Number and Place Value

Key Vocabulary

ten million
millions
thousands
hundreds
tens
ones
zero
place value
greater than
less than
order
round
rounded
negative number
partition
digit
interval
sequence
linear sequence

Compare and Order

equals

$26 + 38 = 8 × 8$

Both calculations have the value 64.

greater than

$223\ 873 > 98\ 256$

The number on the left has 2 hundred thousands and the number on the right has 0 hundred thousands.

less than

$901\ 198 < 1\ 091\ 098$

The number on the right has 1 million and the number on the left has 0 millions.

smallest | 81 782 | 127 352 | 127 835 | 137 019 | 200 002 | greatest

Negative Numbers

$3 - 8 = -5$

$-6 + 11 = 5$

-5   -3

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

+6   +5

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

Number and Place Value

Numbers to Ten Million

3 926 471

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	9	2	6	4	7	1

three million, nine hundred and twenty-six thousand, four hundred and seventy-one

3 926 471	
3 926 000	471

```
              3 926 471
        _____|_____|_____
       |        |                 |
   3 500 000  426 300            171
```

```
0                              5 000 000                           10 000 000
   1 000 000  2 000 000  3 000 000  4 000 000   6 000 000  7 000 000  8 000 000  9 000 000
|----|----|----|----|----|----|----|----|----|----|
                             x
```
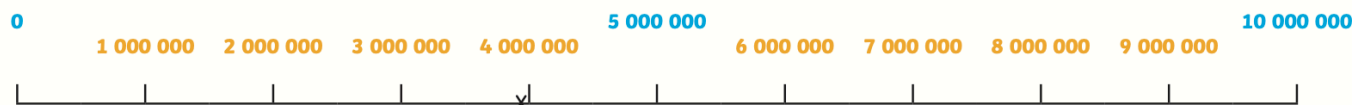
Round Any Number

Rounding to the nearest 1000
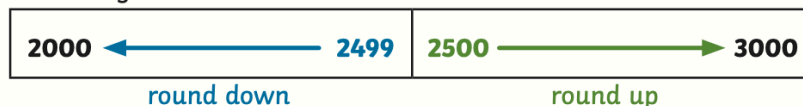
2000 ←——————— 2499	2500 ——————→ 3000
round down	round up

Rounding to the nearest 100 000

200 000 ←——————— 249 999	250 000 ——————→ 300 000
round down	round up

Rounding to the nearest 10 000

20 000 ←——————— 24 999	25 000 ——————→ 30 000
round down	round up
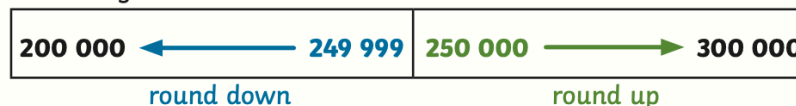
Rounding to the nearest 1 000 000

2 000 000 ←——————— 2 499 999	2 500 000 ——————→ 3 000 000
round down	round up
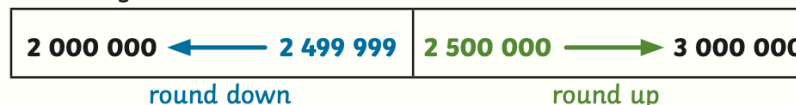
Key Vocabulary

Add
Total
Make
Plus
Sum
More
Altogether
Difference
Leave
Subtract
Difference between
Less
Minus
Take away
Mentally, Orally
Column Addition
Column Subtraction
Estimate
Inverse operation
Solve problems
Number facts
Place Value
Complex

Add and Subtract Whole Numbers

Column Method

	4	5	8	6	4
+	2	3	4	9	7
	6	9	3	6	1
		1	1	1	

Starting with the ones, add each column in turn. Regroup tens, hundreds, thousands, ten thousands as required.

	3	5	$^6\not7$	$^{13}\not4$	$^1\not2$
-		3	4	7	6
	3	2	2	6	6

Starting with the ones, subtract each column in turn. Exchange tens, hundreds, thousands and/or ten thousands as required.

Multiply up to 4-digit by 2-digit

1	$\not3$	$\not2$	
	1	5	4
×		2	6
	9	2	4
3	0	8	0
4	0	0	4
1	1		

Start with the ones.

$154 \times 6 = 924$

$154 \times 20 = 3080$

$3080 + 924 = 4004$

Order of Operations

B	Brackets	$10 \times (4 + 2) = 10 \times 6 = 60$
O	Order	$5 + 2^2 = 5 + 4 = 9$
D	Division	$10 + 6 \div 2 = 10 + 3 = 13$
M	Multiplication	$10 - 4 \times 2 = 10 - 8 = 2$
A	Addition	$10 \times 4 + 7 = 40 + 7 = 47$
S	Subtraction	$10 \div 2 - 3 = 5 - 3 = 2$

Short Division

Start from the left.

12	5	^{5}2	^{4}8	6	^{6}0
	4	4	0 $\cdot$ 5		

$5 \div 12 = 0\ r5$
$52 \div 12 = 4\ r4$
$48 \div 12 = 4$
$6 \div 12 = 0\ r6$

Long Division

		1	2	0	r	3
14	1	6	8	3		
	1	4	0	0		
		2	8	3		
		2	8	0		
				3		

Common Factors

Factors of 48

1	2	3	4	6	8	12	16	24	48

Factors of 30

1	2	3	5	6	10	15	30

Common factors: 1, 2, 3, 6

Primes

A prime number has only 1 and itself as factors: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 33, 37, 41, 43

A composite number has factors other than 1 and itself.

Mental Calculations and Estimation

Order of calculations:

$50 \times 34 \times 2 = 50 \times 2 \times 34 = 100 \times 34 = 3400$

Money: £8.99 + £3.49 = £12.48

Use £9 + £3.50 = £12.50 and subtract 2p

Estimate on a number line

-8   0   8   16   20   24

Subdivide line to estimate: **17**

Common Multiples

Multiples of 3

3	...	18	21	24	...	39	42

Multiples of 7

7	14	21	28	35	42

Common multiples: 21, 42...

Squares and Cubes

Square numbers result from a number being multiplied by itself (e.g. $5 \times 5 = 25$):

1, 4, 9, 16, 25, 36, 49, 64, 81, 100

Cube numbers result from a number being multiplied by itself twice ($2 \times 2 \times 2 = 8$):
1, 8, 27, 64, 125

Reason from Known Facts

$90 \div 10 = 9$ **so $90 \div 20 = 4.5$ and $90 \div 5 = 18$**

$16 \times 9 = 144$ **so $1.6 \times 9 = 14.4$**

$4352 \div 17 = 256$
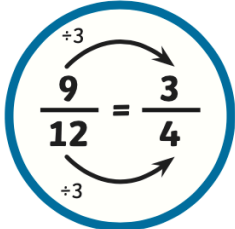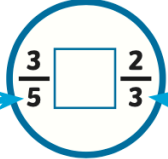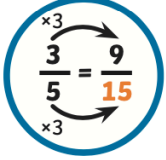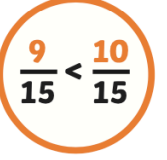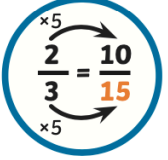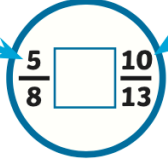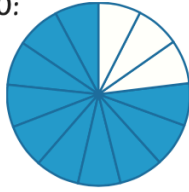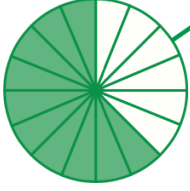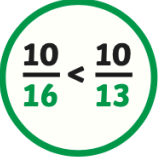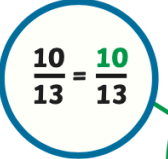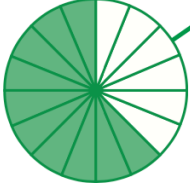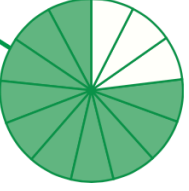
so $256 \times 18 = 4352 + 256 = 4608$

$3786 + 2850 = 6636$

so $4786 + 2850 = 7636$

and $2786 + 3850 = 6636$

and $8636 - 3786 = 4850$

Key Vocabulary

numerator
denominator
proper fraction
improper fraction
factor
highest common multiple
lowest common multiple
equivalents
common numerator
common denominator
decimal equivalent
simplify
simplest form
mixed number
whole number
mixed number

Simplify Fractions

$$\frac{9}{12}$$

Factors of 9:
1, **3**, 9

Factors of 12:
1, 2, **3**, 4, 6, 12

$$\frac{9}{12} = \frac{3}{4}$$

÷3 ÷3

Compare and Order Fractions

Use the Common Denominator

Multiples of 5:
5, 10, **15**

$$\frac{3}{5} \square \frac{2}{3}$$

Multiples of 3:
3, 6, 9, 12, **15**

$$\frac{3}{5} = \frac{9}{15}$$ (×3)

$$\frac{9}{15} < \frac{10}{15}$$

$$\frac{2}{3} = \frac{10}{15}$$ (×5)

Use the Common Numerator

Multiples of 5:
5, **10**, 15

$$\frac{5}{8} \square \frac{10}{13}$$

Multiples of 10:
10, 20

$$\frac{5}{8} = \frac{10}{16}$$ (×2)

$$\frac{10}{16} < \frac{10}{13}$$

$$\frac{10}{13} = \frac{10}{13}$$

Adding and Subtracting Proper Fractions

Same Denominators

 $\frac{4}{7}+\frac{2}{7}=\frac{6}{7}$

 $\frac{8}{11}-\frac{3}{11}=\frac{5}{11}$

Different Denominators

$\frac{2}{7}+\frac{3}{5}$

Multiples of 7: 7, 14, 21, 28, **35**
Multiples of 5: 5, 10, 15, 20, 25, 30, **35**

$\frac{2}{7}=\frac{10}{35},\ \frac{3}{5}=\frac{21}{35}$

$\frac{10}{35}+\frac{21}{35}=\frac{31}{35}$

$\frac{9}{10}-\frac{1}{4}$

Multiples of 10: 10, **20**
Multiples of 4: 4, 8, 12, 16, **20**

$\frac{9}{10}=\frac{18}{20},\ \frac{1}{4}=\frac{5}{20}$

$\frac{18}{20}-\frac{5}{20}=\frac{13}{20}$

Multiplying Proper Fractions

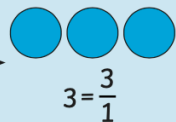### Multiplying Fractions by Fractions

$\frac{1}{2}\times\frac{1}{3}=\frac{1}{2}\times\frac{1}{3}=\frac{1}{6}$

Multiplying Fractions by Whole Numbers

 $\frac{2}{5}\times 3 \rightarrow$ $3=\frac{3}{1}$

$\frac{2}{5}\times\frac{3}{1}=\frac{6}{5}=1\frac{1}{5}$

Adding and Subtracting Mixed Numbers

Add or subtract the whole numbers and fractions separately.

$2\frac{2}{5}+1\frac{3}{10}$

$2+1=3$

$\frac{2}{5}+\frac{3}{10}=\frac{4}{10}+\frac{3}{10}=\frac{7}{10}$

$3+\frac{7}{10}=3\frac{7}{10}$

$2\frac{1}{2}-1\frac{1}{4}$

$2-1=1$

$\frac{1}{2}-\frac{1}{4}=\frac{2}{4}-\frac{1}{4}=\frac{1}{4}$

$1+\frac{1}{4}=1\frac{1}{4}$

Convert the mixed numbers to improper fractions.

$2\frac{2}{5}+1\frac{3}{10}$

$2\frac{2}{5}=\frac{12}{5}$ $1\frac{3}{10}=\frac{13}{10}$

$\frac{12}{5}+\frac{13}{10}=\frac{24}{10}+\frac{13}{10}=\frac{37}{10}$

$\frac{37}{10}=3\frac{7}{10}$

$2\frac{1}{2}-1\frac{1}{4}$

$2\frac{1}{2}=\frac{5}{2}$ $1\frac{1}{4}=\frac{5}{4}$

$\frac{5}{2}-\frac{5}{4}=\frac{10}{4}-\frac{5}{4}=\frac{5}{4}$

$\frac{5}{4}=1\frac{1}{4}$

Dividing Fractions by Whole Numbers

$$\frac{2}{5}\div 2=\frac{1}{5}$$

Multiplication and division are the inverse of one another so:

÷ 2 is the same as × $\frac{1}{2}$

$$\frac{2}{5}\times\frac{1}{2}=\frac{2}{10}$$

Key Vocabulary

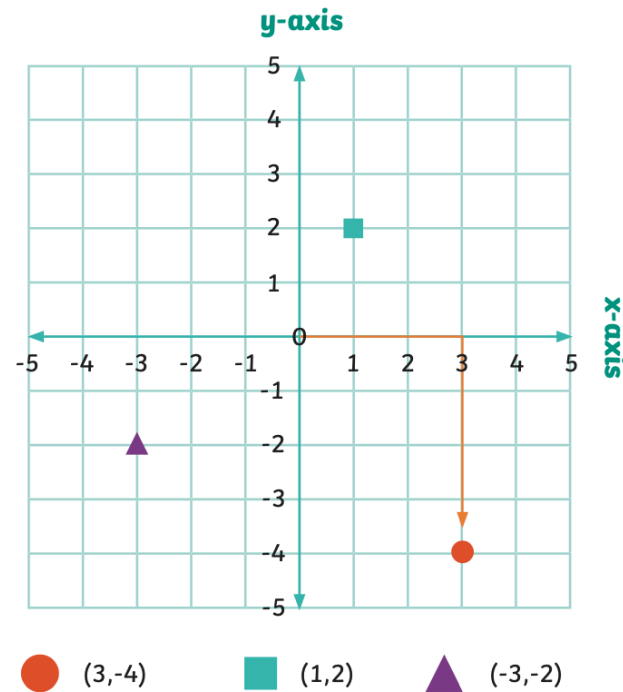| |
|---|
| **translate** |
| **translation** |
| **reflect** |
| **reflection** |
| **up** |
| **down** |
| **right** |
| **left** |
| **coordinates** |
| **quadrant** |
| **x-axis** |
| **y-axis** |
| **horizontal** |
| **vertical** |

Four Quadrants

Coordinates can use positive and negative numbers. Whether positive or negative, the x-axis coordinate is written first, followed by the y-axis coordinate.
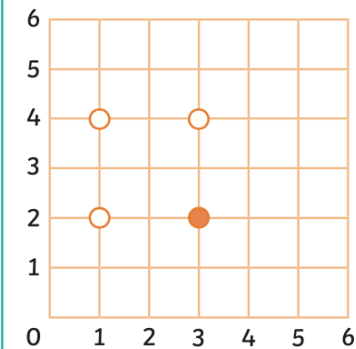

● (3,-4)   ■ (1,2)   ▲ (-3,-2)

Look at the circle. It is 3 units along the x-axis and 4 down the y-axis. Its coordinates are (3,-4).
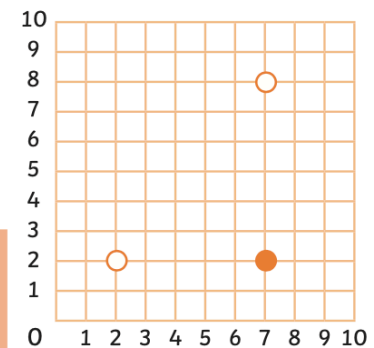
Completing Shapes

Using the properties of a shape, a polygon can be completed on a grid.

To make a square, think of the square's properties.

All of a square's sides are the same length. If the completed sides are 2 units in length, the missing point must complete two more sides of 2 units.

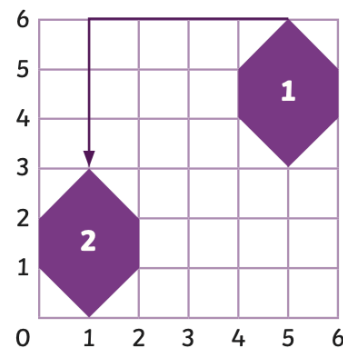To make a right-angled triangle, think of the triangle's properties.

A right-angled triangle should have three sides with one 90° angle.

Translation

A shape is translated when it is moved without being rotated or resized. Every point of the shape moves the same distance and in the same direction.
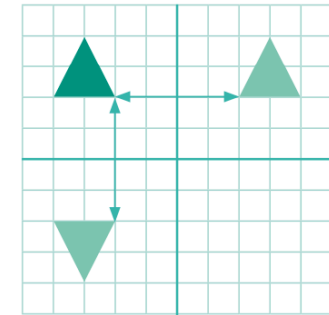

Shape 1 has been translated 4 units left and 3 units down.

Reflections

A shape is reflected when it is flipped over a line which acts as a mirror. Every point on the original shape is the same distance from the mirror line as the same point on the reflected shape. The original triangle has been reflected in the x-axis and in the y-axis.

Missing Coordinates

Shapes can be shown on unmarked grids.
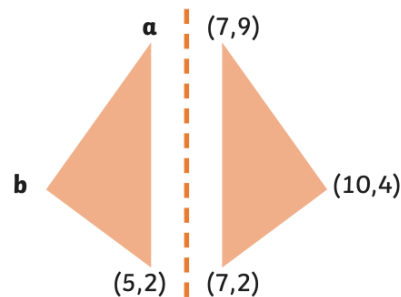
Point a is in the same position along the x-axis as (5,2) and in the same position on the y-axis as (7,9).

Point a (5,9)

Point b is in the same position on the y-axis as (10,4). Both triangles will have the same width. The width of the right-hand triangle is 3. This means that the width of the left-hand triangle is also 3.

Point b (2,4)