  $5(1 - 2x) + 3(2x - 3)$
- 6)  $2(5x - 1) - 3(x + 4)$
- 7)  $3(x - 5) - 2(4x - 3)$
- 8)  $2(3 + 2x) - 3(2x - 1)$



## Week 6:

- LI: I can identify and take out common factors to simplify expressions

Demonstration Video: <https://corbettmaths.com/2013/02/06/factorisation/>

Tasks:

1 **Factorising** is the \_\_\_\_\_ of expanding. To **fully factorise**  $3x + 12$  find the **highest** \_\_\_\_\_ **factor** of  $3x$  and  $12$  and \_\_\_\_\_ both terms by this.

$3x + 12 \equiv \underline{\hspace{1cm}}(x + 4)$

$20h - 5 \equiv \underline{\hspace{1cm}}(4h - 1)$

$4f^2 + 12f \equiv 4f(f + \underline{\hspace{1cm}})$

- 2 Fill in the spaces below to complete the factorisations:

$$4a + 8 \equiv 4(\underline{\hspace{1cm}} + 2)$$

$$50f + 70 \equiv \underline{\hspace{1cm}}(5f + 7)$$

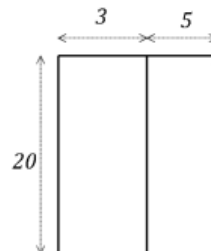
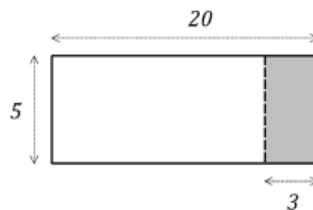
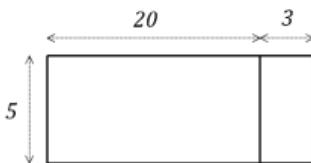
$$3r - 12 \equiv \underline{\hspace{1cm}}(r - 4)$$

$$15d - 6 \equiv \underline{\hspace{1cm}}(5d - \underline{\hspace{1cm}})$$

$$14 + 4g \equiv 2(\underline{\hspace{1cm}} + \underline{\hspace{1cm}}g)$$

$$20a + 15b \equiv \underline{\hspace{1cm}}(\underline{\hspace{1cm}}a + \underline{\hspace{1cm}}b)$$

- 3 Match each area model to the correct calculation:



$$20(3 + 5)$$

$$5(20 - 3)$$

$$5(20 + 3)$$

Question 4: Can you spot any mistakes?

Factorise

$$w^2 - 5w$$

$$w(w + 5)$$

(1)

Question 5: Can you spot any mistakes?

Factorise completely

$$24x^2 + 20x$$

$$4(6x^2 + 5x)$$

(2)

Question 6: Can you spot any mistakes?

Factorise completely

$$20a^2c + 30ac$$

$$5ac(4a^2 + 6)$$

(2)



## 7 Fully factorise

- |                 |                 |                  |                       |
|-----------------|-----------------|------------------|-----------------------|
| (a) $4x + 6$    | (b) $15x + 20$  | (c) $9y - 12$    | (d) $5x + 15$         |
| (e) $6x - 3$    | (f) $4x + 8$    | (g) $5y - 25$    | (h) $8w + 24$         |
| (i) $10y + 15$  | (j) $14w + 21$  | (k) $20y - 30$   | (l) $27x + 18$        |
| (m) $6 - 4x$    | (n) $9 + 12y$   | (o) $45 + 60x$   | (p) $16y - 32$        |
| (q) $22a + 55$  | (r) $100 - 40y$ | (s) $6x + 9y$    | (t) $4w - 2a$         |
| (u) $25y - 35z$ | (v) $8x^2 + 20$ | (w) $30y^3 - 15$ | (x) $42y + 28x - 56c$ |

## 8 Fully factorise

- |                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| (a) $x^2 + 7x$    | (b) $x^2 - 3x$    | (c) $y^2 + y$     | (d) $w^2 + 9w$    |
| (e) $x^2 - 7x$    | (f) $4w^2 + 10w$  | (g) $6x^2 - 8x$   | (h) $9y^2 - 6y$   |
| (i) $10c + c^2$   | (j) $5g - g^2$    | (k) $14x^2 + 35x$ | (l) $40x^2 - 50x$ |
| (m) $12x^2 + 18x$ | (n) $24x^2 - 18x$ | (o) $45y^2 + 60y$ | (p) $7w^2 + 2w$   |

## 9 Fully factorise

- |                     |                   |                    |                    |
|---------------------|-------------------|--------------------|--------------------|
| (a) $x^2 + xy$      | (b) $a^2 - ab$    | (c) $xy + xz$      | (d) $ab + ac - ad$ |
| (e) $32y^3 + 24y^2$ | (f) $12x^4 + 15x$ | (g) $4a^5 - 12a^2$ | (h) $8w^9 + w^7$   |





## Week 7:

- **LI:** I can recognise that different-looking expressions may be identical and prove simple algebraic identities

**Demonstration Videos:** <https://www.youtube.com/watch?v=UBaMbrC02T0>  
<https://youtu.be/0v-G6OwcKmU>

### Tasks:

#### 1 True or false?

$$12 \times 8 = 10 \times 8 + 2 \times 8$$

$$6(7 + 4) = 6 \times 7 + 4$$

$$15(2 + 10) = 15 + 12$$

$$9(14 - 5) = 9 \times 14 - 9 \times 5$$

#### 2 Circle the odd one out in each column of calculations:

$$40 \times 9 + 2 \times 9$$

$$13 \times 15$$

$$20 \times 7 - 1 \times 7$$

$$9(40 + 2)$$

$$10 \times 10 + 3 \times 5$$

$$7(20 - 1)$$

$$49 \times 2$$

$$15(10 + 3)$$

$$(20 - 1) \times 7$$

$$(40 + 2) \times 9$$

$$(10 + 3) \times 15$$

$$21 \times 7$$

#### 3

**Do this without using a calculator**

Calculate  $39 \times 63 + 39 \times 37$

A 3,510

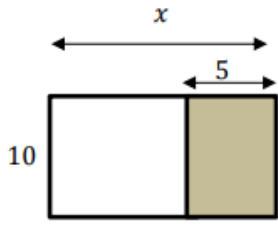
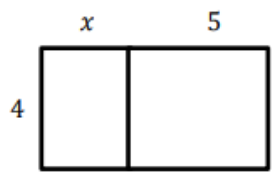
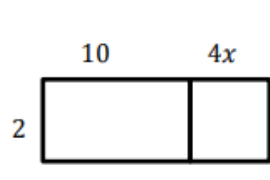
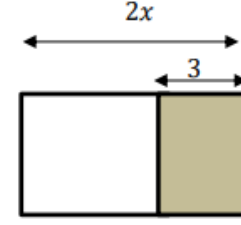
B 3,900

C 4,290

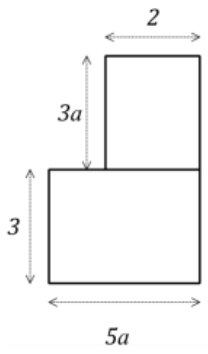
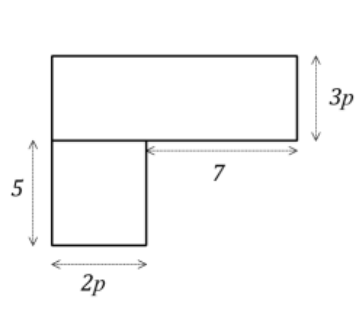
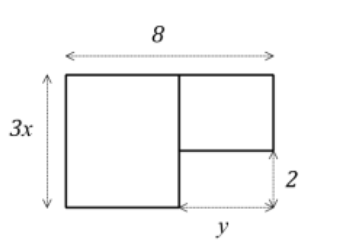
D 97,812



4. Match two correct expressions for the area to each diagram:

<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>4x + 20</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>20 + 8x</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>10x - 15</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>10x - 50</math></div>
			
<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>2(10 + 4x)</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>10(x - 5)</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>4(x + 5)</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>5(2x - 3)</math></div>

5. Circle the **incorrect** expression for each area:

		
<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>21a</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>10p + 21p</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>24x - 2y</math></div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>15a + 6a</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>3p(2p + 7) + 10p</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>8(3x - 2) + 2(8 - y)</math></div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>2(3a + 3) + 3(5a - 2)</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>6p^2 + 31p</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>3x(8 + y)</math></div>
<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>5a(3 + 3a)</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>(2p + 7)(3p + 5) - 35</math></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><math>3x(8 - y) + y(3x - 2)</math></div>

6

Do this without using a calculator

Calculate:  $50 \times 161 - 50 \times 81$

A 648,000

B 4,500

C 4,000

D 3,500



Attainment Band :	Unit 5 – Algebra	
	Knowledge and Understanding	Skills
<b>Yellow Plus</b>	Knows the pattern of a hundred square and can follow a sequence 14*	Solves geometrical problems involving algebra 12 Uses problem solving skills to evaluate algebraic expressions 14
<b>Yellow</b>	Recognises how to evaluate other expressions when given an equation 11 Understands the properties of a rectangle 12*	Expands brackets with more complex terms 7b Factorises expressions fully, including taking out a common unknown 8b Uses a formula to find the pattern of a sequence 13b
<b>Blue</b>	Knows how to find the perimeter of special triangles using geometrical notation 6* Understands the meaning of factors 8*	Uses algebraic expressions to represent the perimeter of a shape 6 Expands brackets to simplify expressions 7a Factorises simple expressions 8a Calculates the input value when given the output, using a formula 9b Evaluates algebraic expressions using substitution 10/b/c Determines what various terms represent in an expression 13a
<b>Green</b>	Explains, using correct mathematical language, why a calculation is incorrect 2 Understands algebraic notation 4*/10* Recognises how an expression can also be described in words 4	Calculates square numbers 2* Uses brackets to change a calculation 3 Simplifies expressions by collecting like terms 5a Substitutes in to a basic algebraic expression 10a Evaluates algebraic expressions using substitution into formulae 9a
<b>White</b>	Understands the correct order of operations 1*	Calculates questions involving multiple operations 1 Recalls times tables and displays good mental arithmetic skills 1*

\* Asterisks mark next to a question number means a question has been broken down into subparts.