KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 7

2025 Mathematics 2026

Unit 2 Tasks – Part 1

DO NOT WRITE INSIDE

KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 7

2025 Mathematics 2026

Unit 2 Tasks – Part 2

DO NOT WRITE INSIDE

Contents

1 Powers and Roots

Fluency Practice

Question 1: Write each of the following as multiplications
e.g. $5^2 = 5 \times 5$

(a) 3^2 (b) 1^2 (c) 6^2 (d) 9^2 (e) 10^2 (f) 4^2 (g) 12^2

Question 2: Write each of the following using the "squared" symbol
e.g. $8 \times 8 = 8^2$

(a) 2×2 (b) 5×5 (c) 11×11 (d) 35×35 (e) 20×20 (f) 13×13 (g) 7×7

Question 3: Work out each of the following

(a) 5^2 (b) 3^2 (c) 8^2 (d) 9^2 (e) 2^2 (f) 10^2 (g) 7^2

(h) 1^2 (i) 4^2 (j) 6^2 (k) 11^2 (l) 20^2 (m) 12^2 (n) 50^2

Question 4: Write down the first 10 square numbers

Question 5: Work out each of the following.
You may not use a calculator

(a) 14^2 (b) 18^2 (c) 21^2 (d) 27^2 (e) 35^2 (f) 19^2 (g) 28^2

(h) 43^2 (i) 56^2 (j) 81^2 (k) 92^2 (l) 99^2 (m) 120^2 (n) 163^2

Question 6: Work out each of the following.
You may use a calculator

(a) 73^2 (b) 59^2 (c) 208^2 (d) 199^2 (e) 6.5^2 (f) 8.2^2 (g) 7.8^2

(h) 0.7^2 (i) 27.6^2 (j) 0.45^2 (k) 19.11^2 (l) 800^2 (m) 1000^2 (n) 1111^2

Purposeful Practice

Apply

Question 1: Write down the square numbers from the list below

91 101 10 2 4 81 200 16 90 121

Question 2: 100 can be written as the sum of two different square numbers.
Which two square numbers?

Question 3: 85 can be written as the sum of two square numbers in two different ways.
Show how this can be done.

Question 4: Tom says "if you square a number the answer is always bigger."
Show Tom is incorrect using two different examples.

Question 5: James is adding up consecutive triangular numbers
(a) Write down the first 10 triangular numbers (you may research this)
(b) Add together the first and second triangular numbers.
(c) Add together the second and third triangular numbers.
(d) Add together the third and fourth triangular numbers.
(e) What do you notice about your answers?
(f) Will this always happen? Can you explain why?

Question 6: Rebecca says "when you add three consecutive square numbers, the answer is always odd."
Is Rebecca right? Explain your answer.

Question 7: Duncan has answered the questions below.
Can you spot any mistakes?

Write down the value of

(a) 3^2

3 x 2 = 6

6 ..... (1)

(b) seven squared

7 x 2 = 14

14 ..... (1)

(c) 8^2

8 x 2 = 16

16 ..... (1)

Problem Solving

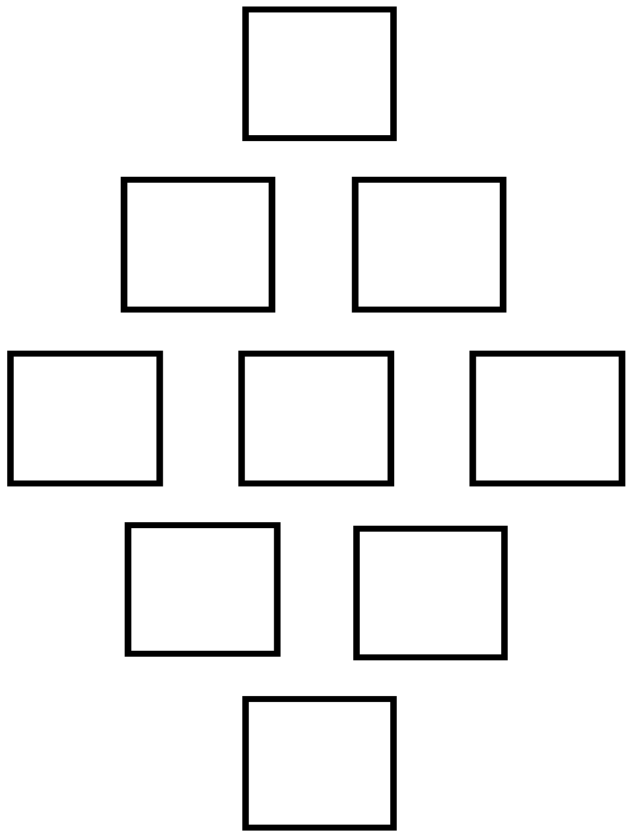
put the digits 1 to 9 in the spaces so that the numbers, reading across, are all squares

can you prove there is only one solution?

1 2 3

4 5 6

7 8 9



Fluency Practice

Question 1: Work out each of the following

(a) $\sqrt{9}$ (b) $\sqrt{25}$ (c) $\sqrt{100}$ (d) $\sqrt{4}$ (e) $\sqrt{36}$ (f) $\sqrt{64}$

(g) $\sqrt{16}$ (h) $\sqrt{81}$ (i) $\sqrt{144}$ (j) $\sqrt{121}$ (k) $\sqrt{1}$ (l) $\sqrt{0}$

Question 2: Below is a list of numbers.

0 1 4 7 8 9 11 15 20 25 29

From the list write down:

(a) The square root of 81
(b) The square root of 225
(c) The square root of 400
(d) The square root of 1

Question 3: Work out each of the following
You may use a calculator

(a) $\sqrt{324}$ (b) $\sqrt{1444}$ (c) $\sqrt{841}$ (d) $\sqrt{4225}$ (e) $\sqrt{21316}$ (f) $\sqrt{652864}$

(g) $\sqrt{29.16}$ (h) $\sqrt{53.29}$ (i) $\sqrt{0.16}$ (j) $\sqrt{216.09}$ (k) $\sqrt{123.21}$ (l) $\sqrt{13.1044}$

Purposeful Practice

Apply

Question 1: Harriet thinks of a number.
She squares it and then adds 11.
Harriet's answer is 36.
What was her original number?

Question 2: A square has an area of 225cm^2.
Work out the perimeter of the square.

Question 3: Place each of the digits in the correct position to make the correct calculation.

Question 4: Can you spot any mistakes?

Write down the value of

(a) $\sqrt{16}$

8
(1)

(b) $\sqrt{100}$

50
(1)

Question 5: x is a positive integer.
Find the value of x.

$$\sqrt{3^2 + 4^2 + 12^2} = \sqrt{3^2 + 4^2} + \sqrt{x^2}$$

Question 6: In 1980 a man's age was the square root of the number of the year of his birth.

(a) When was he born?
(b) Did he have to join the forces in the First World War or the Second World War?

Purposeful Practice

Write down the value of:

(a) 5^2 (b) 2^3

(c) 3^2 (d) 6^3

(e) 1^2 (f) 7^3

(g) 9^2 (h) 3^3

(i) 8^2 (j) 4^3

Write down the value of:

(a) $\sqrt{9}$ (b) $\sqrt[3]{125}$

(c) $\sqrt{49}$ (d) $\sqrt[3]{512}$

(e) $\sqrt{25}$ (f) $\sqrt[3]{8}$

(g) $\sqrt{81}$ (h) $\sqrt[3]{64}$

(i) $\sqrt{121}$ (j) $\sqrt[3]{729}$

(a) When you subtract one square number from another the answer is 35. What are the two square numbers?

(b) Write down a number that you can cube to give an answer between 400 and 600.

(c) Find two square numbers that have exactly one cube number between them.

(d) Work out the square root of 64, then cube it.

(e) The square of a positive number is twice as big as the cube of that number. What is the number?

Complete the pattern:

1

$1 + 3 =$

$1 + 3 + 5 =$

$1 + 3 + 5 + 7 =$

Continue the pattern. What do you notice?

Fluency Practice

Question 1: Write each of the following as multiplications
e.g. $4^3 = 4 \times 4 \times 4$

(a) 5^3 (b) 2^3 (c) 9^3 (d) 10^3 (e) 7^3 (f) 0.2^3 (g) 15^3

Question 2: Write each of the following using the "cubed" symbol
e.g. $8 \times 8 \times 8 = 8^3$

(a) $4 \times 4 \times 4$ (b) $1 \times 1 \times 1$ (c) $6 \times 6 \times 6$ (d) $11 \times 11 \times 11$

(e) $0.5 \times 0.5 \times 0.5$ (f) $27 \times 27 \times 27$ (g) $500 \times 500 \times 500$

Question 3: Work out each of the following
You may not use a calculator

(a) 2^3 (b) 1^3 (c) 5^3 (d) 6^3 (e) 9^3 (f) 10^3 (g) 20^3

(h) 4^3 (i) 8^3 (j) 3^3 (k) 50^3 (l) 15^3 (m) 12^3 (n) 21^3

Question 4: Write down the first 10 cube numbers

Question 5: Work out each of the following.
You may use a calculator

(a) 53^3 (b) 39^3 (c) 108^3 (d) 99^3 (e) 3.5^3 (f) 7.2^3 (g) 6.8^3

(h) 0.7^3 (i) 12.6^3 (j) 0.45^3 (k) 8.11^3 (l) 600^3 (m) 1000^3 (n) 1111^3

Purposeful Practice

Apply

Question 1: James says the sum of the first two cube numbers is a square number.

(a) Is he correct?
(b) What about the first three cube numbers?
(c) What about the first four cube numbers?

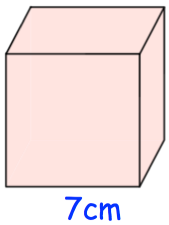
Question 2: Tom says "if you cube a number the answer is always bigger."
Show Tom is incorrect using two different examples.

Question 3: Work out the following

(a) $(-2)^3$ (b) $(-1)^3$ (c) $(-10)^3$ (d) $(-5)^3$

Question 4: Rebecca says "when you add three consecutive cube numbers, the answer is always odd."
Is Rebecca right? Explain your answer.

Question 5: Work out the volume of this cube.



Question 6: Find three numbers that are square numbers **and** cube numbers

Problem Solving

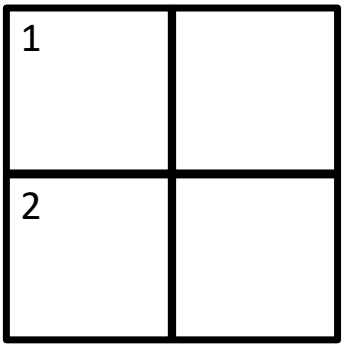
Can you complete this cross-number?

Across

1. A cube
2. A cube

Down

1. One less than a cube



Fluency Practice

Question 1: Work out each of the following

(a) $\sqrt[3]{8}$ (b) $\sqrt[3]{1}$ (c) $\sqrt[3]{0}$ (d) $\sqrt[3]{125}$ (e) $\sqrt[3]{1000}$ (f) $\sqrt[3]{27}$

(g) $\sqrt[3]{512}$ (h) $\sqrt[3]{64}$ (i) $\sqrt[3]{343}$ (j) $\sqrt[3]{729}$ (k) $\sqrt[3]{216}$ (l) $\sqrt[3]{8000}$

Question 2: Below is a list of numbers.

0 1 4 7 8 9 11 15 20 27 30

From the list write down:

(a) The cube root of 64
(b) The cube root of 1
(c) The cube root of 27000
(d) The cube root of 512

Question 3: Work out each of the following
You may use a calculator

(a) $\sqrt[3]{1331}$ (b) $\sqrt[3]{13824}$ (c) $\sqrt[3]{1728}$ (d) $\sqrt[3]{3375}$ (e) $\sqrt[3]{2744}$ (f) $\sqrt[3]{125000}$

(g) $\sqrt[3]{0.125}$ (h) $\sqrt[3]{42.875}$ (i) $\sqrt[3]{0.064}$ (j) $\sqrt[3]{1.728}$ (k) $\sqrt[3]{17.576}$ (l) $\sqrt[3]{1.953125}$

Purposeful Practice

Apply

Question 1: James says the cube root of 64 is 8.
Explain his mistake.

$\sqrt[3]{64}$

Question 2: Megan says the cube root of 27 is 9.
Explain her mistake.

$\sqrt[3]{27}$

Question 3: The cube root of 1 is 1.
Find another number so that when it is cube rooted, it gives the same value.

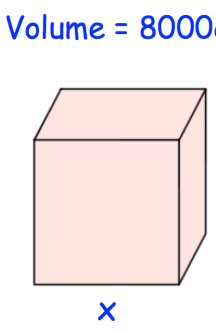
Question 4: Harry has thought of a number.
He works out the cube root of the number.
Harry says his answer is larger than his starting number.
Archie says he must be wrong.

Show that Harry could be correct.

Question 5: Work out the following cube roots

(a) $\sqrt[3]{-8}$ (b) $\sqrt[3]{-1}$ (c) $\sqrt[3]{-27}$ (d) $\sqrt[3]{-1000}$

Question 6: Shown is a cube with a volume of $8000cm^3$
Find x



Purposeful Practice

Write down the value of:

(a) 5^2 (b) 2^3

(c) 3^2 (d) 6^3

(e) 1^2 (f) 7^3

(g) 9^2 (h) 3^3

(i) 8^2 (j) 4^3

Write down the value of:

(a) $\sqrt{9}$ (b) $\sqrt[3]{125}$

(c) $\sqrt{49}$ (d) $\sqrt[3]{512}$

(e) $\sqrt{25}$ (f) $\sqrt[3]{8}$

(g) $\sqrt{81}$ (h) $\sqrt[3]{64}$

(i) $\sqrt{121}$ (j) $\sqrt[3]{729}$

(a) When you subtract one square number from another the answer is 35. What are the two square numbers?

(b) Write down a number that you can cube to give an answer between 400 and 600.

(c) Find two square numbers that have exactly one cube number between them.

(d) Work out the square root of 64, then cube it.

(e) The square of a positive number is twice as big as the cube of that number. What is the number?

Complete the pattern:

1

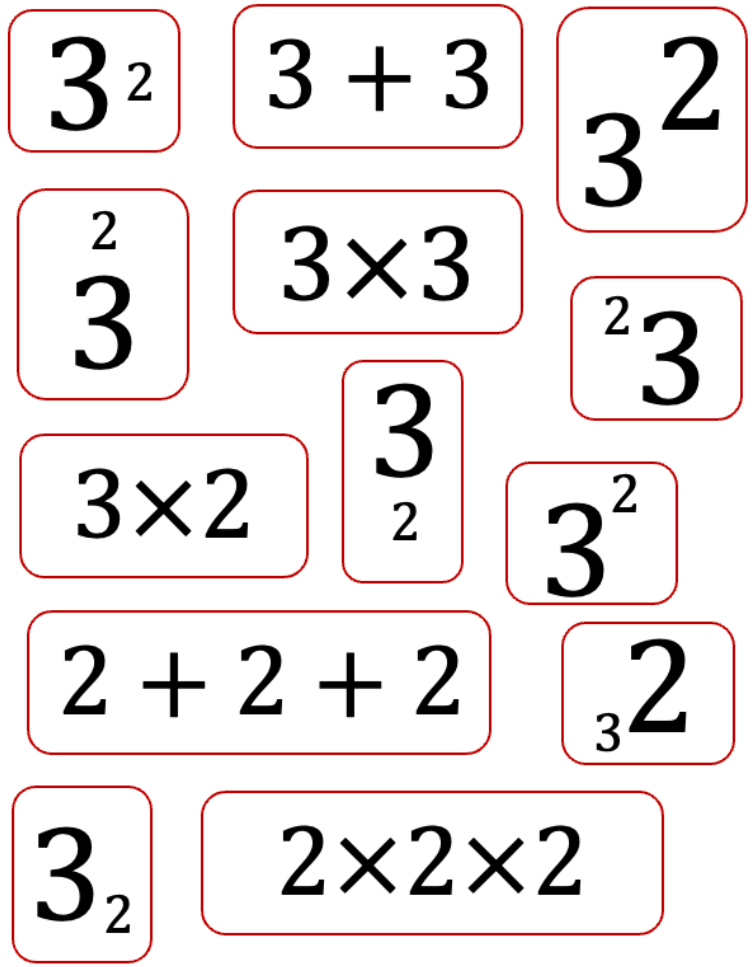
$1 + 3 =$

$1 + 3 + 5 =$

$1 + 3 + 5 + 7 =$

Continue the pattern. What do you notice?

Sort each expression below into the correct box on the left.



Represents three to the power of two

Mathematically valid but doesn't represent three to the power of two

Currently mathematically meaningless

Match each worded expression with its numerical equivalent

2^9 9^2

1^2 2^1

4^9 9^4

4^2 2^4

3^2 2^3

1^3 3^1

One cubed

One squared

Two to the power one

Two cubed

Nine to the power two

Three to the power one

Three squared

Four to the power nine

Four squared

Nine to the power four

Two to the power four

Two to the power nine

Purposeful Practice

For 1-7, write down the expression in digits, for 8-13 write down the expression in words.

1) Seven to the power six
2) Six to the power seven
3) Eighteen squared
4) Fourteen thousand cubed
5) Nineteen million three hundred thousand and five to the power two
6) Zero point seven three to the power nine
7) Sixteen point zero one to the power eight million and six thousand

8) 5^7
9) 6^3
10) 10^2
11) 9^{19}
12) 3^6
13) 7^5

Fluency Practice

Question 1: Write out in full.
e.g. $7^4 = 7 \times 7 \times 7 \times 7$

(a) 9^2 (b) 10^3 (c) 2^5 (d) 3^8 (e) 5^3 (f) 4^6 (g) 1^3

(h) 6^7 (i) 12^3 (j) 50^2 (k) 1^9 (l) 8^4 (m) 9^3 (o) 0.5^3

Question 2: Using a calculator, work out the answers to Question 1.
Use the power button.

Question 3: Write the following in index notation.
e.g. $5 \times 5 \times 5 = 5^3$

(a) $4 \times 4 \times 4$ (b) $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$ (c) $2 \times 2 \times 2 \times 2 \times 2 \times 2$

(d) $8 \times 8 \times 8 \times 8$ (e) $10 \times 10 \times 10 \times 10 \times 10$ (f) $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

(g) $0.9 \times 0.9 \times 0.9$ (h) $5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$ (i) $120 \times 120 \times 120 \times 120$

(j) $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

Question 4: Using a calculator, work out the answers to Question 3.
Use the power button.

Question 5: Without using a calculator, find the values of the following

(a) 10^2 (b) 3^3 (c) 2^6 (d) 5^3 (e) 10^3 (f) 4^3 (g) 1^5

(h) 2^7 (i) 1^8 (j) 10^5 (k) 14^2 (l) 5^4 (m) 10^6 (n) 9^3

Question 6: Find the values of

(a) 2^2 (b) 2^3 (c) 2^4 (d) 2^5 (e) 2^6 (f) 2^7 (g) 2^8

Question 7: Find the values of

(a) 10^2 (b) 10^3 (c) 10^4 (d) 10^5 (e) 10^6 (f) 10^7 (g) 10^8

Purposeful Practice

Apply

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.

$\square^{\square} = 81$ $\square^{\square} = 81$

Question 3: Fill in the boxes with possible integers.

$\square^{\square} = 64$ $\square^{\square} = 64$

$\square^{\square} = 64$

Purposeful Practice

Section A: DO NOT use a calculator to answer these questions

1. Write down:

a) The powers of 2, from 2^1 to 2^{10} _____

b) The powers of 10, from 10^1 to 10^6 _____

2. Fill the blanks:

a) $3\times3\times3\times3=3^{\square}$

b) $5\times5\times5=5^{\square}$

c) $7\times7\times7\times7\times7=7^{\square}$

d) $10\times10=10^{\square}$

e) $w\times w\times w\times w\times w\times w=w^{\square}$

f) $\frac{2}{3}\times\frac{2}{3}\times\frac{2}{3}=\left(\frac{2}{3}\right)^{\square}$

3. Evaluate:

a) $3^4=\square$

b) $4^3=\square$

c) $10^5=\square$

d) $6^3=\square$

4. Fill the blanks:

e) $2^{\square}=128$

f) $5^{\square}=125$

g) $3^{\square}=243$

h) $\square^{2}=49$

Section B: Use a calculator to answer these questions

1. Evaluate:

a) $111^2=\square$ b) $31^3+1=\square$ c) $4^8+20=\square$

2. Which is bigger, 6^7 or 7^6?

3. Evaluate:

a) $2^{12}=\square$ b) $64^2=\square$ c) $8^4=\square$ d) $16^3=\square$

4. Evaluate 3^0, 8^0, 25^0 and a few more numbers to the power of 0. What do you find?

5. Evaluate 2^{-1}, 5^{-1}, 12^{-1} and a few more numbers to the power of -1. What do you find?

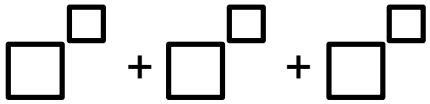
Problem Solving

1. Without a calculator, can you complete these statements?

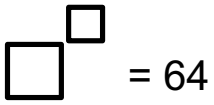
$2^{15} = 32768$	$4^5 = 1024$	$3^{10} = 59049$	$5^6 = 15625$
$2^{14} =$	$4^6 =$	$3^8 =$	$5^8 =$ .....

2. Arrange the digits 1 to 6 to make the sum:

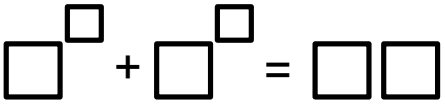
a) as large as possible
b) as small as possible
c) have a total of 122



3. Can you find two integers to fill the blanks?
How many different answers are there?!



4. Arrange the digits 1 to 6
to make the sum true:



5a) Complete the table:

2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9
1	2	4							

b) Work out the following:

Sum	Answer
2^0	
$2^0 + 2^1$	
$2^0 + 2^1 + 2^2$	
$2^0 + 2^1 + 2^2 + 2^3$	
$2^0 + 2^1 + 2^2 + 2^3 + 2^4$	
$2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5$	
$2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6$	
$2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6 + 2^7$	

c) Use your answers to 1 and 2 to calculate $2^0 + 2^1 + ... + 2^{31} + 2^{32}$

Purposeful Practice

Section A: DO NOT use a calculator to answer these questions.
You can use the 'powers recap' sheet though!

1. Evaluate:

a) $\sqrt{64}$

b) $\sqrt{121}$

c) $\sqrt[3]{27}$

d) $\sqrt[4]{16}$

e) $\sqrt[5]{1}$

f) $\sqrt[3]{729}$

g) $\sqrt[4]{1296}$

h) $\sqrt{289}$

i) $\sqrt[4]{2401}$

j) $\sqrt[3]{512}$

2. Complete the table

Power	Root
	$\sqrt{169} = 13$
$10^4 = 10000$	
$5^3 = 125$	
	$\sqrt[5]{32} = 2$
$x^6 = y$	
	$\sqrt[n]{c} = a + b$

3. Fill the blanks:

$\sqrt[\square]{\square} = 2$

How many different answers can you find?

Section B: Use a calculator to answer these questions

1. Evaluate:

a) $\sqrt{15129}$

b) $\sqrt{103041}$

c) $\sqrt[3]{10941048}$

d) $\sqrt[4]{14641}$

e) $\sqrt[5]{6436343}$

f) $\sqrt[4]{104060401}$

2. Solve:

a) $x^5 = 7776$

b) $x^3 = 1367631$

c) $x^{23} = 8388608$

d) $x^4 + 4 = 96059605$

e) $x^3 + 8 = 9393939$

f) $x^5 + 1 = 33554433$

3. John says " the square root of a number is always smaller than the number".
Give an example that shows John is **wrong**.

Use what you know about related calculations to calculate the following square roots.

$\sqrt{2.25} =$

$\sqrt{0.49} =$

$\sqrt{10000} =$

$\sqrt{25\,000\,000} =$

$\sqrt{1.96} =$

$\sqrt{0.0196} =$

$\sqrt{1\,960\,000} =$

$\sqrt{0.0081} =$

$\sqrt{810\,000} =$

$\sqrt{0.01} =$

$\sqrt{0.000036} =$

$\sqrt{1.69} =$

$\sqrt{169\,000\,000} =$

$\sqrt{0.0121} =$

1. Work out the value of... (you only need to find the positive square root where necessary)

a. 5^2 b. 11^3 c. $\sqrt{100}$ d. 3^3 e. 9^2 f. $\sqrt[3]{512}$ g. $\sqrt[3]{343}$ h. 8^2 i. $\sqrt[3]{1331}$ j. 12^2

2. Work out the value of... (you only need to find the positive square root where necessary)

a. $2^2 + 3^2$ b. $\sqrt{36} + 2^3$ c. $12^2 - \sqrt[3]{512}$ d. $5^2 \times 10^2$ e. $\sqrt{81} \div \sqrt[3]{27}$

f. $4^3 - 7^2$ g. $\sqrt{121} \times 2^2$ h. $\sqrt[3]{1728} \div \sqrt[3]{64}$ i. $8^2 - \sqrt[3]{343}$ j. $3^3 + 6^2$

3. Find the value of the missing box...

a. $\square^2 + 4^2 = 52$ b. $\sqrt[3]{\square} - 2^3 = 3$ c. $\sqrt{100} \div \square^2 = 4$ d. $3^3 + \square^3 = 539$

e. $\sqrt{\square} \times \sqrt[3]{125} = 45$ f. $\square^2 + \sqrt{25} = 149$ g. $7^3 - \square^2 = 294$ h. $\sqrt[3]{216} \times \square^3 = 384$

4. Use your knowledge of square, cubes and roots to work out the value of... (you only need to find the positive square root where necessary)

a. 60^2 b. $\sqrt[3]{8000}$ c. $(-7)^2$ d. $\sqrt[3]{1331000}$ e. $\sqrt{0 \cdot 49}$ f. $0{\cdot}5^2$

g. $\sqrt{400}$ h. $\sqrt[3]{-343}$ i. $0{\cdot}8^2$ j. $\sqrt{2500}$ k. $(-5)^3$ l. $\sqrt{640000}$

5. Find the numbers *a, b, c, d* and *e* which are consecutive integers such that

$$a^2 + b^2 + c^2 = d^2 + e^2$$

6. Find a and b so that

$$a^3 - b^3 = 316$$

and

$$a - b = 4$$

Find the Quote – Squares, Cubes and Roots

START	900	4	15	121	8	20	30	3600
O	T	O	B	N	A	I	Y	E
11^2	? X ? = 1600	Square root 36	4^2	$\sqrt[3]{125}$	Cube root 27	9 squared	7 X 7	10^3

27	3	225	400	36	14	64	13	9
E	H	E	R	T	O	L	A	I
√121	√169	50 squared	1^3	End	5^2	3 cubed	√225	30^2

81	2	1000	40	6	5	16	10	7
T	U	S	,	Q	C	I	T	B
√49	8^2	Square root 64	√400	13^2	? X ? = 144	6 squared	$\sqrt[3]{64}$	15^2

169	12	25	1	2500	49	11
U	E	M	N	C	O	A
√81	Square root 900	60^2	√100	√196	√4	20 X 20

powers 2 to the power 3 is not 6 and 1 to the power 3 is not 3 (without a calculator, show steps)

1) 2^3	2) 3^2	3) 5^2	4) 3^3	5) 10^4	6) 2^6
7) 30^2	8) $3^3 - 5^2$	9) $2^7 - 11^2$	10) $8^2 - 2^6$	11) 1^7	12) 20^3
13) $2^{10} - 10^3$	14) $6^2 - 2^5$	15) $2^7 - 5^3$	16) $7^3 - 3^5$	17) $9^3 - 3^6$	18) $14^2 - 13^2$
19) 15^2	20) 1.2^2	21) 11^3	22) 0.5^2	23) $2^3 \times 5^2$	24) $2^8 \div 8^2$

Fluency Practice

$3^3 + 3 =$

$2^3 + 2 =$

$1^3 + 6^3 + 10 =$

$2^3 + 3^3 =$

$5^3 - 2^3 =$

$7^2 - 2^3 =$

$4^3 - 4^2 =$

$8^2 - 4^3 =$

$10^2 + 5^3 =$

$12^2 + 11^2 =$

$3^3 \times 3^2 =$

$7^2 \times 4^3 =$

$10^2 \times 10^2 \times 10^2 = 1$

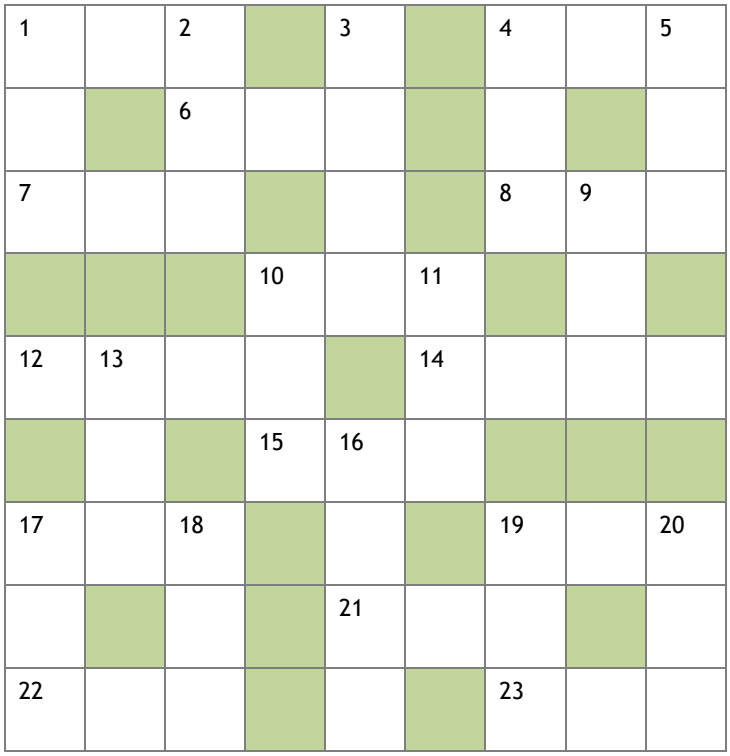
$6^3 \div 3 =$

$12^2 \div 3 =$

$6^3 \div 10^2 =$

$\frac{7^2 \times 3^3}{10^2} =$

Purposeful Practice



Across

1. Smallest 3-digit cube
4. $\sqrt{982081}$
6. 3^6
7. Largest square number below 200
8. First 3 digits of $\sqrt{179\,854\,921}$
10. $\sqrt[3]{5\,929\,741}$
12. $2^{10} + 2^7$
14. $\sqrt{2.25} \times 16^3$
15. Answer to 6 across plus 10^2
17. A palindromic square number
19. A square, and each digit is square
21. $5^4 + 4^4$
22. $(\sqrt{905})^2$
23. 3 squared, cubed

Down

1. A palindromic square number
2. 24^2
3. $2 \times 10^3 - 2^1$
4. Biggest 3-digit square number
5. $(\sqrt{2} \times \sqrt{72})^2$
9. Last three digits of 2^{14}
10. A power of 2
11. Rearrange the digits of 14^2 to form another square number
13. Mean of 1 across and 11 down
16. A 7^{th} power
17. $10 \times 8^2 + 3^2$
18. 5 squared squared
19. $\sqrt[3]{72\,511\,713}$
20. 11 down plus $\sqrt{900}$

Purposeful Practice

In each row, two statements are false and one is true.
Can you find the **true** statement?

	A	B	C
1	$2 \times 2 \times 2 = 6$	$2 \times 2 \times 2 = 8$	$2 \times 2 \times 2 = 10$
2	3^2 means 3×3	3^2 means $3 + 3$	3^2 means $3 - 3$
3	$(-3)^2 = 6$	$(-3)^2 = -9$	$(-3)^2 = 9$
4	$2^3 = 6$	$2^3 = 8$	$2^3 = -8$
5	$(-10)^2 = -20$	$(-10)^2 = 20$	$(-10)^2 = 100$
6	$1^5 = 1$	$1^5 = 5$	$1^5 = -1$
7	$3^3 = 9$	$3^3 = 27$	$3^3 = 6$
8	$6^1 = 36$	$6^1 = \frac{1}{6}$	$6^1 = 6$
9	$(-2)^3 = -8$	$(-2)^3 = 6$	$(-2)^3 = -6$
10	$(-3)^3 = -9$	$(-3)^3 = 9$	$(-3)^3 = -27$
11	$1^{400} = 1{,}400$	$1^{400} = 1$	$1^{400} = 400$
12	$5^2 = 10$	$5^2 = 7$	$5^2 = 25$
13	$(-3)^4 = -12$	$(-3)^4 = -81$	$(-3)^4 = 81$

Are equal to each other	One is twice as big as the other	One is 3 times as big as the other	One is 4 times as big as the other

2^5 *and* 4^3

2^6 *and* 8^2

3^2 *and* 6^2

3^4 *and* 4^3

1^4 *and* 4^1

3^5 *and* 3^4

3^3 *and* 9^2

4^2 *and* 2^3

4^2 *and* 2^4

Using a calculator: odd one out

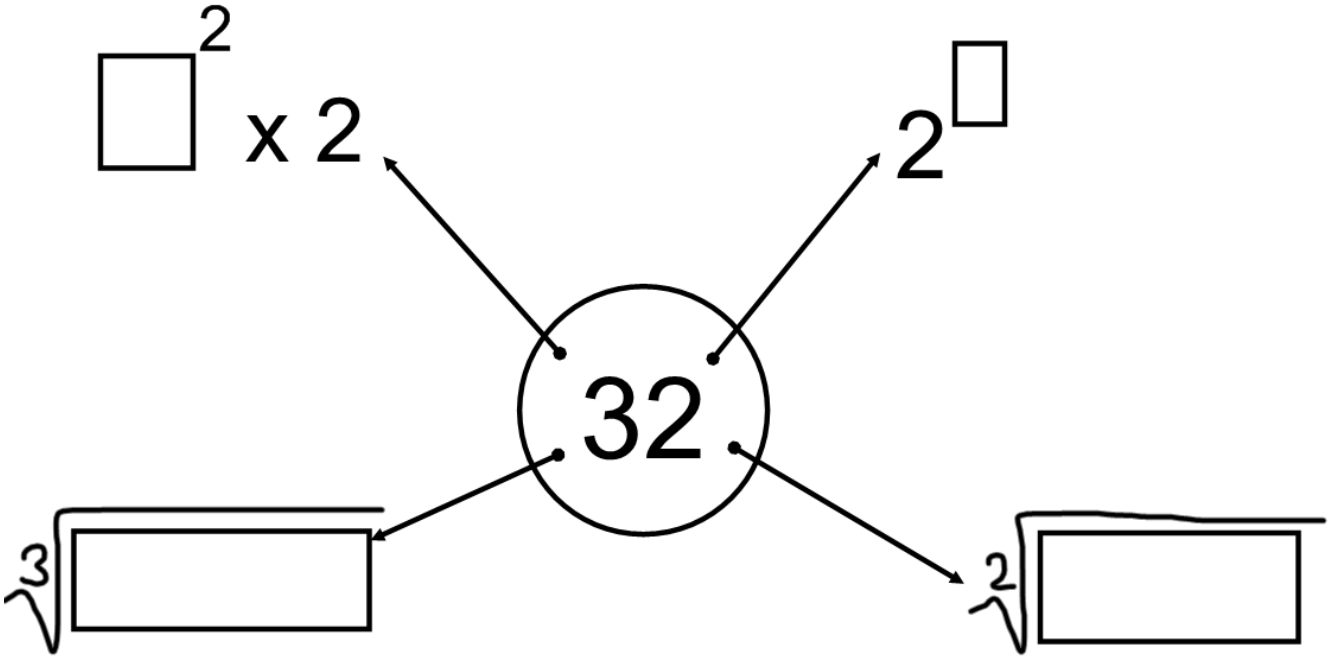
In each row, two of the cells have the same value and the third one is different. Decide which is the odd one out.

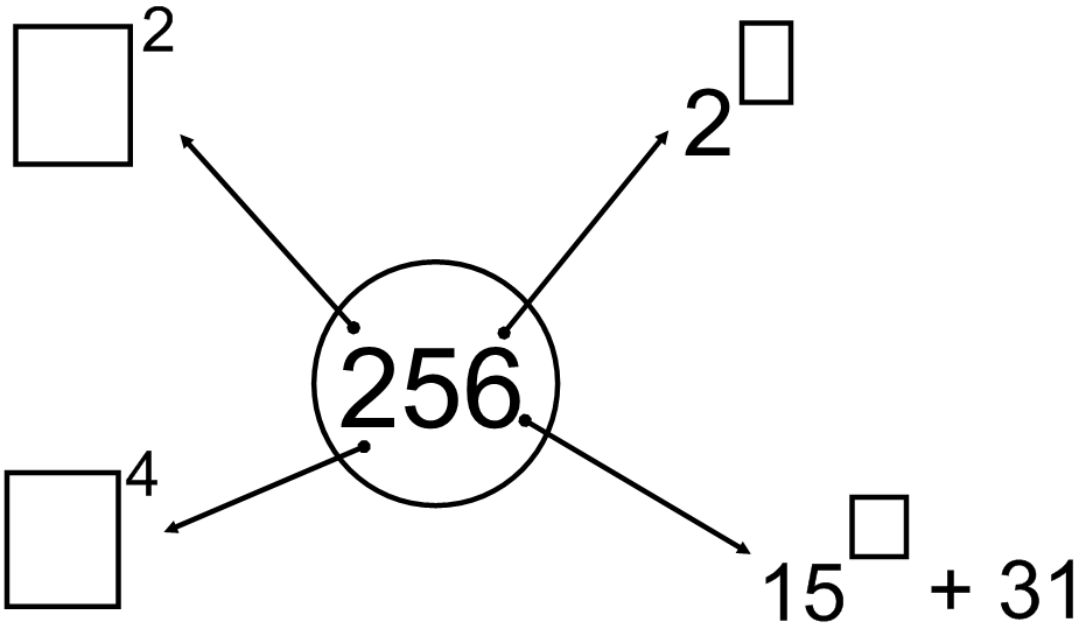
$\frac{\sqrt{11.56}}{4}$	$\sqrt{\frac{11.56}{4}}$	1.7
-3.6^2	$(-3.6)^2$	12.96
$\sqrt{6.76} + 5.49$	8.09	3.5
$\sqrt[3]{15625}$	25	125
$\frac{15.8 + 3.5^2}{7.5 - 3.76}$	-0.02	7.5
$6.2 + 4.9^2$	$(6.2 + 4.9)^2$	30.21

**N.B. In one of these rows, all three cells are equal - there isn't an odd one out! Which row is it?

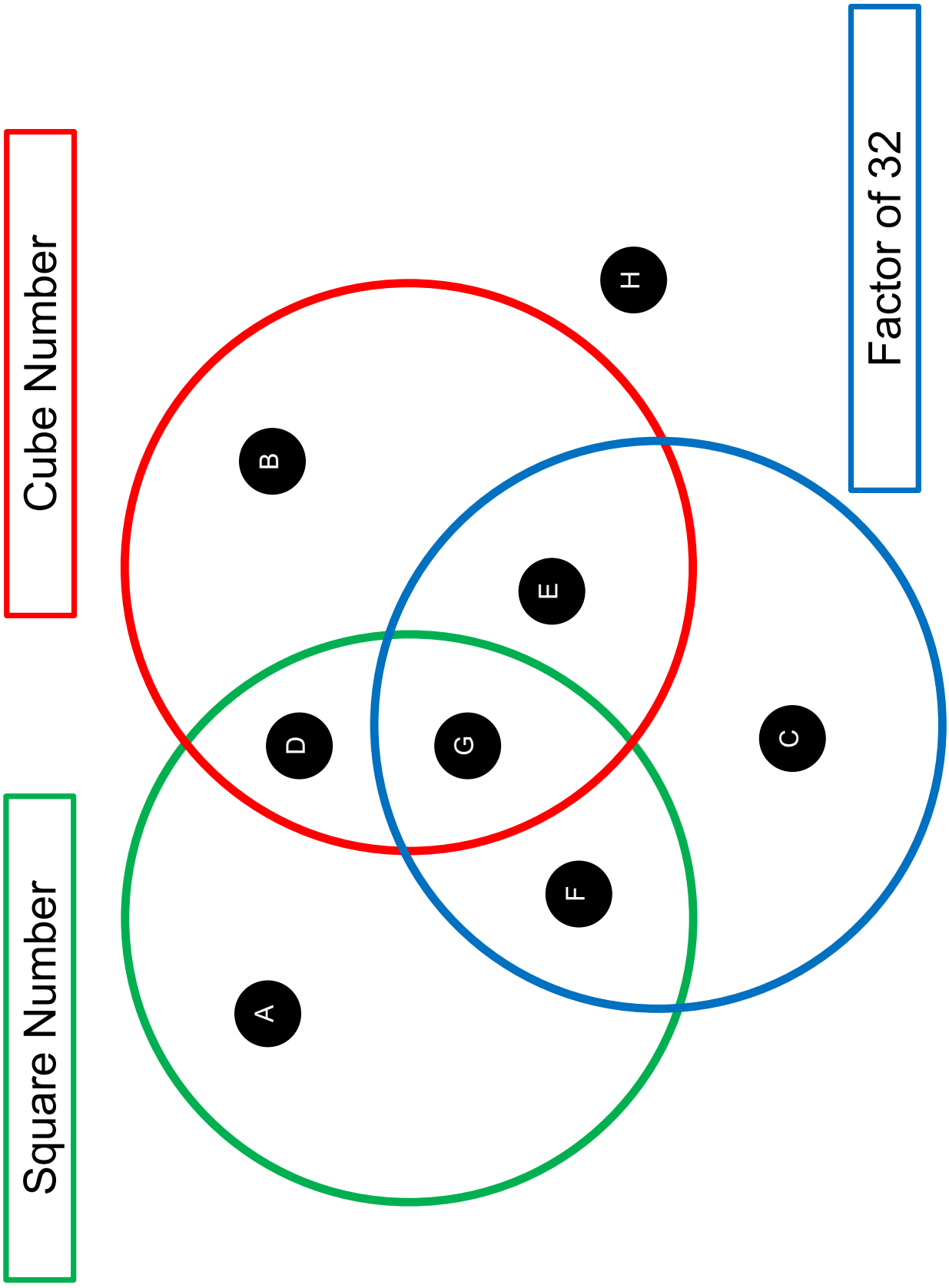
-4.1^2	16.81	-16.81
$\frac{26.25}{3.5^2}$	$\left(\frac{26.25}{3.5}\right)^2$	56.25
$\sqrt[3]{91.125 - 3.7}$	$\sqrt[3]{91.125} - 3.7$	0.8
7.5 x 2.3 + 3.1	7.5(2.3 + 3.1)	40.5
$\frac{3}{1.6} \times \frac{2.2}{0.8}$	$\frac{3 \times 2.2}{1.6 \times 0.8}$	5.15625
$\frac{626.2 - 6}{5 \times 0.8}$	$\frac{626.2 - 6}{5} \times 0.8$	155.05
$\frac{26.5 - 12}{27.6 - 21.8}$	4.265217391	2.5

Fluency Practice





Problem Solving



2 Order of Operations

Purposeful Practice

2. Highlight all the calculations on the right which will have the same value as the one on the left. Do not work any of them out; use what you have learnt about order.

a. $14 + 320 + 65 - 121 - 97$

$14 + 65 + 320 - 121 - 97$

$65 + 320 - 121 + 14 - 97$

$121 + 320 + 65 - 14 - 97$

$14 + 97 + 65 - 121 - 320$

$65 - 121 + 320 - 97 + 14$

b. $14 \times 320 \times 65 \div 121 \div 97$

$14 \times 65 \div 121 \div 97 \times 320$

$14 \div 121 \times 65 \div 97 \times 320$

$65 \times 320 \div 97 \times 14 \div 121$

$97 \times 320 \times 65 \div 121 \div 14$

$97 \times 320 \times 65 \div 121 \times 14$

c. $2.4 - 5.1 + 6.5 + 12.6 - 3.8$

$5.1 - 2.4 + 12.6 + 6.5 - 3.8$

$6.5 + 2.4 + 12.6 - 5.1 - 3.8$

$2.4 - 3.8 + 6.5 + 12.6 + 5.1$

$3.8 - 5.1 + 6.5 + 12.6 - 2.4$

$2.4 - 5.1 + 12.6 - 3.8 + 6.5$

d. $13 \div 11 \times 15 \times 21 \div 4$

$\frac{11 \cdot 15 \cdot 21}{4 \cdot 13}$ $\frac{13 \cdot 15 \cdot 21}{4 \cdot 11}$ $\frac{21 \cdot 15 \cdot 13}{4 \cdot 11}$

$\frac{13 \cdot 15 \cdot 21}{11 \cdot 4}$ $\frac{15 \cdot 21 \cdot 11}{13 \cdot 4}$ $\frac{13 \div 11 \cdot 15}{21 \div 4}$

3. *Dividing by 3 and dividing by 4 is the same as dividing by 12, because 3 × 4 is 12.*
   Is this statement correct? Explain your reasoning.

4. *Subtracting 3 and subtracting 7 is the same as subtracting 4, because 7 – 3 = 4.*
   Is this statement correct? Explain your reasoning.

5. Work out the value of each calculation by ordering and grouping the numbers in a helpful way.

   a. $5 - 8 - 2 + 12$

   b. $4 \times 5 \div 6 \times 3$

   c. $12 + 9 - 6 + 3 - 14$

   d. $2 - 12 + 20 - 8 + 5$

   e. $1 \div 8 \times 16 \div 6 \times 3$

   f. $14 - 11 + 5 - 3 - 2 + 7 - 10$

   g. $\frac{3 \cdot 5 \cdot 8}{10 \cdot 2}$

6. How many ways can you find to answer 5(g)?

Fluency Practice

3. Work out the value of these calculations.

   Don't forget you can rewrite × as ·, and ÷ as $\frac{\square}{\square}$, to make it clearer.

   a. $5 + 4 \times 3$

   b. $7 \times 2 - 10$

   c. $10 - 8 \div 4$

   d. $5 + 2 - 2 \times 3$

   e. $5 - 2 \times 3 + 2$

   f. $10 + 12 \div 4 - 9$

   g. $6 \times 5 - 3 \times 2$

   h. $15 \div 3 - 14 \div 7$

   i. $\frac{40}{5} + \frac{18}{9}$

   j. $4 \cdot 3 + 9 \cdot 5$

   k. $10 \cdot 2 + 11 \cdot 3 - 8 \cdot 5$

   l. $8 \times 7 + 7 \times 2 - 15 \div 5$

   m. $25 \div 5 + 30 \div 3 - 60 \div 6 + 50 \div 5$

   n. $18 \times 3 - 9 \times 2 + 16 \div 4$

   o. $100 \div 5 - 15 \div 3 - 10 \div 2 - 150 \div 15$

   p. $48 \div 8 + 36 \div 6 + 25 \times 4$

   q. $4 \times 10 + 12 \times 5 - 7 \times 9$

   r. $\frac{20}{2} - 5 \cdot 2 + \frac{12}{2} + 21 \cdot 2$

4. Work out the value of these calculations.

   Don't forget you can rewrite × as ·, and ÷ as $\frac{\square}{\square}$, to make it clearer.

   a. $6 \times 4 \div 2 \times 5 + 4 \times 6 \div 12$

   b. $\frac{6 \cdot 5 \cdot 4}{2} + \frac{6 \cdot 4}{12}$

   c. $6 \times 5 \times 4 \div 2 + 6 \times 4 \div 12$

   d. $5 + 5 \div 5 \times 5 + 5 \times 5 \times 5$

   e. $\frac{12 \cdot 3}{9} - 2 \div 2 \times 3$

   f. $\frac{15 \cdot 2}{3 \cdot 2 \cdot 5} + \frac{90}{3 \cdot 3 \cdot 5}$

   g. $11 \times 5 \times 2 - 8 \times 4 \div 2 + 6 \times 5 \times 3$

   h. $12 \times 0.5 \times 4 + \frac{48}{2} - 9 \div 3 \times 8$

5. How many calculations, using a mixture of operations from the multiplication and addition groups, can you make that have a value of 1?

6. Work out the value of the calculations. Find the letter that corresponds to each answer and you should spell out some words.

a. $5 \cdot 2 + 6$

b. $3 \cdot 6 + 4$

c. $4 \cdot 7 - 2$

d. $3 \cdot 6 + 9$

e. $4 + 6 \cdot 5$

f. $3 + 7 \cdot 1$

g. $5 \cdot 6 + 20$

h. $8 \cdot 4 - 1$

i. $\frac{4 \cdot 11}{2}$

j. $9 \cdot 3 - 1$

k. $5 \cdot 10 + 2 \cdot 2$

l. $2 + 7 \cdot 3$

m. $\frac{50}{2} - 3$

n. $8 \cdot 5 + 2 \cdot 3 - 4$

o. $5 \cdot 6 - 10 \div 2 - 2$

p. $2 \cdot 5 \cdot 5$

q. $7 \cdot 4 + 2 \cdot 7$

10	V
16	Y
20	G
21	M
22	O
23	D
24	I
25	S
26	U
27	H
28	J
29	C
30	T

31	F
32	L
33	X
34	A
35	Q
36	Z
37	P
38	B
39	W
42	R
50	E
54	N
60	K

1. Work out the value of these calculations.

   a. $11^2 + 10$

   b. $13 - 3^2$

   c. $6 \cdot 2^3$

   d. $100 \div 5^2$

   e. $2^5 + 6^2$

   f. $10^3 - 5^3$

   g. $10^3 \cdot 5^3$

   h. $3^2 + 4^2$

2. Work out the value of these calculations.

   a. $5 \times 2^3 + 8 \times 3 - 2 \times 9$

   b. $8 \cdot 3 - 2 \cdot 9 + 5 \cdot 2^3$

   c. $12 \div 2^2 + 15 \div 3$

   d. $\frac{15}{3} + \frac{12}{2^2}$

   e. $6 \cdot 10^2 - 4 \cdot 5^3$

   f. $\frac{10^2}{5} + 5^2 - 3 \cdot 5$

   g. $12 + 1^5 + 2^6$

   h. $2^3 \cdot 3^2 \cdot 5$

3.

   a. In questions 2a and 2b above, explain why the answers are the same.

   b. In questions 2c and 2d above, explain why the answers are the same.

Problem Solving

4. Here is a calculation.

$$2 \times 5^2$$

Pupil A says the answer is 50.
Pupil B says the answer is 100.

Which pupil is correct? Why? What mistake has the other one made?

5. Match the calculations on the right with their correct value on the left.
One of the values does not match up with a calculation. Circle it and write a calculation that will match it.

9	$5 \cdot 2^2$
100	$3^4 \div 9$
50	$8^2 + 6^2$
48	$7^2 - 1$
20	

6. Write some calculations of your own, along with the answers, for a friend to work out. See how complex you can make them.

Fluency Practice

1. Work out the value of these calculations.

   a. $12 - 5 - 3$

   b. $12 - (5 - 3)$

   c. $9 + 2 \times 3$

   d. $(9 + 2) \times 3$

   e. $4 \cdot 5 + 1$

   f. $4 \cdot (5 + 1)$

   g. $3 \cdot (6 - 2) + 8$

   h. $5 \cdot (9 + 1) + 6 \cdot (8 + 2)$

   i. $20 \div 10 - 6$

   j. $20 \div (10 - 6)$

   k. $6 + 3 \cdot 5 - 4$

   l. $(6 + 3) \cdot (5 - 4)$

2. Work out the value of these calculations.

   a. $100 \div 10 \div 10$

   b. $100 \div (10 \div 10)$

   c. $120 \div 12 \div 2$

   d. $120 \div (12 \div 2)$

   e. 5×2^3

   f. $(5 \times 2)^3$

   g. $3 \cdot 4^2$

   h. $(3 \cdot 4)^2$

   i. $10 + 3^2$

   j. $(10 + 3)^2$

   k. $6 + 4^2 \cdot 10 - 2$

   l. $(6 + 4)^2 \cdot (10 - 2)$

Problem Solving

3.

State whether each one of the statements below is *true* or *false*. Calculate the correct answer for those that are *false*.

(a) $6 \times 7 - 2 = 40$

(b) $8 \times (6 - 2) + 3 = 56$

(c) $35 - 7 \times 2 = 56$

(d) $3 + 7 \times 3 = 30$

(e) $18 - (4 + 7) = 21$

(f) $43 - 3 + 2 = 42$

(g) $80 \div 2 + 6 = 10$

(h) $64 - 10 + 2 = 52$

4. A pupil writes down:

$$4 \times 7 + 2 \times 3 = 90$$

a. Explain why this answer is incorrect and calculate the correct answer.
b. Use brackets to make the pupil's calculation correct.

5. Two pupils, A and B, are given this problem:

$$30 \div 6 - 3 + 1$$

Pupil A says the answer is 1.
Pupil B says the answer is 11.

a. Neither pupil is correct. What is the correct answer?
b. Use brackets to get Pupil A's answer.
c. Use brackets to get Pupil B's answer.

6.

Put brackets into each of the calculations below to make it correct:

(a) $13 - 4 - 1 = 10$

(b) $30 - 9 + 2 = 19$

(c) $60 \div 6 \div 3 = 30$

7. Work out the value of these calculations.

a. $2 \cdot (3 + 4)$

b. $2(3 + 4)$

c. $5 \cdot (10 - 4)$

d. $5(10 - 4)$

e. $6(50 - 30)$

f. $(50 - 30)6$

g. $3(12 - 3) - 2$

h. $4 + 3(1 + 1)$

i. $15 - 2(7 - 4)$

j. $0.5(10 - 4)$

k. $0.2(1 + 4)$

l. $0.2(0.1 + 0.4)$

m. $0.8(5 + 3) - 2(0.1 + 1)$

n. $(6 - 1.5)(3 - 1)$

8. Work out the value of these calculations, all of which contain hidden brackets.

a. $\frac{2+6}{2}$

b. $\frac{10-5}{5}$

c. $\frac{16}{3+5}$

d. $\frac{20}{10-6}$

e. $\frac{300}{10^2+50}$

f. $\frac{(2+3)^2}{6-1}$

g. $\left(\frac{9+1}{2}\right)^2$

h. $\left(\frac{20-4}{10-2}\right)^3$

i. $\sqrt{11+5}$

j. $\sqrt[3]{2 \cdot 25 + 60 + 5 \cdot 3}$

k. $\sqrt{3^2+4^2}$

l. 10^{2+3}

m. $2^{10\div 2}$

n. $\left(\frac{\sqrt{13^2-5^2}}{8\div 2}\right)^{5-2}$

9. Here is a calculation.

$$5 \times 3^2$$

Pupil A says the answer is 225.
Pupil B says the answer is 45.

a. Which pupil is correct? Why?
b. Use brackets to create a calculation that would make the other pupil's answer correct.

Fluency Practice

$\sqrt{16} + 9$

$\sqrt{16 + 9}$

$\sqrt{9} + 16$

$\sqrt{36} + \sqrt{64}$

$\sqrt{36 + 64}$

$(\sqrt{100} + \sqrt{25})^2$

$(\sqrt[3]{100 + 25})^2$

$\sqrt{\sqrt{16}}$

$\sqrt{60 + \sqrt{16}}$

$\sqrt{\sqrt{81} - \sqrt{16}}$

$\sqrt{\sqrt{64} - \sqrt[3]{64}}$

$\sqrt{64} - \sqrt{\sqrt[3]{64}}$

$\sqrt{\sqrt[3]{125} + \sqrt{16}}$

$$\frac{\sqrt[3]{125} + \sqrt{\frac{\sqrt{81} - \sqrt[3]{64}}{(\sqrt[3]{1})^2}}}{2}$$

$$\sqrt[3]{125} + \sqrt{\frac{\sqrt{81} - \sqrt[3]{64}}{(\sqrt[3]{1})^2}} \div 2$$

$$\sqrt[3]{125} \div \sqrt{\frac{\sqrt{81} - \sqrt[3]{64}}{(\sqrt[3]{1})^2}} + 2$$

$\frac{12}{2}+4\times\sqrt{9}=$	$\frac{12\times\sqrt{4}}{2}+9=$
$\frac{12+4}{2}\times\sqrt{9}=$	$12\times\sqrt{\frac{\sqrt{4}}{2}}-9=$
$12+\frac{\sqrt{4\times9}}{2}=$	$\sqrt{12\times\sqrt{4}+1}-\sqrt{9}=$
$\frac{\sqrt{12+4}\times9}{2}=$	$\sqrt{12-\sqrt{9}}\times\frac{\sqrt{4}+12}{\sqrt{4+12}-\sqrt{9}}=$
$12-\frac{\sqrt{4}}{2}\times9=$	

2.

Put brackets into each of the statements below to make it correct:

(a) $3 \times 6 + 1 = 21$

(b) $5 + 6 \times 2 = 22$

(c) $45 \div 6 + 3 = 5$

(d) $49 - 3 + 2 = 44$

(e) $7 \times 3 + 2 = 35$

(f) $13 - 4 \times 2 = 18$

3.

Write out each of the calculations below, filling in the missing numbers:

(a) $3 \times \ ? \ + 2 = 17$

(b) $? \times 5 - 8 = 22$

(c) $(4 + \ ? \ ) \times 2 = 20$

(d) $6 - \ ? \times 2 = 0$

(e) $(7 - \ ? \ ) \times 4 = 20$

(f) $? \div 3 + 4 = 8$

4.

State whether each one of the statements below is *true* or *false*:

(a) $(3 \times 6) \times 2 = 3 \times (6 \times 2)$

(b) $(4 + 2) + 7 = 4 + (2 + 7)$

(c) $(8 - 2) - 1 = 8 - (2 - 1)$

(d) $(8 \div 2) \div 2 = 8 \div (2 \div 2)$

Fluency Practice

5. Work out the value of these calculations.

$$\frac{3 \times 3 + 3^3}{3} \qquad 3^3 - \frac{3+3}{3} \qquad 3 + \left(\frac{3}{3} + 3\right)^3$$

$$\frac{3 \times 3}{3} + 3^3 \qquad \frac{3}{3} - 3 + 3^3 \qquad 3 + \frac{(3+3)^3}{3}$$

$$\frac{3+3}{3} + 3^3 \qquad \frac{3-3}{3} + 3^3 \qquad 3 + \left(\frac{3+3}{3}\right)^3$$

$$\frac{3 + 3 \times 3^3}{3} \qquad \frac{3^3 - 3}{3} + 3 \qquad 3 + \left(\frac{3-3}{3}\right)^3$$

$$\frac{3^3 + 3}{3} + 3 \qquad \frac{3^3 - 3 + 3}{3} \qquad 3 + \left(\frac{3}{3}\right)^{3+3}$$

Fluency Practice

6. Work out the value of these calculations.

$\sqrt{16}+9$

$\sqrt{16+9}$

$\sqrt{9}+16$

$\sqrt{36}+\sqrt{64}$

$\sqrt{36+64}$

$(\sqrt{100}+\sqrt{25})^2$

$(\sqrt[3]{100+25})^2$

$\sqrt{\sqrt{16}}$

$\sqrt{60+\sqrt{16}}$

$\sqrt{\sqrt{81}-\sqrt{16}}$

$\sqrt{\sqrt{64}-\sqrt[3]{64}}$

$\sqrt{64}-\sqrt{\sqrt[3]{64}}$

$\sqrt{\sqrt[3]{125}+\sqrt{16}}$

$\dfrac{\sqrt[3]{125}+\sqrt{\dfrac{\sqrt{81}-\sqrt{64}}{(\sqrt[3]{1})^2}}}{2}$

$\sqrt[3]{125}+\sqrt{\dfrac{\sqrt{81}-\sqrt{64}}{(\sqrt[3]{1})^2}}\div 2$

$\sqrt[3]{125}\div\sqrt{\dfrac{\sqrt{81}-\sqrt{64}}{(\sqrt[3]{1})^2}}+2$

Fluency Practice

2. Work out the value of each calculation.

a. $\frac{-5+\sqrt{5^2-4\cdot1\cdot6}}{2}$

b. $\frac{-5-\sqrt{5^2-4\cdot1\cdot6}}{2}$

c. $\frac{-7+\sqrt{7^2-4\cdot1\cdot12}}{2}$

d. $\frac{-7-\sqrt{7-4\cdot1\cdot12}}{2}$

3. Calculate the value of

(a) $8.2 \div 0.2 - 0.1$

(b) $3.6 \times 0.2 - 0.1$

(c) $8.2 \times (6 - 5.4)$

(d) $2.2 - 0.7 \times 0.2$

4. Copy out each calculation and fill in the missing numbers.

(a) $0.8 + ? \times 0.6 = 3.2$

(b) $? \times 0.5 + 6 \times 0.4 = 3.9$

(c) $0.9 + 4.8 \div ? = 6.9$

(d) $2.7 \div ? - 1.4 = 1.6$

Problem Solving

Insert + – × ÷ and ( ) signs in between the numbers to make the sums correct.

e.g., 6 6 3 = 8 insert + and ÷

$6 + 6 \div 3$

$= 6 + 2$

$= 8$

You are also allowed to put digits next to each other to make numbers (concatenation) (e.g., 1 2 can become 12), but you can't alter the *order* of the digits.

e.g., 1 2 5 2 = 36 insert × and –

$12 \times (5 - 2) = 36$

Try these.

1 4 1 = 3
4 2 7 = 6
5 6 2 = 9
8 2 8 = 12
6 4 9 = 15
8 4 6 = 18
5 1 6 = 21
9 6 4 = 24
7 4 9 = 27
2 4 7 = 30

5 3 6 7 = 1
8 7 5 5 = 4
6 4 2 2 = 9
3 9 1 7 = 16
9 3 9 4 = 25
2 7 4 3 = 36
4 9 4 2 = 49
6 4 5 8 = 64
1 8 5 2 = 81
6 8 5 2 = 100

1 5 5 4 = 101
2 3 5 6 = 102
6 9 2 5 = 103
2 6 7 8 = 104
8 1 2 9 = 105
9 5 6 7 = 106
9 6 8 7 = 107
6 7 4 7 = 108
8 5 6 9 = 109
5 5 7 3 = 110

8 4 9 7 = 0
6 8 4 6 = 11
5 7 9 3 = 22
1 4 9 3 = 33
3 5 2 8 = 44
1 6 2 8 = 55
2 7 4 3 = 66
3 7 4 7 = 77
4 1 4 8 = 88
8 1 3 5 = 99

Fluency Practice

Work out:

(a) $5 + 4 \times 3$

(b) $4 \times 3 + 5$

(c) $6 + 10 \div 2$

(d) $17 + 20 \div 4$

(e) $30 - 10 \times 2$

(f) $30 - 20 \div 4$

Work out:

(a) $4 + 3^2$

(b) $5^2 - 3$

(c) $6^2 + 3 \times 4$

(d) $4^3 - 30 \div 6$

(e) 2×5^2

(f) $10 - 2^3$

Work out:

(a) $(5 + 2) \times 4$

(b) $100 \div (3 + 7)$

(c) $(12 + 4) \times 3 - 10$

(d) $35 \div (7 - 2) + 10$

(e) $(42 \div 7) - 2^2 + 8$

(f) $(6 \times 3) - (16 \div 4)$

Work out:

(a) $10 + 5 \times 4 - 5^2$

(b) $72 \div 9 - 4 + (9 - 6)^2$

(c) $16 - \sqrt{9} + 5 \times 7$

(d) $10^2 - \sqrt{81} + 3 \times 4$

Add brackets so each calculation is true:

(a) $20 - 5 \times 3 = 45$

(b) $5 + 4 - 2 \times 6 = 17$

(c) $12 + 36 \div 6 - 2 = 21$

Problem Solving

Insert one pair of brackets, if required, into each of these calculations to make the answer correct.

(a) $2 + 3 \times 4 = 14$

(b) $5 + 2 \times 7 = 49$

(c) $6 \times 3 - 1 = 12$

(d) $9 - 2 \times 4 = 1$

(e) $6 + 3 - 2 + 1 = 6$

(f) $21 \div 3 + 4 = 11$

Insert one or more pairs of brackets, if required, into each of these calculations to make the answer correct.

(a) $30 - 12 \times 2 + 15 = 51$

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

(c) $5 + 2^2 - 9 \times 1 = 40$

(d) $30 \div 6 + 4 \times 3 = 17$

(e) $4 \times 2 - 3 + 5 \times 6 = -40$

Insert one or more pairs of brackets, if required, into each of these calculations to make the answer correct.

(a) $3 + 5 \times 2^2 = 103$

(b) $11 - 3^2 \div 4 + 4 = 8$

(c) $2 \times -6^2 - 2 + 5 = 65$

(d) $-4 + 8 \times 3^2 - 5 + 1 = 17$

(e) $10 \div 2 - 3^3 \times 4 - 1 = 24$

By inserting up to two pairs of brackets into the calculation shown, make as many different answers as possible.

$$20 - 3 + 5^2 - 4 \div 2$$

Fluency Practice

Question 1: Work out

(a) $7 + 2 \times 3$ (b) $9 + 4 \times 2$ (c) $10 + 2 \times 2$ (d) $18 + 4 \div 2$

(e) $20 - 5 \times 2$ (f) $8 - 2 \times 3$ (g) $21 - 9 \div 3$ (h) $100 - 40 \times 2$

(i) $16 \div 1 - 3$ (j) $5 + 5 \times 5$ (k) $13 - 7 \div 1$ (l) $7 \times 6 - 4$

(m) $9 + 3 - 2$ (n) $20 - 5 + 6$ (o) $21 - 17 + 4$ (p) $30 \times 4 \div 2$

(q) $(7 + 7) \div 2$ (r) $35 - (9 + 3)$ (s) $40 \times (2 + 3)$ (t) $60 \div (1 + 5)$

(u) $15 \div (3 + 2)$ (v) $9 \times (7 + 4)$ (w) $90 \div (52 - 7)$ (x) $(8 + 9) \times 3$

(y) $10 + 5 + 3 \times 3$ (z) $100 - 6 + 2 \times 3$

Question 2: Work out

(a) $5 - 2^2$ (b) $7 + 3^2$ (c) $9^2 + 1$ (d) $6^2 - 5^2$

(e) $(7 - 2)^2$ (f) $(4 + 3)^2$ (g) $(1 + 2)^3$ (h) $(2 + 8)^3$

(i) $10 - \sqrt{16}$ (j) $\sqrt{(2 + 14)}$ (k) $\sqrt{4} + 3^2$ (l) $2 \times 5 - \sqrt{4}$

Question 3: Work out

(a) $5 \times 3 + 2 \times 6$ (b) $9 \div 3 + 15 \times 2$ (c) $10 \div 2 - 2 \times 1$ (d) $5 \times (2 + 1) + 4$

(e) $8 + (5 - 1) \times 3$ (f) $50 - (1 + 4) \times 4$ (g) $19 \times 2 + 5^2$ (h) $8^2 + 2 \times 3^2$

(i) $7 \times (8 \div 4)^2$ (j) $11 + 11 - 6^2 \div 2$

Question 4: Copy out the following and insert brackets in each to make the correct answer.

(a) $10 \times 2 + 6 = 80$ (b) $5 + 5 \div 5 = 2$ (c) $18 - 6 \div 2 = 6$

(d) $5 + 2 \times 3 + 1 = 13$ (e) $2 \times 7 + 1 \times 3 = 48$ (f) $9 + 3^2 \times 10 \div 2 = 90$

Problem Solving

Apply

Question 1: Matthew says 9 + 3 x 2 = 15. Is he correct?

Question 2: Samuel says 6 + 4 x 9 = 90. Is he correct?

Question 3: Using the numbers 2, 3 and 4 and the operations +, −, and x make as many different possible answers.

Question 4: Matilda thinks of a number, n.
She adds 2 and then multiplies by 3.

Which expression below is correct?

A	B	C
$n + 2 \times 3$	$3n + 2$	$(n + 2) \times 3$

Question 5: Can you spot any mistakes?

Work out $9 + 4 \times 3 + 2$

$= 13 \times 3 + 2$

$= 39 + 2$

$= 41$

Extension Task

Using four number 2's try to make as many different answers as you can.
You may use +, −, x, ÷ and brackets.

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

order of operating

what are:

(1) $7 - 3 \times 2 =$

(2) $4 + 6 \div 2 =$

(3) $(7 + 8) \div 5 =$

(4) $(2 \times 3^2 - 2^2) \div 7 =$

(5) $3 \times 5 - 6 \div 3 \times 5 =$

(6) $2 \times 5^2 - 2^3 \times 5 =$

(7) $5 \times 3 - 2^2 \times 3 \div 4 - 3 =$

(8) $2(5^2 - 4^2) \div 3 + 2 =$

(9) $1 + 2(3 \times 4 - 5) - 3^2 =$

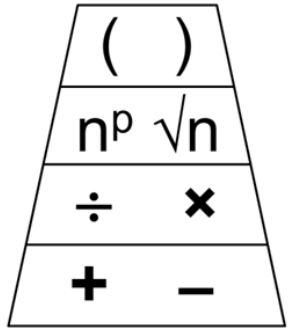
(10) $2(2 \times 3^2 - 4) - 3 \times 2^3 =$

use the digits:
1 , 1 , 2 , 4 and 6
once only and in
any order
involving brackets
and + , – , × and ÷
(as many times as
you like) to make

39

try to find three

solutions



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

$4(4^2 - 1 - 3^2) \div 3 + 1$

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

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

$(4 + 1)(2 + 1)^2 - 3(2^3 - 2) \div 2$

some more?

bracketed

some of these need brackets to make them correct
copy them out and place brackets if and where they are needed

(1) $2 \times 3 + 7 = 20$

(2) $2 + 5 \times 6 = 32$

(3) $13 - 2 \times 5 = 55$

(4) $20 - 6 \div 2 = 7$

(5) $7 - 4 - 1 = 4$

(6) $10 - 4 + 2 = 4$

(7) $20 \div 4 \times 5 = 1$

(8) $15 \div 3 + 2 = 7$

(9) $9 - 2 \times 4 = 1$

(10) $7 \times 6 \div 2 = 21$

(11) $18 - 8 - 3 = 13$

(12) $20 \div 10 \div 2 = 1$

(13) $16 \div 8 \div 2 = 4$

(14) $20 - 5 - 2 - 1 = 18$

(15) $36 \div 2 \times 3 + 4 = 10$

(16) $3 + 2 \times 5 - 3 = 7$

(17) $4 \times 5 + 2 \times 3 = 44$

(18) $8 \div 4 + 4 \times 2 = 2$

(19) $15 - 4 - 2 - 1 = 12$

(20) $4 \times 5 + 10 \div 2 = 15$

where do you put brackets with

$$20 \div 5 + 5 \times 2 =$$

to get these answers:

(a) 14
(b) 4
(c) 1
(d) 18

(a)	(b)	(c)	(d)
Calculate $13 + 5 \times 2$	Calculate $30 - 15 \div 5$	Calculate $2 + 7 - 4 \times 3$	Calculate $24 - 4 \times 2 + 9$
(e)	**(f)**	**(g)**	**(h)**
Calculate $6 + 4^2 - 5$	Calculate $(4 + 3)^2 - 5 \times 2$	Calculate $100 - 2 \times 3^3$	Calculate $2 \times 6^2 - 3 \times \sqrt{25}$
(i)	**(j)**	**(k)**	**(l)**
Calculate $-3 + 10 + 7 \times -4$	Calculate $\sqrt{40 - 4 \times (-1)^2}$	Calculate $\frac{0.5 \times 4^2}{7 - 3}$	Calculate $\frac{7.5 - 2 \times 1.5^2}{\sqrt{8 - 2^2}}$
(m)	**(n)**	**(o)**	**(p)**
Add brackets to make the calculation correct. $5 + 6 - 2^2 \times 3 = 53$	Add brackets to make the calculation correct. $\frac{8 \times 0.5^2 - (-8)}{-5 + 2 \times -1} = 8$	Insert the numbers 1, 4, 5 and 8 once each to make the biggest number possible. $(\square + \square) \times \square^{\square} - \square$	Insert the numbers 2, 3, 5 and 10 once each to make the smallest number possible. $\square - \square \times \square^{\square} + \square$

A1 Which is correct? $3 + 4 \times 2 = 14$ or $3 + 4 \times 2 = 11$	**A2** Which is correct? $18 - 6 \div 3 = 4$ or $18 - 6 \div 3 = 16$	**A3** Which is correct? $10 - 5 \times 2 + 4 = 4$ or $10 - 5 \times 2 + 4 = 14$	**A4** Which is correct? $12 + 6 - 4 \div 2 = 16$ or $12 + 6 - 4 \div 2 = 7$
B1 Work out $5 \times 3 + 4 \times 2$	**B2** Work out $5 \times (3 + 4) \times 2$	**B3** Which is bigger… $6 \times (5 + 4)$ or $6 \times 5 + 4$	**B4** Which is bigger… $3 \times (6 + 2)$ $(3 + 2) \times 4$ or $(8 + 4) \times (8 - 4)$
C1 Add brackets '(' and ')' to $2 + 3 \times 6 = 30$ so that the calculation is correct	**C2** Add brackets '(' and ')' to $2 \times 7 - 3 = 8$ so that the calculation is correct	**C3** Add brackets '(' and ')' to $2 + 5 \times 6 - 4 = 12$ and $2 + 5 \times 6 - 4 = 38$ so that the calculations are correct	**C4** Add brackets '(' and ')' to $3 + 4 \times 6 - 2 = 40$ $3 + 4 \times 6 - 2 = 28$ $3 + 4 \times 6 - 2 = 19$
D1 Add '+' '–' '×' and/or '÷' to 2 6 4 = 26 so that the calculation is correct	**D2** Add '+' '–' '×' and/or '÷' to 3 7 5 = 16 so that the calculation is correct	**D3** Add '+' '–' '×' and/or '÷' to 3 6 2 = 6 and 3 6 2 = 20 so that the calculations are correct	**D4** Add '+' '–' '×' and/or '÷' to 16 8 4 2 = 16 16 8 4 2 = 10 16 8 4 2 = 46
E1 Add brackets '(' and ')' to $12 + 8 \div 4 - 2$ so that the answer is as big as possible.	**E2** Find the missing integer $(3 + \square) \times 2 + 5 = 19$	**E3** Find the missing integers $2 + \square \times (5 - 3) = 16$ $(\square - 3) \times (3 + 4) = 35$ $4 \times (8 - \square) \times 3 = 60$	**E4** Use any of the numbers 2, 3, 7 and 8 and brackets ( ) and the signs +, –, ×, ÷ to make each of the integers from 30 to 40

Problem Solving

1 **Example 1**

Sylvia bought 4 bananas for 50 pence each and 2 apples for 80 pence each.

How much did she spend? Show working.

$4 \times 50 + 2 \times 80$

$= 200 + 160$

$= 360$ She spent 360p or £3.60

Example 2

The price of rice is £2 per bag. Gary buys 6 bags. He pays using a £20 note.

How much change will he get?

$20 - 6 \times 2$

$= 20 - 12$

$= 8$ He will get £8 change.

Example 3

Every day on the way to work Robert buys a coffee costing £2.50 and a donut costing £1.50.

He works 5 days per week. If he does this every day for 4 weeks, how much will he spend?

$4 \times 5(2.50 + 1.50)$

$= 4 \times 5 \times 4$

$= 4 \times 20$

$= 80$ He will spend £80.

Calculate each of the following, showing full working.

(a) Hamza bought 4 new shirts for £15 each and 2 pairs of trousers for £25 each. How much did he spend?

(b) Mark gets paid £100 per day. He works 5 days per week. On two of the days he buys lunch, costing £4 each time. How much does he have left over after paying for his lunches?

(c) The price of a shirt is £80. The store manager gives a discount of £35. A man and his brother bought 4 shirts and then share the cost. How much do they each pay?

(d) I measured the floor area of two rooms in my house. Both of the rooms are square shaped. One of them is 5 metres wide and the other is 4 metres wide. What is the total floor area?

(e) On a school trip, some pupils visited the gift shop. One bought a mug costing £8. Five bought a pencil costing £1 and five bought a box of fudge costing £3. How much was spent in total?

(f) Louise pays £20 for materials to make earrings. She makes 10 earrings and sells 7 for £5 and 3 for £2. How much profit does she make?

2 Create story problems which could match up with each of the following calculations.

(a) $3 \times 2 + 4 \times 5$ (b) $12 - 5 \times 2$ (c) $3 \times 2(4 + 7)$ (d) $5^2 - 4^2$

Problem Solving

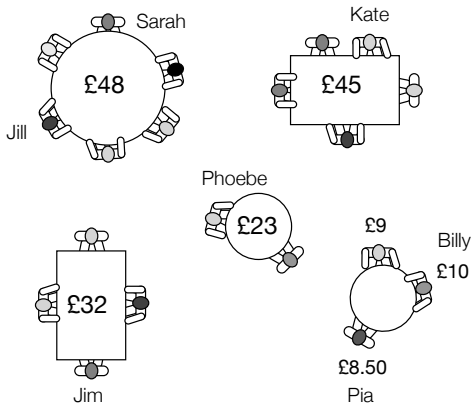
1 The diagram shows a plan view of people sitting in a cafe.
The value in the middle of each table is the total bill for the table.
Each table shares their bill equally except for the table of three.

Write an expression for:

a) how much Jill pays.
b) how much Kate pays.
c) how much Kate and Jill pay altogether.

d) how much Jim and Jill pay altogether.
e) how much Sarah and Phoebe pay altogether.
f) how much Pia, Kate and Jim pay altogether.

g) Jim's change if he pays with s £10 note.
h) Kate's change if she pays with s £20 note.
i) the diffference between Phoebe's bill and Jim's bill.



2 For each situation, write an expression for the calculation ... and complete it with two more lines of working.

a) On Tuesday Niall went for a quick lunch with five other friends. The bill came to £42 and they split the cost equally.

On Wednesday he went for a quick lunch with three other friends. The bill came to £24 and they split the cost equally.

How much did Niall spend in total?

b) On Saturday Leela went for a quick lunch with two other friends. The bill came to £27 and they split the cost equally.

On Sunday she went for a quick lunch with four other friends. The bill came to £35 and they split the cost equally.

How much did Leela spend in total?

c) On Wednesday Caitlin went for lunch with four other friends. The bill came to £46 and they split the cost equally.

On Thursday she went for a quick lunch with three other friends. The bill came to £28 and they split the cost equally.

How much less did Caitlin spend on Thursday?

d) On Saturday Zak went for lunch with three other friends. The bill came to £32 and they split the cost equally.

He paid his share with a £10 note.

How much change did Zak receive?

e) On Tuesday Lucy went for lunch with two other friends. The bill came to £36 and they split the cost equally.

She paid her share with a £20 note.

How much change Lucy receive?

f) On Sunday Aaron went for lunch with five other friends. The bill came to £72 and they split the cost equally.

He paid her share with a £10 note and a £5 note.

How much change did Aaron receive?

g) Jamie lives in a flat with three others. At the end of March one person moved out. They split their utility bills equally.

Their March electricity bill was £120.

Their April electricity bill was £90

How much as Jamie paid in total?

h) Maddie lives in a flat with two others. At the end of October one person moved out. They split their utility bills equally.

Their October gas bill was £60

Their November gas bill was £80

How much more did Maddie pay in November than in October?

i) Rosie lives in a flat with four others. At the end of January another person moves in. They split their utility bills equally.

Their January water bill was £51.

Their February water bill was £54

How much less did Rosie pay in February than in January?

3 Write a story foreach of these expressions ... and work out the answer.

a) $12 \div 2 + 21 \div 3$ b) $20 - 30 \div 5$ c) $66 \div 6 - 56 \div 8$ d) $30 + 27 \div 3$

4 Evalaute these expressions and calculate their value.

a) $24 \div 8 + 30 \div 6$ b) $45 \div 5 - 32 \div 4$ c) $23 - 15 \div 5$ d) $3^2 + 18 \div 3$

e) $42 \div 7 + 4^2$ f) $352 - 7 \div 7$ g) $2 \times 3 + 16 \div 4 + 8 \times 2$ h) $100 - 35 \div 7 - 3^2$

find the missing operations

1.) $4 \square 3 \square 2 = 6$

2.) $5 \square 7 \square 2 = 19$

3.) $5 \square 4 \square 3 = 12$

4.) $3 \square 4 \square 5 = 7$

5.) $(8 \square 4) \square 2 = 1$

6.) $8 \square (4 \square 2) = 1$

7.) $(5 \square 3) \square 2 = 4$

8.) $5 \square (3 \square 2) = 4$

9.) $(3 \square 4) \square 2 = 6$

10.) $3 \square (4 \square 2) = 6$

11.) $(7 \square 7) \square 3 = 3$

12.) $7 \square (7 \square 3) = 3$

13.) $6 \square 3 \square 9 = 2$

14.) $6 \square (9 \square 3) = 2$

15.) $6 \square (3 \square 9) = 2$

16.) $(6 \square 9) \square 3 = 2$

17.) $(6 \square 8) \square 4 = 3$

18.) $(4 \square 8) \square 6 = 3$

19.) $6 \square 4 \square 2 = 3$

20.) $6 \square (2 \square 3) = 9$

test out any general rules that you think might apply

Problem Solving

Task 1 - Missing operators

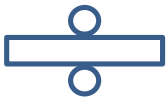
Fill the blanks with +, -, x or ÷ to make these calculations correct. Make sure you use the correct order of operations (BIDMAS).

1. 5 ..... 2 ..... 3 = 11
2. 8 ..... 6 ..... 2 = 5
3. 4 ..... 3 ..... 2 = 14
4. 14 ..... 2 ..... 3 = 21
5. 3 ..... 2 ..... 2 = 3
6. 6 ..... 2 ..... 3 = 5
7. 12 ..... 4 ..... 2 = 4
8. 5 ..... 9 ..... 2 = 23
9. 2 ..... 6 ..... 12 = 1
10. 6 ..... 3 ..... 2 = 0

Task 2 - The 24 puzzle

Using any combination of +, -, x, ÷ and ( ), make a total of 24 with each of the given sets of numbers. The numbers do not have to be kept in their original ascending order.

11. 1 2 3 4 .....
12. 1 2 5 6 .....
13. 1 5 6 9 .....
14. 2 3 6 7 .....
15. 1 2 3 6 .....
16. 5 5 9 9 .....
17. 1 2 8 9 .....
18. 1 2 3 5 .....
19. 1 2 7 9 .....
20. 1 4 7 7 .....



order of operating

find the missing number

1.) $4 + ? \times 2 = 18$

2.) $5 + ? \div 2 = 8$

3.) $10 - ? \times 2 = 4$

4.) $5 + ? \div 3 = 10$

5.) $4 \times 5 - ? \div 2 = 15$

6.) $3 + ? \times 3 = 15$

7.) $6 + ? \div 2 = 8$

8.) $12 - ? \times 2 = 4$

9.) $7 + ? \div 3 = 10$

10.) $10 \times 6 - ? \div 2 = 20$

11.) $\dfrac{9 + ?}{3 + 2} = 3$

12.) $\dfrac{40 - 28}{10 - ?} = 3$

13.) $\dfrac{30 - 14}{12 - ?} = 4$

14.) $\dfrac{3 \times 8 - ?^2}{10 - 2 \times 3} = 2$

15.) $\dfrac{4 \times 9 - ?^2}{1 + 4 \times 2} = 3$

Problem Solving

1 Positive Integers

A
$(3 + \_\_\_)^2 = 25$

B
$4^3 + \_\_\_^2 = 73$

C
$100 - \_\_\_^2 = 36$

D
$\_\_\_^3 + \_\_\_^2 = 10$

E
$(7 - \_\_\_)^3 = 27$

F
$\_\_\_^2 - 3 \times 4 = 13$

G
$2^{\square} + 3^2 = 25$

H
$\_\_\_^2 \div 5^2 = 4$

I
$4 \times \_\_\_^2 = 64$

J
$(12 - \_\_\_)^2 = 81$

K
$(\_\_\_ \times 2)^3 = 1000$

L
$(3 + \_\_\_)^3 = 64$

2 Positive and Negative Integers

A
$\_\_\_^3 + 2 = -6$

B
$(-2)^2 + \_\_\_ = 12$

C
$(4 - \_\_\_)^3 = -1$

D
$\_\_\_^3 + (-2)^3 = -16$

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

F
$5 \times \_\_\_^3 = -40$

G
$(-1 \times \_\_\_)^3 = 27$

H
$(-5)^2 + \_\_\_^3 = 26$

I
$(-8)^2 \div \_\_\_ = 32$

J
$(\_\_\_ + 1)^5 = -32$

K
$(-10)^{\square} = -1000$

L
$(-3)^2 \times \_\_\_^3 = -72$

M
$\_\_\_^3 - 4 = 4$

N
$\_\_\_ - 10^2 = -100$

O
$10^3 - (-10)^2 = \_\_\_$

directed number gaps (ii)

(1) $\square \times (\square + \square) = 28$
use -7, -6 and 2

(2) $\square \times (\square + \square) = -15$
use -5, -3 and 6

(3) $\square \times (\square + \square) = -40$
use 10, -5 and -2

(4) $\square \times (\square - \square) = -70$
use -6, 8 and -5

(5) $\square \times (\square - \square) = 24$
use -8, -2 and -4

(6) $\square \times (\square - \square) = -63$
use -6, -7 and 3

(7) $(\square + \square) \div \square = \square$
use -5, -8, 3 and -7

(8) $(\square - \square) \div \square = \square$
use -8, -7, 6 and -2

(9) $(\square + \square) \div \square = \square$
use -3, -3, 9 and -2

(10) $(\square + \square) \div \square = \square$
use -9, -2, 8 and -7

(11) $(\square - \square) \div \square = \square$
use -3, 9, 1 and 6

(12) $(\square + \square) \div \square = \square$
use -4, -5, 3 and -7

directed number gaps (i)

(1) $\square \times \square + \square = -13$

use -3 , -2 and 5

(2) $\square \times \square + \square = -11$

use -5 , -2 and 3

(3) $\square \times \square + \square = -23$

use 4 , -3 and -5

(4) $\square \times \square + \square = 21$

use -3 , 6 and -5

(5) $\square \times \square + \square = 17$

use -5 , -3 and -4

(6) $\square \times \square + \square = -27$

use -6 , -7 and 3

(7) $\square \times \square - \square = 13$

use -5 , 2 and -3

(8) $\square \times \square - \square = -19$

use 4 , -3 and 5

(9) $\square \times \square - \square = 17$

use -2 , -5 and -6

(10) $\square \times \square - \square = -19$

use -5 , 3 and -8

(11) $\square \times \square - \square = 34$

use -7 , -4 and -6

(12) $\square \times \square - \square = -26$

use -8 , -6 and 4

inserting brackets (i)

(1) show where you put brackets in

$20 \div 5 + 5 \times 2$

to get answers:
(a) 14
(b) 4
(c) 1
(d) 18

(2) show where you put brackets in

$16 \div 8 \div 4 \div 2$

to get answers:
(a) 1
(b) 4
(c) 16
(d) ¼

(3) where can you put brackets in

$20 \div 4 + 1 \times \square$

and what number goes in the box to make 12?

try to find two solutions

(4) where can you put brackets in

$24 \div 4 + 2 \times \square$

and what number goes in the box to make 40?

try to find two solutions

(5) show where you put brackets in

$60 \div 4 + 2 \times 3 - 1$

to get answers:
(a) 20
(b) 5
(c) 29
(d) 19
(e) 50
(f) 7½
(g) 2⅓
(h) 6⅔

some have more than one solution

(6) show where you put brackets in

$1 + 3 \times 8 \div 4 - 2$

to get answers:
(a) 6
(b) 5
(c) 1
(d) 0
(e) 13
(f) 16
(g) 12½
(h) 4¼

some have more than one solution

inserting brackets (ii) place brackets and decide what number goes in the box to make these statements true

(1)

48 ÷ 6 + 2 × □ = 60

48 ÷ 6 + 2 × □ = 60

48 ÷ 6 + 2 × □ = 60

(2)

36 ÷ 3 × 2 + □ = 48

36 ÷ 3 × 2 + □ = 48

36 ÷ 3 × 2 + □ = 48

(3)

120 ÷ 4 + 2 × □ = 320

120 ÷ 4 + 2 × □ = 320

120 ÷ 4 + 2 × □ = 320

(4)

30 ÷ 3 + 2 × □ = 48

30 ÷ 3 + 2 × □ = 48

30 ÷ 3 + 2 × □ = 48

(5)

100 ÷ 10 – 5 × □ = 20

100 ÷ 10 – 5 × □ = 20

100 ÷ 10 – 5 × □ = 20

(6)

21 ÷ 7 + 3 × □ = 42

21 ÷ 7 + 3 × □ = 42

21 ÷ 7 + 3 × □ = 42

(7)

2 × □ + 120 ÷ 4 = 180

2 × □ + 120 ÷ 4 = 180

2 × □ + 120 ÷ 4 = 180

2 × □ + 120 ÷ 4 = 180

(8)

5 × □ – 20 ÷ 4 = 20

5 × □ – 20 ÷ 4 = 20

5 × □ – 20 ÷ 4 = 20

5 × □ – 20 ÷ 4 = 20

4 Fours!

Using **exactly** 4, 4, 4, 4 and **any** operation, can you make a calculation for each number from 0 to 30?

0: _____

1: _____

2: _____

3: _____

4: _____

5: _____

6: _____

7: _____

8: $4 + 4 + 4 - 4$

9: _____

10: _____

11: _____

12: _____

13: _____

14: _____

15: _____

16: _____

17: _____

18: _____

19: _____

20: _____

21: _____

22: _____

23: _____

24: _____

25: _____

26: _____

27: _____

28: _____

29: _____

30: _____

50 to 100!

Using **only** the numbers 1, 2, 3, 4 & 5 **once**, can you make a calculation for each number from 50 to 100?

50: _____
51: _____
52: $(5 \times 2 + 3) \times 4$
53: _____
54: _____
55: _____
56: _____
57: _____
58: _____
59: _____
60: _____
61: _____
62: _____
63: _____
64: _____
65: _____
66: _____
67: _____
68: _____
69: _____
70: _____
71: _____
72: _____
73: _____
74: _____

75: _____
76: _____
77: _____
78: _____
79: _____
80: _____
81: _____
82: _____
83: _____
84: _____
85: _____
86: _____
87: _____
88: _____
89: _____
90: _____
91: _____
92: _____
93: _____
94: _____
95: _____
96: _____
97: _____
98: _____
99: _____

100: _____

Purposeful Practice

		Value				
		Even Less	Less	Same	More	Even More
Number of brackets	Even more					
	More					
	Same			1 + (2 + 3) - (4 - 5) - 6		
	Less					
	Even Less					

3 Introduction to Algebra

Intelligent Practice

Write an algebraic expression for each of the following:

1) 7 more than x
2) 7 less than x
3) 9 less than x
4) 9 lots of x
5) 19 lots of x
6) x divided by 19
7) x shared between 19
8) x less than 19
9) x less than 3
10) x less than y
11) x more than y
12) x multiplied by y
13) x divided by y
14) x divided by 3
15) x divided by 3 and then add 2
16) x divided by 3 and then subtract 2
17) x lots of 3 and then subtract 2
18) x lots of 3 and then squared
19) x lots of 3 squared
20) x squared and then multiply by 3

Fluency Practice

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

Apply

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

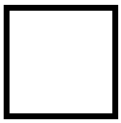
Purposeful Practice

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

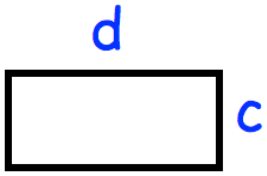
(a) A 2 mile journey (b) A 15 mile journey (c) A journey of x miles

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

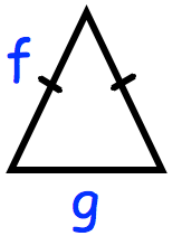
(a)



(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 older 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 £20 and spends £y on presents.
(b) Eric had £m and spends £12 on presents.
(c) Luke had £a and spends £b on presents.

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

Question 7: A plumber charges £15 per hour plus a £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

algebraic notation

Match the algebraic notation on the left with its description on the right. Record your answers in the table.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q

A) $3a$

B) $3 + a$

C) $3a^2$

D) $a - 3$

E) $2a + 1 = 3$

F) $a = 2b + 3$

G) $3(a + b)$

H) $3ab$

I) a^3

J) $b(a + 3)$

K) $ab + 3$

L) $3a^2 + b$

M) $2a^2 + ab$

N) ab^2

O) $(ab)^2$

P) $3 - ab + b^3 + a$

Q) $a(b - 3)$

1) The same as a × a × a

2) The coefficient of b is 1

3) The product of 3a and a

4) A formula

5) The coefficient of a^2 is 2

6) Add 3 to a, then multiply by b

7) The same as a^2b^2

8) 3 less than a

9) The product of 3 and ab

10) b is multiplied by ab

11) Subtract 3 from b, then multiply by a

12) The sum of 3 and a

13) An equation

14) Multiply a and b, then add 3

15) a is multiplied by 3

16) An expression with 4 terms

17) (a + b) + (a + b) + (a + b)

Fluency Practice

translation

1) any number add five
2) any number added to six and then times by three
3) any number divided by another
4) any number added to two times another number all multiplied by five
5) any number add ten all squared
6) any number divided by six added to three then all times by five
7) five times any number added to two times another number
8) any number times by three then add six
9) any number times by three then all squared
10) any number add ten then multiply by two
11) one number divided by another number then times by seven
12) any number times by itself then times by three
13) one square number subtract another square number
14) any number add three all divided into another number
15) three times any number then times by two

which goes with which?

a) $3(k + 6)$
b) $(d + 10)^2$
c) $5f + 2g$
d) $5\left(\frac{e}{6} + 3\right)$
e) $n + 5$
f) $\frac{7b}{h}$
g) $h^2 - a^2$
h) $3d^2$
i) $6y$
j) $\frac{w}{z}$
k) $(3y)^2$
l) $\frac{w}{k + 3}$
m) $5(b + 2c)$
n) $2(k + 10)$
o) $3m + 6$

Fluency Practice

a b c

- Match the words with the algebra.
- One expression in words and one expression in algebra do not match. Write a matching expression for each.

"Multiply **b** by 2 then subtract from **a**."	$a(b - c)$
"Subtract **c** from **a** then multiply by **b**."	$\frac{a}{c} - b$
"Add **b** to **a** then divide into **c**."	$\frac{ab}{c}$
"Multiply **a** by **b** then divide by **c**."	$\frac{c}{a + b}$
"Divide **c** by **b** then multiply by **a**."	abc
"Multiply **a** by **c** then divide into **b**."	$b(a - c)$
"Add **b** to **a** then divide by **c**."	$a - 2b$
"Multiply **ab** by **c**."	$\frac{b}{ac}$
"Multiply **a** by 4 then subtract **c**."	$\frac{a + b}{c}$
"Subtract **c** from **b** then multiply by **a**."	$\frac{c}{b} \times a$

Words won't fail me!

1 Join the expressions in words to the equivalent algebraic expressions.

The product of **a** and **c** is divided by **b**.	$\frac{a-b}{c}$
Divide **a** by **c** then subtract **b**.	$\frac{c}{a-b}$
Subtract **b** from **a** and then divide into **c**.	$\frac{b}{a+c}$
Multiply **a** by **c** then divide into **b**.	$\frac{a}{c}-b$
Subtract **b** from **a** then divide by **c**.	$\frac{b}{ac}$
Divide the sum of **a** and **c** into **b**.	$\frac{ac}{b}$

2 Write algebraic expressions equivalent to these expressions in words.

The sum of **a** and **b** is divided by the sum of **c** and **d**. →	
a is added to **b** then divided into the product of **c** and **d**. →	
Add **a** to **b** and divide by the product of **c** and **d**. →	
The sum of **a** divided by **c** and **b** divided by **d**. →	

3 Write expressions in words equivalent to these algebraic expressions.

$\frac{a+b}{c}$ →	
$\frac{c+d}{a+b}$ →	
$\frac{cd}{ab}$ →	
$\frac{c}{a+b}$ →	

Purposeful Practice

	Write the calculation in numbers	Write the expression in algebra
Ex	Becky begins a game with 12 marbles. She wins 3 and loses 5. How many marbles does she have at the end of the game? **12 + 3 − 5 = 10**	Becky begins a game with x marbles. She wins y and loses z. How many marbles does she have at the end of the game? $x + y - z$
1	In a class of 30 children, 10 have a sister. How many children don't have a sister?	In a class of a children, b have a sister. How many children don't have a sister?
2	There were 30 questions in a spelling test. Megan got 25 correct. How many did she get wrong?	There were x questions in a spelling test. Megan got y correct. How many did she get wrong?
3	Lucy went on a journey, going 65 miles by train, 4 miles by bus, and 3 miles on foot. How far did she travel?	Lucy went on a journey, going x miles by train, y miles by bus, and z miles on foot. How far did she travel?
4	Mark buys 3 chocolates bars, each costing 25p. How much does he spend on chocolate bars?	Mark buys a chocolates bars, each costing b pence. How much does he spend on chocolate bars, in pence?
5	Nihal is 11 years old. His sister is 5 years older. How old is his sister?	Nihal is x years old. His sister is y years older. How old is his sister?
6	Maddie has 4 cards. Emma has 10 times as many. How many cards does Emma have?	Maddie has a cards. Emma has b times as many. How many cards does Emma have?
7	Aisha went shopping with £5. She spent £2.50 on a toy and £1 on a bag of sweets. How much did she have left?	Aisha went shopping with x pounds. She spent y pounds on a toy and z pounds on a bag of sweets. How much did she have left, in pounds?
8	Apples cost 15p and bananas cost 10p. Jacob buys 2 apples and 3 bananas. How much does he spend?	Apples cost a pence and bananas cost b pence. Jacob buys x apples and y bananas. How much does he spend, in pence?
9	How far will a car go in 4 hours at 30 miles per hour?	How far will a car go in t hours at v miles per hour?
10	Daniel is 12 years old. Anna is twice as old as Daniel. Grace is three years younger than Anna. How old is Grace?	Daniel is d years old. Anna is c times as old as Daniel. Grace is b years younger than Anna. How old is Grace?

Purposeful Practice

(a) An equilateral triangle has sides of length x cm. Write a formula for the perimeter P of the triangle.

(b) A helicopter consumes n litres of fuel per minute. Write a formula for the total number of litres T consumed during a flight lasting 30 minutes.

(c) Each month I pay $£a$ for my house insurance and $£b$ for my car insurance. Find a formula for the total amount T I spend on house and car insurance per year.

(d) Jo receives £500 for her birthday, which she saves in a bank. She adds £10 per month to her savings. Find a formula for the amount $£P$ she will have after m months of saving.

(e) A rectangle has length $2x\ cm$ and width $(x+3)cm$. Find formulae for the area A and the perimeter P of the rectangle.

(f) Pencils cost 15p each and pens cost 25p each. Write a formula for the cost C of x pencils and y pens.

(g) My brother is 6 years older than me, and my sister is 3 years younger than me. I am x years old. Write a formula for the mean age M of me, my brother and my sister.

(h) A rectangle of dimensions a cm by b cm has a 1 cm square cut from each of its four corners. The sides formed are then folded up to make a rectangular tray. Find a formula for the volume V of the tray.

PIRATE PETE WENT PLUNDERIN'

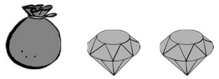
For each of Pete's hauls, form an **algebraic expression** for the **total** number of **gems** Pete got!

 A **chest** of gems (c).

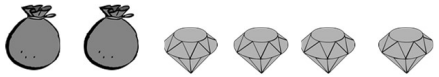
 A **bag** of Gems (b).

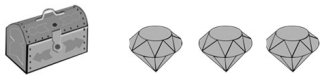
 **1** gem

JANUARY 1662

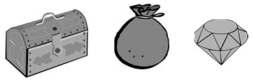
HAUL 1 

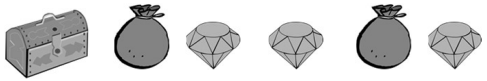
2 

3 

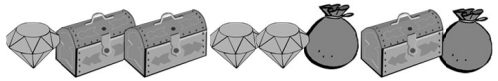
4 

5 

6 

7 

8 

9 

Use Pete's diary to **express** how many total gems he ended with after each day.

MARCH 1662

2ND : 3 chests of gems, 2 bags of gems and 5 loose gems.

4TH : 3 chest of gems… and another 6 gems from the Santa Anna!

5TH : 2 bags of gems… but then I lost 5 gems overboard!

11TH : 4 bags and a chest … then Pirate Paul stole 10 gems off me!

12TH : only half a bag of gems :(arrrrhhh….

14TH : half a chest of gems and 5 individual gems.

15TH : a quarter bag of gems… and spent 2 gems on new boots.

18TH : 2 bags and 5 gems… but I met Pirate Paul and he doubled it!

20TH : 15 more gems than my last haul! Yo ho ho!

21ST : got 2 bags, but one split and spilt half the gems overboard!

23RD : 2 chests, 3 bags and 6 gems… but had to pay my crew half of it.

24TH : Triple the haul from the 20th!

26TH : 2 chests of gems, and gave my crew one bag full of gems.

27TH : 2 chests, 8 bags and 5 gems, paid for a new sail (a whole 5 bags!) and a new hat (8 gems).

31ST : Got a chest and 7 gems from the Bounty… doubled it when I met the Victoria…. But had to pay my crew 1 bag and 20 gems.

PIRATE TALES

Can you write an expression for how many gems each pirate got?

Pete tells his 7 pirate friends how many (n) gems he got.
Match each comment to an expression for how many gems they got.

'2 more than you!'

'I got half what you got!'

$n - 2$

$n + 2$

'I got 2 more than twice what you got.'

'Only 2 less than you!'

$\frac{n}{2} + 2$

$\frac{n}{2}$

$2n - 2$

'Double what you got, but I've lost 2 gems!'

$\frac{n}{2} - 2$

$2n + 2$

'I got 2 more than half what you got!'

'Half what you got then lost two!'

Pete got (x) gems.
Abby said she got 3 more gems than Pete.
Greg said he got 4 times the gems Abby did.

Which expressions describe how many gems Greg got?

$x + 3$ $\quad 4x + 3$ $\quad 4(x + 3)$ $\quad x + 12$ $\quad 4x + 12$

If Pete got (x) gems,
write expressions for how many gems each pirate said they got.

Hannah: 5 more than Pete
Dave: double what Hannah got

Mike: double Pete's gems
Sally: triple what Mike got

Kim: 5 less than Pete
Danny: 4 times what Kim got

Rachel: 3 more than double
Blackbeard: double what Rachel got

Tom: 6 less than triple
Christina: a third of what Tom got

Max: 8 less than Blackbeard

Rico: half of Max's haul

Sophie: double Dave's haul, and another 5

Julia: half of what Kim got

Wendy: 2 less than a third of what Danny got

Algebraic Ages

1)

Amy is a years old.

Zack is 7 years older than Amy.

Using a, write an expression for Zack's age.

2)

Bill is b years old.

Vicky is 4 times Bill's age.

Write an expression for Vicky's age.

3)

Cathy is c years old.

Trey is 12 years younger than Cathy.

Write an expression for Trey's age.

4)

David is d years old.

Mae is a third as old as David.

Write an expression for Mae's age.

5)

Elise is e years old.

Yarik is triple Elise's age.

Will is 8 years older than Yarik

Yarik's age =

Will's age =

6)

Frey is f years old.

Henry is 4 times Frey's age.

Jane is 18 years younger than Henry.

Henry's age =

Jane's age =

7)

Greg is g years old.

Pete is 12 years older than Greg.

Pete's age =

Greg & Pete's <u>total</u> age =

8)

Hannah is h years old.

Jess is 3 times Hannah's age.

Kelly is 15 years younger than Jess.

Hannah, Jess & Kelly's total age =

Intelligent Practice

Question	Variables	Coefficients	Constant	Terms
$3x - 9$				
$3x + 4y - 9$				
$3x - 4y - 9$				
$3x - 4y + 9$				
$-3x - 4y + 9$				
$9 - 3x - 4y$				
$9 - 3a - 4b$				
$3a^2 - 4b^2 + 9$				
$3a^2 - 4a + 9$				
$3a^2 - 4a$				
$3a^2 - 4$				
$3ab - 4$				
$3ab - 4a$				
$3ab - 4a - 5b$				
$3a^2b - 4a - 5b$				
$3ab^2 - 4a - 5b$				
$3ab^2 - 4ab - 5b$				
$3ab^2 - 4a^2b - 5b$				
$3ab^2 - 4a^2b - 5ab$				
$3ab^2 - 4a^2b - 5ab - 6$				

Fluency Practice

Question 1: Simplify each of the following

(a) $y + y + y + y$ (b) $w + w + w + w + w$ (c) $a + a + a + a + a + a$ (d) $s + s + s$

(e) $n + n$ (f) $g + g + g + g - g$ (g) $y + y + y + y - y - y$ (h) $p + p - p - p$

(i) $3y + 2y$ (j) $4a + 3a$ (k) $9k + 5k$ (l) $7m + m$

(m) $15c + 20c$ (n) $6w - 3w$ (o) $10y + 3y - 5y$ (p) $20t - 14t$

(q) $7x - 3x - x$ (r) $8k - 8k$ (s) $7y - 2y + y$ (t) $5u - 4u$

(u) $y^2 + y^2$ (v) $a^2 + a^2 + a^2$ (w) $c^2 + c^2 + c^2 + c^2 + c^2$ (x) $7y^2 + 3y^2$

(y) $2w^2 + 4w^2 + 8w^2$ (z) $6y^2 - 2y^2 + 3y^2$

Question 2: Simplify the following expressions

(a) $4u - 6u$ (b) $8w - 9w$ (c) $4a + 2a - 9a$ (d) $2y - 9y$

(e) $-3g - 2g$ (f) $-4f + 9f$ (g) $-m - 7m$ (h) $5y^2 - 7y^2$

(i) $6a^2 + 2a^2 - 9a^2$ (j) $ab + ab + ab$

Question 3: Simplify the following expressions

(a) $3a + 2b + 4a + b$ (b) $7y + 5y + 2h + 2h$ (c) $g + 8a + 2a + g$

(d) $7m + 7p + 8m + p + 2p$ (e) $9e + 2 + e + 2$ (f) $4 + 3a + 2a + 8$

(g) $2y + 4 + 3y - 1$ (h) $8 + 3w - w - 3$ (i) $5 - 4s - 2 + 10s$

(j) $3x + 6y + 5x - 2y$ (k) $6m - 2s + 11s + m$ (l) $2a + 3b - 2 + a + 3b + 4$

(m) $3a - 2b + a - 5b$ (n) $2x - 2y - 6x + 5y$ (o) $y - 4m - 3y - 5m$

(p) $7p - 2q - q + 3r + 4r$ (q) $11c + 8d - 6c - 11d$

Fluency Practice

Question 4: Simplify the following

(a) $3y^2 + 4ab + 7y^2 + ab$ (b) $9x^2 - 2x - 11x^2 + 5x$ (c) $7ac - 3ab + 9ab - 7ac$

Question 5: Expand and simplify the following

(a) $2(y + 3) + 3(y + 1)$ (b) $8(x + 2) + 3(x + 3)$ (c) $4(x - 1) + 2(x + 3)$

(d) $5x + 3 + 2(x + 9)$ (e) $3(2y + 1) + 4(2y + 5)$ (f) $5(2x + 3) + 2(3x + 1)$

(g) $7(c + 2) + 3(c - 2)$ (h) $5(2a + 7) + 2(9a - 4)$ (i) $9(t + 3) + 3(2t - 11)$

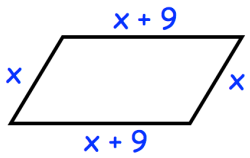
(j) $2(x - 4) + 5(x - 2)$ (k) $6(y - 1) - 2(y + 3)$ (l) $8(x + 2) - 3(x - 2)$

(m) $5(2y - 3) + 3(y - 2)$ (n) $2(4w - 5) - 2(w - 7)$ (o) $5(3y + 7) - 3(2y - 5)$

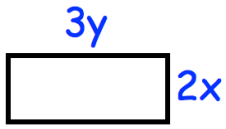
Apply

Question 1: Write down the perimeter of each shape below

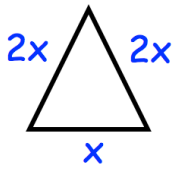
(a)



(b)



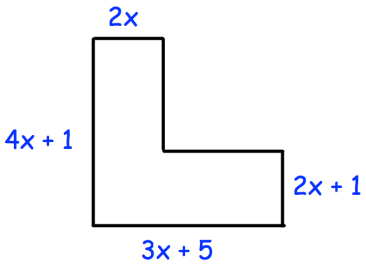
(c)



Question 2: A square has a side length of 3x.
Find an expression for the perimeter of the square.

Question 3: $6x + 7y + x - 8y = 7x - y$
Write down three other expressions that are equal to $7x - y$

Question 4: Find an expression for the perimeter of this shape



Fluency Practice

Simplify:

(a) $a + a + a$

(b) $d + d + d + d + d$

(c) $2x + 5x$

(d) $4b + b$

(e) $y + y + 4y$

(f) $m + 2m + 3m$

Simplify:

(a) $x + x + x - x$

(b) $y + y - y - y$

(c) $7a - 2a$

(d) $3b - 2b$

(e) $m + 3m - m$

(f) $5n - n - n$

Simplify:

(a) $x^2 + x^2 + x^2 + x^2$

(b) $xy + xy + xy$

(c) $ab + ab + ab - ab$

(d) $3y^2 + 5y^2$

(e) $12cd - 5cd$

(f) $4x + 4x^2$

Simplify:

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

(b) $2x - 5x$

(c) $x^2 + 6x^2 + 2x^2 - 3x^2$

(d) $ab + 3ab - 4ab$

(e) $5y^2 - 2y^2 + 3y^2$

(f) $-a + 5a - 2a$

(g) $abc + bac + cba$

(h) $2a^2 + 3a^2 - 4a^2$

Fluency Practice

Simplify:

(a) $x + x + y + y$

(b) $a + a + b + a + b$

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

(d) $4x + x + y + 9y$

(e) $6a + 3b + 2a + b$

(f) $a + 2b + 4a + b + 5a$

Simplify:

(a) $a + a + a - a + b + b$

(b) $5x - 2x + 3y + 4y$

(c) $4c + 7c + 6d - 3d$

(d) $8x - 6x + 3y - 2y$

(e) $7a + 2b - 5a + 6b$

(f) $10x + 8y - 3x - 5y$

Simplify

(a) $5p - 3q + 2 - 4p + 5 + 4q$

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

(c) $x^2 + y^3 - 2x^2 + 4y^3$

(d) $x^2y + xy + x^2y$

(a) A rectangle has a width x cm and a length $x + 5$ cm. Write down a simplified expression for its perimeter.

(b) A square has sides of length $2x - 3$ cm. Write down a simplified expression for its perimeter.

A triangle has sides of lengths $ab + 3$, $2ab - 7$ and $4ab + a$ cm. Write a simplified expression for the perimeter of the triangle.

Fluency Practice

?x + 5y – 6x + ?y = 7x + 6y what could the missing numbers be?

?x - 5 + 2x + ? = -8x + 4 what could the missing numbers be?

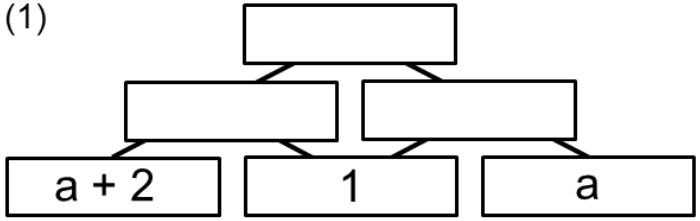
?y +5z + ? -7y + ?z +4 + 2z = 3y + z + 4 what could the missing numbers be?

-x +?x - 4x - 8x = 2x what could the missing number be?

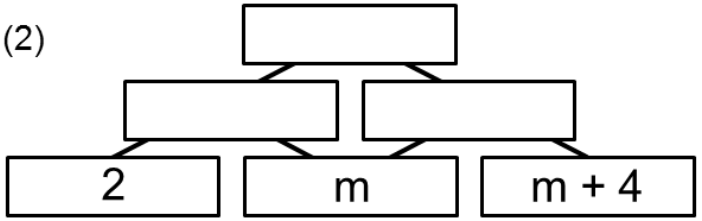
expression pyramids 1

complete the addition pyramids

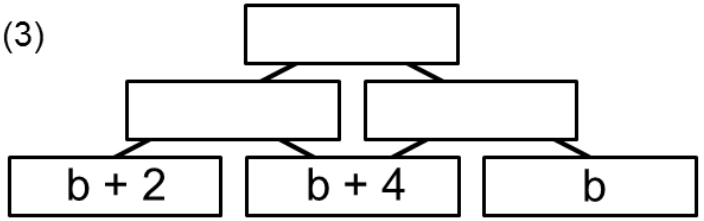
(1)



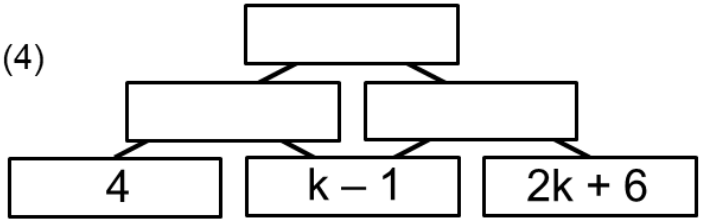
(2)



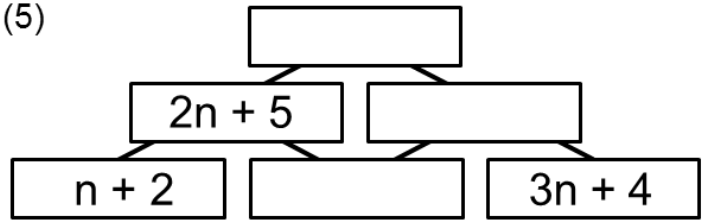
(3)



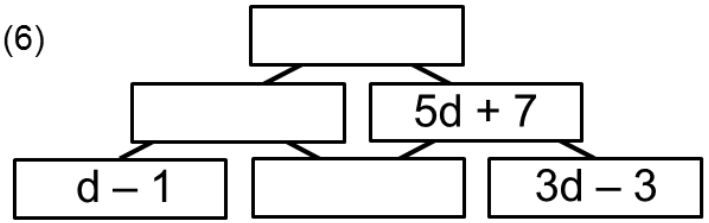
(4)



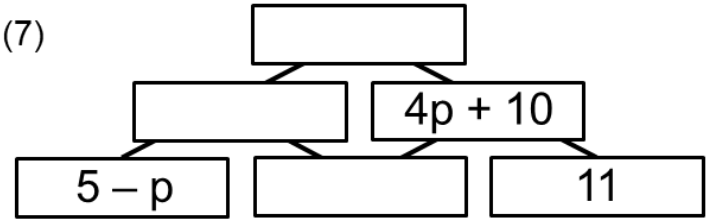
(5)



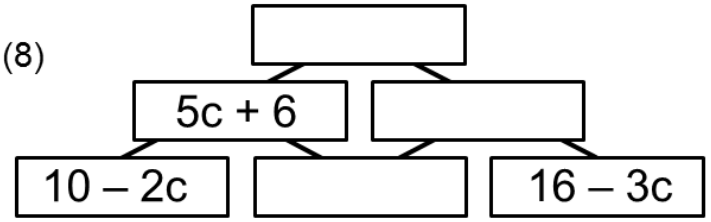
(6)



(7)



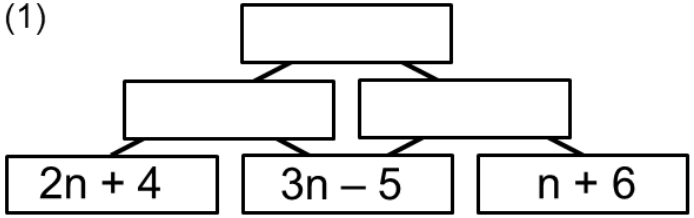
(8)



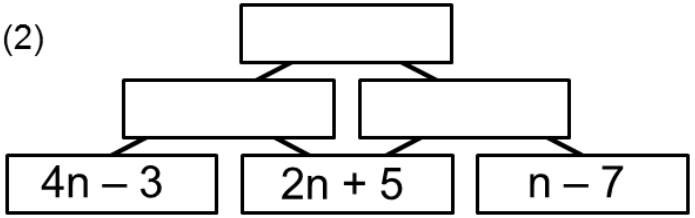
expression pyramids 2

complete the addition pyramids

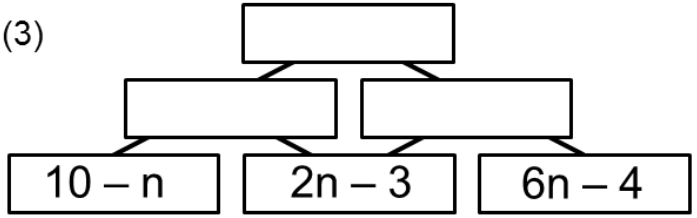
(1)



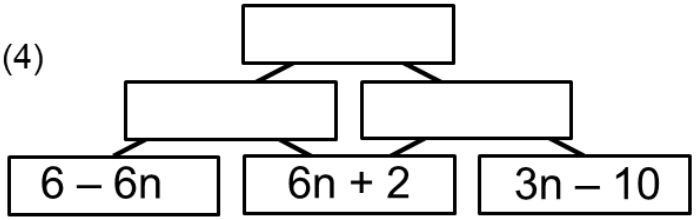
(2)



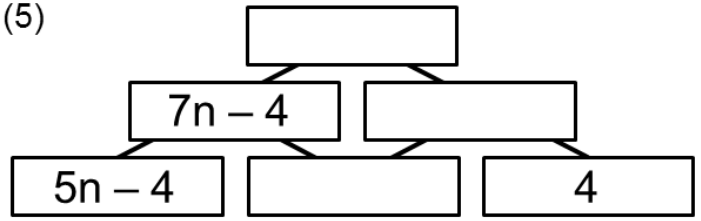
(3)



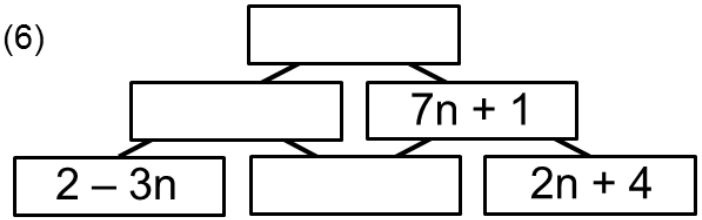
(4)



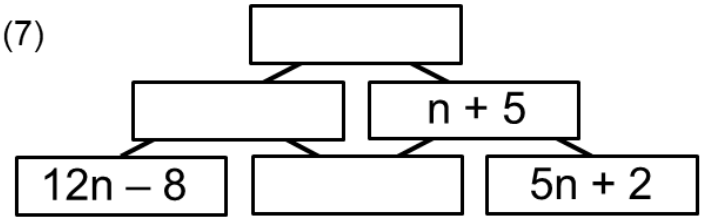
(5)



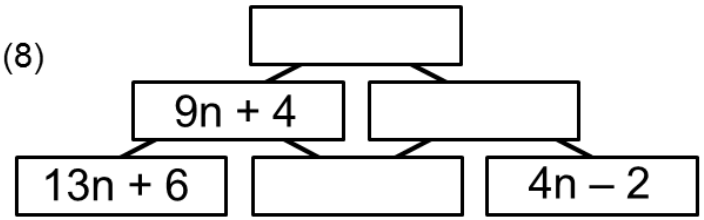
(6)



(7)

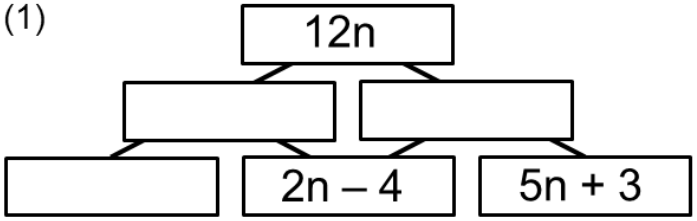


(8)

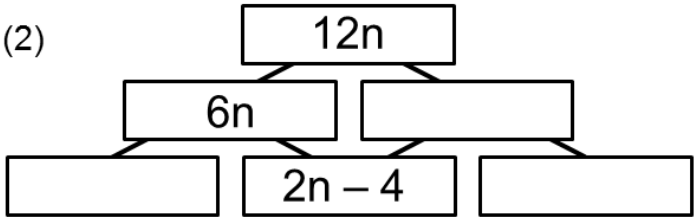


expression pyramids 3 complete the addition pyramids

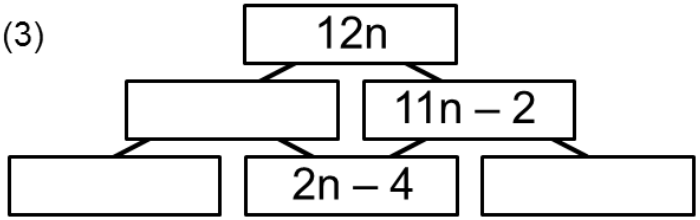
(1)



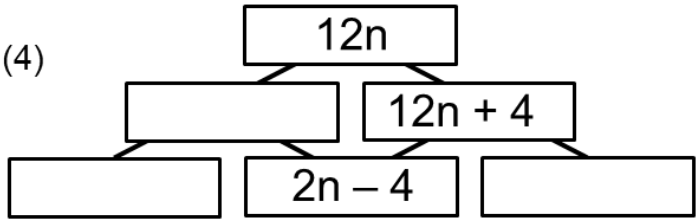
(2)



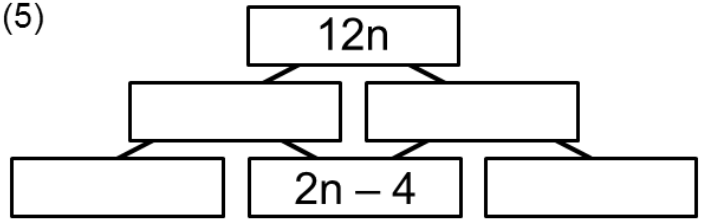
(3)



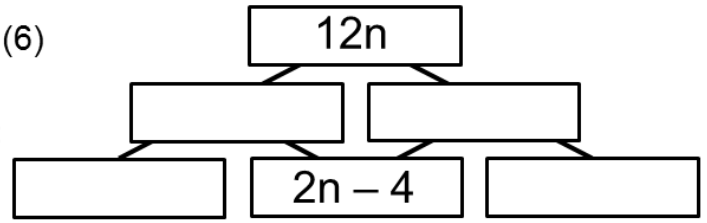
(4)



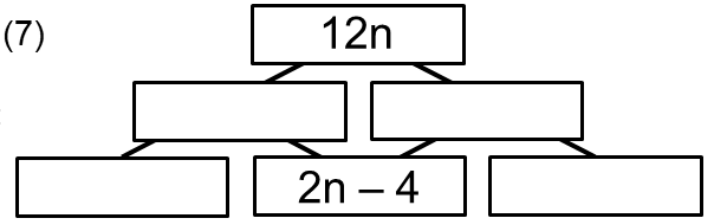
(5) make up your own:



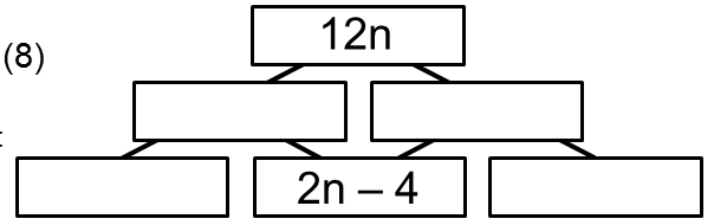
(6) make up your own:



(7) make up your own:



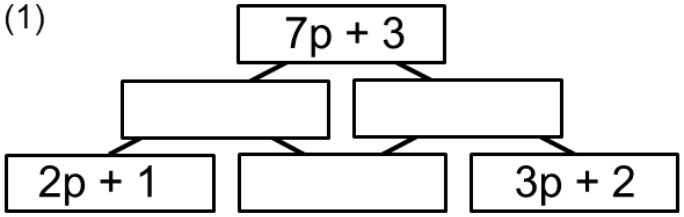
(8) make up your own:



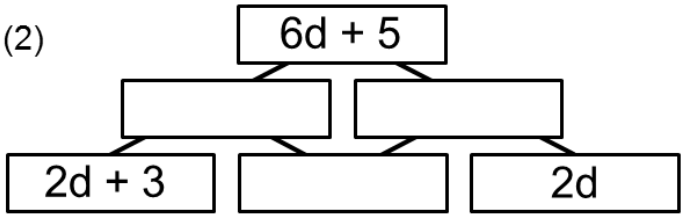
expression pyramids 4

complete the pyramids

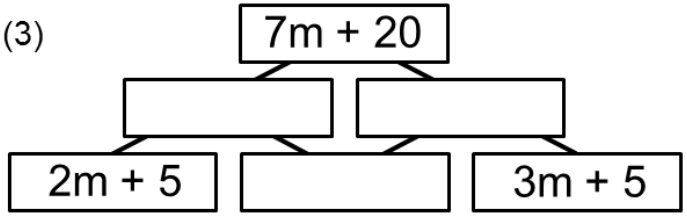
(1)



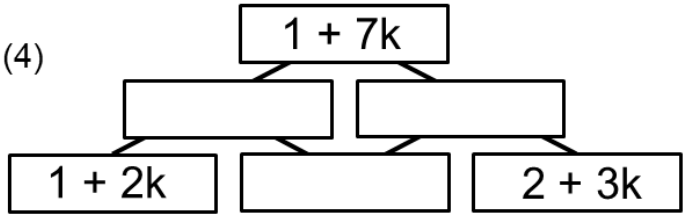
(2)



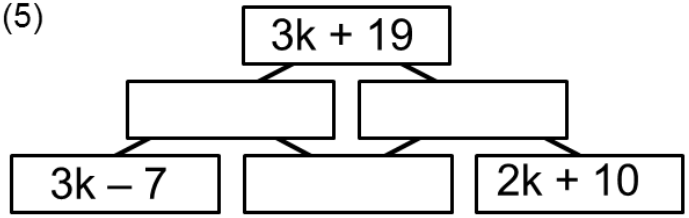
(3)



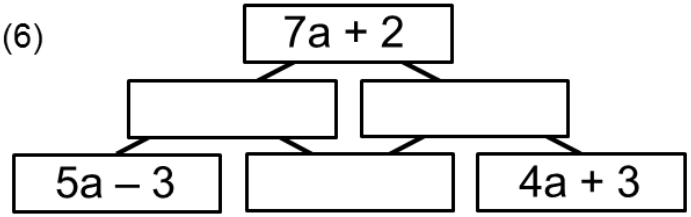
(4)



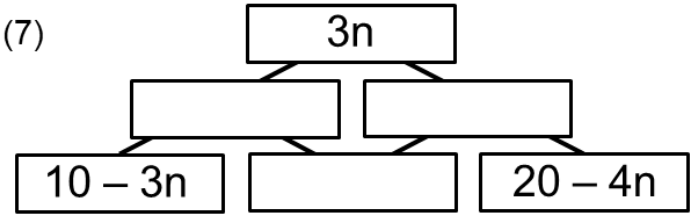
(5)



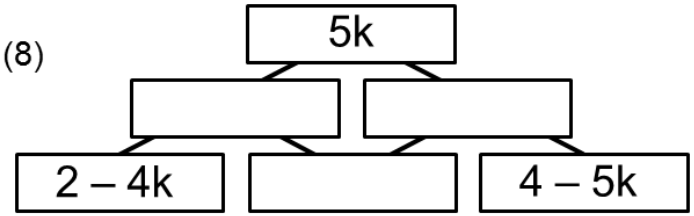
(6)



(7)



(8)

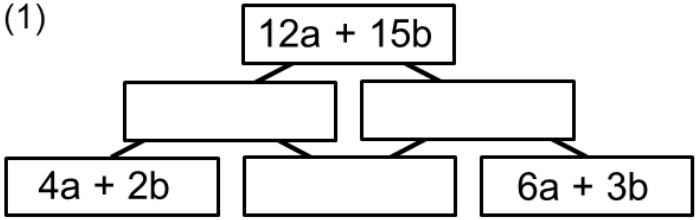


Fluency Practice

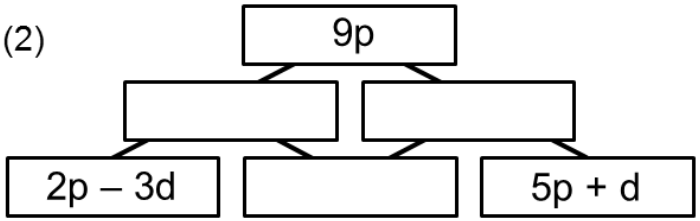
expression pyramids 5

complete the pyramids

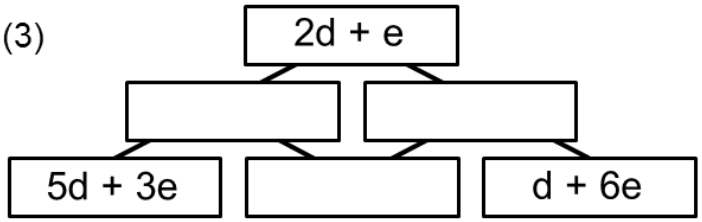
(1)



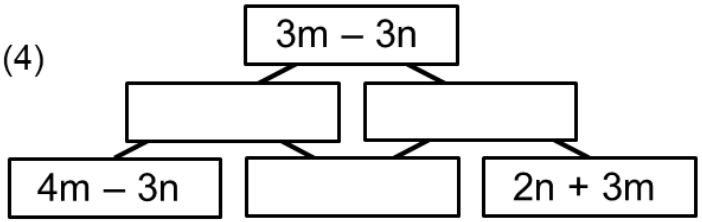
(2)



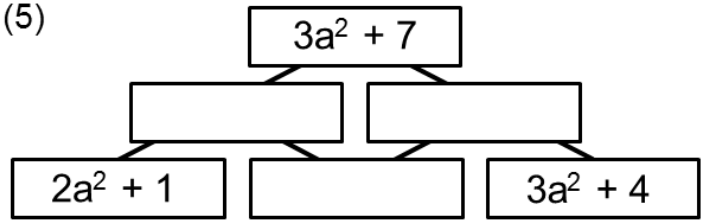
(3)



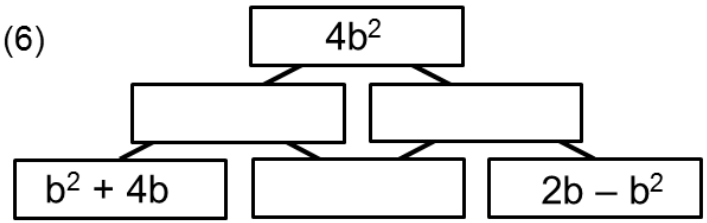
(4)



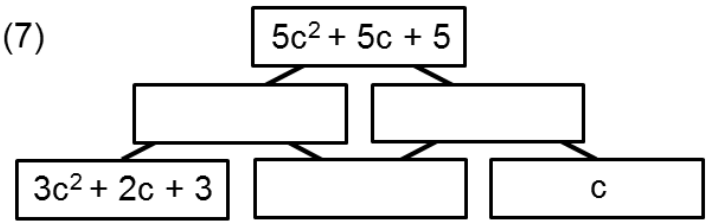
(5)



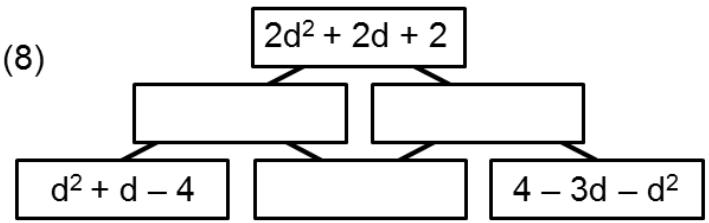
(6)



(7)



(8)



Fluency Practice

Fluency Practice

Algebra Pyramids

Each brick is the two bricks below it added together.

A)

$a+2$	2	a

B)

$a+3$	a	$2a$

C)

$a+3$	$a-1$	3

D)

	$2a+7$	$3a+8$
	$2a+3$	

E)

$b-5$	3	$b-2$

F)

	$3b-2$	
	$b-5$	1

G)

	$4b$	
$2b-2$		
$b-5$		

H)

$7-b$	$2b$	$b+4$

I)

	$c+4$	$3-2c$

J)

$2c+3$	$1+c$	$7-3c$

K)

$14-6c$	$c+5$	
	$8-3c$	

L)

	$12-2c$	
$1-c$		
	$c+5$	

Problem Solving

MAGIC Squares

In each square, the rows, columns and diagonals all total the same **MAGIC** expression! Can you complete the squares?

A

$8a$	a	$6a$
	$9a$	

MAGIC Exp. = $15a$

B

	$5x$	
	$9x$	
	$13x$	$11x$

MAGIC Exp. =

C

$-2t$	$5t$	0
	t	

MAGIC Exp. = $3t$

D

	c	
$7c$	$-3c$	

MAGIC Exp. = $3c$

E

$5d$	$2d$	$-d$
		$6.5d$

MAGIC Exp. =

F

$a+8b$		
	$a+5b$	
	$a+9b$	$a+2b$

MAGIC Exp. =

G

	$d-5e$	$d-4e$	
	$d+4e$		$d+e$
$d+2e$		$d-e$	
$d-3e$	$d+7e$	$d+8e$	$d-6e$

MAGIC Exp. =

H

$5a-3b$		$4a-2b$	$9b-7a$
		$4b-2a$	$7a-5b$
$8b-6a$	$3a-b$		
$8a-6b$			$6b-4a$

MAGIC Exp. =

1

MAGIC Squares

In each grid, the rows, columns and diagonals all total the same MAGIC expression! Can you complete them?

A

	$a+b$	
a		$a-2b$

MAGIC Exp. = $3a+3b$

B

		$3d-c$
	$2c$	
$5c-3d$	$2d$	

MAGIC Exp. =

C

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

MAGIC Exp. =

D

$-5.5s$	$-2t-5s$	
$10t-8s$		

MAGIC Exp. = $6t-18s$

E

	$7i+6j-5k$	$6i+5j-4k$	$6k-4i-5j$
$4i+3j-2k$	$4k-2i-3j$	$3k-i-2j$	$i+k$
$5i+4j-3k$		$8k-6i-7j$	

MAGIC Expression =

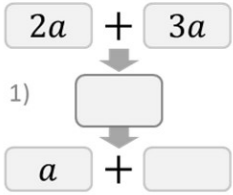
F

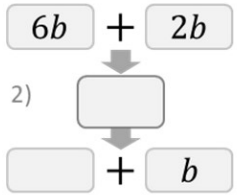
	$4a-2b-2c$		$11a-9b+5c$
$9a-7b+3c$		$6a-4b$	$5b-3a-9c$
$10a-8b+4c$	$a+b-5c$	$5a-3b-c$	$4b-2a-8c$

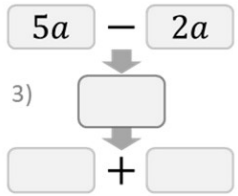
MAGIC Expression =

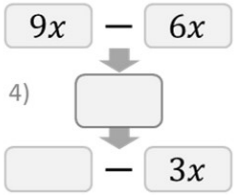
2

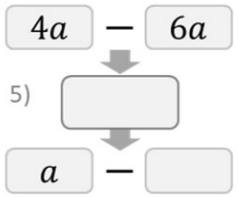
Group 'n' Split

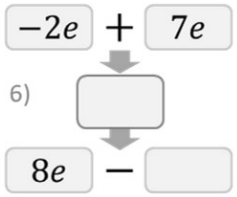


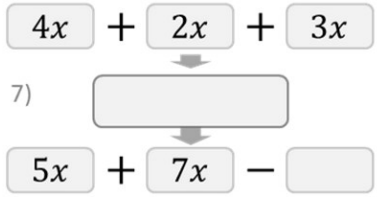


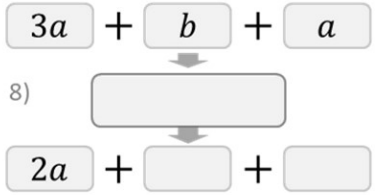


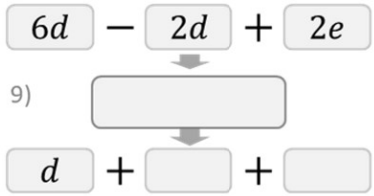


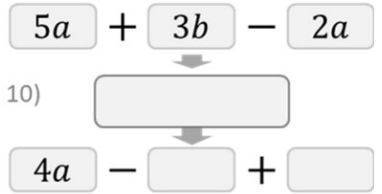


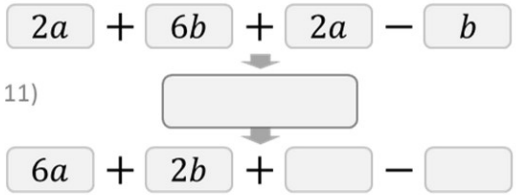


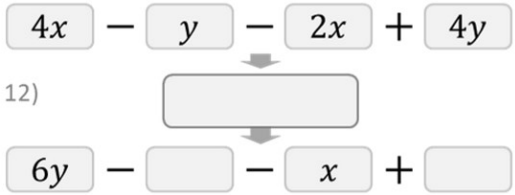


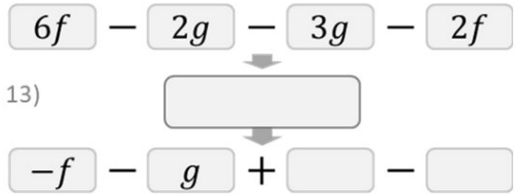


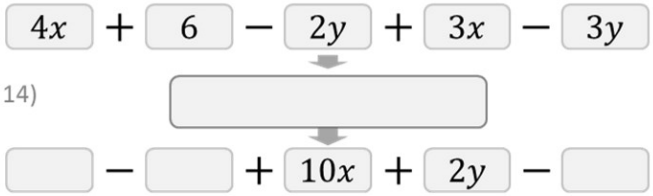


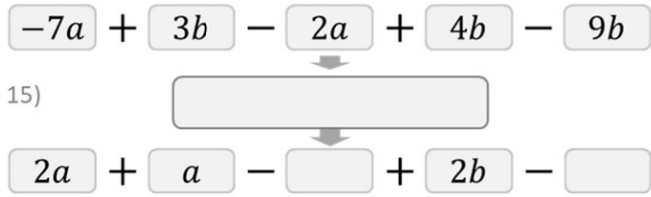












Fluency Practice

Group 'n' Split

16) $4a + 3b - a + 2b$ → ☐ + ☐ ; ☐ = a

17) $2x - 8x + 2y + 3x$ → ☐ + ☐ ; ☐ = $2x$

18) $7 + 6e - e + 2 - 4e$ → ☐ + ☐ ; ☐ = $-e$

19) $3g - 2h - 5g + 5h$ → ☐ + ☐ ; ☐ = $4g$

20) $2x - 5y - 3x + 6y$ → ☐ + ☐ ; ☐ = $2y + x$

21) $-2b + 3a + 4b - 3 - a$ → ☐ + ☐ ; ☐ = $a - 2$

22) $-4m + 5n - 4 - 2m - 3n + 2$ → ☐ + ☐ ; ☐ = $1 - 2m$

23) $6a - 4b + 4c - 9a - 2c + b$ → ☐ + ☐ ; ☐ = $-a - 2b$

24) $3a - 2c + b - c - 5a$ → ☐ + ☐ ; ☐ = $2a + c - 2b$

25) $6z - 4x + 2y - 2z + x - 4y$ → ☐ + ☐ ; ☐ = $x - 4y + z$

26) $-4k + 5i + 7j - 9i - 2j + 5k$ → ☐ + ☐ ; ☐ = $-2i - j - 4k$

27) $6x - 3y - z - 3x - (2x + 5y)$ → ☐ + ☐ ; ☐ = $5x + y - 7z$

28) $-2a + 4c - 4b + (7a - 2b) + 8 - 5a - (-4b) - c$ → ☐ + ☐ ; ☐ = $b - 3a - 4c - 3$

Problem Solving

(1) 5x	(2) 2x
(3) -3x	(4) -x
(5) 2y	(6) -3y
(7) y	(8) 4
(9) -7	(10)

Pupil task -

1. What do cards 1 and 2 make?
2. What do cards 3 and 4 make?
3. What do cards 1, 2, 3 and 4 make?
4. What do cards 1 and 8 make?
5. What do cards 1, 2 and 8 make?
6. What do cards 1 and make?
7. What do cards 1, 3 and 8 make?
8. What do cards 1, 4 and 9 make?
9. What do cards 2, 4, 7 and 9 make?
10. What do cards 1 and 7 make?
11. What do cards 1, 2, 7 and 6 make?
12. What do cards 3, 4, 5 and 6 make?
13. What do cards 5, 6, 7, 8 and 9 make?

Pupil task two

1. Which cards do I require to make x ?
2. Which cards do I require to make –2x?
3. Which cards do I require to make 0?
4. Which cards do I require to make 7x + 3y + 4 ?
5. Which cards do I require to make an expression with 3 negative terms?

Pupil task three

1. Lucy says it is possible to combine cards to make 3x + 3y + 3. Is she correct?
2. Fill in the blank card so that you can make Lucy's expression.
3. Now we have this extra card is it possible to combine cards to make

   i.) -x -2y -8 - if so, which cards do you need?

   ii.) -4x - 3y - 4 - if so, which cards do you need?

   iii.) - 3x + 4y - 9 - if so, which cards do you need?

Simplify by collecting like terms:	
(3)	$2x^2 + 4x + 5y - x^2 - 2x - 8y$
(4)	$3x + y - 8z + y - 5x + 2y + 2z$
(5)	$4 + 6x^2 + 8x - 3x^2 + 5 - 14x$
(6)	$-8y + 3x^2 + 7x - 8y - x^2 - 2x + 2x^2 + 3x + 4y$
(7)	$-3 - 4x - y + 9x + 11y - 12$
(8)	$2x^2 + 3xy - 12y^2 + 10yx + 3y^2 - xy - 9y^2 + 4x^2$
(9)	$-11y + 12xy + 10x - 4yx - 10y + 4x$
(10)	$15x^2 + 14x - 15y + 8 - 7x^2 + 10 + 2x - 2 + 6y + 16 - 15y$

Intelligent Practice

Explain what the following mean:

1) $3x$
2) $3b$
3) ab
4) ab^2
5) a^2b^2
6) a^2b
7) $5a^2$
8) $(5a)^2$
9) $(5ab)^2$
10) $(5ab)^3$
11) $5ab^3$
12) $5a^2b^3$
13) $(5a^2b)^3$
14) $(5a^2b^2)^3$
15) $(5ab^2)^3$
16) $(10ab^2)^3$

Fluency Practice

Note the order of operations when creating algebraic expressions!

$a \times b = ab$

$a + b = a + b$

Calculation	Algebraic Expression
$3 \times a$	
$4 + 3 \times a$	
$2 + 4 + 3 \times a$	
$2 + 4 + b \times a$	
$2 + 4 - b \times a$	
$a + 4 - b \times a$	
$a + c - b \times a$	
$a \times c - b \times a$	
$a \times c - 2 \times b \times a$	
$c - 2 \times b \times a$	
$c \times 2 \times b \times a$	
$2 \times a \times c \times b$	
$2 \times a \times c + b$	
$b + 2 \times a \times c + b$	
$b \times 2 \times a \times c + b$	
$b \times 2 + a \times c + b$	

Fluency Practice

Question 1: Simplify the following expressions.

(a) $3 \times y$ (b) $w \times 3$ (c) $7 \times x$ (d) $a \times 4$

(e) $a \times c$ (f) $f \times g$ (g) $h \times d$ (h) $a \times y \times m$

(i) $t \times t$ (j) $p \times p$ (k) $a \times a \times a$ (l) $m \times m \times m$

(m) $4 \times f \times g$ (n) $3 \times w \times y$ (o) $p \times 5 \times s$ (p) $n \times c \times 7$

(q) $t \times c \times w$ (r) $y \times x \times w$ (s) $5 \times a \times a$ (t) $y \times 3 \times y$

Question 2: Simplify the following expressions.

(a) $5 \times 3w$ (b) $4y \times 2$ (c) $3 \times 3m$ (d) $10g \times 3$

(e) $4 \times 2 \times y$ (f) $3 \times 2 \times 2p$ (g) $5 \times 2y \times 3$ (h) $9a \times 2 \times 2$

(i) $3a \times c$ (j) $4y \times z$ (k) $5c \times b$ (l) $c \times 6y$

(m) $2a \times 3y$ (n) $6c \times 3t$ (o) $9w \times 3a$ (p) $2y \times 2g$

(q) $2y \times y$ (r) $5w \times w$ (s) $m \times 3m$ (t) $x \times 2x$

(u) $4t \times 2t$ (v) $6y \times 3y$ (w) $9a \times 9a$ (x) $12y \times 10y$

(y) $2a \times 3p \times 5w$ (z) $10y \times 2p \times 3c \times m$

Question 3: Simplify the following expressions

(a) $a^2 \times a$ (b) $y \times y^2$ (c) $w^2 \times w^2$ (d) $m^2 \times m^3$

(e) $2t^2 \times t$ (f) $4m \times m^2$ (g) $g \times 2g^2$ (h) $p^2 \times 3p^2$

(i) $3p^2 \times 2p$ (j) $2v^2 \times 7v^2$ (k) $9p^2 \times 7p^2$ (l) $5w^2 \times 2w^3$

(m) $7a^3 \times 4a^3$ (n) $6c^4 \times 5c^3$ (o) $aw \times w$ (p) $r \times ry$

Purposeful Practice

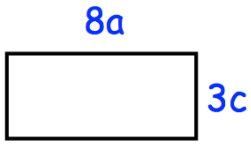
(q) $ay \times ay$ (r) $c^2f \times f$ (s) $dg \times d^2$ (t) $3x^2y \times 2x$

(u) $4ab \times 2ab$ (v) $3m^2n^2 \times 4mn$ (w) $2cd^2 \times d^2$ (x) $4a^2bc^2 \times a^3b$

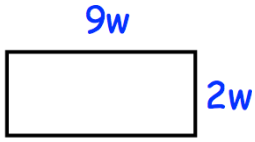
(y) $2ad^2e \times a^3c$ (z) $8m^2n \times 3no^5$

Apply

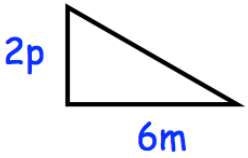
Question 1: Find an expression for the area of this rectangle



Question 2: Find an expression for the area of this rectangle

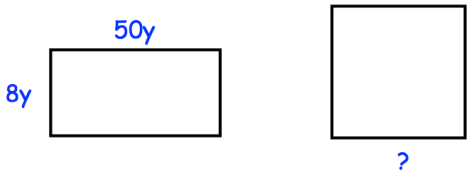


Question 3: Find an expression for the area of this triangle

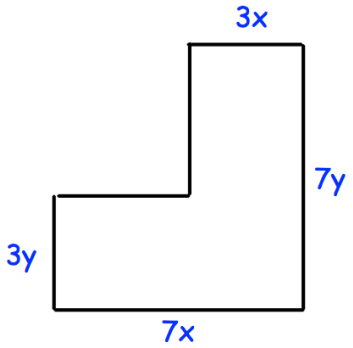


Question 4: The area of the rectangle and square are equal.
Find the side length of the square.

Not drawn to scale



Question 5: Find an expression for the area of this shape



Fluency Practice

×	$3a^2$	$2a$	ab
a^3			
ab^2			
$3ab$			

×	$3ab$	$(2a)^2$	$\frac{1}{3}bc^3$
c^2			
$3b^{-4}$			
6			

×		$(ab)^2$	ab^{-2}
$4ab^3$	$8a^3b^3$		
b^2c			
		$\frac{1}{2}a^2b^3$	

×	$(2a^2)^3$		abc^{-1}
$3ac$			
ab		$6ab$	
			$2ab^2c^{-3}$

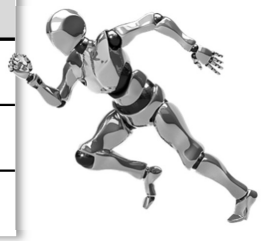
×	$3a^3$		
	a^4	2	$\frac{1}{3}a^2bc^3$
	$6ab$		$2a^{-1}b^2c^3$
$3abc^{-3}$		$18bc^{-3}$	$3a^2b^2$

×			$4ab$
$6a^{-1}b$			
$4a$	$2a^2b$	$8a^3b$	
			$2a^3$

1 Multiplication **GRIDZ**

A

×	2	4	x	y
x				
	6	12		
y			xy	



B

×	4	y	$2x$	$3y$	
5	20		$10x$		
	$12x$	$3xy$			
$2y$					$2xy$
x					

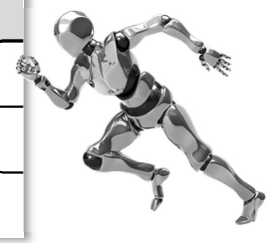
C

×	$3x$	4		y	$4x$		$5y$
$3y$						$3y^3$	
x			x^3				
$2y$							
		$8x$					
					$4xy$		

1 Multiplication **GRIDZ**

A

×	2	4	x	y
x				
	6	12		
y			xy	



B

×	4	y	$2x$	$3y$	
5	20		$10x$		
	$12x$	$3xy$			
$2y$					$2xy$
x					

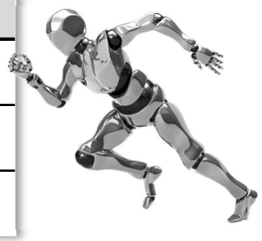
C

×	$3x$	4		y	$4x$		$5y$
$3y$						$3y^3$	
x			x^3				
$2y$							
		$8x$					
					$4xy$		

2 Multiplication GRIDZ

A

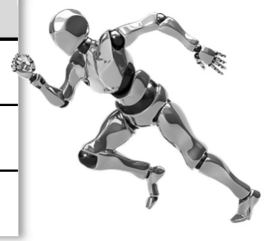
×	$3t$		$5df$	$2t$
	$9dt$	$6d^2$		
				$2t^2$
	$12ft$			



2 Multiplication GRIDZ

A

×	$3t$		$5df$	$2t$
	$9dt$	$6d^2$		
				$2t^2$
	$12ft$			



B

×	$2ce$	$5e^2$	$4cd$		
			$4cd^3$		
$3e$				$9c^2e$	
	$4c^2e$				
$3d^2$					$3d^2e$

B

×	$2ce$	$5e^2$	$4cd$		
			$4cd^3$		
$3e$				$9c^2e$	
	$4c^2e$				
$3d^2$					$3d^2e$

C

×			$2x^2z^2$		$4y$	$3yz^2$	
xyz							
$2x^2y$	$6x^3y^2$			$8x^4y^2$			x^2yz
	$12x^2y^3$						
			$6x^3z^4$				
		$4y^3z$			$8y^2z$		

C

×			$2x^2z^2$		$4y$	$3yz^2$	
xyz							
$2x^2y$	$6x^3y^2$			$8x^4y^2$			x^2yz
	$12x^2y^3$						
			$6x^3z^4$				
		$4y^3z$			$8y^2z$		

Fluency Practice

Algebraic Splits

1) $3x \times 4 \rightarrow 12x \rightarrow \_ \times 2$

2) $3b \times 2a \rightarrow \_ \rightarrow 6a \times \_$

3) $8y \times y \rightarrow \_ \rightarrow \_ \times 2y$

4) $4x^2 \times 3x \rightarrow \_ \rightarrow x^2 \times \_$

5) $4a \times ab \rightarrow \_ \rightarrow \_ \times 2b$

6) $xy \times xy \rightarrow \_ \rightarrow y \times \_$

7) $ab \times \_ \rightarrow \_ \rightarrow 5b \times a^3$

8) $2x^2 \times 3y^2 \rightarrow \_ \rightarrow 3x \times \_$

9) $\_ \times a^2 \rightarrow \_ \rightarrow 3a^2b \times 4ab$

10) $4a \times abc^2 \rightarrow \_ \rightarrow \_ \times 2bc$

11) $3xyz^2 \times \_ \rightarrow \_ \rightarrow 2y^3z \times 3xz$

12) $8rs^2 \times \_ \rightarrow \_ \rightarrow 6rs^3t \times 4rst^2$

Fluency Practice

Algebraic Ladders

1) $2x^2$ → $\square \times 2$ → $\square \times \square$

2) $6y^2$ → $\square \times 2$ → $\square \times y^2$

3) $6a^2$ → $\square \times a$ → $\square \times 3$

4) $8b^2$ → $\square \times \square$ → $2 \times b$

5) $4c^3$ → $2 \times \square$ → $c^2 \times \square$

6) $15d^2e$ → $3 \times \square$ → $\square \times \square$ → $d \times d$

7) $16fg^2$ → $\square \times 4g^2$ → $2g \times \square$

8) $8h^2i$ → $2h \times \square$ → $\square \times \square$ → $2 \times i$

9) $9j^2k^2$ → $3j \times \square$ → $\square \times \square$ → $j \times k$

10) $12l^3m$ → $\square \times 3l$ → $lm \times \square$ → $\square \times 2$

11) $20n^3p^2$ → $\square \times 2n$ → $\square \times \square$ → $2n \times p$

12) $24q^2r^4$ → $\square \times 3qr^2$ → $4r \times \square$ → $\square \times 4r$

13) $18s^3tu^2$ → $\square \times 3stu$

14) $30v^3w^4x^3$ → $5vw^2x^2 \times \square$

Fluency Practice

Algebraic Ladders

1) $2x^2$ → [ ] × [ ] → [x] × [x] and [x] × [x]

2) $6y^2$ → [ ] × [ ] → [3] × [y^2] and [3] × [y^2]

3) $6a^2$ → [ ] × [ ] → [$2a$] × [3] and [$2a$] × [3]

4) $8b^2$ → [ ] × [ ] → [2] × [b] and [2] × [b]

5) $4c^3$ → [ ] × [ ] → [c^2] × [$2c$] and [c^2] × [$2c$]

6) $15d^2e$ → [3] × [ ] → [d] × [d] and [d] × [d]

7) $16fg^2$ → [ ] × [ ] → [$2g$] × [$2g$] and [$2g$] × [$2g$]

8) $8h^2i$ → [$2h$] × [ ] → [2] × [i] and [2] × [i]

9) $9j^2k^2$ → [$3j$] × [ ] → [j] × [k] and [j] × [k]

10) $12l^3m$ → [ ] × [$3l$] → [ ] × [$2l$] and [$2l$] × [2]

11) $20n^3p^2$ → [ ] × [$2n$] → [$5np$] × [ ] → [ ] × [p] and [ ] × [p]

12) $24q^2r^4$ → [ ] × [$3qr^2$] → [ ] × [ ] → [$0.5q$] × [$4r$] and [$0.5q$] × [$4r$]

13) [ ] → [$6s^2u$] × [$3stu$] and [$6s^2u$] × [$3stu$]

14) $30v^3w^4x^3$ → [ ] × [$6v^2w^2x$] and [ ] × [$6v^2w^2x$]

ALL Product Pair Possibilities!

Each expression is the product of two terms.
Complete each pair of terms.

$2ab$

$2a$	×	
a	×	
	×	2

$4ab$

2	×	
	×	$4b$
4	×	
	×	$4a$
$2a$	×	

$6ab$

	×	2
$3a$	×	
ab	×	
	×	a
$2a$	×	
$2ab$	×	
	×	

$2a^2$

2	×	
	×	a

$9a^2$

3	×	
$9a$	×	
9	×	
	×	

$8a^2$

$4a^2$	×	
4	×	
	×	$4a$
	×	a
	×	

$3a^2b$

3	×	
	×	a^2
	×	b
$3a$	×	
	×	

a^2b^2

a	×	
a^2b	×	
	×	b^2
	×	

$3a^3b$

	×	a^3b
	×	$3ab$
$3a^2$	×	
a	×	
	×	b
$3a$	×	
	×	

$8a^2b^2$

	×	a^2b^2	$8a$	×			×	a^2b
$8a^2$	×			×	$2a^2$		×	$2a^2b^2$
$4b$	×			×	$2ab^2$	$2a$	×	
	×	b	$2b$	×			×	$2b$
$4a^2$	×		2	×		$8b^2$	×	
	×	$4b^2$	$2a^2b$	×			×	

ALL Product Pair Possibilities!

If each expression is the product of two terms, find *every possible* product pair!

$2ab$

$2a \times b$

$4ab$

$2 \times 2ab$

$6ab$

$2a^2$

$8a^2$

$9a^2$

$3a^2b$

a^2b^2

$3a^3b$

$8a^2b^2$

Fluency Practice

Question 1: Simplify the following expressions.

(a) $12x \div 2$ (b) $9y \div 3$ (c) $15a \div 5$ (d) $28c \div 7$

(e) $8m \div 2m$ (f) $10c \div 2c$ (g) $18d \div 3d$ (h) $35m \div 5m$

(i) $5ac \div a$ (j) $6xy \div y$ (k) $7mn \div n$ (l) $20ab \div 2a$

(m) $25xy \div 5y$ (n) $80gh \div 10h$ (o) $27xy \div 3xy$ (p) $32abc \div 8ac$

Question 2: Simplify the following expressions.

(a) $\frac{14c}{2}$ (b) $\frac{56w}{7}$ (c) $\frac{45a}{9a}$ (d) $\frac{105y}{5y}$

(e) $\frac{mw}{m}$ (f) $\frac{8cf}{c}$ (g) $\frac{15xy}{3x}$ (h) $\frac{70ab}{2a}$

(i) $\frac{30ef}{6ef}$ (j) $\frac{20cde}{5cde}$ (k) $\frac{42ghk}{6gh}$

Question 3: Simplify the following expressions.

(a) $h^2 \div h$ (b) $x^3 \div x$ (c) $7y^2 \div y$ (d) $40m^2 \div 2m$

(e) $16c^2 \div 4c$ (f) $20g^2 \div g^2$ (g) $45x^3 \div x$ (h) $30t^3 \div 3t$

(i) $9h^3 \div 3h^2$ (j) $10x^3 \div 5x^3$ (k) $24m^2 \div 3$

Question 4: Simplify the following expressions.

(a) $\frac{g^2}{g}$ (b) $\frac{w^3}{w}$ (c) $\frac{3a^2}{a}$ (d) $\frac{24e^2}{3e}$

(e) $\frac{35c^3}{7c^2}$ (f) $\frac{52c^3}{13c}$ (g) $\frac{100w^3}{10w^3}$

Purposeful Practice

Question 5: Simplify the following expressions

(a) $a^2b^2 \div ab$ (b) $xy^2 \div x$ (c) $4ab^3 \div 2ab^2$ (d) $25c^2d^2 \div 5cd$

(e) $16x^4y^3 \div 4x^2y^2$ (f) $10c^3de^2 \div 2cde$ (g) $15abc^4 \div bc^3$ (h) $24d^3e^9f \div 8d^3f$

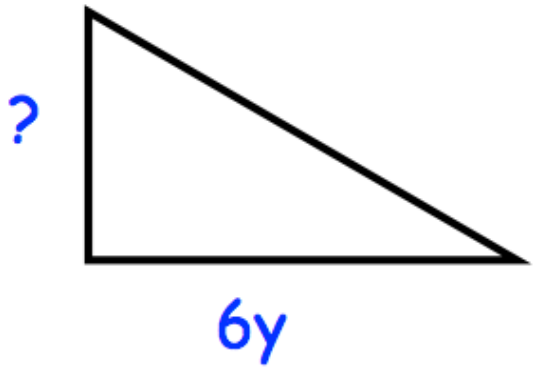
Question 6: Simplify the following expressions.

(a) $\dfrac{a^3c^3}{ac}$ (b) $\dfrac{10a^4c^3}{2ac^2}$ (c) $\dfrac{9abc^3}{3ac^2}$ (d) $\dfrac{45a^5b^8c^4}{3a^3b^4c}$

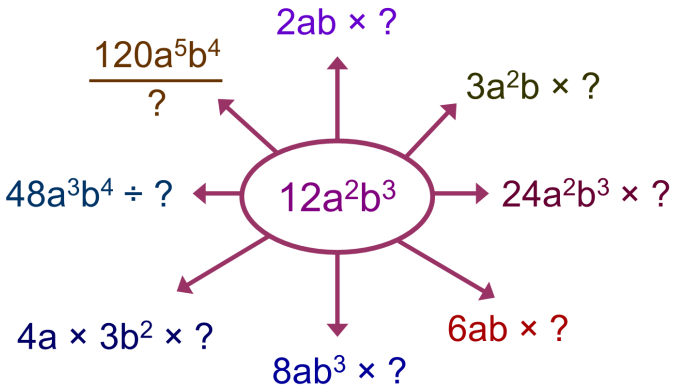
Apply

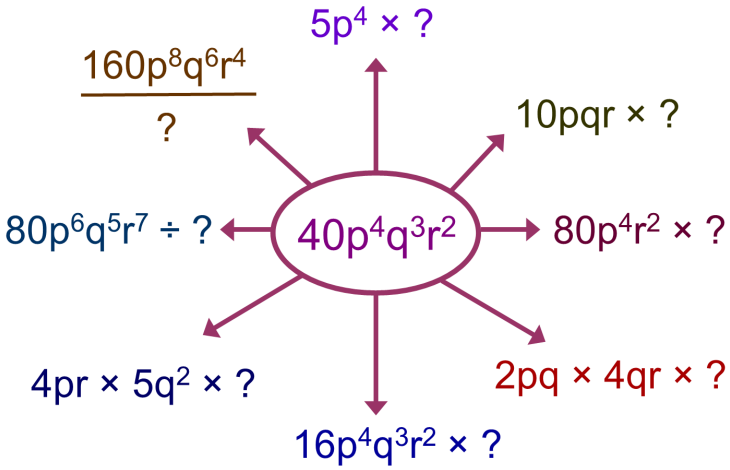
Question 1: The area of the rectangle shown below is $18cd$
Find an expression for the length of the longest side.

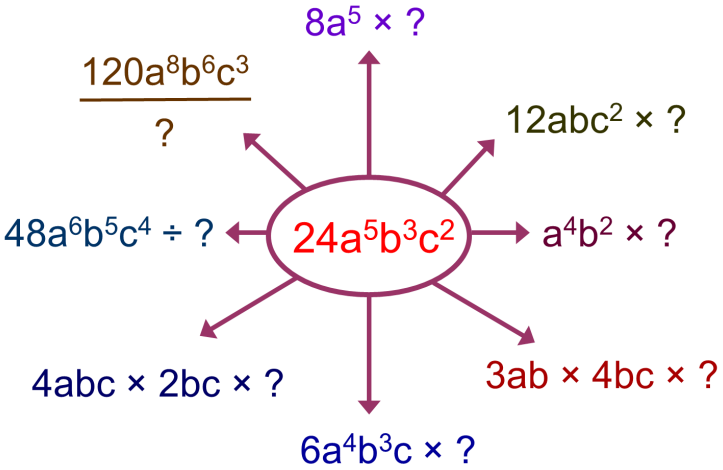
Question 2: The area of the triangle shown below is $12y^2$
Find an expression for the height of the triangle.



Purposeful Practice







Purposeful Practice

Simplify:

(a) $5 \times a$

(b) $8 \times x$

(c) $-2 \times b$

(d) $6 \times ab$

(e) $3 \times y^2$

(f) $2 \times 3b$

(g) $3 \times 5x$

(h) $-5 \times 3y$

(i) $6 \times 4ab$

(j) $7 \times 4x^2$

Simplify:

(a) $\frac{18a}{6}$

(b) $\frac{16b}{4}$

(c) $\frac{24x}{12}$

(d) $\frac{6y}{2}$

(e) $\frac{15ab}{3}$

(f) $\frac{-8a}{4}$

(g) $\frac{25x^2}{5}$

(h) $\frac{7.5xy}{2.5}$

Simplify:

(a) $6a \times b \times 2c$

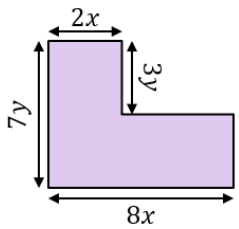
(b) $-3x \times 4 \times 2y$

(c) $-4d \times -7e \times f$

(d) $2.5u \times -2v \times 6w$

(a) A rectangle has a length of $2x$ cm and a width of $5y$ cm. Find a simplified expression for the area of the rectangle.

(b) Find a simplified expression for the area of this compound shape.



Simplifying Expressions					
Simplify $4x + 2x - x$	Simplify $2 \times d$	Simplify $\frac{10a}{5}$	Simplify $a \times 2b$	Simplify $2k - 5k$	Simplify $(xy)^2$
Simplify $\frac{30a^3}{6a}$	Simplify $3x + y - 2x + 4y$	Simplify $4c \times 2d$	Simplify $a \times a \times a$	Simplify $(2a)^3$	Simplify $9x + 7y - 2x - 8y$
Simplify $\frac{40x^5y^2}{5x^2y}$	Simplify $a^2 \times a^3$	Simplify $7a + 5b - 2a - 2b$	Simplify $4x^2y \times 3x^2$	Simplify $3x + x^2 + 4x - x^2$	Simplify $2x \times x^2$
Simplify $7 + x - 3 + 4x$	Simplify $(3b^2)^3$	Simplify $3x^2 \times 4x$	Simplify $6x^2 - 8x^2 + 3x^2$	Simplify $(2xy)^4$	Simplify $5 \times d \times d \times d$
Simplify $5ab \times 3a^4b$	Simplify $2a + 6b - a - b$	Simplify $(2ab^2)^3$	Simplify $3a \times 7b$	Simplify $\frac{8a^2}{16ab}$	Simplify $3a^3b \times 5bc \times 2ac^2$

Fluency Practice

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) fgh (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

Purposeful Practice

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.

Apply

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

Hire Cost = 30 x 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?

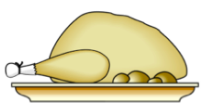
Question 2: The cost of photocopying is given as:

Cost in pence = 3 x number of black & white pages + 15 x 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

Time = 40 minutes per kilogram plus 20 minutes



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

Purposeful Practice

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

Weekly pay = basic pay + number of houses rented x 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.

Question 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.

Problem Solving

What's z?

start here 

Use the clues to work out the value of z.

Write down the values of the letters as you go.

$a + 6 = -2$

$b = a + 2$

$b - 1 = c$

$d = a - c$

$d + -3 = e$

$e - 5 = F$

$G = F + e$

$H = G + G$

$H - -4 = I$

$I - 6 = J$

$J - e = k$

$L = k + 10$

$-4 + L = M$

$n + 8 = M$

$o = n + -3$

$o + p = 0$

$q = p - a$

$q - -8 = r$

$r - H = S$

$100 - t = S$

$U = t + -8$

$U - t = V$

$V - 6 = W$

$W - J = X$

$Y = -X$

$-4 + Y = Z$

Substitution Code Breaker!

Substitute the number **6** into each of these expressions.
The value of the expression will then give you a letter in the code box.
Write the letter in the box. They spell a secret message – can you crack it?

a. $2n + 4$ gives ..16.. **T**

b. $3n - 5$ gives ……..

c. $16 – 2n$ gives ……..

d. $n^2 - 10$ gives ……..

e. $n \div 2$ gives ……..

f. $4n \div 2$ gives ……..

g. $3(2n - 4)$ gives ……..

h. $3n + 8$ gives ……..

i. $\frac{6n}{4}$ gives ……..

j. $20 - n$ gives ……..

k. $(n+1)(n-2)$ gives ……..

l. $4n + 4$ gives ……..

m. $20 – n - 1$ gives ……..

n. $n - 2$ gives ……..

o. $\frac{6n + 4}{2}$ gives ……..

p. $n^2 - 12$ gives ……..

q. $2(n + 3)$ gives ……..

r. $4n$ gives ……..

s $\frac{9n + 2}{2}$ gives ……..

t. $n - 1$ gives ……..

Code Box

1 = J	8 = A	15 = Z	22 = C
2 = B	9 = N	16 = T	23 = U
3 = K	10 = D	17 = X	24 = I
4 = E	11 = F	18 = M	25 = W
5 = !	12 = Y	19 = Y	26 = S
6 = G	13 = H	20 = L	27 = P
7 = ?	14 = O	21 = Q	28 = T

Negative Numbers Substitution Code Breaker!

Substitute the number **-2** into each of these expressions.
The value of the expression will then give you a letter in the code box.
Write it in the yellow box. The letters spell a secret message – can you crack it?

a. $2n + 4$ gives ..... **O** | **S**

b. $3n + 5$ gives .....

c. $15 - 2n$ gives .....

d. $n^2 - 10$ gives .....

e. $1 - 9n$ gives .....

f. $3n - 1$ gives .....

g. $3(2n + 3)$ gives .....

h. $3n + 8$ gives .....

i. $n + 2$ gives .....

j. $\frac{6n}{3}$ gives .....

k. $n(n+1)$ gives .....

l. $4n + 1$ gives .....

m. $-5n$ gives .....

n. $21 + n$ gives .....

o. $\frac{6n + 4}{4}$ gives .....

p. $n^2 - 10$ gives .....

q. $3(n + 1)$ gives .....

r. $n^2 - 4$ gives .....

s. $\frac{8 - 15n}{2}$ gives .....

t. $-5 + n$ gives .....

u. $(n+3)(n+3)$ gives .....

Code Box

-8 = K	-1 = K	6 = J	13 = B
-7 = T	0 = S	7 = P	14 = A
-6 = L	1 = !	8 = F	15 = ?
-5 = U	2 = N	9 = Q	16 = U
-4 = I	3 = X	10 = H	17 = R
-3 = O	4 = D	11 = Z	18 = W
-2 = C	5 = Y	12 = M	19 = E

Fluency Practice

substitute a value of n = 4 into these expressions:

(1) $2(2n - 1) =$

(2) $4n - 2 =$

(3) $5(2n - 6) =$

(4) $10(n - 3) =$

(5) $\frac{2n + 4}{6} =$

(6) $\frac{n + 2}{3} =$

(7) $\frac{n + 8}{2} =$

(8) $\frac{1}{2}n + 4 =$

(9) $n^2 - 1 =$

(10) $(n - 1)(n + 1) =$

(11) $10\left(\frac{2n + 12}{4}\right) =$

(12) $5(n + 6) =$

(13) $(n + 1)^2 - 2n =$

(14) $n^2 + 1 =$

(15) $\frac{1}{4}n - 2 =$

(16) $\frac{3(n - 5) - 9}{12} =$

Purposeful Practice

$\frac{1}{2}a + b$	$a^2 - b$	$b - a$
$2a - 3b$	a = -4 b = 3	$3a^2$
$b - 3a^2$	$3(b + a)$	$\frac{a - b}{2}$

a^3	$(2a)^3$	$(b + a)^2$
$b - (b - a)$	a = -5 b = -2	$ab + ba + 2$
$\frac{2b - 3a - 1}{ab^2}$	$\frac{1}{2}ab$	$\sqrt{10ab}$

think!

1. If a = -9, what is the problem with calculating $\sqrt{a}$?
2. If $a^2 = 9$, what are the two possible values of a?
3. If a = -3, what is the difference between $\frac{1}{3}a$ and $\frac{a}{3}$?
4. If a = -2, why is $3a^2$ not equal to 36?

challenge

If a = -2, b = 3 & c = -1, calculate:

$$\sqrt[3]{\frac{b - 2(c - a)}{abc^2 + (b - a)}}$$

Purposeful Practice

$\left(\frac{1}{3}a\right)^2$	$\sqrt[3]{ab - b^2}$	$b^2 - b$
$\left(\frac{ab}{9}\right)^2$	a = 6 b = -3	$\frac{1}{2}ab^3$
$b - 2(b-a)$	$-2(b+a)^2$	$\sqrt{\frac{2a}{b+6}}$

$\frac{1}{2}a^2$	$2b - 3a$	$\sqrt{\frac{3a}{2b}}$
$\frac{ab^2}{3}$	a = -2 b = -3	$\sqrt[3]{ab - a}$
$\left(\frac{2ab}{3}\right)^2$	$b^2 - a(b-a)$	$\frac{1}{4}a^2b$

think!

1. Why is it possible to cube root -64, but not square root it?

2. What happens if we substitute 2 into $\frac{1}{x-2}$?

3. If a = -3, why is 5 – a equal to 8?

4. If a = -4 and b = -3, why is 10 – (a - b) equal to 11?

challenge

If a = -2, b = 3 &
c = -1, calculate:

$$\sqrt[4]{(b-a)\left(\frac{ab^2c}{b+3}\right)+1}$$

www.MathsPad.co.uk

Fluency Practice

Evaluate each expression using the values, a = -3 and b = -1.

1 a^2	2 $2b^2$	3 b^3	4 $(-b)^3$
5 $a+b$	6 $a-b$	7 $-a-b$	8 ab
9 a^2+b^2	A a^2-b^2	B a^3+b^3	C a^3-b^3
D $2a^2+b$	E $2a^2-b$	F $2a^2-2b$	G $2a^2-2b^2$
H $2a^2-2b^3$	I $2b^3-2a^3$	J $2(a+b)$	K $2(a-b)$
L $3(b-a)$	M $a(a-b)$	N $b(b-a)$	O $b(a-2b)$
P $a^2(a+b^2)$	Q $b^2(a^2-b)$	R $(a+b)^2$	S $(a-b)^2$
T $(2a-b)^2$	U $(a-b)^3$	V $a(a+b)^2$	W $(2a^2-2b)^2$
X $\frac{a}{b}$	Y $\frac{a+b}{b}$	Z $\frac{a-b}{b}$	α $\frac{a+b}{a-b}$
β $\frac{a^2+b}{a-b}$	γ $\frac{a^2+b}{(a-b)^2}$	Δ $\frac{2(a+b)}{2(a+b)^2}$	ϵ $\frac{2(b-a)}{2(a-b)^2}$

Fluency Practice

Given that $a = 5$, find the values of:

(a) $a + 6$ (b) $a - 3$

(c) $3a$ (d) $5a - 2$

(e) $\frac{a}{5}$ (f) a^2

(g) $3a - 1$ (h) $a^2 + 10$

(i) $10 - a$ (j) $50 - a^2$

Given that $b = -3$, find the values of:

(a) $b + 8$ (b) $b - 1$

(c) $4b$ (d) $4b - 3$

(e) $\frac{b}{3}$ (f) b^2

(g) $2b + 2$ (h) $b^2 + 1$

(i) $10 - b$ (j) $20 - b^2$

Given that $a = 10, b = 2$ and $c = 7$, find the value of:

(a) $a + b$ (b) $c - b$

(c) $2c + b$ (d) $a + b - c$

(e) $5 + 3b$ (f) $100 - 4a$

(g) $a + b^2$ (h) $a^2 + 2b$

(i) $\frac{a^2}{20}$ (j) $\frac{a+b}{3}$

Given that $a = 8, b = -3$ and $c = 4$, create an expression that will give a value of:

(a) 20 (b) 18

(c) 25 (d) 16

(e) 28 (f) -4

Fluency Practice

Using the formula $A = L \times W$, find the value of A when:

(a) $L = 10$ and $W = 6$

(b) $L = 2.5$ and $W = 8$

(c) $L = 3.5$ and $W = 4$

Using the formula $s = \frac{d}{t}$, find the value of s when:

(a) $d = 10$ and $t = 2$

(b) $d = 450$ and $t = 9$

(c) $d = 20$ and $t = 2.5$

Using the formula $A = \frac{b \times h}{2}$, find the value of A when:

(a) $b = 10$ and $h = 12$

(b) $b = 5$ and $h = 7$

(c) $b = 2.5$ and $h = 10$

Using the formula $V = L \times W \times H$, find the value of V when:

(a) $L = 10, W = 5$ and $H = 2$

(b) $L = 8, W = 6$ and $H = 4$

(c) $L = 3, W = 4$ and $H = 2.5$

Using the formula $F = m \times a$, find the value of V when:

(a) $m = 4$ and $a = -6$

(b) $m = 7.5$, and $a = -10$

Using the formula $E = \frac{m \times v^2}{2}$, find the value of E when:

(a) $m = 5$ and $v = 2$

(b) $m = 20$, and $v = 4$

A1 $a=3, b=2, c=5$ Evaluate $3a+bc$	**A2** $d=7, e=4, f=13$ Evaluate $e(f-d)$	**A3** $x=5, y=3, z=6$ Evaluate $x^2-\frac{y}{z}$	**A4** $m=10, t=2$ Given that $G=\frac{m}{t^2-1}$ Find G
B1 $a=2, b=6, c=-3$ Evaluate $ab+2c$	**B2** $e=-1, f=4$ Evaluate $7(f-e)$	**B3** $p=-3, q=2, r=7$ Evaluate $p^2+2q-pr$	**B4** $p=2, q=8, r=-7$ Given that $t=pq+r$ Find t
C1 $a=-3, b=5, c=-2$ Evaluate a^2-bc	**C2** $a=3, b=-4, c=-1$ Evaluate $ab+bc-ac$	**C3** $p=-5, q=-4$ Evaluate $pq-\frac{p}{q}$	**C4** $a=-3, b=-8, c=-5$ Given that $M=a^2+\sqrt{\frac{4b-c}{a}}$ Find M
D1 $s=-2, t=11$ Given that $H=\frac{(t-3)^2}{s^3+20}$ Find H	**D2** $a=-7, d=4, n=21$ Given that $S=\frac{n}{2}[2a+(n-1)d]$ Find S	**D3** $a=-10, u=35, t=3$ Given that $s=ut+\frac{1}{2}at^2$ Find s	**D4** $a=-3, b=7, c=-2$ Given that $x=\frac{-b-\sqrt{b^2-4ac}}{2a}$ Find x

Substitution into Expressions and Formulae			
In this column: $a = 3, b = 7$ and $c = 2$	In this column: $d = 4, e = -2$ and $f = 9$	In this column: $u = 5, a = -10, t = 2.5$	In this column: $h = 6, w = 3.5$ and $l = 20$
Find $a^2 + b - c$	Find $2d^2 - f$	Find $u^2 - at$	Find A, where $A = l \times w$
Find $ab + 2c$	Find $d(f - e)$	Find $\frac{\sqrt{2a^2 + u^2}}{t}$	Find P, where $P = 2l + 2w$
Find $\frac{ab + bc}{c}$	Find $e^2 + df$	Find v, where $v = u + at$	Find V, where $V = l \times w \times h$
Find $\frac{-b + \sqrt{b^2 - 4ac}}{2a}$	Find $de - \frac{f}{e}$	Find s, where $s = ut + \frac{1}{2}at^2$	Find V, where $V = \frac{1}{3}w^2h$

50 to 100!

$a = 1$ $b = 2$ $c = 3$
$d = 4$ $e = 5$

Use the variables to form expressions that equal each number.
You can only use each variable **once**.

50 = _____
51 = _____
52 = _____
53 = _____
54 = _____
55 = _____
56 = _____
57 = _____
58 = _____
59 = _____
60 = cde
61 = _____
62 = _____
63 = _____
64 = _____
65 = _____
66 = _____
67 = _____
68 = _____
69 = _____
70 = _____
71 = _____
72 = _____
73 = _____
74 = _____

75 = _____
76 = _____
77 = _____
78 = _____
79 = _____
80 = _____
81 = _____
82 = _____
83 = _____
84 = _____
85 = _____
86 = _____
87 = _____
88 = _____
89 = _____
90 = _____
91 = _____
92 = _____
93 = _____
94 = _____
95 = _____
96 = _____
97 = _____
98 = _____
99 = _____

100: _____

WHAT ARE YOUR VALUES?

For each expression,
find **positive integer values** for the **variables** that make it **true**.

Is only one set of values possible?

1

$a =$
$b =$

$a + b = 7$

2

$x =$
$y =$

$2x + y = 16$

3

$T =$
$w =$

$3T - w = 9$

4

$c =$
$d =$

$4c + 2d = 48$

5

$e =$
$k =$

$3k - 5e = 19$

6

$Q =$
$S =$

$2Q - \frac{S}{2} = 3$

7

$b =$
$X =$

$12 - 3X + 2b = 15$

8

$e =$
$t =$

$3(2e - t) = 27$

9

$a =$
$b =$
$c =$

$3a - b + 4c = 20$

10

$q =$
$r =$

$\frac{2r - 3q}{5} = 2$

11

$e =$
$f =$
$g =$

$\frac{5e - 2f}{2g} = 6$

WHAT ARE YOUR VALUES?

For each expression,
find **integer values** for the **variables** that make it **true**.

Some variables **must** be negative (see the minus sign).

Is only one set of values possible?

1

$a =$
$b =$

$$a + b = 12$$

2

$x =$
$y =$

$$2x + 3y = 17$$

3

$T =$
$w = -$

$$2T + 2w = 6$$

4

$e =$
$k =$

$$5k - 3e = 19$$

5

$Q =$
$S =$

$$\frac{2S + 5Q}{4} = 7$$

6

$b =$
$X = -$

$$12 - 3b + 2X = 0$$

7

$e =$
$t =$

$$4(t + 2e) = 28$$

8

$c =$
$d = -$

$$c - d = 14$$

9

$x =$
$y =$
$z =$

$$3y - 3x + z = 11$$

10

$a =$
$b =$
$c = -$

$$3a - b - 2c = 8$$

WHAT ARE YOUR VALUES?

For each expression,
find **integer values** for the **variables** that make it **true**.

The second variable **must** be negative.

Is only one set of values possible?

1

$a =$
$b = -$ $\qquad a + b = 8$

2

$x =$
$y = -$ $\qquad 3x + y = 12$

3

$T =$
$w = -$ $\qquad 3T + 2w = 10$

4

$c =$
$d = -$ $\qquad 4c - d = 33$

5

$e =$
$k = -$ $\qquad 3e - 2k = 19$

6

$Q =$
$S = -$ $\qquad 2S + \frac{Q}{2} = 0$

7

$b =$
$X = -$ $\qquad 20 - 3X + 2b = 37$

8

$e =$
$t = -$ $\qquad 3(2t + e) = 12$

9

$a =$
$b = -$ $\qquad 2a - 2b + 3c = 33$
$c =$

10

$q =$
$r = -$ $\qquad \frac{r - 3q}{2} = -4$

11

$e =$
$f = -$ $\qquad \frac{e - 2f}{g} = 3$
$g =$

Problem Solving

what values of ‘a’ and ‘b’ make the three expressions equal?

1) $3a + 5$ $4(b + 1)$ $8a – 5b$

2) $a + 3b + 2$ $2a + b$ $a + b + 10$

3) $5b – 3a$ $2b + 5a$ $11a – b + 6$

what values of ‘a’ and ‘b’ make the three expressions equal?

1) $a^2 + b^2$ $2(4b – a)$ $2(ab + 2)$

2) $2a^2 + b + 4$ $9a + ½b$ $ab + 2$

3) $b^2 – a^2$ $3(b + a)$ $7(b – a)$

If $x = 5$ and $y = (-1)$

1. Put the following in order from smallest to biggest.

$2x + 10$	$15 + y$	$2y + 3x$
$x^2 - 10$	$6y + 4x$	$5y + 3x$

2. Come up with an expression that would be 3rd in the order.

3. Come up with new values of x and y that would change the order of the cards.

Come up with your own expressions on these cards using x, and/or y.

If $x = 2$ and $y = 3$ put them in ascending order.

Change one thing only about one of the expressions so that this expression now has the biggest value.

Change one thing only about another of the expressions so that it has the second smallest value.

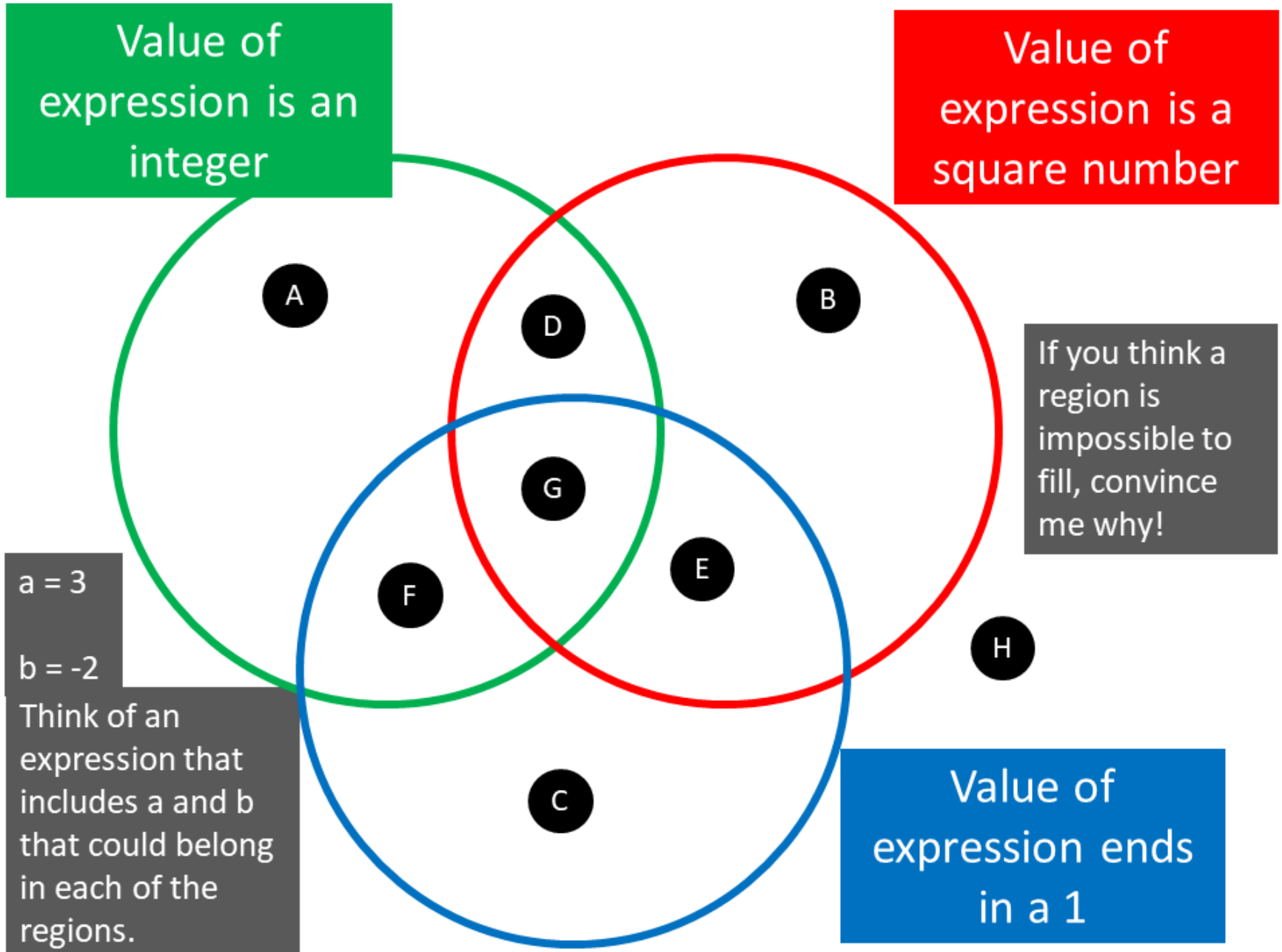
Challenge. Come up with 6 expressions so that your mean average of the values is between 8 and 10.

Instructions: Complete the remaining boxes with different values of *x* by making the minimum change possible to the centre box. If there are boxes that cannot be filled in, say why.

Value of the expression

Value of *x*

	Less	Same	More
More	$3x + 2y$ $x =\quad, y =$	$3x + 2y$ $x =\quad, y =$	$3x + 2y$ $x =\quad, y =$
Same	$3x + 2y$ $x =\quad, y =$	$3x + 2y$ $x = 3, y = 2$	$3x + 2y$ $x =\quad, y =$
Less	$3x + 2y$ $x =\quad, y =$	$3x + 2y$ $x =\quad, y =$	$3x + 2y$ $x =\quad, y =$

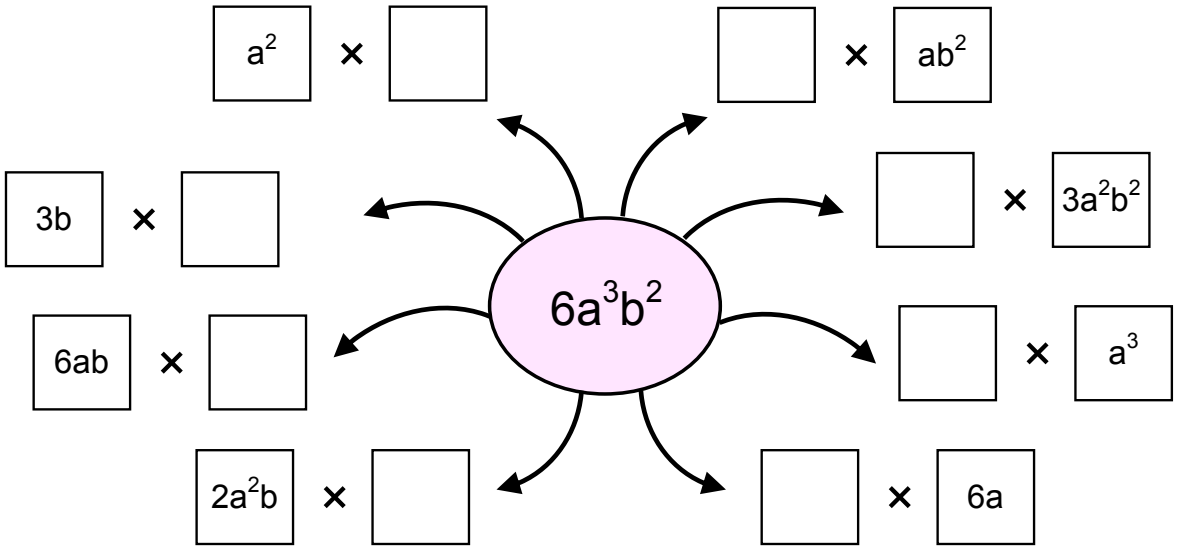

Value of expression is an integer
Value of expression is a square number
Value of expression ends in a 1
A
B
C
D
E
F
G
H
If you think a region is impossible to fill, convince me why!
a = 3
b = -2
Think of an expression that includes a and b that could belong in each of the regions.

Problem Solving

Complete the missing parts of each of these calculations:

a^3	×	ab	=	$6ab$	÷	2	=
$2a$	×	$3ab$	=	a^2b	÷	a^2	=
x^2y	×		= $2x^2y^3$	ab^3	÷	ab	=
$3d^4$	×		= $6a^2d^5$	$4a^2b$	÷		= $2a^2$

Show 8 different ways of multiplying to make $6a^3b^2$:



Simplify these divisions:

$\frac{2ab}{b} =$	$\frac{ab^3}{ab} =$	$\frac{12a^3b^3}{3ab^2} =$
$\frac{6a^2b}{3a} =$	$\frac{9a^2b^3}{3ab^2} =$	$\frac{7a^2b}{7b} =$
$\frac{10a^3b}{2a^2} =$	$\frac{8ab^5}{2b^2} =$	$\frac{2a^2 \times 3b}{6a} =$

Simplifying Expressions					
Simplify $4x + 2x - x$	Simplify $2 \times d$	Simplify $\frac{10a}{5}$	Simplify $a \times 2b$	Simplify $2k - 5k$	Simplify $(xy)^2$
Simplify $\frac{30a^3}{6a}$	Simplify $3x + y - 2x + 4y$	Simplify $4c \times 2d$	Simplify $a \times a \times a$	Simplify $(2a)^3$	Simplify $9x + 7y - 2x - 8y$
Simplify $\frac{40x^5y^2}{5x^2y}$	Simplify $a^2 \times a^3$	Simplify $7a + 5b - 2a - 2b$	Simplify $4x^2y \times 3x^2$	Simplify $3x + x^2 + 4x - x^2$	Simplify $2x \times x^2$
Simplify $7 + x - 3 + 4x$	Simplify $(3b^2)^3$	Simplify $3x^2 \times 4x$	Simplify $6x^2 - 8x^2 + 3x^2$	Simplify $(2xy)^4$	Simplify $5 \times d \times d \times d$
Simplify $5ab \times 3a^4b$	Simplify $2a + 6b - a - b$	Simplify $(2ab^2)^3$	Simplify $3a \times 7b$	Simplify $\frac{8a^2}{16ab}$	Simplify $3a^3b \times 5bc \times 2ac^2$

Fluency Practice

Example

Simplify $\boldsymbol{3a^2 + a \times a}$

Multiplication first: $3a^2 + a \times a \quad = 3a^2 + a^2$

Addition second: $3a^2 + a^2 \quad = \boldsymbol{4a^2}$

Simplify these expressions

1.	$5b + 3b \times 2$	2.	$5b + 2 \times 3b$
3.	$3b \times 2 + 5b$	4.	$3b \times 2 + 5$
5.	$5 + 3b \times 2$	6.	$5 + 2 \times 3b$
7.	$5 + 2b \times 3b$	8.	$5b + 2b \times 3b$
9.	$5b^2 + 2b \times 3b$	10.	$2b \times 3b - b^2$
11.	$5b^2 + 2b \times 3b - b^2$	12.	$2b \times 3b - b^2 + 5b^2$
13.	$2b \times 3b - b \times 5b$	14.	$2b \times 3b + b \times 5b$
15.	$5b^2 + 2 \times 3b - b^2$	16.	$5b^2 + 2 \times 3b - b$
17.	$5b^2 + 3b \times b - 2b^2$	18.	$2b \times 5b + 3b \times b$
19.	$5b^2 + a \times a$	20.	$2a + 5b^2 - a$
21.	$b \times 2b - 5b^2 + 3a \times b - ab$	22.	$b + 6b^2 \div 3b$
23.	$8b \times b + 6b^2 \div 2b$	24.	$\dfrac{10a^2 + 2a \times a}{3a \times 2a}$
25.	$\dfrac{6a + 7 \times 2a}{8a \times 2 + 20a^2 \div 5a}$	26.	$5a^2 \div a - \sqrt{8a^2 + 4a \times 2a}$

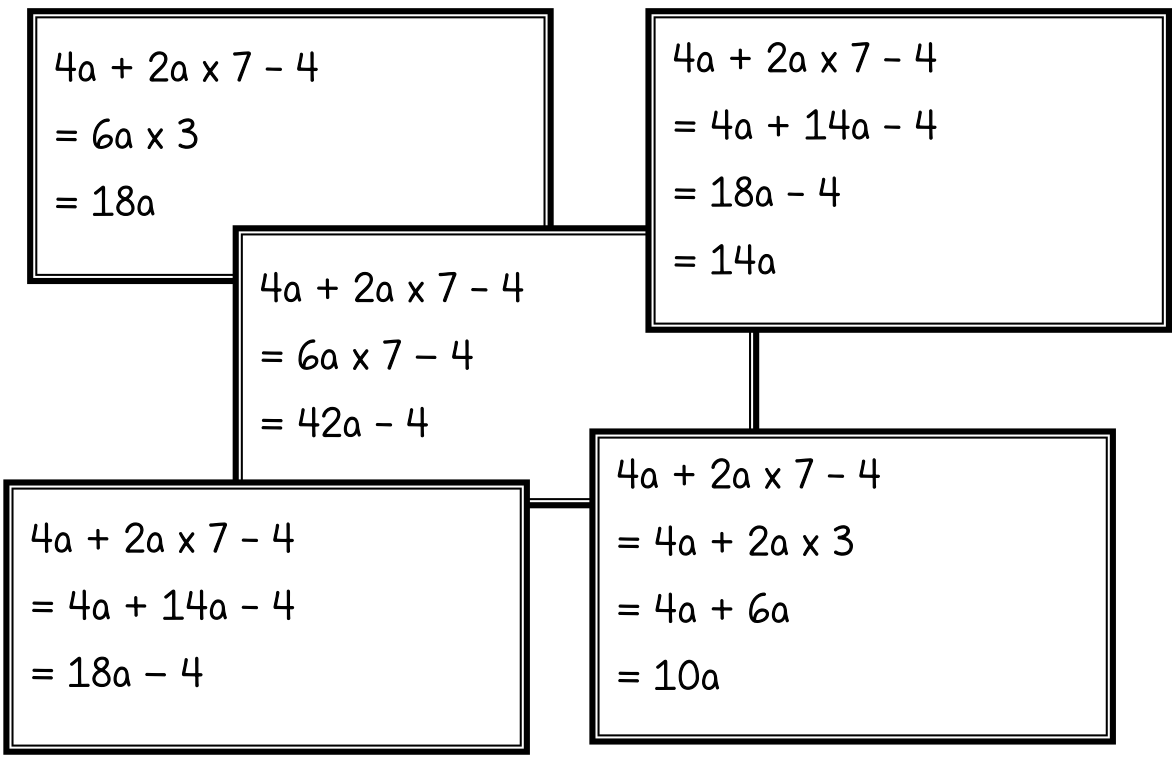
Purposeful Practice

Where required, insert brackets to make these identities true.

Example	$(3a + 2a) \times 4a \equiv 20a^2$ ✓
1.	$5a + 4a \times 2a \equiv 18a^2$
2.	$3 \times a + 4a \times 2a \equiv 30a^2$
3.	$3 \times 2a + 4a \div 2a \equiv 9$
4.	$8 \times 2a + 8a^2 \div 2a \equiv 20a$
5.	$4a \times 2a + 5a^2 \equiv 8a^2 + 20a^3$
6.	$3a \times b + b \equiv 6ab$
7.	$4a + b \times 3a \equiv 12a^2 + 3ab$
8.	$2 \times 2b \times 2b + 3 \times b - b \equiv 16b^2$

Spot the mistake

Identify the errors in these solutions. Can you see how they arrived at their answers? Which one is correct?



Purposeful Practice

SUM PRODUCT 1

Top Box = Middle boxes **added**.
Bottom Box = Middle boxes **multiplied**

EXAMPLE

Sum $+$ | $2a+4$ |
| $2a$ | 4 |
Product $\times$ | $8a$ |

A)
$+$ | |
| $3c$ | 4 |
$\times$ | |

B)
$+$ | |
| $4g$ | 5 |
$\times$ | |

C)
$+$ | |
| 3 | $3h$ |
$\times$ | |

D)
$+$ | |
| 6 | |
$\times$ | $18b$ |

E)
$+$ | $4d-3$ |
| | -3 |
$\times$ | |

F)
$+$ | $5-3c$ |
| | 5 |
$\times$ | |

G)
$+$ | |
| $3e$ | |
$\times$ | $3e^2$ |

H)
$+$ | $6t$ |
| t | |
$\times$ | |

I)
$+$ | $5w$ |
| | |
$\times$ | $6w^2$ |

J)
$+$ | $8h$ |
| | |
$\times$ | $15h^2$ |

K)
$+$ | $2f$ |
| | $-2f$ |
$\times$ | |

L)
$+$ | $3d$ |
| | $7d$ |
$\times$ | |

M)
$+$ | |
| $-2c$ | $-6c$ |
$\times$ | |

N)
$+$ | |
| $2b$ | a |
$\times$ | |

O)
$+$ | $4k+3t$ |
| $3t$ | |
$\times$ | |

P)
$+$ | |
| $3x$ | $4xy$ |
$\times$ | |

Purposeful Practice

SUM PRODUCT 2

Top Box = Middle boxes **added**.
Bottom Box = Middle boxes **multiplied**

EXAMPLE

Sum +

$2a$	$3d$

Product ×

$6ad$

A)

+

$3c$	$5t$

×

B)

+

$3g$	$2r$

×

C)

+

$4f$	$-3h$

×

D)

+

$3e-5n$	
$-5n$	

×

E)

+

$-2d-3f$	
	$-3f$

×

F)

+

$2ab$	$3a$

×

G)

+

$2d+3dt$	
$2d$	

×

H)

+

$7ef$	
$3ef$	

×

I)

+

$3qk$	$2k$

×

J)

+

$3x^2$	$2x^2y$

×

K)

+

	$3f+2$

×

$12f+8$

L)

+

$2e+1$	
$2e-4$	

×

M)

+

	$3e+4$

×

$9e^2+12e$

N)

+

$4d+5$	$-2d$

×

O)

+

$c+5$	
$3c$	

×

P)

+

$4y-3$	$2xy$

×