



Number, Place Value and Rounding

Key vocab: intervals across zero, three decimal places, ten thousandths, numbers up to 10 000 000

NC Objectives:

- Read, write, order, and compare numbers to at least 10 000 000, and determine the value of each digit.
- Identify the value of each digit in numbers given to three decimal places.
- Use negative numbers in context and calculate intervals across zero.
- Solve number problems and practical problems that involve place value.

Concrete	Pictorial	Abstract
	<p>Use the number line to answer the questions.</p> <p>What is 6 less than 4? What is 5 more than -2? What is the difference between 3 and -3?</p> <p>Match the representations to the numbers in digits.</p> <p>One million, four hundred and one thousand, three hundred and twelve.</p>	<p>Identify the value of the highlighted digit.</p> <p>1,345,789</p> <p>543,081</p> <p>Teddy's number is 306,042. He adds 5,000 to his number. What is his new number?</p> <p>Mo has £17.50 in his bank account. He pays for a jumper which costs £30. How much does he have in his bank account now?</p>

Reasoning

<p>Spot the pattern</p> <p>5 less than 22 is 17</p> <p>5 less than 12 is -70 and 120</p> <p>5 less than 2 is -70 and -20</p> <p>5 less than -8 is -70 and 160</p> <p>Estimate</p> <p>Estimate the value of the hidden numbers.</p>	<p>Rank by difficulty</p> <p>What is the difference between:</p> <p>If we build from -20 to 20, we will have 40 floors.</p> <p>Do you agree? Explain why.</p> <p>Put a digit in the missing spaces to make the statement correct.</p> <p>4,62 __ ,645 < 4,623,64 __</p> <p>Is there more than one option? Can you find them all?</p>	<p>Jack draws bar model A. His teacher asks him to draw another where the total is 30,000</p> <p>Use the digit cards and statements to work out my number.</p> <p>0 3 3 5 5 6 7</p> <p>The ten thousands and hundreds have the same digit.</p> <p>The hundred thousand digit is double the tens digit.</p> <p>It is a six-digit number.</p> <p>It is less than six hundred and fifty-five thousand.</p> <p>Is this the only possible solution?</p>
--	---	--

Number, Place Value and Rounding

Key vocab: intervals across zero, three decimal places, ten thousandths, numbers up to 10 000 000

NC Objectives:

- Round any whole number to a required degree of accuracy.
- Solve problems which require answers to be rounded to specified degrees of accuracy.

Concrete	Pictorial	Abstract																																																	
<p>Round 54,928 to the nearest 10, 100 and 1,000. Use a number line to help you if necessary.</p>		<p>Tick the options that show what the number in the place value chart will be when it is rounded to the nearest ten thousand and nearest hundred thousand.</p> <table border="1" style="margin-bottom: 10px;"> <tr> <td>Millions</td> <td>Hundred thousands</td> <td>Ten thousands</td> <td>Thousands</td> <td>Hundreds</td> <td>Tens</td> <td>Ones</td> </tr> <tr> <td>•••</td> <td>••••</td> <td>•</td> <td>••••</td> <td>••</td> <td>••</td> <td>•••</td> </tr> </table> <p>Options:</p> <ul style="list-style-type: none"> 2,620,000 Two million, six hundred and ten thousand Two million, six hundred thousand 2,700,000 <p>The lengths of four rivers are shown in the table.</p> <table border="1" style="margin-bottom: 10px;"> <thead> <tr> <th>River</th> <th>Length (km)</th> </tr> </thead> <tbody> <tr> <td>Mississippi</td> <td>5,495</td> </tr> <tr> <td>Saint Lawrence</td> <td>2,938</td> </tr> <tr> <td>Nile</td> <td>5,831</td> </tr> <tr> <td>Rio Grande</td> <td>2,983</td> </tr> </tbody> </table> <p>Round the length of the Mississippi to the nearest 100 km. <input style="width: 50px;" type="text"/></p> <p>Round the following numbers to the nearest 1000, 10 000, 100 000 and 1 000 000.</p> <table border="1"> <thead> <tr> <th>Number</th> <th>Rounded to the nearest 1000</th> <th>Rounded to the nearest 10 000</th> <th>Rounded to the nearest 100 000</th> <th>Rounded to the nearest 1 000 000</th> </tr> </thead> <tbody> <tr> <td>3 476 389</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>7 307 381</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5 937 037</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4 502 378</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones	•••	••••	•	••••	••	••	•••	River	Length (km)	Mississippi	5,495	Saint Lawrence	2,938	Nile	5,831	Rio Grande	2,983	Number	Rounded to the nearest 1000	Rounded to the nearest 10 000	Rounded to the nearest 100 000	Rounded to the nearest 1 000 000	3 476 389					7 307 381					5 937 037					4 502 378				
Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones																																													
•••	••••	•	••••	••	••	•••																																													
River	Length (km)																																																		
Mississippi	5,495																																																		
Saint Lawrence	2,938																																																		
Nile	5,831																																																		
Rio Grande	2,983																																																		
Number	Rounded to the nearest 1000	Rounded to the nearest 10 000	Rounded to the nearest 100 000	Rounded to the nearest 1 000 000																																															
3 476 389																																																			
7 307 381																																																			
5 937 037																																																			
4 502 378																																																			

Reasoning

Which answer?

What is the smallest whole number that, when rounded to the nearest 100, is 3 000?

- (a) 3001
- (b) 2950
- (c) 2500

I know... so...

2074 rounded to the nearest 10 is **2070**

2074 rounded to the nearest 50 is _____

3 165 rounded to the nearest 10 is _____

3 165 rounded to the nearest ____ is 3 160

Explore

A and B are whole numbers.

Rounded to the nearest 100, A is 500

Rounded to the nearest 10, B is 350

What is the smallest possible difference between A and B?

Whitney rounded 2,215,678 to the nearest million and wrote 2,215,000

Can you explain to Whitney what mistake she has made?

Miss Grogan gives out four number cards.

15,987 15,813 15,101 16,101

Four children each have a card and give a clue to what their number is.

Tommy says, "My number rounds to 16,000 to the nearest 1,000"

Alex says, "My number has one hundred."

Jack says, "My number is 15,990 when rounded to the nearest 10"

Dora says, "My number is 15,000 when rounded to the nearest 1,000"

Can you work out which child has which card?

My number is 1,350 when rounded to the nearest 10



Mo



Rosie

My number is 1,400 when rounded to the nearest 100

Both numbers are whole numbers.

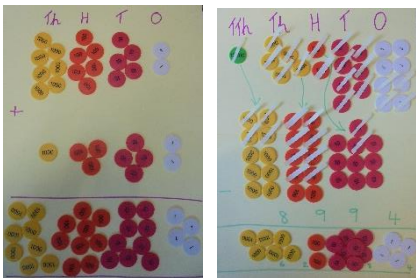
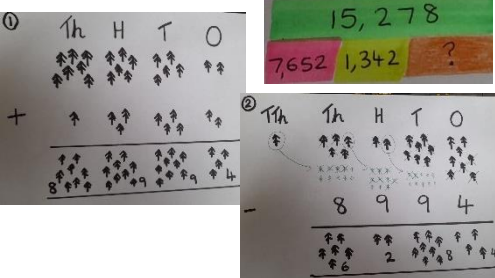
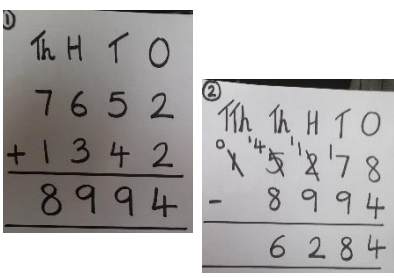
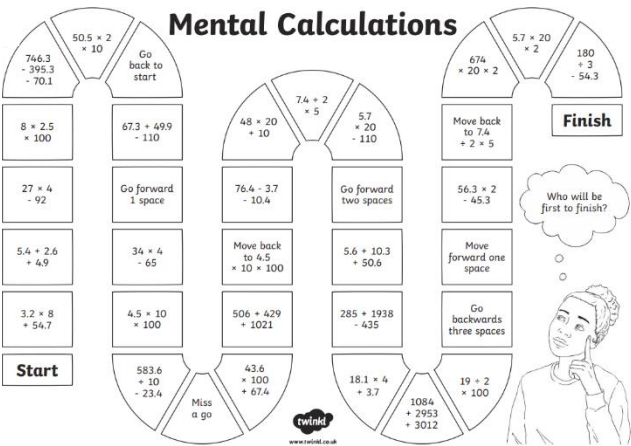
What is the greatest possible difference between the two numbers?

Addition and Subtraction

Key vocab: estimation, mixed operations

NC Objectives:

- Perform mental calculations, including with mixed operations and large numbers.
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Concrete	Pictorial	Abstract	Mental Calculations
<p style="text-align: center;">Addition and Subtraction Multi-Step Problems</p> <p>In a forest, a company has 15278 trees growing. The company harvests 7652 trees in November to sell to shops and 1342 trees in December. How many trees do they have left?</p> 	<p style="text-align: center;">Addition and Subtraction Multi-Step Problems</p> <p>In a forest, a company has 15278 trees growing. The company harvests 7652 trees in November to sell to shops and 1342 trees in December. How many trees do they have left?</p> 	<p style="text-align: center;">Addition and Subtraction Multi-Step Problems</p> <p>In a forest, a company has 15278 trees growing. The company harvests 7652 trees in November to sell to shops and 1342 trees in December. How many trees do they have left?</p> 	<p style="text-align: center;">Mental Calculations</p> 

Reasoning

How many ways?


Complete using digits 1-9. Use the 7 as shown.

7 = + + +

Level 1: I can find a way
 Level 2: I can find different ways
 Level 3: I know how many ways there are

Class 6 are calculating the total of 3,912 and 3,888

Alex says,




We can just double 3,900


Is Alex correct? Explain.

2,000 – 1,287


Here are three different strategies for this subtraction calculation:



I used the column method.



I used my number bonds from 87 to 100 then from 1,300 to 2,000



I subtracted one from each number and then used the column method.

Jack
Whose method is most efficient?

A milkman has 250 bottles of milk.

He collects another 160 from the dairy, and delivers 375 during the day.

How many does he have left?

My method:

375 – 250 = 125

125 + 160 = 285

Tommy

Do you agree with Tommy?
Explain why.

On Monday, Whitney was paid £114

On Tuesday, she was paid £27 more than on Monday.

On Wednesday, she was paid £27 less than on Monday.

How much was Whitney paid in total?

How many calculations did you do?

Is there a more efficient method?

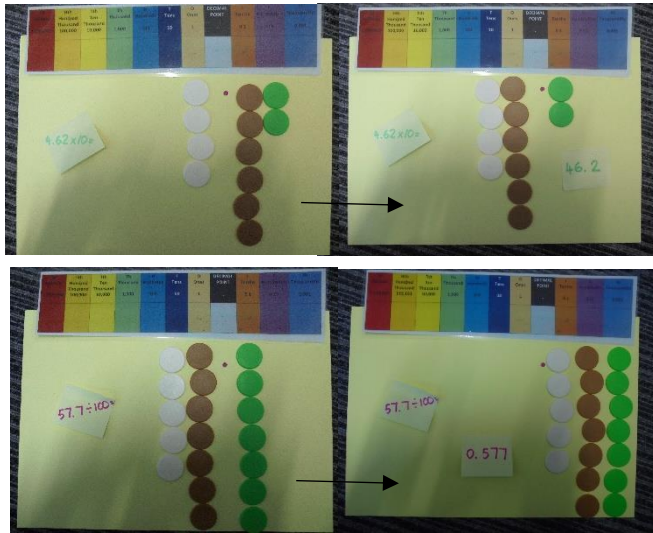
Multiplication and Division

Key vocab: scale factor, long division, whole number, fractions, rounding, mixed operations, degree of accuracy

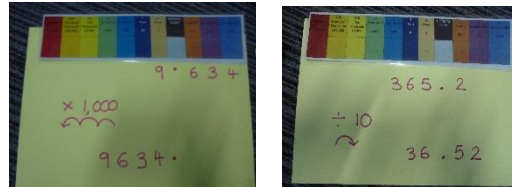
NC Objectives:

- Multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places.

Concrete



Pictorial



Make 234 on a place value grid using counters.

HTh	TTh	Th	H	T	O
			○	○ ○	○ ○ ○

When I multiply 234 by 10, where will I move my counters?
Is this always the case when multiplying by 10?

HTh	TTh	Th	H	T	O
	●	● ●	● ● ●		

What number is represented in the place value grid?
Divide the number by 100
Which direction do the counters move?
How many columns do they move? How do you know how many columns to move?
What number do we have now?

Abstract

Divide the following numbers by 10, 100 and 1000 to complete the table.

	+ 100	+ 1000	+ 10
4.08			
215.9			
9.99			
450.04			

Here are six cards:

- × 10
- × 100
- × 1000
- ÷ 10
- ÷ 100
- ÷ 1000

Use a card to complete each calculation.

- 5.3 = 0.53
- 5.3 = 5300
- 5.3 = 0.053

673 + 100 = **3.705 × 1,000 =**

Reasoning

Explain the mistakes

- Mistake 1**
 $3.4 \times 100 = 3.400$
- Mistake 2**
 $0.7 \times 100 = 700$
- Mistake 3**
 $35 \div 10 = 350$
- Mistake 4**
 $6.4 \times 10 = 60.4$

Dora says,



When you multiply by 100, you should add two zeros.

Do you agree?
Explain your thinking.

Using the digit cards 0-9 create a number with up to 3 decimal places e.g. 3.451
Cover the number using counters on your Gattegno chart.

10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000
1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009

Explore what happens when you multiply your number by 10, then 100, then 1,000

What patterns do you notice?

Eva says,



Do you agree?
Explain why.

When you divide by 10, 100 or 1,000 you just take away the zeros or move the decimal point.

Can you find a path from 6 to 0.06?
You cannot make diagonal moves.

6	× 10	× 10	+ 100
+ 10	× 100	× 100	+ 10
× 10	+ 10	+ 1,000	+ 100
+ 1,000	× 1,000	× 100	0.06

Using the following rules, how many ways can you make 70?

- Use a number from column A
- Use an operation from column B.
- Use number from column C.

A	B	C
0.7		0.1
7		1
70	×	10
700	÷	100
7,000		1,000

Is there more than one way?

Multiplication and Division

Key vocab: scale factor, long division, whole number, fractions, rounding, mixed operations, degree of accuracy

NC Objectives:

- Multiply multi-digit numbers up to 4 digits by a 2-digit whole number using the formal written method of long multiplication.
- Multiply 1-digit numbers with up to two decimal places by whole numbers.

Concrete

Pictorial

Abstract

Rosie is saving her pocket money. Her mum says,
"Whatever you save, I will give you five times the amount."

If Rosie saves £2.23, how much will her mum give her?
 If Rosie saves £7.76, how much will her mum give her? How much will she have altogether?

Calculate.

	4	2	6	7
x			3	4

	3	0	4	6
x			7	3

A jar of sweets weighs 1.213 kg.
 How much would 4 jars weigh?

Reasoning

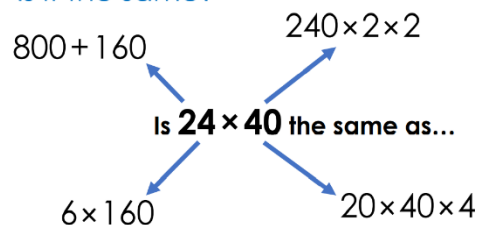
True or false?

$17 \times 13 = 15 \times 15$

What do you notice?

Try other examples. Do you see a pattern?

Is it the same?



Missing digits

$$\begin{array}{r} 25\boxed{} \\ \times \boxed{}7 \\ \hline 1771 \\ 7590 \\ \hline 9361 \end{array}$$

Chocolate eggs can be bought in packs of 1, 6 or 8
 What is the cheapest way for Dexter to buy 25 chocolate eggs?

2 3 4 5 7 8

Place the digits in the boxes to make the largest product.

x				

Whitney says, When you multiply a number with 2 decimal places by an integer, the answer will always have more than 2 decimal places.



Do you agree? Explain why. Fill in the blanks


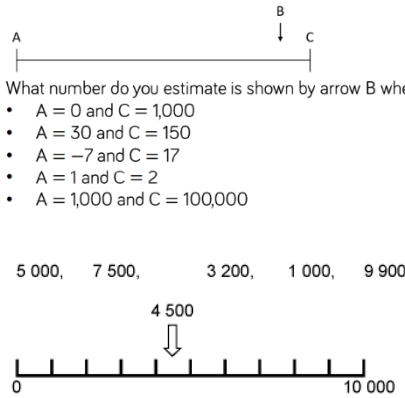
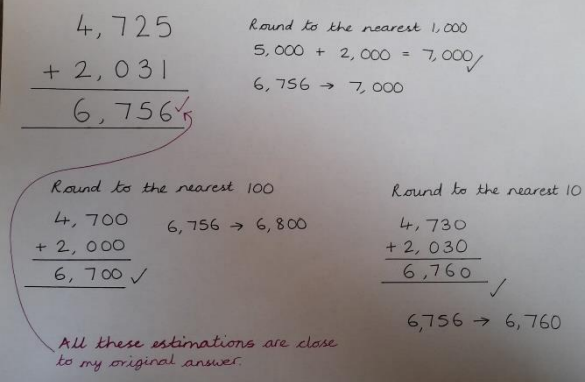
		3	•	4	5
x					
		0	•	3	0
				4	0
	1			0	0

Multiplication and Division

Key vocab: scale factor, long division, whole number, fractions, rounding, mixed operations, degree of accuracy

NC Objectives:

- Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.
- Use knowledge of the order of operations (BODMAS) to carry out calculations involving all four operations.

Concrete	Pictorial	Abstract	
	<div style="text-align: center;">  <p>What number do you estimate is shown by arrow B when:</p> <ul style="list-style-type: none"> • A = 0 and C = 1,000 • A = 30 and C = 150 • A = -7 and C = 17 • A = 1 and C = 2 • A = 1,000 and C = 100,000 </div>	<div style="border: 1px solid purple; padding: 5px; margin-bottom: 10px;"> <p>Alex has 7 bags with 5 sweets in each bag. She adds one more sweet to each bag. Which calculation will work out how many sweets she now has in total? Explain your answer.</p> $7 \times (5 + 1)$ $7 \times 5 + 1$ </div> <div style="border: 1px solid green; padding: 5px; margin-bottom: 10px;"> <p>Teddy has completed this calculation and got an answer of 5</p> $14 - 4 \times 2 \div 4 = 5$ <p>Explain and correct his error.</p> </div> <div style="margin-bottom: 10px;"> $3^2 \times 2 =$ $(3 \times 2^2)^2 =$ </div> <div> $2 \times 3^2 =$ $10 + 3 \times 2^2 =$ </div>	 <div style="border: 1px solid orange; padding: 5px; margin-top: 10px;"> <p>Mo wants to buy a t-shirt for £9.99, socks for £1.49 and a belt for £8.99. He has £22 in his wallet. How could he quickly check if he has enough money?</p> </div>

Reasoning

Countdown

Big numbers: 25, 50, 75, 100

Small numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Children randomly select 6 numbers.

Reveal a target number.

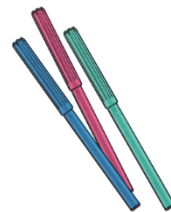
Children aim to make the target number ensuring they can write it as a single calculation using order of operations.

Write different number sentences using the digits 3, 4, 5 and 8 before the equals sign that use:

- One operation
- Two operations with no brackets
- Two operations with brackets

Maths Mastery - Order of Operations

Complete these number sentences by putting in operations.



$$5 \square 4 \square 6 = 7$$

$$5 \square 4 \square 6 = 3$$

$$5 \square 4 \square 6 = 29$$

$$5 \square 4 \square 6 = 15$$

$$5 \square 4 \square 6 = 26$$

Maths Mastery - Order of Operations

How many different ways can you write a number sentence using the numbers 2, 3, 4 and 5, where the answer is 10? Use any operation, but each number can only be used once in any number sentence.

What about using a 6 as well?

Or try 4 other numbers and a different total.



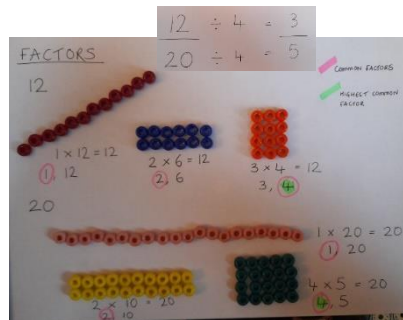
Fractions, Decimals and Percentages

Key vocab: common factors, common multiples, decimal fraction equivalents, simplest form

NC Objectives:

- Identify common factors, common multiples, and prime numbers.
- Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.

Concrete



The factors of 24 are 24, 12, 8, 6, 4, 3, 2 and 1

Use Cuisenaire Rods to find factors.

Pictorial

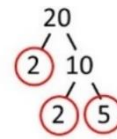
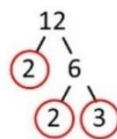
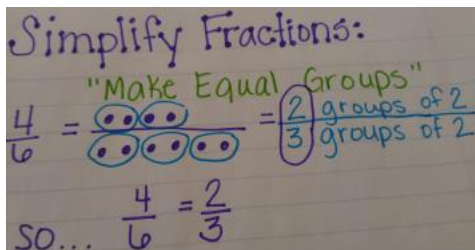


On a 100 square, shade the first 5 multiples of 7 and then the first 8 multiples of 5

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	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

What common multiple of 7 and 5 do you find?

Use this number to find other common multiples of 7 and 5



Abstract

List all of the prime numbers between 10 and 30

Find the common factors of each pair of numbers.

$$\frac{4}{16} = \frac{\quad}{\quad} \quad \frac{9}{12} = \frac{\quad}{\quad}$$

$$\frac{6}{15} = \frac{\quad}{\quad} \quad \frac{12}{20} = \frac{\quad}{\quad}$$

24 and 36
20 and 30
28 and 45

List 5 common multiples of 4 and 3

Alex and Eva play football at the same local football pitches. Alex plays every 4 days and Eva plays every 6 days.

They both played football today.

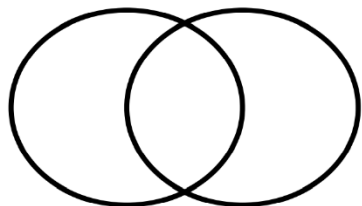
After a fortnight, how many times will they have played football on the same day?

Reasoning

Explore

Put a number in each section of the Venn diagram.

even numbers prime numbers



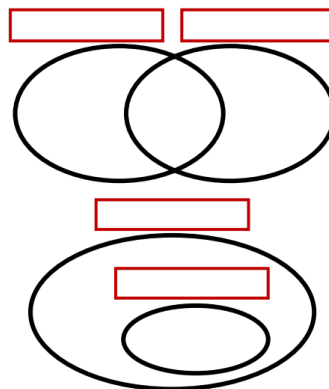
How many numbers can go in the middle section?

True or false?

'Odd square numbers greater than 1 have three factors.'

Explore

Position the headings. Put a number in each section.



Headings:

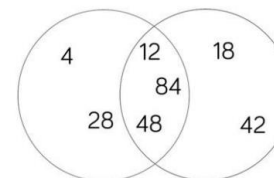
- Multiples of 7
- Multiples of 3
- Multiples of 12
- Even numbers

Find the total of the fractions. Give your answer in its simplest form.

$$\frac{5}{9} + \frac{1}{9} = \quad \frac{5}{9} + \frac{3}{9} = \quad \frac{5}{9} + \frac{7}{9} =$$

Do all the answers need simplifying? Explain why.

Work out the headings for the Venn diagram.



Add in one more number to each section.

Can you find a square number that will go in the middle section of the Venn diagram?

There are 49 pears and 56 oranges.



They need to be put into baskets of pears and baskets of oranges with an equal number of fruit in each basket.

Amir says,



There will be 8 pieces of fruit in each basket.

Jack says,



There will be 7 pieces of fruit in each basket.


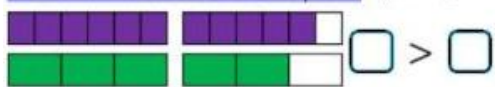

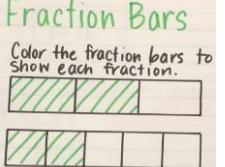
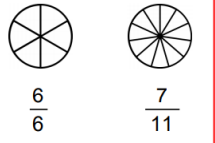
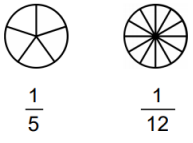
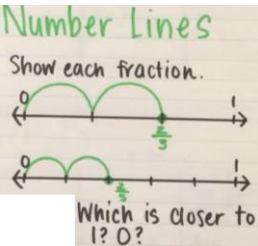
Who is correct? Explain how you know.

Fractions, Decimals and Percentages

Key vocab: common factors, common multiples, decimal fraction equivalents, simplest form

NC Objectives:

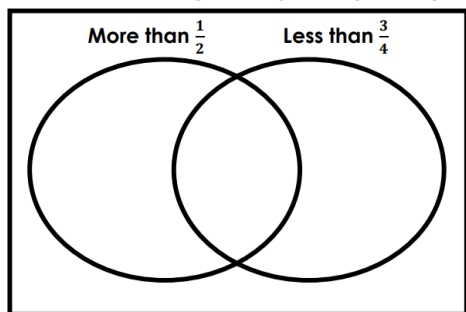
- Compare and order fractions, including fractions greater than 1.

Concrete	Pictorial	Abstract
 <p>Use fraction shapes to make fractions to compare.</p>	<p>Use the bar model to compare $1\frac{2}{3}$ and $1\frac{5}{6}$</p>  <p>Use the bar models to compare $\frac{3}{4}$ and $\frac{2}{3}$</p>  <p>Color the fraction bars to show each fraction.</p>  <p>Which is greater?</p>  	<p>Order the fractions in descending order.</p> $\frac{3}{8}, \frac{11}{20}, \frac{1}{2}, \frac{2}{5}, \frac{3}{4}, \frac{7}{10}$ <p>Which fraction is the greatest? Which fraction is the smallest?</p> <p>Dora is comparing $\frac{5}{6}$ and $\frac{3}{4}$ by finding the lowest common multiple of the denominators.</p> <p>Multiples of 6: 6, 12, 18, 24 Multiples of 4: 4, 8, 12, 16 12 is the LCM of 4 and 6</p> $\frac{5}{6} = \frac{10}{12}, \quad \frac{3}{4} = \frac{9}{12}$ $\frac{10}{12} > \frac{9}{12}$ <p>Use Dora's method to compare the fractions.</p> $\frac{4}{5} \bigcirc \frac{3}{4}, \quad \frac{3}{5} \bigcirc \frac{4}{7}, \quad \frac{3}{4} \bigcirc \frac{7}{10}, \quad 2\frac{2}{5} \bigcirc 2\frac{3}{8}$ 

Reasoning

Explore

Write these fractions in the correct section of the Venn diagram:

$$\frac{3}{6}, \quad \frac{4}{10}, \quad \frac{3}{5}, \quad \frac{7}{8}$$


Add some of your own fractions

How many ways?

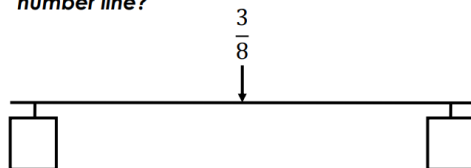
Complete the fractions using three of the number cards.

$$\frac{\square}{8} > \frac{\square}{\square}$$

Number cards: 3, 4, 5, 6

Different ways

Which fractions could be at either end of the number line?



Two different pieces of wood have had a fraction chopped off.

Here are the pieces now, with the fraction that is left.



Which piece of wood was the longest to begin with?

Explain your answer.

Can you explain your method?

Use the digit cards to complete the statements.



$$\frac{\square}{4} > \frac{\square}{6} \quad \frac{\square}{4} < \frac{6}{\square}$$

Find three examples of ways you could complete the statement.

$$\frac{\square}{\square} < \frac{\square}{\square}$$

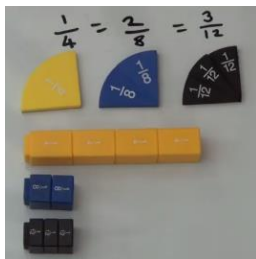
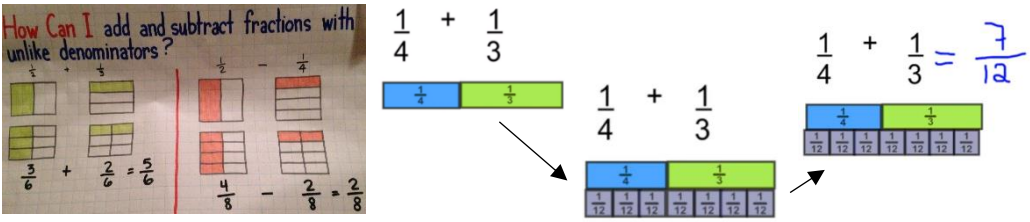
Can one of your ways include an improper fraction?

Fractions, Decimals and Percentages

Key vocab: common factors, common multiples, decimal fraction equivalents, simplest form

NC Objectives:

- Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.

Concrete	Pictorial	Abstract						
 <p>Use fraction shapes to help find common denominators through equivalent fractions.</p>	<p>How Can I add and subtract fractions with unlike denominators?</p>  <p>$\frac{1}{4} + \frac{1}{3} = \frac{7}{12}$</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th>Step 1</th> <th>Step 2</th> <th>Step 3</th> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table> <p>Use this method to help you solve:</p> <p>$2\frac{3}{5} - \frac{3}{10}$ $1\frac{2}{3} - \frac{1}{6}$ $1\frac{5}{6} - \frac{7}{12}$</p> <p>Use a number line to find the difference between $1\frac{2}{5}$ and $\frac{3}{10}$</p> <p>$1\frac{2}{5} = 1\frac{4}{10}$</p> <p>Use a number line to find the difference between:</p> <p>$3\frac{5}{6}$ and $\frac{1}{12}$ $5\frac{5}{7}$ and $\frac{3}{14}$ $2\frac{7}{9}$ and $\frac{11}{18}$</p>	Step 1	Step 2	Step 3				<p>Adding & Subtracting Fractions</p> <p>Add. $\frac{1}{2} + \frac{2}{3}$</p> <ol style="list-style-type: none"> Find a common denominator. $2 \times 3 = 6$ $2, 4, 6, 8, 3, 6, 9, 12$ Write equivalent fractions with the common denominator. $\frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$ $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$ Write the problem using the equivalent fractions. $\frac{1}{2} + \frac{2}{3} \rightarrow \frac{3}{6} + \frac{4}{6}$ Find the sum. Add the numerators. The denominator stays the same. $\frac{3}{6} + \frac{4}{6} = \frac{7}{6}$ <p>Tommy is adding mixed numbers. He adds the wholes and then adds the fractions. Then, Tommy simplifies his answer.</p> <p>$1\frac{1}{2} + 2\frac{1}{6} = 1\frac{3}{6} + 2\frac{1}{6} = 3\frac{4}{6} = 3\frac{2}{3}$</p> <p>Use Tommy's method to add the fractions.</p> <p>$3\frac{1}{2} + 2\frac{3}{8} =$ $34\frac{1}{9} + 5\frac{2}{5} =$ $12\frac{5}{12} + 2\frac{1}{7} =$</p>
Step 1	Step 2	Step 3						

Reasoning

How many ways?

$$\frac{1}{5} + \frac{2}{\square} = \frac{\square}{20}$$

The answer must be a proper fraction

- Level 1: I can find a way
Level 2: I can find different ways
Level 3: I know how many ways there are

I know... so...

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

$$2\frac{4}{5} = \frac{14}{5}$$

$$3\frac{1}{5} = \frac{\square}{\square}$$

Dexter subtracted $\frac{3}{5}$ from a fraction and his answer was $\frac{8}{45}$

What fraction did he subtract $\frac{3}{5}$ from? Give your answer in its simplest form.

Use the same digit in both boxes to complete the calculation.
Is there more than one way to do it?

$$\frac{\square}{20} + \frac{1}{\square} = \frac{9}{20}$$

A car is travelling from Halifax to Brighton. In the morning, it completes $\frac{2}{3}$ of the journey. In the afternoon, it completes $\frac{1}{5}$ of the journey. What fraction of the journey has been travelled altogether? What fraction of the journey is left to travel?

If the journey is 270 miles, how far did the car travel in the morning? How far did the car travel in the afternoon? How far does the car have left to travel?



Rank by difficulty

$$\frac{3}{9} + \frac{7}{9}$$

$$\frac{3}{6} + \frac{5}{10}$$

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

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

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

Fill in the boxes to make the calculation correct.

$$1\frac{\square}{10} = \frac{3}{\square} + \frac{\square}{10}$$

Fractions, Decimals and Percentages

Key vocab: common factors, common multiples, decimal fraction equivalents, simplest form

NC Objectives:

- Multiply simple pairs of proper fractions, writing the answer in its simplest form. Divide proper fractions by whole numbers.

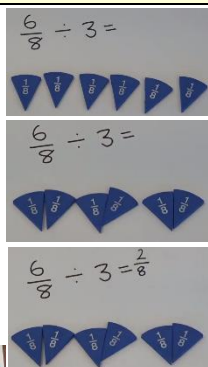
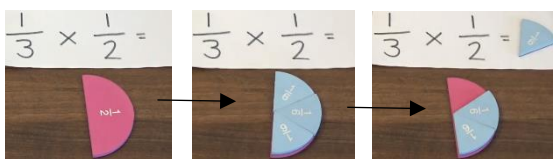
Concrete

Dexter is calculating $\frac{1}{3} \times \frac{1}{2}$ by folding paper. He folds a piece of paper in half. He then folds the half into thirds. He shades the fraction of paper he has created. When he opens it up he finds he has shaded $\frac{1}{6}$ of the whole piece of paper.

$\frac{1}{3} \times \frac{1}{2}$ means $\frac{1}{3}$ of a half. Folding half the paper into three equal parts showed me that $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

Represent and calculate the multiplications by folding paper.

$$\frac{1}{4} \times \frac{1}{2} = \quad \frac{1}{4} \times \frac{1}{3} = \quad \frac{1}{4} \times \frac{1}{4} =$$



Pictorial

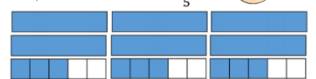
Eva partitions $2\frac{3}{5}$ to help her to calculate $2\frac{3}{5} \times 3$

$$2 \times 3 = 6$$

$$\frac{3}{5} \times 3 = \frac{9}{5} = 1\frac{4}{5}$$

$$6 + 1\frac{4}{5} = 7\frac{4}{5}$$

Use Eva's method to calculate:

$$2\frac{5}{6} \times 3 \quad 1\frac{3}{7} \times 5 \quad 2\frac{2}{3} \times 3 \quad 4 \times 1\frac{1}{6}$$


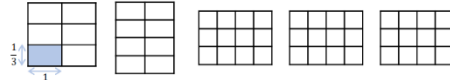
Complete:

$$4 \times \frac{7}{8} = ?$$

$3 \times \frac{2}{3} = ?$

$\frac{2}{5} \times 7 = ?$

Alex is drawing diagrams to represent multiplying fractions.



Shade the diagrams to calculate:

$$\frac{1}{3} \times \frac{1}{2} = \quad \frac{1}{4} \times \frac{1}{2} = \quad \frac{1}{3} \times \frac{1}{4} = \quad \frac{2}{3} \times \frac{1}{4} = \quad \frac{2}{3} \times \frac{3}{4} =$$

Write your answers in their simplest form.

Use the diagrams to help you calculate.

$$\frac{3}{4} \div 3 = \quad \frac{4}{7} \div 4 = \quad \frac{4}{7} \div 2 =$$

Abstract

Convert the mixed number to an improper fraction to multiply.

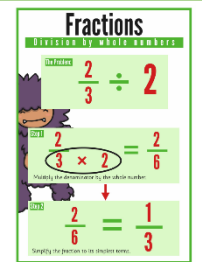
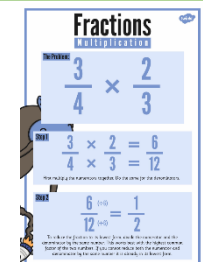
$$2\frac{3}{5} \times 3 = \frac{13}{5} \times 3 = \frac{39}{5} = 7\frac{4}{5}$$

Use this method to calculate:

$$3 \times 2\frac{2}{5} \quad 1\frac{5}{7} \times 3 \quad 2 \times 1\frac{3}{4} \quad 2 \times 1\frac{1}{6}$$

Calculate.

$$\frac{1}{11} \div 1 = \quad \frac{2}{11} \div 2 = \quad \frac{3}{11} \div 3 = \quad \frac{4}{11} \div 4 =$$

$$\frac{2}{11} \div 2 = \quad \frac{4}{11} \div 2 = \quad \frac{6}{11} \div 2 = \quad \frac{8}{11} \div 2 =$$


Reasoning

I know... so...

$$\frac{3}{5} \times 4 = \frac{\square}{\square}$$

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

$$\frac{3}{5} \times 7 = \frac{\square}{\square}$$

Explain the mistake

$$\frac{3}{4} \times 5 = \frac{15}{20}$$

Rank by difficulty

$$\frac{1}{4} \times 5 \quad \frac{3}{10} \times 3$$

$$\frac{3}{4} \times 3$$

I know... so...

$$\frac{3}{4} \div 2 = \frac{3}{8}$$

$$\frac{3}{4} \div 3 = \frac{1}{\square}$$

$$\frac{3}{4} \div 4 = \frac{\square}{16}$$

How many ways?

$$\frac{\square}{4} \times \square = 3\frac{3}{4}$$

- Level 1: I can find a way
- Level 2: I can find different ways
- Level 3: I know how many ways there are

Rank by difficulty

$$\frac{2}{3} \div 4$$

$$\frac{4}{5} \div 4$$

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

Eva and Amir both work on a homework project.

Eva: I spent $4\frac{1}{4}$ hours a week for 4 weeks doing my project.

Amir: I spent $2\frac{3}{4}$ hours a week for 5 weeks doing my project.

Who spent the most time on their project?

Explain your reasoning.

Tommy says,

Dividing by 2 is the same as finding half of a number so $\frac{4}{11} \div 2$ is the same as $\frac{1}{2} \times \frac{4}{11}$

Do you agree? Explain why.

How many ways can you complete the missing digits?

$$\frac{\square}{\square} \times \frac{3}{\square} = \frac{6}{12}$$

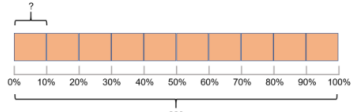
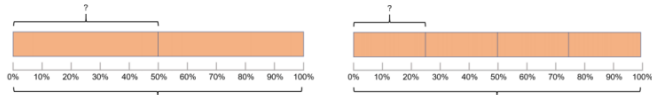


$$= \frac{\square}{2}$$

Fractions, Decimals and Percentages

Key vocab: common factors, common multiples, decimal fraction equivalents, simplest form

NC Objectives:

- Solve problems involving the calculation of percentages of whole numbers or measures such as 15% of 360 and the use of percentages for comparison.

Concrete	Pictorial	Abstract
	<p>Mo uses a bar model to find 30% of 220</p>  <p>10% of 220 = 22, so 30% of 220 = $3 \times 22 = 66$</p> <p>Use Mo's method to calculate:</p> <p>40% of 220 20% of 110 30% of 440 90% of 460</p> <p>Use the bar models to help you complete the calculations.</p>  <p>50% of 406 = _____ 25% of 124 = _____</p>	<p>1) Find 1% of 200</p> <p>2) Find 1% of 40</p> <p>3) Find 2% of 900</p> <p>4) Find 3% of 850</p> <p>5) Find 3% of 220</p> <p>Find: 50% of 300 25% of 300 10% of 300 1% of 300</p> <p>Complete the sentences.</p> <p>25% is equivalent to $\frac{1}{\square}$ To find 25% of an amount, divide by _____</p> <p>10% is equivalent to $\frac{1}{\square}$ To find 10% of an amount, divide by _____</p> <p>1% is equivalent to $\frac{1}{\square}$ To find 1% of an amount, divide by _____</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;">  <p>75% of price = _____</p> </div> </div> <div style="border: 1px solid gray; background-color: #e0e0e0; padding: 5px; margin-top: 10px;"> <p>36% of 250</p> <p>1% = $250 \div 100$</p> <p>1% = 2.5</p> <p>36% = 2.5</p> <p style="text-align: right;"> $\begin{array}{r} \times 36 \\ 150 \\ + 750 \\ \hline 900 \end{array}$ </p> <p>36% of 250 = 90</p> </div>

Reasoning

How many ways can you find 45% of 60?

Use similar strategies to find 60% of 45

What do you notice?

Does this always happen?

Can you find more examples?

Fill in the missing values to make this statement correct.

Can you find more than one way?

25% of = % of 60

What percentage questions can you ask about this bar model?



A golf club has 200 members.

58% of the members are male.
50% of the female members are children.

- (a) How many male members are in the golf club?
- (b) How many female children are in the golf club?

Complete the missing numbers.

50% of 40 = _____% of 80

_____% of 40 = 1% of 400

10% of 500 = _____% of 100


Mo says,

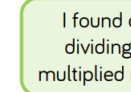
To find 10% you divide by 10, so to find 50% you divide by 50

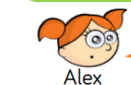
Do you agree? Explain why.

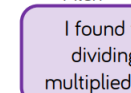


Four children in a class were asked to find 20% of an amount, this is what they did:

 Whitney: I divided by 5 because 20% is the same as one fifth

 Amir: I found one percent by dividing by 100, then I multiplied my answer by 20

 Alex: I did 10% add 10%

 Jack: I found ten percent by dividing by 10, then I multiplied my answer by 2

Who do you think has the most efficient method? Explain why.
Who do you think will end up getting the answer incorrect?

Fractions, Decimals and Percentages

Key vocab: common factors, common multiples, decimal fraction equivalents, simplest form

NC Objectives:

- Associate a fraction with division and calculate decimal fraction equivalents (e.g., 0.375) for a simple fraction (e.g., $\frac{3}{8}$).
- Recall and use equivalences between simple fractions, decimals, and percentages, including in different contexts.

Concrete	Pictorial	Abstract																																																																					
<div style="display: flex; justify-content: space-around;"> <table border="1" style="font-size: small;"> <thead> <tr> <th>Fractions</th> <th>Decimals</th> <th>Percentages</th> </tr> </thead> <tbody> <tr> <td>$\frac{1}{10}$</td> <td>= 0.1</td> <td>= 10%</td> </tr> <tr> <td>$\frac{1}{4}$</td> <td>= 0.25</td> <td>= 25%</td> </tr> <tr> <td>$\frac{1}{5}$</td> <td>= 0.2</td> <td>= 20%</td> </tr> <tr> <td>$\frac{1}{2}$</td> <td>= 0.5</td> <td>= 50%</td> </tr> <tr> <td>$\frac{1}{100}$</td> <td>= 0.01</td> <td>= 1%</td> </tr> </tbody> </table> </div>	Fractions	Decimals	Percentages	$\frac{1}{10}$	= 0.1	= 10%	$\frac{1}{4}$	= 0.25	= 25%	$\frac{1}{5}$	= 0.2	= 20%	$\frac{1}{2}$	= 0.5	= 50%	$\frac{1}{100}$	= 0.01	= 1%	<table border="1" style="font-size: small;"> <thead> <tr> <th>Pictorial representation</th> <th>Percentage</th> <th>Fraction</th> <th>Decimal</th> </tr> </thead> <tbody> <tr> <td></td> <td>There are 41 parts per hundred 41%</td> <td>41 out of 100 $\frac{41}{100}$</td> <td>41 hundredths 0.41</td> </tr> <tr> <td></td> <td>There are 31 parts per hundred 31%</td> <td>___ out of 100 $\frac{\square}{100}$</td> <td>___ hundredths</td> </tr> </tbody> </table> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> % — □ </div> <div style="text-align: center;"> % — □ </div> <div style="text-align: center;"> % — □ </div> </div>	Pictorial representation	Percentage	Fraction	Decimal		There are 41 parts per hundred 41%	41 out of 100 $\frac{41}{100}$	41 hundredths 0.41		There are 31 parts per hundred 31%	___ out of 100 $\frac{\square}{100}$	___ hundredths	<table border="1" style="font-size: small;"> <thead> <tr> <th>F</th> <th>D</th> <th>P</th> </tr> </thead> <tbody> <tr> <td>$\frac{13}{50}$</td> <td>0.26</td> <td>26%</td> </tr> <tr> <td>$\frac{6}{25}$</td> <td></td> <td></td> </tr> <tr> <td></td> <td>0.94</td> <td></td> </tr> <tr> <td></td> <td></td> <td>35%</td> </tr> <tr> <td>$\frac{13}{20}$</td> <td>0.55</td> <td></td> </tr> <tr> <td></td> <td></td> <td>85%</td> </tr> <tr> <td>$\frac{7}{20}$</td> <td>0.48</td> <td></td> </tr> </tbody> </table> <p>Complete the table.</p> <table border="1" style="font-size: small;"> <thead> <tr> <th>Decimal</th> <th>Fraction</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>0.35</td> <td>$\frac{35}{100}$</td> <td>35%</td> </tr> <tr> <td>0.27</td> <td></td> <td></td> </tr> <tr> <td>0.6</td> <td></td> <td></td> </tr> <tr> <td>0.06</td> <td></td> <td></td> </tr> </tbody> </table> <p>Use <, > or = to complete the statements.</p> <p>0.36 <input type="radio"/> 40% $\frac{7}{10}$ <input type="radio"/> 0.07</p> <p>0.4 <input type="radio"/> 25% 0.4 <input type="radio"/> $\frac{1}{4}$</p> <p>Which of these are equivalent to 60%?</p> <div style="display: flex; justify-content: space-around; font-size: x-small;"> $\frac{60}{100}$ $\frac{6}{100}$ 0.06 $\frac{3}{5}$ $\frac{3}{50}$ 0.6 </div>	F	D	P	$\frac{13}{50}$	0.26	26%	$\frac{6}{25}$				0.94				35%	$\frac{13}{20}$	0.55				85%	$\frac{7}{20}$	0.48		Decimal	Fraction	Percentage	0.35	$\frac{35}{100}$	35%	0.27			0.6			0.06		
Fractions	Decimals	Percentages																																																																					
$\frac{1}{10}$	= 0.1	= 10%																																																																					
$\frac{1}{4}$	= 0.25	= 25%																																																																					
$\frac{1}{5}$	= 0.2	= 20%																																																																					
$\frac{1}{2}$	= 0.5	= 50%																																																																					
$\frac{1}{100}$	= 0.01	= 1%																																																																					
Pictorial representation	Percentage	Fraction	Decimal																																																																				
	There are 41 parts per hundred 41%	41 out of 100 $\frac{41}{100}$	41 hundredths 0.41																																																																				
	There are 31 parts per hundred 31%	___ out of 100 $\frac{\square}{100}$	___ hundredths																																																																				
F	D	P																																																																					
$\frac{13}{50}$	0.26	26%																																																																					
$\frac{6}{25}$																																																																							
	0.94																																																																						
		35%																																																																					
$\frac{13}{20}$	0.55																																																																						
		85%																																																																					
$\frac{7}{20}$	0.48																																																																						
Decimal	Fraction	Percentage																																																																					
0.35	$\frac{35}{100}$	35%																																																																					
0.27																																																																							
0.6																																																																							
0.06																																																																							

Reasoning

In his first Geography test, Mo scored 38%
 In the next test he scored $\frac{16}{40}$
 Did Mo improve his score?
 Explain your answer.

Alex says,

0.84 is equivalent to $\frac{84}{10}$

Do you agree?
 Explain why.

Mo shares 6 bananas between some friends.

Each friend gets 0.75 of a banana.

How many friends does he share the bananas with?
 Show your method.

Amir says,

The decimal 0.42 can be read as 'four tenths and two hundredths'.

Teddy says,

The decimal 0.42 can be read as 'forty-two hundredths'.

Who do you agree with?
 Explain your answer.

Amir says 0.3 is less than 12% because 3 is less than 12

Explain why Amir is wrong.

Complete the part-whole model.
 How many different ways can you complete it?

Can you create your own version with different values?

True or False?

0.3 is bigger than $\frac{1}{4}$

Explain your reasoning.

Odd one out.

A

B

C

D

E

F 0.2×3

Which is the odd one out and why?

Measurement

Key vocab: decimal notation, cubic centimetres (cm³), cubic metres (m³), cubic millimetre (mm³), cubic kilometre (km³), decimal places, formulae, miles

NC Objectives:

- Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.
- Use, read, write, and convert between standard units, converting measurements of length, mass, volume, and time from a smaller unit of measure to a larger unit, and vice versa, including decimal notation to three decimal places.
- Convert between miles and km.

Concrete	Pictorial	Abstract																																				
<p>There are ___ grams in one kilogram. There are ___ kilograms in one tonne. Use these facts to complete the tables.</p> <table border="1" style="display: inline-table; margin-right: 20px;"> <thead> <tr><th>g</th><th>kg</th></tr> </thead> <tbody> <tr><td>1,500</td><td></td></tr> <tr><td></td><td>2.05</td></tr> <tr><td>1,005</td><td></td></tr> </tbody> </table> <table border="1" style="display: inline-table;"> <thead> <tr><th>kg</th><th>tonnes</th></tr> </thead> <tbody> <tr><td>1,202</td><td></td></tr> <tr><td></td><td>4.004</td></tr> <tr><td>125</td><td></td></tr> </tbody> </table> <p>There are ___ mm in one centimetre. There are ___ cm in one metre. There are ___ m in one kilometre. Use these facts to complete the table.</p> <table border="1" style="width: 100%;"> <thead> <tr><th>mm</th><th>cm</th><th>m</th><th>km</th></tr> </thead> <tbody> <tr><td>44,000</td><td></td><td></td><td></td></tr> <tr><td></td><td>2,780</td><td></td><td></td></tr> <tr><td></td><td></td><td>15.5</td><td></td></tr> <tr><td></td><td></td><td></td><td>1.75</td></tr> </tbody> </table>	g	kg	1,500			2.05	1,005		kg	tonnes	1,202			4.004	125		mm	cm	m	km	44,000					2,780					15.5					1.75	<p>Choose the unit of measure that would be the most appropriate to measure the items.</p> <div style="border: 1px solid blue; border-radius: 10px; padding: 5px; display: inline-block; margin: 10px 0;">cm kg km g tonnes ml mm litres</div> <ul style="list-style-type: none"> • The weight of an elephant • The volume of water in a bath • The length of an ant • The length of a football pitch • The weight of an apple <p>Estimate how much juice the glass holds:</p> <div style="display: flex; align-items: center; margin: 10px 0;"> <div style="border: 1px solid orange; border-radius: 10px; padding: 5px; display: inline-block;">250 ml 2 litres 0.5 litres $\frac{1}{2}$ kg</div> </div> <p>Estimate the height of the door frame:</p> <div style="display: flex; align-items: center; margin: 10px 0;"> <div style="border: 1px solid green; border-radius: 10px; padding: 5px; display: inline-block; margin-right: 10px;">20 mm 20 cm 20 m 2 km 2 m 0.2 km</div> </div>	<p>A parcel weighs 439 grams. How much would 27 parcels weigh? Give your answer in kilograms.</p> <p>To bake buns for a party, Ron used these ingredients:</p> <div style="border: 1px solid orange; border-radius: 15px; padding: 10px; margin: 10px 0;"> <p>600 g caster sugar 0.6 kg butter 18 eggs (792 g) $\frac{3}{4}$ kg self-raising flour 10 g baking powder</p> </div> <p>What is the total mass of the ingredients? Give your answer in kilograms.</p> <p>In the United Kingdom, the maximum speed on a motorway is 70 miles per hour (mph). In France, the maximum speed on a motorway is 130 kilometres per hour (km/h). Which country has the higher speed limit, and by how much? Give your answer in both units.</p>
g	kg																																					
1,500																																						
	2.05																																					
1,005																																						
kg	tonnes																																					
1,202																																						
	4.004																																					
125																																						
mm	cm	m	km																																			
44,000																																						
	2,780																																					
		15.5																																				
			1.75																																			

Reasoning

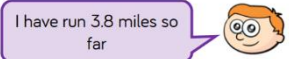
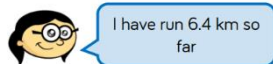
Explain the mistakes

23cm = 2.3 mm

3.05m = 3005 cm

740m = 7.4 km

Ron and Annie are running a 5 mile race.

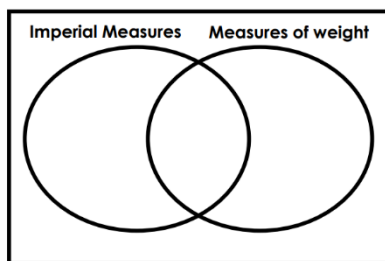


Who has the furthest left to run?

Explore

Write these measures in the correct section of the Venn diagram:

pounds metres grams pints miles



Add some more units of measure

Put these capacities in order, starting with the smallest.

3 litres	3,500 ml
0.4 litres	0.035 litres
450 ml	330 ml

Each nail weighs 3.85 grams.

There are 24 nails in a packet.

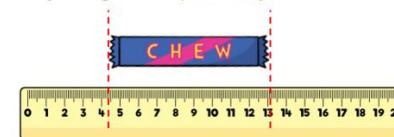
What would be the total mass of 60 packets of nails? Give your answer in kilograms.

How many packets would you need if you wanted $\frac{1}{2}$ kg of nails?

How many grams of nails would be left over?

Teddy thinks his chew bar is 13.2 cm long.

Do you agree? Explain why.



Measurement

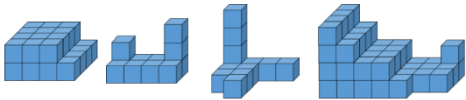
Key vocab: decimal notation, cubic centimetres (cm^3), cubic metres (m^3), cubic millimetre (mm^3), cubic kilometre (km^3), decimal places, formulae, miles

NC Objectives:

- Recognise that shapes with the same areas can have different perimeters and vice versa.
- Calculate the area of parallelograms and triangles.
- Calculate, estimate, and compare volume of cubes and cuboids using standard units, including cm^3 and m^3 , and extending to other units such as mm^3 and km^3 .
- Recognise when it is possible to use the formulae for area and volume of shapes.

Concrete

Make each shape using multilink cubes.



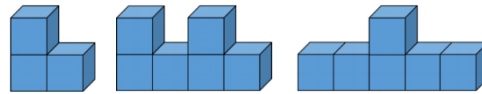
If each cube has a volume of 1 cm^3 , what is the volume of each shape?
Place the shapes in ascending order based on their volume.
What about if each cube represented 1 mm^3 , how would this affect your answer? What about if they were 1 m^3 ?

If one multilink cube represents 1 cubic unit, how many different models can you make with a volume of 12 cubic units?

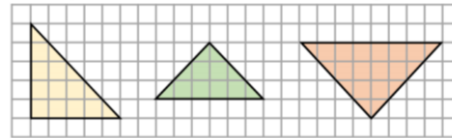
Approximate the area of the parallelogram by counting squares.
Now cut along the dotted line.
Can you move the triangle to make a rectangle?
Calculate the area of the rectangle.

Pictorial

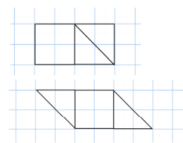
If each cube has a volume of 1 cm^3 , find the volume of each solid.



Count squares to calculate the area of each triangle.



Here are two quadrilaterals.



Sort the shapes into the Carroll diagram.

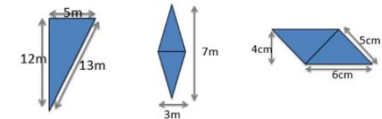
	Quadrilateral	Not a quadrilateral
Area of 12 cm^2		
Area of 16 cm^2		



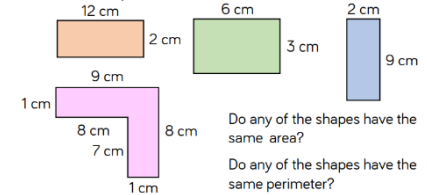
Now draw another shape in each section of the diagram.

Abstract

Calculate the area of each shape.

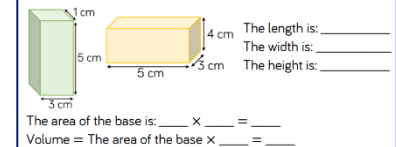


Look at the shapes below.



Do any of the shapes have the same area?
Do any of the shapes have the same perimeter?

Complete the sentences for each cuboid.

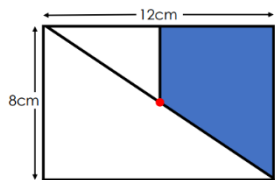


Reasoning

Different ways

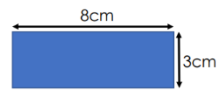
The red spot is in the centre of the rectangle.

What is the area of the blue section?

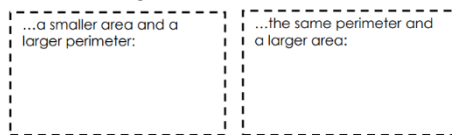


Can you work it out in different ways?

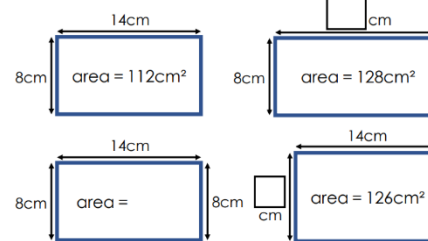
Draw



Draw a rectangle with...



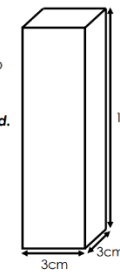
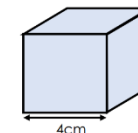
I know... so...



Estimate

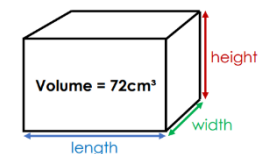
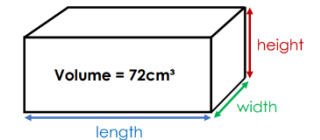
The cube is full of water. The water will be poured into the cuboid.

Estimate the height that the water will reach in the cuboid.



Estimate

Estimate the length, width and height of each cuboid:

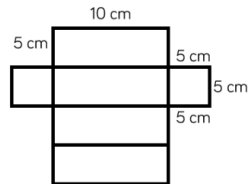
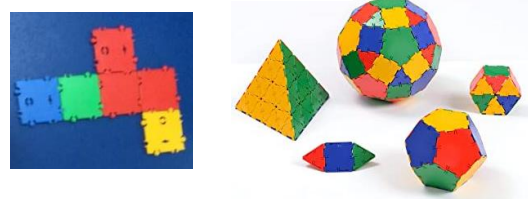
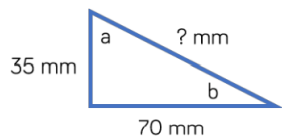
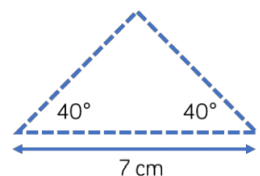
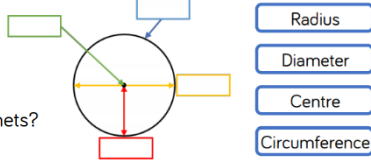




Geometry

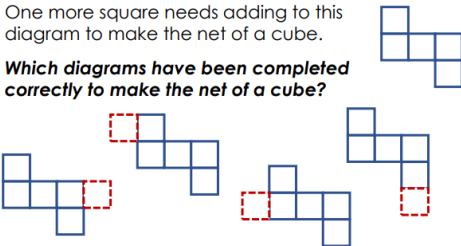
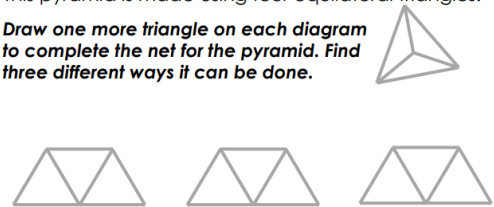
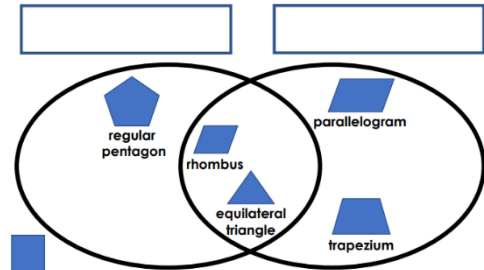
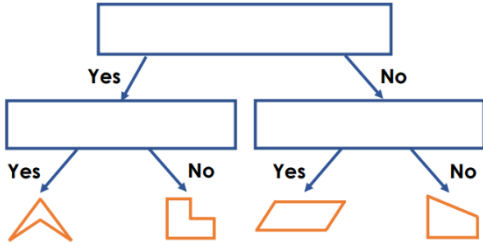
Key vocab: radius, diameter, circumference, nets, four quadrants

NC Objectives:

- Recognise, describe, and build simple 3D shapes, including making nets.
- Draw 2D shapes using given dimensions and angles.
- Compare and classify geometric shapes based on their properties and sizes.
- Illustrate and name parts of circles, including radius, diameter, and circumference, and know that the diameter is twice the radius.

Concrete	Pictorial and Abstract
<p>Accurately draw this net. Cut, fold and stick to create a cuboid.</p>  <p>Use equipment such as Polydron to make shape nets.</p> 	<p>On a piece of squared paper, accurately draw the shapes.</p> <ul style="list-style-type: none"> • A square with perimeter 16 cm. • A rectangle with an area of 20 cm². • A right-angled triangle with a height of 8 cm and a base of 6 cm. • A parallelogram with sides 3 cm and 5 cm. <p>Draw the triangle accurately on squared paper to work out the missing length. Measure the size of angles A and B.</p>  <p>Rosie has been asked to draw this triangle on plain paper using a protractor.</p>  <p>Create a step-by-step plan to show how she would do this.</p> <p>Using the labels complete the diagram:</p>  <p>What three-dimensional shape can be made from these nets?</p>  <p>Identify and describe the faces of each shape.</p> <p>Draw possible nets of these three-dimensional shapes.</p> 

Reasoning

<p>It is correct?</p> <p>One more square needs adding to this diagram to make the net of a cube.</p> <p>Which diagrams have been completed correctly to make the net of a cube?</p> 	<p>Different ways</p> <p>This pyramid is made using four equilateral triangles.</p> <p>Draw one more triangle on each diagram to complete the net for the pyramid. Find three different ways it can be done.</p> 	<p>Explore</p> <p>Write the headings for the Venn diagram</p>  <p>Add other shapes to the diagram</p> <p>Explore</p> <p>Write the questions in the branching database:</p> 
--	--	---

Geometry

Key vocab: radius, diameter, circumference, nets, four quadrants

NC Objectives:

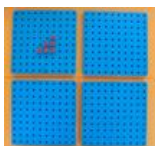
- Find unknown angles in any triangles, quadrilaterals, and regular polygons.
- Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.
- Describe positions on the full coordinate grid (all four quadrants).
- Draw and translate simple shapes on the coordinate plane and reflect them in the axes.

Concrete

Take two quadrilaterals.

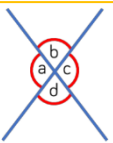


For the first quadrilateral, measure the interior angles using a protractor.
For the second, tear the corners off and place the interior angles at a point as shown.



What's the same? What's different? Is this the case for other quadrilaterals?

Take a piece of paper and draw a large 'X'. Mark the angles on as shown. Measure the angles you have drawn. What do you notice about angles b and d? What do you notice about angles a and c? Is this always the case? Investigate with other examples.



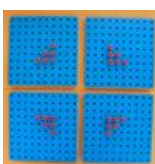
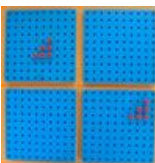
Use different coloured pieces of card to make an equilateral, isosceles, scalene and right-angled triangle.



Use a protractor to measure each interior angle, then add them up. What do you notice?

Now take any of the triangles and tear the corners off. Arrange the corners to make a straight line.

The interior angles of a triangle add up to

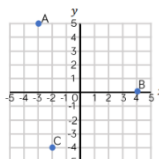


Pictorial and Abstract

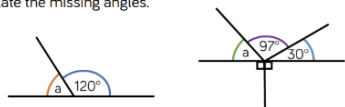
Complete the table.

Angle	Fraction of a full turn	Degrees
Right angle	$\frac{1}{4}$	90°
Straight line		
Three right angles		
Full turn		

Dora plotted three coordinates. Write down the coordinates of points A, B and C.



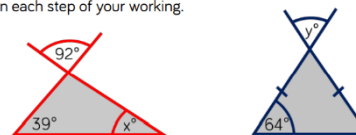
Calculate the missing angles.



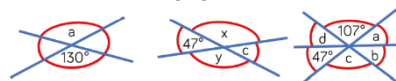
Work out the value of f and g. Explain each step of your working.



Work out the value of x and y. Explain each step of your working.



Find the size of the missing angles.



Is there more than one way to find them?

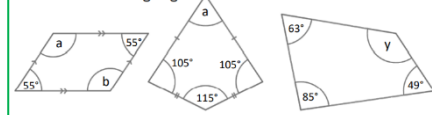
Calculate the missing angles and state the type of triangle that these corners have been torn from.



Calculate the missing angles.

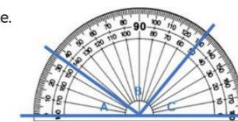


Calculate the missing angles.



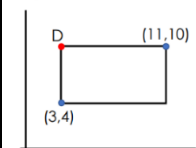
Work out the size of each angle.

Explain how you found your answers.



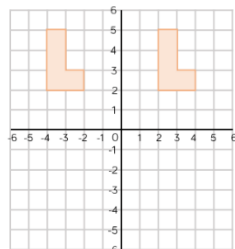
Reasoning

Explain the mistake

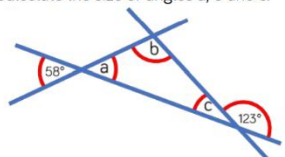


Calculate the coordinates of Point D.
(3,1)
Explain the mistake

Annie has reflected the shape in the y-axis. Is her drawing correct? If not explain why.



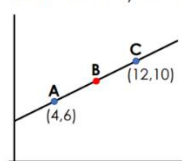
Calculate the size of angles a, b and c.



Give reasons for all of your answers.

Explain the mistake

Point B is half-way between points A and C.



Calculate the coordinates of Point B.
(6,5)
Explain the mistake

Amir says,

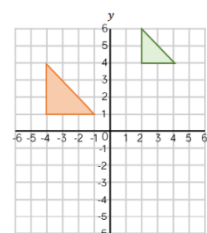


My triangle has two 90° angles.

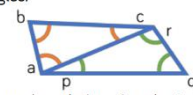
Can Amir be correct? Can you demonstrate this?

Spot the Mistake.

The green triangle has been translated 6 units to the left and 3 units down.



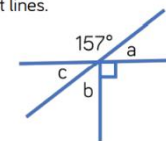
This quadrilateral is split into two triangles.



Use your knowledge of angles in a triangle to find the sum of angles in a quadrilateral.

Split other quadrilaterals into triangles too. What do you notice?

The diagram below is drawn using three straight lines.



Whitney says that it's not possible to calculate all of the missing angles.

Do you agree? Explain why.

Statistics

Key vocab: pie chart, mean, average

NC Objectives:

- Interpret and construct:
 - pie charts
 - line graphs
 and use to solve problems.
- Calculate and interpret the mean as an average.

Concrete	Pictorial	Abstract																						
<p>What is the same and what is different about the two graphs?</p> <p>Here is a graph showing daily water consumption over two days.</p> <p>At what times of the day was the same amount of water consumed on Monday and Tuesday? Was more water consumed at 2 p.m. on Monday or Tuesday morning? How much more?</p>	<p>There are 600 pupils at Copingham Primary school. Work out how many pupils travel to school by:</p> <p>a) Train b) Car c) Cycling d) Walking</p> <p>Classes in Year 2 and Year 5 were asked what their favourite drink was. Here are the results:</p> <p>What fraction of pupils in Year 5 chose Fizzraid? How many children in Year 2 chose Rolla Cola? How many more children chose Vomto than Rolla Cola in Year 2? What other questions could you ask?</p>	<p>150 children voted for their favourite ice cream flavours. Here are their results:</p> <p>How many people voted for Vanilla? How many more people voted for Chocolate than Mint Chocolate Chip? How many people chose Chocolate, Banana and Vanilla altogether?</p> <p>Complete the table:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Radius</th> <th>Diameter</th> </tr> </thead> <tbody> <tr> <td>26 cm</td> <td></td> </tr> <tr> <td></td> <td>37 mm</td> </tr> <tr> <td>2.55 m</td> <td></td> </tr> <tr> <td></td> <td>99 cm</td> </tr> <tr> <td></td> <td>19.36 cm</td> </tr> </tbody> </table> <p>Here is a method to find the mean.</p> <p>Use this method to calculate the mean average for the number of slices of pizza eaten by each child.</p> <p>Calculate the mean number of crayons:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Crayon colour</th> <th>Amount</th> </tr> </thead> <tbody> <tr> <td>Blue</td> <td>14</td> </tr> <tr> <td>Green</td> <td>11</td> </tr> <tr> <td>Red</td> <td>10</td> </tr> <tr> <td>Yellow</td> <td>9</td> </tr> </tbody> </table>	Radius	Diameter	26 cm			37 mm	2.55 m			99 cm		19.36 cm	Crayon colour	Amount	Blue	14	Green	11	Red	10	Yellow	9
Radius	Diameter																							
26 cm																								
	37 mm																							
2.55 m																								
	99 cm																							
	19.36 cm																							
Crayon colour	Amount																							
Blue	14																							
Green	11																							
Red	10																							
Yellow	9																							

Reasoning



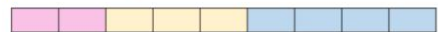

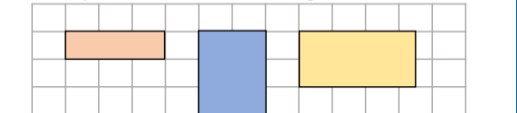


<h3>Explain</h3> <p>Marton Vale Primary ran an 'Active Start' project, encouraging children to walk or cycle to school. They wanted to improve children's fitness and reduce traffic congestion around school.</p> <p>Mode of Travel to School, February</p> <p>Mode of Travel to School, May</p> <p>How successful was the 'Active Start' project?</p>	<p>What could this graph be showing?</p> <p>Label the horizontal and vertical axes to show this.</p> <p>Is there more than one way to label the axes?</p>	<p>96 people took part in this survey.</p> <p>Our favourite pets</p> <p>How many people voted for cats? $\frac{3}{8}$ of the people who voted for dogs were male. How many females voted for dogs? What other information can you gather from the pie chart? Write some questions about the pie chart for your partner to solve.</p>	<p>Three football teams each play 10 matches over a season. The mean number of goals scored by each team was 2.</p> <p>How many goals might the teams have scored in each match? How many solutions can you find?</p> <p>Miss Jones is carrying out a survey in class about favourite crisp flavours. 15 pupils chose salt and vinegar.</p> <p>How many fewer people chose ready salted?</p>
			<p>Work out the age of each member of the family if:</p> <p>Mum is 48 years old. Teddy is 4 years older than Jack and 7 years older than Alex.</p> <p>Mean age of 50 (Mum and Dad) Mean age of 13 (Teddy, Jack, and Alex) Mean age of 6 (Alex and Eva)</p> <p>Calculate the mean age of the whole family.</p>

Ratio and Proportion

Key vocab: ratio, proportion, size, quantity, missing value, integer, multiplication, division, multiply, divide, solve, problem, calculate, percentage, comparison, unequal sharing, grouping
Fractions, multiples

NC Objectives:

- Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.
- Solve problems involving the calculation of percentages of whole numbers or measures such as 15% of 360 and the use of percentages for comparison.
- Solve problems involving similar shapes where the scale factor is known or can be found.
- Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

Concrete	Pictorial	Abstract
<p>Use counters, smarties etc. to explore ratio. Sort the counters/smarties by colour and write the ratios accordingly.</p> 	<p>Complete the sentences.</p>  <p>For every two blue flowers there are ___ pink flowers. For every blue flower there are ___ pink flowers.</p> <p>This bar model shows the ratio 2 : 3 : 4</p>  <p>What fraction of the bar is pink? What fraction of the bar is yellow? What fraction of the bar is blue?</p>	<p>Write down the ratio of:</p> <ul style="list-style-type: none"> • Bananas to strawberries • Blackberries to strawberries • Strawberries to bananas to blackberries • Blackberries to strawberries to bananas  <p>The ratio of red to green marbles is 3 : 7 Draw an image to represent the marbles. What fraction of the marbles are red? What fraction of the marbles are green?</p> <p>Copy these rectangles onto squared paper then draw them double the size, triple the size and 5 times as big.</p> 
<p>A farmer plants some crops in a field. For every 4 carrots he plants 2 leeks. He plants 48 carrots in total. How many leeks did he plant? How many vegetables did he plant in total?</p> 		
<p>Jack mixes 2 parts of red paint with 3 parts blue paint to make purple paint. If he uses 12 parts blue paint, how many parts red paint does he use?</p> <p>Enlarge these shapes by:</p> <ul style="list-style-type: none"> • Scale factor 2 • Scale factor 3 • Scale factor 4 		

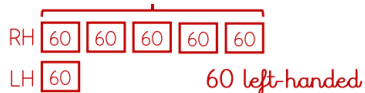
Reasoning

Which picture?

For every five children in the school who are right-handed, there is one left-handed child. There are 300 right-handed children in the school. How many left-handed children?

Who do you agree with?

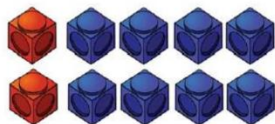
Jen's method 300



Rhian's method



True or False?



- For every red cube there are 8 blue cubes.
- For every 4 blue cubes there is 1 red cube.
- For every 3 red cubes there would be 12 blue cubes.
- For every 16 cubes, 4 would be red and 12 would be blue.
- For every 20 cubes, 4 would be red and 16 would be blue.

Annie is making some necklaces to sell.
For every one pink bead, she uses three purple beads.



Each necklace has 32 beads in total.

The cost of the string is £2.80
The cost of a pink bead is 72p.
The cost of a purple bead is 65p.

How much does it cost to make one necklace?

This recipe makes 10 flapjacks.

Flapjacks

120 g butter
 100 g brown sugar
 4 tablespoons golden syrup
 250 g oats
 40 g sultanas

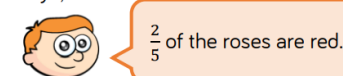
Amir has 180 g butter.

What is the largest number of flapjacks he can make?

How much of the other ingredients will he need?

Ron plants flowers in a flower bed.
For every 2 red roses he plants 5 white roses.

He says,



Is Ron correct?

Algebra

Key vocab: missing number, problem, pairs, number sentence, variables, combination, possibility, enumerate, equation, formulae, generate, linear number, sequence

NC Objectives:

- Express missing number problems algebraically.
- Find pairs of number that satisfy number sentences involving two unknowns.
- Enumerate all possibilities of combinations of two variables.
- Use simple formulae.
- Generate and describe linear number sequences.

Concrete	Pictorial	Abstract																																																														
<p>Match each equation to the correct bar model and then solve to find the value of x.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> $x + 5 = 12$ </div> <div style="text-align: center;"> $3x = 12$ </div> <div style="text-align: center;"> $12 = 3 + x$ </div> </div> <div style="margin-top: 10px;"> <p>Here is each step of an equation represented by a bar model. Write the algebraic steps that show the solution of the equation.</p> </div> <div style="margin-top: 10px;"> <p>Use bar models to solve these equations.</p> <div style="border: 1px solid green; padding: 5px; display: inline-block;"> $3b + 4 = 19$ $20 = 4b + 2$ </div> </div>	<p>Amir represents a word problem using cubes, counters and algebra.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #c8e6c9;"> <th>Words</th> <th>Concrete</th> <th>Algebra</th> </tr> </thead> <tbody> <tr> <td>I think of a number</td> <td></td> <td>x</td> </tr> <tr> <td>Add 3</td> <td></td> <td>$x + 3$</td> </tr> <tr> <td>My answer is 5</td> <td></td> <td>$x + 3 = 5$</td> </tr> </tbody> </table> <p>Complete this table using Amir's method.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #c8e6c9;"> <th>Words</th> <th>Concrete</th> <th>Algebra</th> </tr> </thead> <tbody> <tr> <td>I think of a number</td> <td></td> <td></td> </tr> <tr> <td>Add 1</td> <td></td> <td></td> </tr> <tr> <td>My answer is 8</td> <td></td> <td></td> </tr> </tbody> </table>	Words	Concrete	Algebra	I think of a number		x	Add 3		$x + 3$	My answer is 5		$x + 3 = 5$	Words	Concrete	Algebra	I think of a number			Add 1			My answer is 8			<p>Complete the table for the given function machine.</p> <div style="display: flex; align-items: center; justify-content: center;"> Input → $\times 3$ → $- 4$ → Output </div> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #fff9c4;"> <th>Input</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr style="background-color: #fff9c4;"> <th>Output</th> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <ul style="list-style-type: none"> What patterns do you notice in the outputs? What is the input if 20 is the output? How did you work it out? <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;"> <p>If $\star = 7$ and $\heartsuit = 5$, what is the value of:</p> <p style="text-align: center;">$\star + \heartsuit + \heartsuit$</p> <p>If $a = 7$ and $b = 5$ what is the value of:</p> <p style="text-align: center;">$a + b + b$</p> </div> <p>A book costs £5 and a magazine costs £n. The total cost of the book and magazine is £8. Write this information as an equation.</p> <div style="border: 1px solid blue; padding: 5px; display: inline-block; margin-top: 10px;"> $c \times d = 48$ </div> <p>What are the possible integer values of c and d? How many different pairs of values can you find?</p> <p>Chose values of x and use the equation to work out the values of y.</p> <div style="border: 1px solid red; padding: 5px; display: inline-block; margin-right: 10px;"> $7x + 4 = y$ </div> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #fff9c4;"> <th>Value of x</th> <th>Value of y</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table> <p>Complete the table for the function machine.</p> <div style="display: flex; align-items: center; justify-content: center;"> Input → $+ 5$ → Output </div> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #fff9c4;"> <th>Input</th> <th>5</th> <th>5.8</th> <th>10</th> <th>-3</th> <th>-8</th> <th> </th> <th> </th> </tr> </thead> <tbody> <tr style="background-color: #fff9c4;"> <th>Output</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td>9</td> <td>169</td> </tr> </tbody> </table>	Input	1	2	3	4	5	Output						Value of x	Value of y									Input	5	5.8	10	-3	-8			Output						9	169
Words	Concrete	Algebra																																																														
I think of a number		x																																																														
Add 3		$x + 3$																																																														
My answer is 5		$x + 3 = 5$																																																														
Words	Concrete	Algebra																																																														
I think of a number																																																																
Add 1																																																																
My answer is 8																																																																
Input	1	2	3	4	5																																																											
Output																																																																
Value of x	Value of y																																																															
Input	5	5.8	10	-3	-8																																																											
Output						9	169																																																									

Reasoning

Explain

How many possible values for s in each equation?

Equation	One possible value for s	More than one possible value for s	Infinite possible values for s
$50 > 6s$		✓	
$25 < 20 + s$			
$5s - 2 = 18$			
$5s + 2 = t$			

s is a positive whole number

If I know... then I know...

$$6e + 4 = f$$

When $e = 6$, $f =$

When $e = 8$, $f = 52$

When $e =$ $f = 58$

Explain

$$100 - 5n > 60$$

n is a whole number

Level 1: I can find a possible value for n

Level 2: I can find the largest possible value for n

Which one?

It costs £6 to hire a wetsuit plus £4 per hour used.

It costs £4 to hire a surfboard plus £6 per hour used.

$h =$ hours used

£4 h + £6 = cost to hire a _____

£6 h + £4 = cost to hire a _____

Fill in the gaps with the correct words.

Which answer?

$$3c - 4 = d$$

When $c = 6$, what is the value of d ?

(a) $d = 32$

(b) $d = 14$ Explain how you know.

(c) $d = 5$

Here are two formulae.

$$p = 2a + 5$$

$$c = 10 - p$$

Find the value of c when $a = 10$

Alex has some algebra expression cards.

$y + 4$

$2y$

$3y - 1$

The mean of the cards is 19. Work out the value of each card.

Eva has a one-step function machine. She puts in the number 6 and the number 18 comes out.

6 → → 18

What could the function be? How many different answers can you find?