Summer Scheme of Learning

Year 5

#MathsEveryoneCan

2020-21

White Rose Maths

White Rose Maths

New for 2020/21

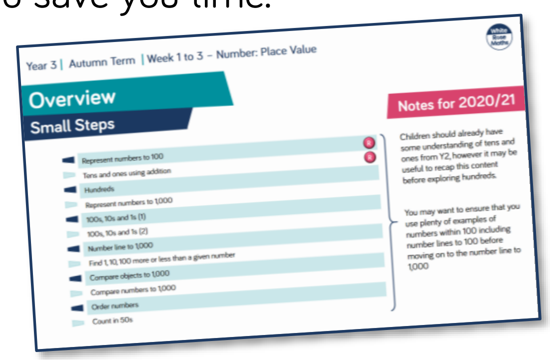
2020 will go down in history. The world has changed for all of us.

We want to do as much as we can to support children, teachers, parents and carers in these very uncertain times.

We have amended our schemes for 2020/21 to:

- ★ highlight key teaching points
- ★ recap essential content that children may have forgotten
- ★ flag any content that you might not have covered during the school closures period.

We hope these changes will add further value to the schemes and save you time.



Lesson-by-lesson overviews

We've always been reluctant to produce lesson-by-lesson overviews as every class is individual and has different needs. However, many of you have said that if blended learning becomes a key feature of school life next year, a weekly plan with linked content and videos could be really useful.

As always, we've listened! We've now produced a complete lesson-by-lesson overview for Y1 to Y9 that schools can use or adapt as they choose. Each lesson will be linked to a free-to-use home learning video, and for premium subscribers, a worksheet. This means that you can easily assign work to your class, whether they are working at home or in school.

Inevitably, this lesson-by-lesson structure won't suit everyone, but if it works for you, then please do make use of this resource as much as you wish.

Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of opportunities to build reasoning and problem solving elements into the curriculum.

For more guidance on teaching for mastery, visit the NCETM website:

https://www.ncetm.org.uk/resources/47230

Concrete - Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

Need some CPD to develop this approach? Visit www.whiterosemaths.com for find a course right for you.

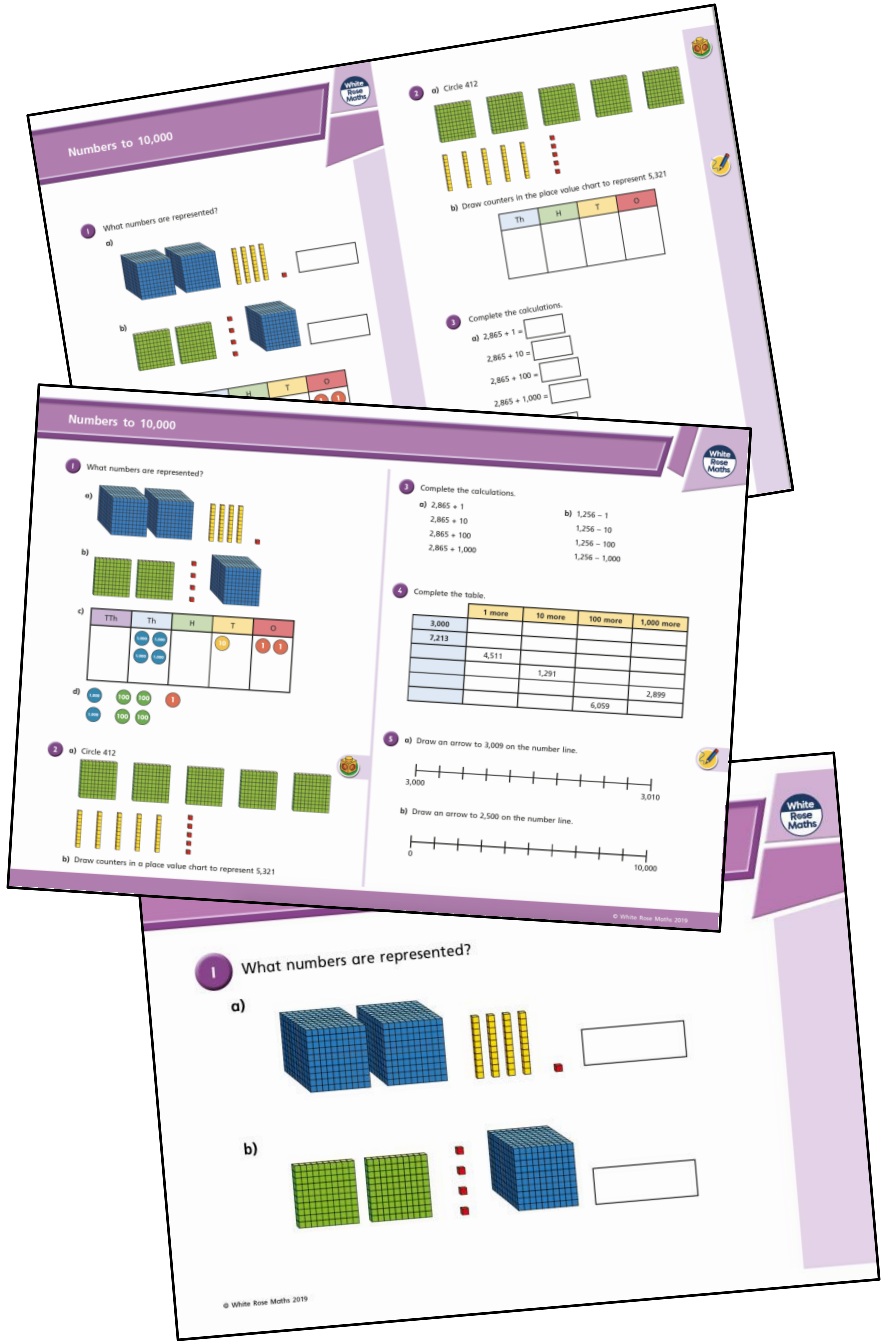
Supporting resources

We have produced supporting resources for every small step from Year 1 to Year 11.

The worksheets are provided in three different formats:

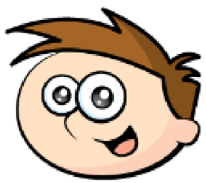
- Write on worksheet – ideal for children to use the ready made models, images and stem sentences.
- Display version – great for schools who want to cut down on photocopying.
- PowerPoint version – one question per slide. Perfect for whole class teaching or mixing questions to make your own bespoke lesson.

For more information visit our online training and resources centre resources.whiterosemaths.com or email us directly at support@whiterosemaths.com



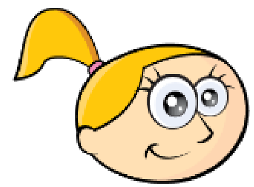
Meet the Characters

Children love to learn with characters and our team within the scheme will be sure to get them talking and reasoning about mathematical concepts and ideas. Who’s your favourite?


Teddy


Rosie

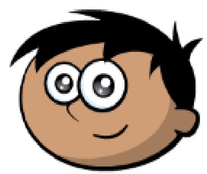

Mo

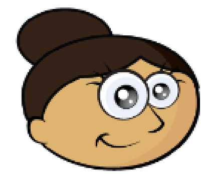

Eva


Alex


Jack


Whitney


Amir


Dora


Tommy


Dexter


Ron


Annie

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	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value			Number: Addition and Subtraction		Statistics		Number: Multiplication and Division			Measurement: Perimeter and Area	
Spring	Number: Multiplication and Division			Number: Fractions						Number: Decimals and Percentages		Consolidation
Summer	Consolidation	Number: Decimals			Geometry: Properties of Shape			Geometry: Position and Direction		Measurement: Converting Units		Measurement: Volume

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Summer - Block 1

Decimals

Overview

Small Steps

- Adding decimals within 1
- Subtracting decimals within 1
- Complements to 1
- Adding decimals – crossing the whole
- Adding decimals with the same number of decimal places
- Subtracting decimals with the same number of decimal places
- Adding decimals with a different number of decimal places
- Subtracting decimals with a different number of decimal places
- Adding and subtracting wholes and decimals
- Decimal sequences
- Multiplying decimals by 10, 100 and 1,000
- Dividing decimals by 10, 100 and 1,000

Notes for 2020/21

This block follows on from learning on decimals in the spring term.

Note that the block has been pushed back to start in the second week of the summer term. This allows the first week to be used to ensure that children are confident in the decimals work they have covered previously.

Adding Decimals within 1

Notes and Guidance

Children add decimals within one whole. They use place value counters and place value charts to support adding decimals and understand what happens when we exchange between columns.

Children build on their understanding that 0.45 is 45 hundredths, children can use a hundred square to add decimals.

Mathematical Talk

What is the number represented on the place value chart?
What digit changes when I add a hundredth?

How many hundredths can I add before the tenths place changes? Explain why.

How can the children shade in the hundred square to support their calculations?

Why does using column addition support adding decimals? What is the same and what is different?

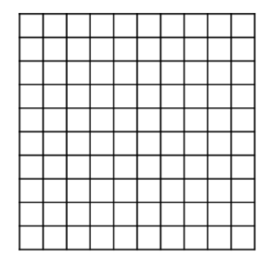
Varied Fluency

Use this place value chart to help answer the questions.

Ones	Tenths	Hundredths	Thousandths
	0.1 0.1 0.1 0.1	0.001	0.01 0.01

- What number is one hundredth more?
- Add 0.3, what number do you have now?
- How many more thousandths can I add before the hundredths digit changes?

Each box in this hundred square represents one hundredth of the whole. Use this to answer:



0.07 + 0.78

0.87 + 0.07

Use the column method to complete the additions.

0.45 + 0.5

0.45 + 0.05

0.45 + 0.005

Adding Decimals within 1

Reasoning and Problem Solving

What mistake has Dora made?

0.41 + 0.3 = 0.413

Use at least 2 representations to show why she is incorrect.

Dora has put the 3 tenths in the thousandths place.

The correct answer is 0.71

Compare the numbers sentences using <, > or =

0.7 + 0.03 + 0.001 ◯ 0.07 + 0.3 + 0.1

0.4 + 0.1 + 0.05 ◯ 0.3 + 0.2 + 0.05

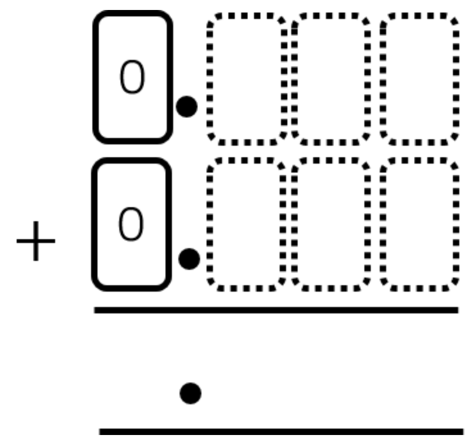
>

=

Rosie has some digit cards.

0	1	2	3	4	5

She uses each card once to make a number sentence.



What is the largest number she can make? What is the smallest?

Largest: 0.951

Smallest: 0.159

Subtracting Decimals within 1

Notes and Guidance

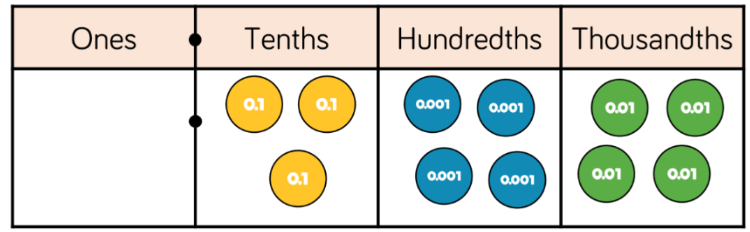
Children subtract decimals using a variety of different methods.
They look at subtracting using place value counters on a place value grid. Children also explore subtraction as difference by using a number line to count on from the smaller decimal to the larger decimal.
Children use their knowledge of exchange within whole numbers to subtract decimals efficiently.

Mathematical Talk

What is the number represented on the place value chart?
What is one tenth less than one?
What is one hundredth less than one?
Show me how you know.
If I'm taking away tenths, which digit will be affected? Is this always the case?
How many hundredths can I take away before the tenths place is affected?

Varied Fluency

Here is a number.



- What is three tenths less than the number?
- Take away 0.02, what is your number now?
- Subtract 5 thousandths. What is the final number?

Find the difference between the two numbers using the number line.

0.424 0.618

Calculate.

0.584 – 0.154 =	0.44 – 0.1 =
0.684 – 0.254 =	0.44 – 0.09 =
0.685 – 0.255 =	0.44 – 0.11 =

Subtracting Decimals within 1

Reasoning and Problem Solving

Here are four calculations.
Which one is the easiest to answer?
Which one is the trickiest to answer?
Explain your choice of order.

$0.45 - 0.3 =$

$0.45 - 0.15 =$

$0.45 - 0.23 =$

$0.45 - 0.18 =$

Children justify the order they have given.

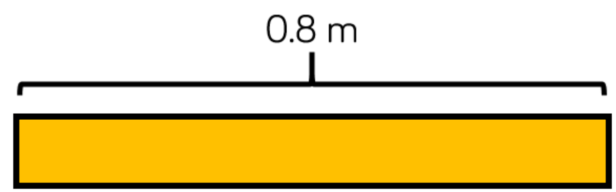
Possible order:

$0.45 - 0.23 = 0.22$
(no exchange)

$0.45 - 0.15 = 0.3$
(no exchange with 0)

$0.45 - 0.3 = 0.15$
(no exchange, different dp)

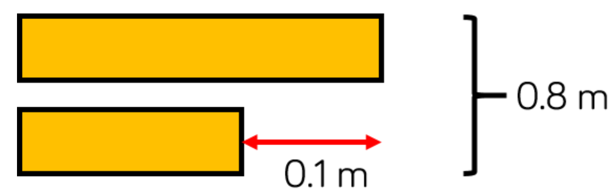
$0.45 - 0.18 = 0.27$
(exchange)



The strip of paper is 0.8 m long.

It is cut into two unequal parts.

The difference in lengths between the two strips of paper is 0.1 m



How long are the two strips of paper?

Strip 1: 0.45 m

Strip 2: 0.35 m

Complements to 1

Notes and Guidance

Children find the complements which sum to make 1

It is important for children to see the links with number bonds to 10, 100 and 1000

This will support them when finding complements to 1, up to three decimal places.

Children can use a hundred square, part-whole models and number lines to support finding complements to one.

Mathematical Talk

What number bonds can you use to help you?

How can shading the hundred square help you find the complement to 1?

How many different ways can you make 1? How many ways do you think there are?

If I add _______, which place will change? How many can I add to change the tenths/hundredths place?

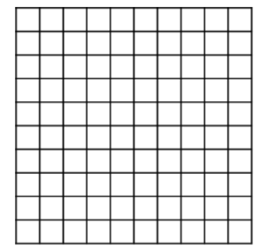
Varied Fluency

- Using a blank hundred square, where each square represents one hundredth, find the complements to 1 for these numbers.

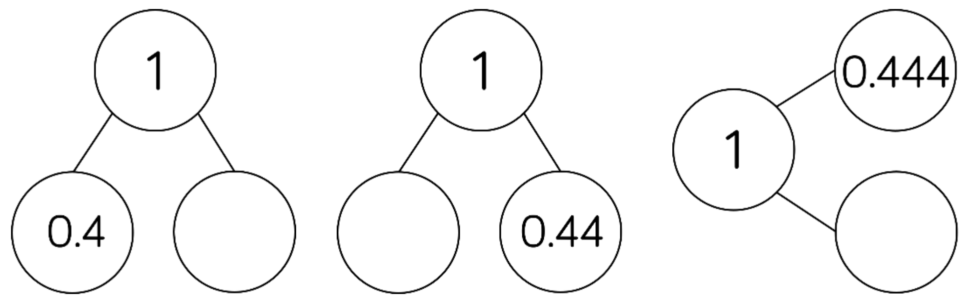
  0.55 + $\boxed{}$ = 1

  1 = 0.32 + $\boxed{}$

  0.11 + 0.5 + $\boxed{}$ = 1

- Complete the part-whole models.

- Use the number line to find the complements to 1

  0.324 ———————————— 1

  0.459 ———————————— 1

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Complements to 1

Reasoning and Problem Solving

0.333 + ☐ = 1

Do you agree with Tommy?
Can you explain what his mistake was?

Tommy has forgotten that when you have ten in a place value column you need to use your rules of exchanging.

e.g.
10 tenths = 1 one
10 hundredths = 1 tenth
10 thousandths = 1 hundredth

The correct answer is 0.667

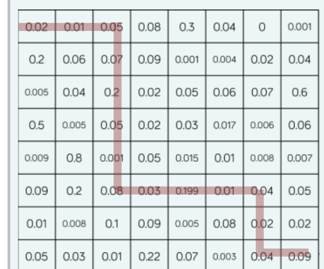
How many different ways can you find a path through the maze, adding each number at a time, to make a total of one?

Start →

0.02	0.01	0.05	0.08	0.3	0.04	0	0.001
0.2	0.06	0.07	0.09	0.001	0.004	0.02	0.04
0.005	0.04	0.2	0.02	0.05	0.06	0.07	0.6
0.5	0.005	0.05	0.02	0.03	0.017	0.006	0.06
0.009	0.8	0.001	0.05	0.015	0.01	0.008	0.007
0.09	0.2	0.08	0.03	0.199	0.01	0.04	0.05
0.01	0.008	0.1	0.09	0.005	0.08	0.02	0.02
0.05	0.03	0.01	0.22	0.07	0.003	0.04	0.09

→ 1

Once you have found a way, can you design your own smaller maze for others to solve?



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Adding – Crossing the Whole

Notes and Guidance

Children use their skills at finding complements to 1 to support their thinking when crossing the whole. Children require flexibility at partitioning decimals, as bridging will be extremely important. Encourage children to make one first, then add the remaining decimal.

For example: 0.74 + 0.48 =

0.74 + 0.26 + 0.22 = 1.22

Mathematical Talk

What happens when we have 10 in a place value column?

How would partitioning a number help us?

How do you decide what number to partition?

Why is partitioning 0.67 into 0.55 and 0.12 more helpful than 0.6 and 0.07?

What complement to 1 would I use to answer this question?

Varied Fluency

- Use the place value grid to answer 0.453 + 0.664

Ones	Tenths	Hundredths	Thousandths
	0.1 0.1 0.1 0.1	0.001 0.001 0.001 0.001 0.001	0.01 0.01 0.01
	0.1 0.1 0.1 0.1 0.1 0.1	0.001 0.001 0.001 0.001 0.001 0.001	0.01 0.01 0.01 0.01

- Amir is using complements to 1 to add decimals.

0.45 + 0.67 =

0.55 + 0.12

0.45 + 0.55 + 0.12 = 1.12

Use Amir's method to solve:

a) 0.56 + 0.78

b) 3.42 + 0.79

- Use the column method to solve the additions.

0.47 + 0.6

0.982 + 0.18

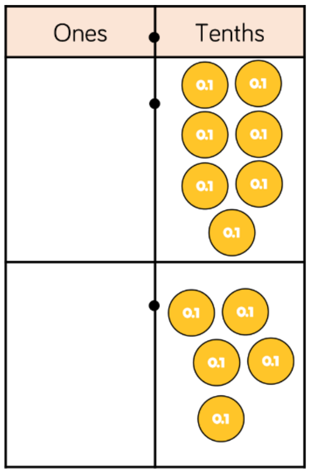
0.92 + 0.8

Adding – Crossing the Whole

Reasoning and Problem Solving

A place value grid is used to solve

0.7 + 0.5

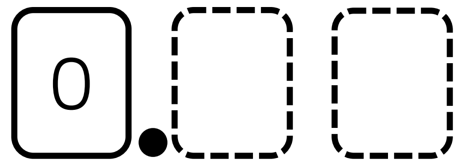


Alex thinks the answer is 0.12
What mistake has she made?

Ten lots of one tenth is one whole. There are 12 tenths so Alex needs to make an exchange. She should exchange 10 tenths for 1 one.

The correct answer is 1.2

You will need a partner and a six-sided dice for this game.



Take it in turns rolling the dice twice and placing the digits in the blank spaces above. Record the number in a table.

Swap over with your partner.

Roll the dice again and add your new number to the first number. The winner is the person who after adding 4 numbers is the closest to 1.5 **without** going over.

Example:

Player 1 rolls a 1 and a 4. 0.14

Player 1 then rolls a 2 and a 6. 0.26

0.14 + 0.26 = 0.38

Player 1	Player 2
0.14	0.64
0.38	1.23
0.69	1.49
1.24	~~1.60~~

Adding – Same Decimal Places

Notes and Guidance

Children add numbers greater than one with the same number of decimal places.

Place value grids and counters are extremely helpful in ensuring children are understanding the value of each digit and understanding when to exchange.

Ensure children see the formal written method (column addition) alongside the place value chart.

Mathematical Talk

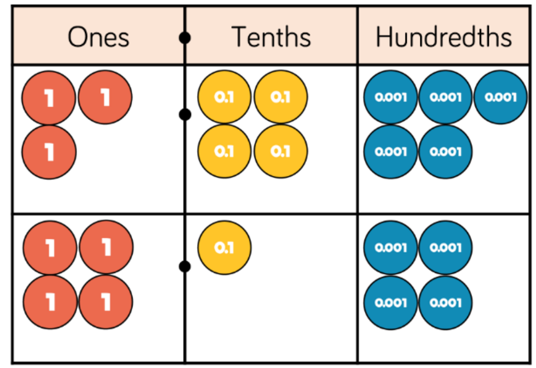
Why is it important to line up the columns?

What happens when there are a total of ten counters in a place value column?

Why is the position of the decimal point important?

Varied Fluency

- Use the place value chart to add 3.45 and 4.14



$$\begin{array}{r} 3.45 \\ +\ 4.14 \\ \hline \\ \hline \end{array}$$

- Use the column method to solve these additions.

$$\begin{array}{r} 4.42 \\ +\ 7.63 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 4.55 \\ +\ 3.07 \\ \hline \\ \hline \end{array}$$

- Ron goes to the shops. He buys 3 items. What is the most he could pay? What is the least he could pay?


£4.45


£5.59


£3.99


£4.05

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Adding – Same Decimal Places

Reasoning and Problem Solving

$+\ 0.2$

$$3.2 + 2.8 = 3 + 3$$

$-\ 0.2$

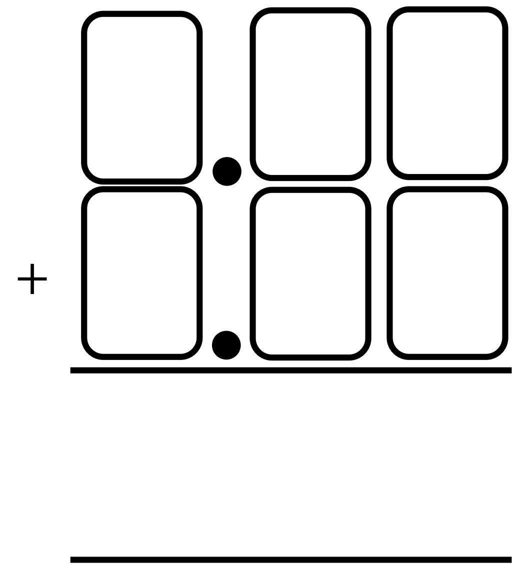
$+\ 0.18$

$$3.18 + 2.82 = 3 + 3$$

$-\ 0.18$

Using these strategies, can you find more number sentences which have the same total as 3 + 3

Children may find a range of answers. The important teaching point is to highlight that you have added the same to one number as you have taken away from the other.



Using the digits 0 – 9 only once in each of the spaces above, what is:

- The largest sum possible
- The smallest sum possible

Is there more than one way of creating each total?

Largest

9.75 + 8.64

9.65 + 8.74

9.64 + 8.75

9.74 + 8.65

Smallest

0.24 + 1.35

0.25 + 1.34

0.34 + 1.25

0.35 + 1.24

Subtract – Same Decimal Places

Notes and Guidance

Children subtract numbers with the same number of decimal places. They use place value counters and a place value grid to support them with exchanging.

Children should be given opportunities to apply subtraction to real life contexts which could involve measures. Bar models can be a useful representation of the problems.

Mathematical Talk

What happens when you need to subtract a greater digit from a smaller digit e.g. 3 hundredths subtract 4 hundredths?

How many tenths are equivalent to one hundredth?

Do we only ever make one exchange in a subtraction calculation?

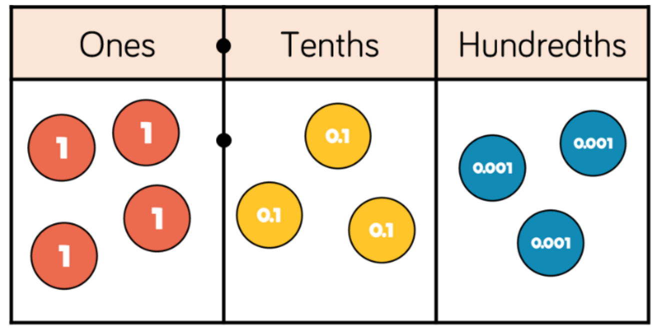
Which of these numbers will need exchanging?

Can you predict what the answer might be?

How could you check your answer?

Varied Fluency

- Use the place value chart to find the to answer 4.33 – 2.14



$$\begin{array}{r} 4.33 \\ -\ 2.14 \\ \hline \\ \hline \end{array}$$

- Use the column method to answer these questions.

$$\begin{array}{r} 6.4 \\ -\ 3.8 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 5.05 \\ -\ 2.15 \\ \hline \\ \hline \end{array}$$

- Jack has £12.54 in his wallet.
  He buys a football which costs £5.82

  How much money does he have left?

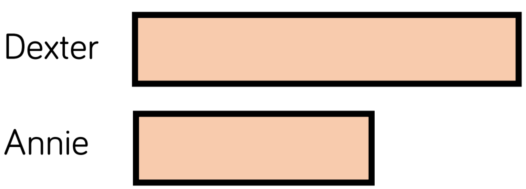
Subtract – Same Decimal Places

Reasoning and Problem Solving

Dexter and Annie have some money.
Dexter has £3.45 more than Annie.

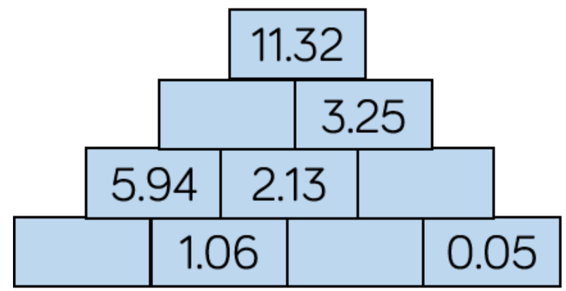
They have £12.45 altogether.

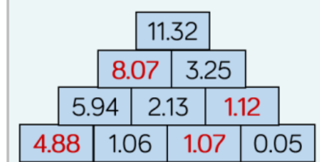
How much money does Annie have?



Annie has £4.50

In this number pyramid, each number is calculated by adding the two numbers underneath.





Adding – Different D.P.

Notes and Guidance

Children add numbers with different numbers of decimal places. They focus on the importance of lining up the decimal point in order to ensure correct place value.

Children should be encouraged to think about whether their answers are sensible. For example, when adding 1.3 to 1.32 and getting an answer 1.45, how do we know it is not a sensible answer? Discuss the importance of estimation.

Mathematical Talk

Why is the decimal point important when we are reading and writing a number?

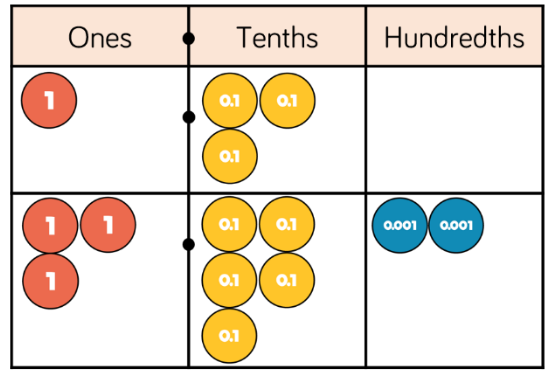
What would a sensible estimate be?

Is this a sensible answer? Why/why not?

What advice would you give to someone that is struggling with recording their numbers in the correct place?

Varied Fluency

- Use the place value grid to add 1.3 and 3.52



$$\begin{array}{r} 1\,.\,3 \\ +\ 3\,.\,52 \\ \hline \\ \hline \end{array}$$

- Use the column method to answer these questions.

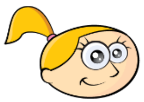
$$\begin{array}{r} 4\,.\,4 \\ +\ 7\,.\,044 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 4\,.\,42 \\ +\ 1\,.\,6 \\ \hline \\ \hline \end{array}$$

- Whitney is cycling in a race.
  She has cycled 3.145 km so far and has 4.1 km left to go. What is the total distance of the race?

Adding – Different D.P.

Reasoning and Problem Solving

Eva is trying to find the answer to



4.144 + 1.4

Here is her working out.

$$
\begin{array}{r}
4.144 \\
+\ \ 1.4 \\
\hline
4.248 \\
\hline
\end{array}
$$

Can you spot and explain her error?

Work out the correct answer.

The digits are lined up incorrectly.

Eva needs to line up the decimal point.

The correct answer is 5.544

Place the calculations in the correct column in the table.

9.99 + 0.1 | 9.99 + 1 | 9.99 + 0.001 | 9.99 + 0.01

Some calculations might need to go in more than one place.

No exchange	Exchange in the ones column	Exchange in the tenths column	Exchange in the hundredths column	Exchange in the thousandths column

Add 2 more calculations to each column.

No exchange:

9.99 + 0.001

Exchange in the ones column:

9.99 + 1

9.99 + 0.1

9.99 + 0.01

Exchange in the tenths column:

9.99 + 0.1

9.99 + 0.01

Exchange in the hundredths column:

9.99 + 0.01

Subtracting – Different D.P.

Notes and Guidance

Children subtract decimals with different numbers of decimal places.

They continue to focus on the importance of lining up the decimal point in order to ensure correct place value.

Children identify the importance of zero as a place holder.

Mathematical Talk

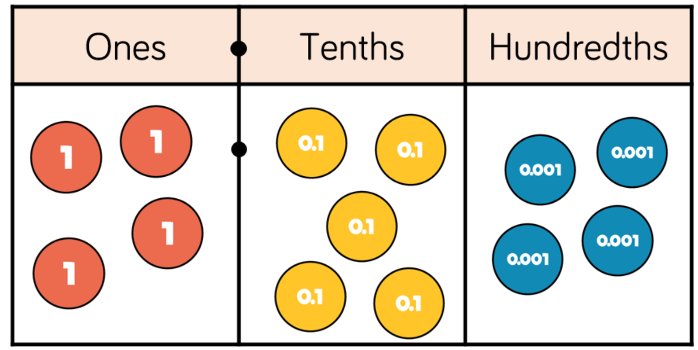
What does it mean if there is nothing in a place value column? How can we represent this in the formal written method?

What do you notice about 4.7 – 3.825 and 4.699 – 3.824? Is one of them more difficult than the other? Why?

Are there more efficient methods for this question?

Varied Fluency

- Use the place value grid to help subtract 1.4 from 4.54



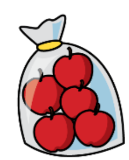
$$\begin{array}{r} 4\,.\,54 \\ -\ 1\,.\,4 \\ \hline \\ \hline \end{array}$$

- Use the column method to work out the following.

$$\begin{array}{r} 6\,.\,06 \\ -\ 3\,.\,7 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 4\,.\,7 \\ -\ 3\,.\,825 \\ \hline \\ \hline \end{array}$$

3.3 – 1.34 =
14.41 – 1.43 =
3 – 1.87 =

- How much change would I get from £10 if I bought a bag of apples costing £4.27?



Subtracting – Different D.P.

Reasoning and Problem Solving

If there are 5 hundredths and I subtract nothing from it then there are still 5 hundredths.

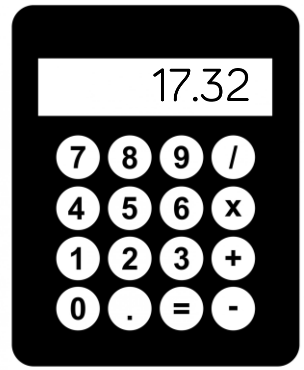
$$\begin{array}{r} 4.9 \\ -\ 3.85 \\ \hline 1.15 \\ \hline \end{array}$$

Do you agree with Whitney?
Explain your answer.

Whitney is not correct. She needs to use zero as a place value holder in the hundredths column of 4.9 and then exchange.

Encourage children to explore more efficient mental strategies as well as correcting the formal method.

The correct answer is 1.05



Teddy used a calculator to solve:
31.4 – 1.408

When he looked at his answer of 17.32 he realised he'd made a mistake.

He had typed all the correct digits in.

Can you spot his mistake?
What should the correct answer be?

Teddy placed the decimal point after the 4 making 14.08 instead of 1.408

The correct answer is 29.992

Wholes and Decimals

Notes and Guidance

Children add and subtract numbers with decimals from whole numbers. Highlight that whole numbers are written without a decimal point.

There may be a misconception when recording integers, link this to the place value grid. Emphasise prior understanding that the decimal point is to the right of the ones place.

Mathematical Talk

What is a whole number/integer?

Where can we add a decimal point to the number 143 so that its value stays the same?

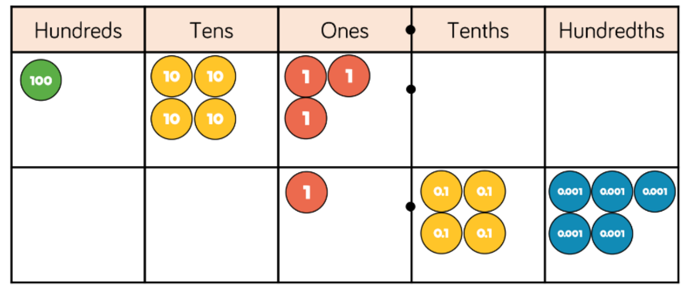
What's the same and what's different about 10 and 10.0 ?

Can you use different methods? (Number line, column subtraction, mentally).

Which is most efficient for this calculation? Explain why.

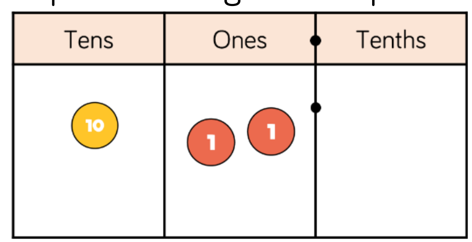
Varied Fluency

Use the place value grid to help add 143 and 1.45



$$
\begin{array}{r}
1\,4\,3\,. \\
+\quad 1\,.\,4\,5 \\
\hline
\\
\hline
\end{array}
$$

Use the place value grid to help work out 12 – 1.2



$$
\begin{array}{r}
1\,2\,. \\
-\quad 1\,.\,2 \\
\hline
\\
\hline
\end{array}
$$

Find the most efficient method to solve this calculations.

43 – 2.14 + 0.86 =

19 – 0.25 =

23 + 4.105 =

19 – 17.37 =

White Rose Maths

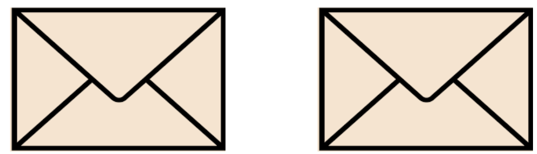
Wholes and Decimals

Reasoning and Problem Solving

What are the missing digits in the calculation?

$$
\begin{array}{r}
31.\square0 \\
-\ \square.37 \\
\hline
29.63 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
31.00 \\
-\ \ 1.37 \\
\hline
29.63 \\
\hline
\end{array}
$$



Two envelopes contain two different numbers.

- The sum of the numbers is 9.92
- The difference between the numbers is 2.32

What numbers are inside the envelopes?

How can this bar model help?

3.8 and 6.12

Decimal Sequences

Notes and Guidance

Children look at decimal sequences and create simple rules, for example: adding 0.5 every time.

It is important to note that they are not expected to generate algebraic expressions for the sequences, but the use of the word 'term' could be used to predict the next number in the sequence. For example, what would be the value of the 10th term in the sequence?

Mathematical Talk

What do increasing and decreasing mean?

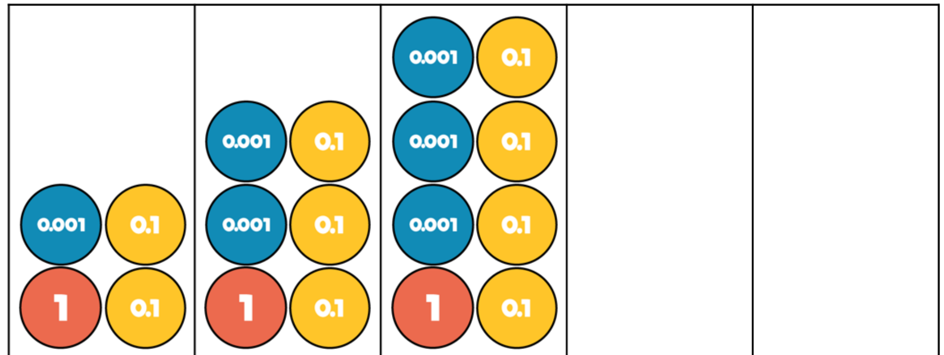
Is the sequence increasing by the same amount each time? By how much?

What is the same about each term? What is changing in each term?

What will the next term in the sequence be?

Varied Fluency

Complete the sequence.



1st	2nd	3rd	4th	5th
1.21	1.32	1.43		

Write the rules for each sequence.

- 0.45, 0.6, 0.75, 0.9 The rule is
- 1.25, 2.5, 3.75, 5, 6.25 The rule is

Generate the first 5 terms of this sequence.

The 1st term is 1.74
The sequence decreases by 0.24 each time.

Decimal Sequences

Reasoning and Problem Solving

9.48 9.52 9.56 9.6 …

The number 9.7 will be in this sequence.

Do you agree with Jack?
Explain your answer.

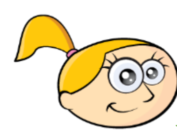
Jack is incorrect, 9.68 and 9.72 will be in the sequence but not 9.7

The terms are increasing by 0.04 therefore 9.7 will not be in the sequence.

	1st sequence	Relationship →	2nd sequence
1st term	0.1		1
2nd term	0.2		2
3rd term	0.3		3
4th term	0.4		4
5th term			

Eva compared the two sequences above. What do you notice about the differences between the terms in the two sequences?

Investigate Eva's sequences below and explain your thinking.



I wonder what the differences would be between sequences that go up in + 0.01 and +1 sequence…

The difference between the terms is increasing by 0.9 each time e.g.

1st + 0.9

2nd + 1.8

3rd + 2.7

4th + 3.6

Children may also notice that the terms in the 2nd sequence are ten times larger than in the first.

The differences would increase by 0.99 each time.

Multiply by 10, 100 and 1,000

Notes and Guidance

Children learn how to multiply numbers with decimals by 10, 100 and 1,000 They look at moving the counters in a place value grid to the left in order to multiply by multiples of 10 Children may have previously made the generalisation that when a number is ten times greater they put a zero on the end of the original number. This small step highlights the importance of understanding the effect of multiplying both integers and decimal numbers by multiples of 10.

Mathematical Talk

What is the value of each digit? Where would these digits move to if I multiplied the number by 10?

Why is the zero important in this number? Could we just take it out to make it easier for ourselves? Why/why not?

What do you notice about the numbers you are multiplying in the table?

Varied Fluency

- Use the place value grid to multiply 3.24 by 10, 100 and 1,000

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths

When you multiply by ____, you move the counters _____ places to the left.

- Use a place value grid to multiply these decimals by 10, 100 and 1,000

4.24 | 2.401 | 42.1

- Complete the table below.

	×10	×100	×1,000
3.14			
13			
0.233			

Multiply by 10, 100 and 1,000

Reasoning and Problem Solving

Multiplying by 1,000 is the same as doing $10 \times 10 \times 10$

Do you agree with Mo?
Explain your answer.

Mo is correct, as you move the digits 3 places to the left in both cases.

Using the digits 0-9 create a number with up to 3 decimal places, for example, 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?

Children will be able to see how the counter will move up a row for multiplying by 10, two rows for 100 and three rows for 1,000. They can see that this happens to each digit regardless of the value.

For example,

3.451×10 becomes 34.51

Each counter moves up a row but stays in the same column.

Divide by 10, 100 and 1,000

Notes and Guidance

Children learn how to divide numbers with decimals by 10, 100 and 1,000

Children use the place value chart to support the understanding of moving digits to the right.

Following on from the previous step, the importance of the place holder is highlighted.

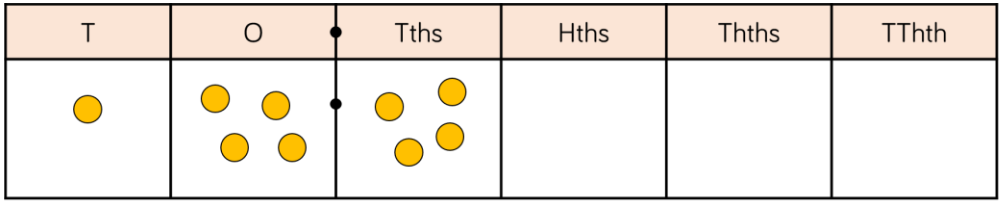
Mathematical Talk

What is the value of each digit? Where would these digits move to if I divided the number by 10?

Which direction do I move the digits of the number when dividing by 10, 100 and 1,000?

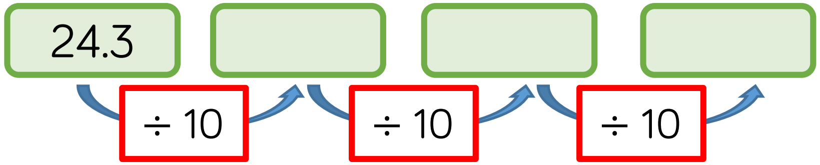
Varied Fluency

- Use the place value grid to divide 14.4 by 10, 100 and 1,000



When you divide by ____, you move the counters _____ places to the right.

- Fill in the missing numbers in the diagram.



- Fill in the missing numbers in these calculations.

$34.2 \div \boxed{} = 0.342$ $\quad \boxed{} \div 10 = 54.1$

$\boxed{} \div 10 = 1.93 \div 100$

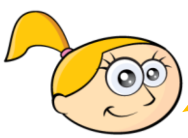
Divide by 10, 100 and 1,000

Reasoning and Problem Solving

If you multiply a number by 1,000, you can just divide the answer by 1,000 to get back to your original number.

Whitney

That's not true, you would need to divide the answer by ten three times.



Eva

Who do you agree with?
Explain your thinking.

Both girls are correct, as dividing by 1,000 is the same as dividing by 10 three times.

Here are three rectangles.

The lengths of rectangle B are 10 times larger than rectangle A.
The lengths of rectangle C are 100 times smaller than rectangle B.

The perimeter of rectangle A is 1,000 times greater than the perimeter of rectangle C.

Do you agree with Mo?
Explain your thinking.

Mo is incorrect.

He has multiplied 10 and 100 to get 1,000 times greater.

The perimeter of rectangle A is only 10 times greater than rectangle C. Children may calculate the perimeters of each rectangle or may just notice the relationship between each.

Summer - Block 2

Properties of Shape

Overview

Small Steps

- Identify angles R
- Compare and order angles R
- Measure angles in degrees
- Measuring with a protractor (1)
- Measuring with a protractor (2)
- Drawing lines and angles accurately
- Calculating angles on a straight line
- Calculating angles around a point
- Triangles R
- Quadrilaterals R
- Calculating lengths and angles in shapes
- Regular and irregular polygons
- Reasoning about 3-D shapes

Notes for 2020/21

Learning on properties of shape may have been missed during lockdown or covered remotely.

Children should recap the essential prerequisite knowledge from year 4 before moving on to look at year 5 content.

Identify Angles

Notes and Guidance

Children develop their understanding of obtuse and acute angles by comparing with a right angle. They use an angle tester to check whether angles are larger or smaller than a right angle.
Children learn that an acute angle is more than 0 degrees and less than 90 degrees, a right angle is exactly 90 degrees and an obtuse angle is more than 90 degrees but less than 180 degrees.

Mathematical Talk

How many degrees are there in a right angle?

Draw an acute/obtuse angle.

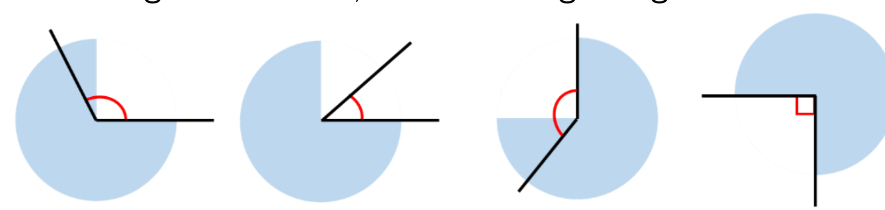
Estimate the size of the angle.

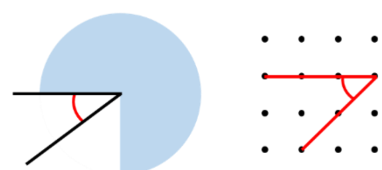
Varied Fluency

R

- A right angle is _____ degrees.
  Acute angles are _____ than a right angle.
  Obtuse angles are _____ than a right angle.

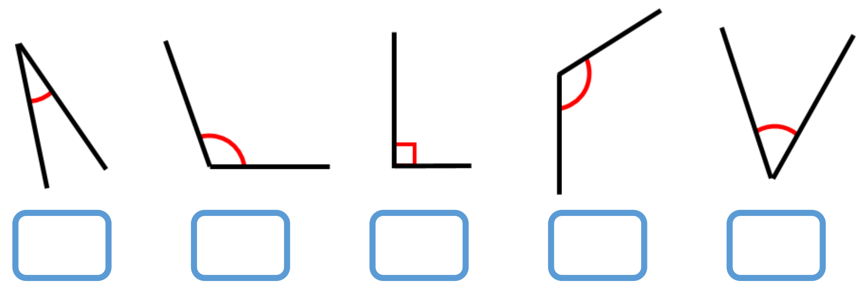
- Sort the angles into acute, obtuse and right angles.





87° 97°

- Label the angles. O for obtuse, A for acute and R for right angle.

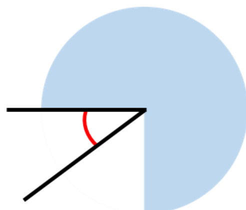


White Rose Maths

Identify Angles

Reasoning and Problem Solving

R



I know the angle is not obtuse.

Teddy

Alex

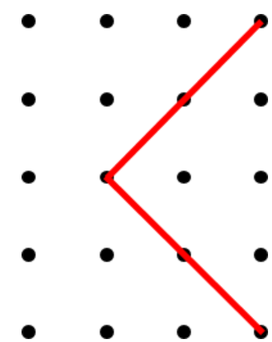
I know the angle is acute.

I think the angle is roughly 45°.

Whitney

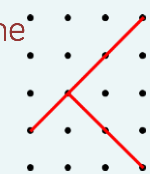
Who is correct?
Explain your reasons.

All are correct. Children may reason about how Whitney has come to her answer and discuss that the angle is about half a right angle. Half of 90 degrees is 45 degrees.



Is the angle acute, obtuse or a right angle? Can you explain why?

The angle is a right angle.
Children may use an angle tester to demonstrate it, or children may extend the line to show that it is a quarter turn which is the same as a right angle.



Find the sum of the largest acute angle and the smallest obtuse angle in this list:

12° 98° 87° 179° 90° 5°

$87° + 98° = 185°$

Compare & Order Angles

Notes and Guidance

Children compare and order angles in ascending and descending order.

They use an angle tester to continue to help them to decide if angles are acute or obtuse.

Children identify and order angles in different representations including in shapes and on a grid.

Mathematical Talk

How can you use an angle tester to help you order the angles?

How many obtuse/acute/right angles are there in the diagrams?

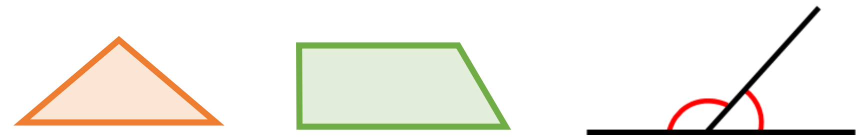
Compare the angles to a right angle. Does it help you to start to order them?

Rotate the angles so one of the lines is horizontal. Does this help you to compare them more efficiently?

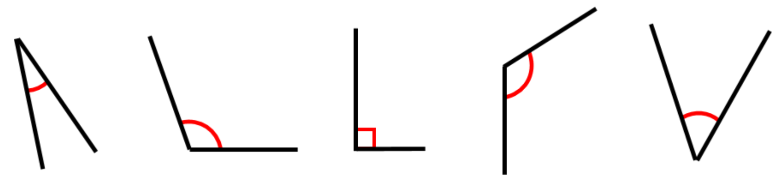
Varied Fluency

R

- Circle the largest angle in each shape or diagram.

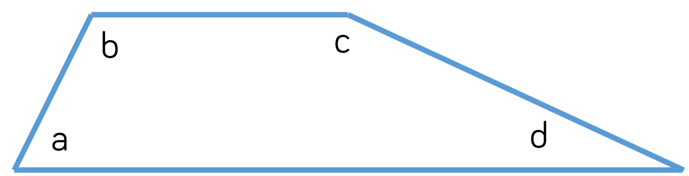


- Order the angles from largest to smallest.



Can you draw a larger obtuse angle?
Can you draw a smaller acute angle?

- Order the angles in the shape from smallest to largest. Complete the sentences.

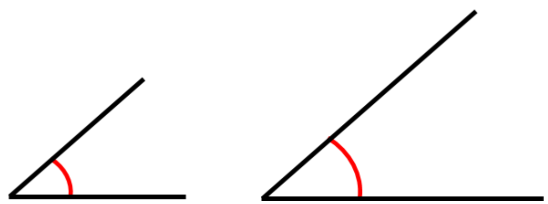


Angle _____ is smaller than angle _____.
Angle _____ is larger than angle _____.

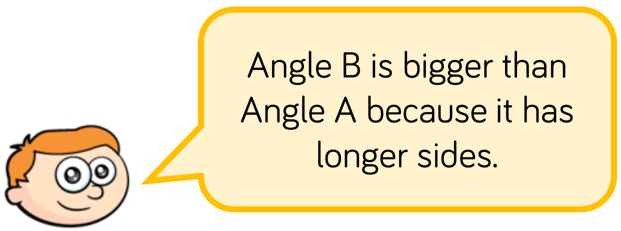
Compare & Order Angles

Reasoning and Problem Solving

R



Angle A Angle B

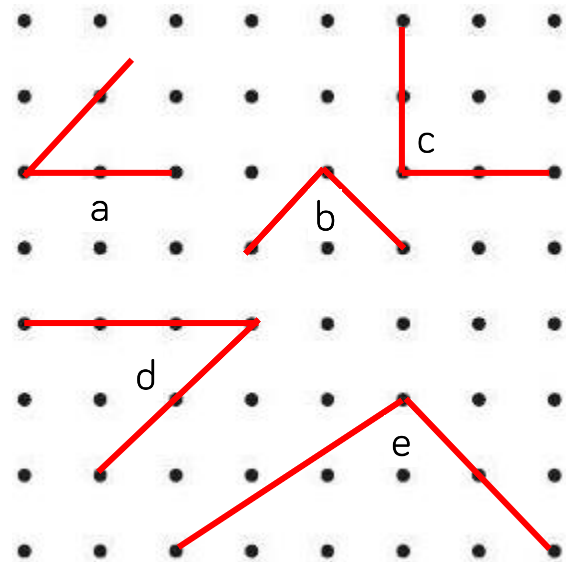


Ron

Do you agree with Ron? Explain your thinking.

Angle A and Angle B are the same size. Ron has mixed up the lengths of the lines with the size of the angles.

Here are five angles.
There are two pairs of identically sized angles and one odd one out.
Which angle is the odd one out?
Explain your reason.



Angle e is the odd one out.

Angle b and c are both right angles.

Angle a and d are both half of a right angle or 45 degrees.

Angle e is an obtuse angle.

Measuring Angles in Degrees

Notes and Guidance

Children recap acute and obtuse angles. They recognise a full turn as 360 degrees, a half-turn as 180 degrees and a quarter-turn (or right angle) as 90 degrees. They consider these in the context of compass directions. Children also deduce angles such as 45 degrees, 135 degrees and 270 degrees. Reflex angles are introduced explicitly for the first time. Children define angles in terms of degrees and as fractions of a full turn.

Mathematical Talk

What is an angle?

Can you identify an acute angle on the clock?

Can you identify an obtuse angle?

What do we call angles larger than 180° but smaller than 360°?

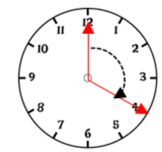
What angles can you identify using compass directions?

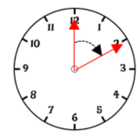
What is the size of the angle?

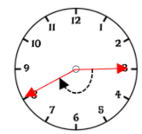
What fraction of a full turn is the angle?

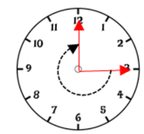
Varied Fluency

Use the sentence stems to describe the turns made by the minute hand. Compare the turns to a right angle.





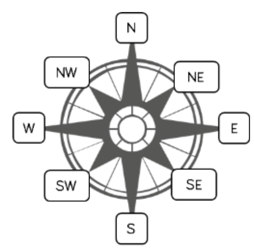




The turn from 12 to 4 is <u>larger</u> than a right angle. It is an <u>obtuse</u> angle.

The turn from ___ to ___ is ______ than a right angle.
It is an ______ angle.

Use the compass to complete the table.



Turn	Degrees	Type of angle	Fraction of a turn
North-East to South-East Clockwise	90°	Right angle	$\frac{1}{4}$ of a turn
North-West to North-West Clockwise			
South-West to South-East Anti-clockwise			
South-West to ______ Clockwise	180°		
North-East to East Clockwise			$\frac{1}{8}$ of a turn

Measuring Angles in Degrees

Reasoning and Problem Solving

Which angle is the odd one out? 180° 45° 79° 270° Could another angle be the odd one out for a different reason?	Multiple responses e.g. 79° is the odd one out because the others are multiples of 45 degrees. They would relate to compass point..
Always, sometimes or never true? • If I turn from North-East to North-West, I have turned 90° • If I turn from East to North-West, I will have turned through an obtuse angle. • If I turn from South-West to South, my turn will be larger than 350°	All are sometimes true, depending on whether you turn clockwise or anti-clockwise or even more than one turn.

Pick a starting point on the compass and describe a turn to your partner. Use the mathematical words to describe your turns: • Clockwise • Anti-clockwise • Degrees • Acute • Obtuse • Reflex • Right angle Can your partner identify where you will finish?	Lots of possibilities. Children can be challenged further e.g. I am equivalent to three right angles, I start at North-West and turn clockwise, where do I finish?

Measuring with a Protractor (1)

Notes and Guidance

Children are taught to use a protractor for the first time. They begin with measuring angles less than 90° - acute angles. They use their knowledge of right angles to help estimate the size of acute angles e.g. "It's close to a right angle, so about 80°."
Children need to develop their understanding of using both the inside and outside scales of the protractor, and need to be taught how to decide which to use.

Mathematical Talk

What unit do we use to measure angles?

How can we tell whether an angle is acute?

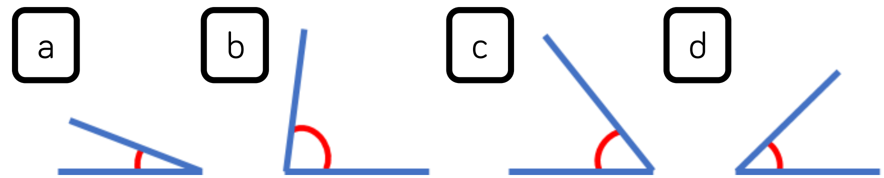
How do we know which scale to use on a protractor?

Where will you place your protractor when measuring an angle?

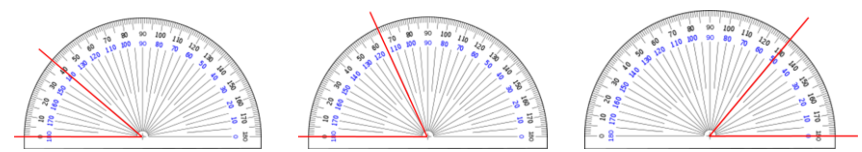
Does moving the paper help you to measure an angle?

Varied Fluency

- Put these angles in order of size. Explain how you know.

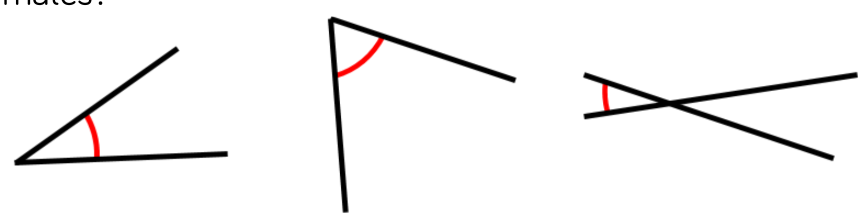


- Read the angles shown on the protractor.



What's the same? What's different?

- Estimate the size of the angles and then use a protractor to measure them to the nearest degree. How close were your estimates?

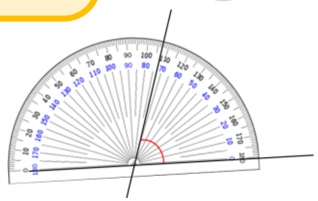


Measuring with a Protractor (1)

Reasoning and Problem Solving

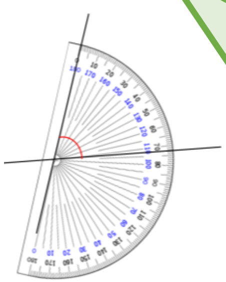
I have measured the angle correctly because my protractor is the right way round.

Teddy



Whitney

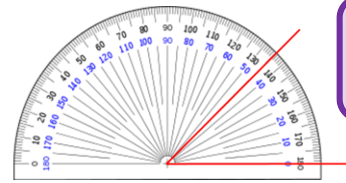
I have measured the angle correctly because my protractor is on the line accurately.



Who do you agree with? Explain why.

They are both correct. It doesn't matter which way the protractor is as long as it is placed on the angle correctly.

Three children are measuring angles. Can you spot and explain their mistake?

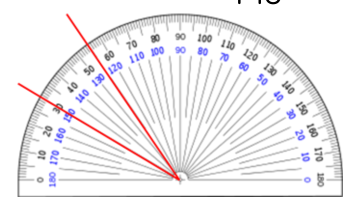


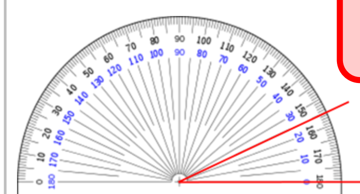
My angle measures 135°

Mo

My angle measures 55°

Dora





My angle measures 35°

Alex

Mo hasn't recognised his angle is acute so his measurement is wrong.

Alex has not placed one of her lines on 0. Her angle measures 25°.

Dora has misread the scale. Her angle measures 25°.

Measuring with a Protractor (2)

Notes and Guidance

Children continue to learn how to use a protractor and focus on measuring obtuse angles.
They use their knowledge of right angles to help estimate the size of obtuse angles e.g. “It’s just over a right angle, so about 100°.”
Children need to develop their understanding of using both the inside and outside scales of the protractor, and need to be taught how to decide which to use.

Mathematical Talk

How do you know an angle is obtuse?

Can you see where obtuse angles would be measured on the protractor?

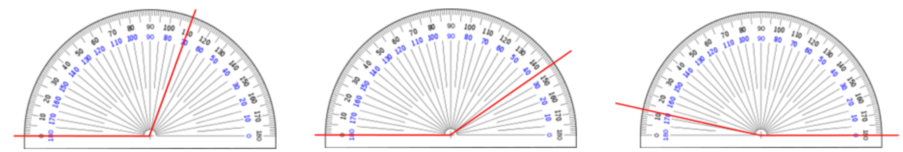
Can you estimate the size of this angle?

What is the size of the angle? What mistake might someone make?

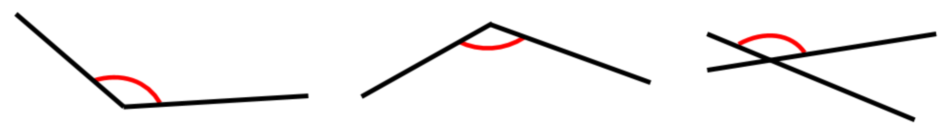
Where will you place your protractor first?

Varied Fluency

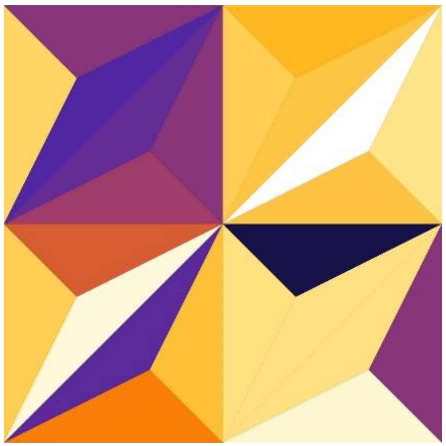
- Measure the angles shown on the protractors.



- Estimate the size of the angles and then use a protractor to measure them to the nearest degree.



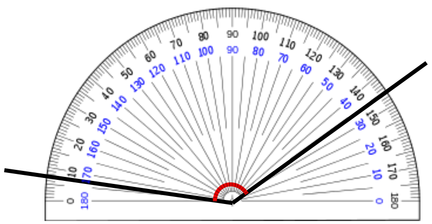
- Identify obtuse angles in the image.
Estimate the size of the angles, and then measure them?



Measuring with a Protractor (2)

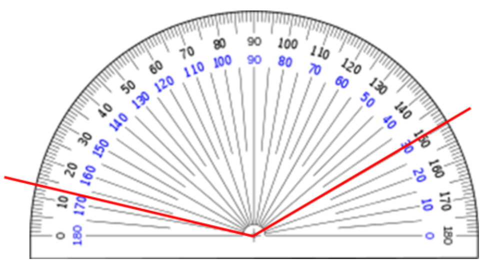
Reasoning and Problem Solving

Rosie is measuring an obtuse angle.
What's her mistake?



Rosie has not placed the 0 line of the protractor on one of the arms of the angle.

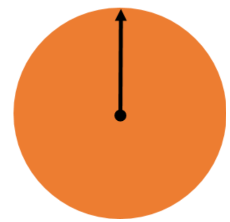
How many ways can you find the value of the angle?



Children may:

- subtract 150 – 13 = 137°
- add up on the protractor as a number line e.g. +7 +100 +30 = 137°
- place the protractor correctly.

Use a cut out of a circle and place a spinner in the centre.



- Point the arrow in the starting position above.
- Move the spinner to try to make the angles shown on the cards below.
- Check how close you are with a protractor.

40° | 72° | 154°

White Rose Maths

Drawing Accurately

Notes and Guidance

Children need to draw lines correct to the nearest millimetre. They use a protractor to draw angles of a given size, and will need to be shown this new skill.

Children continue to develop their estimation skills whilst drawing and measuring lines and angles. They also continue to use precise language to describe the types of angles they are drawing.

Mathematical Talk

How many millimetres are in a centimetre?

How do we draw a line that measures ___?

Explain how to draw an angle.

What's the same and what's different about drawing angles of 80° and 100° ?

How can I make this angle measure ___ but one of the lines have a length of ___?

Varied Fluency

Draw lines that measure:

4 cm and 5 mm	45 mm	4.5 cm

What's the same? What's different?

Draw:

- angles of 45° and 135°
- angles of 80° and 100°
- angles of 20° and 160°

What do you notice about your pairs of angles?

Draw:

- an acute angle that measures 60° with the arms of the angle 6 cm long
- an obtuse angle that measures 130° but less than 140° with the arms of the angle 6.5 cm long

Compare your angles with your partner's.

Drawing Accurately

Reasoning and Problem Solving

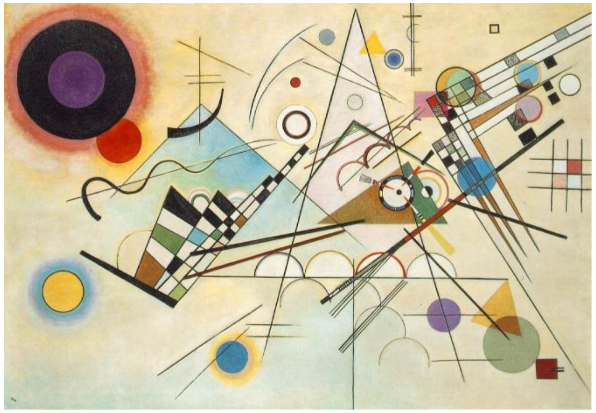
Draw a range of angles for a friend.
Estimate the sizes of the angles to order them from smallest to largest.
Measure the angles to see how close you were.

Always, sometimes or never true?

- Two acute angles next to each other make an obtuse angle.
- Half an obtuse angle is an acute angle.
- 180° is an obtuse angle

- Sometimes
- Always
- Never

Use Kandinsky's artwork to practice measuring lines and angles.



Create clues for your partner to work out which line or angle you have measured.

For example, "My line is horizontal and has an obtuse angle of 110° on it."

Angles on a Straight Line

Notes and Guidance

Children build on their knowledge of a right angle and recognise two right angles are equivalent to a straight line, or a straight line is a half of a turn.

Once children are aware that angles on a straight line add to 180 degrees, they use this to calculate missing angles on straight lines.

Part-whole and bar models may be used to represent missing angles.

Mathematical Talk

How many degrees are there in a right angle?

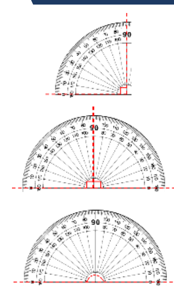
How many will there be in two right angles?

If we place two right angles together, what do we notice?

How can we calculate the missing angles?

How can we subtract a number from 180 mentally?

Varied Fluency

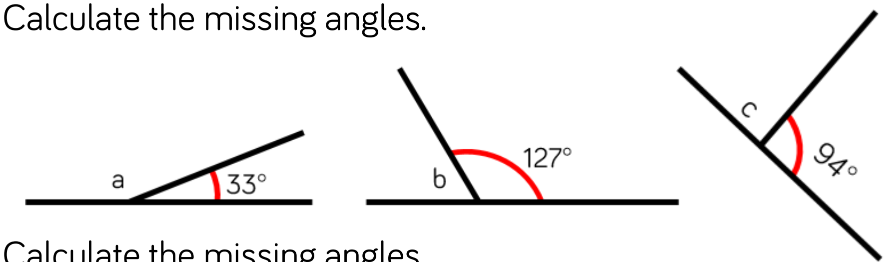


There are ______degrees in a right angle.

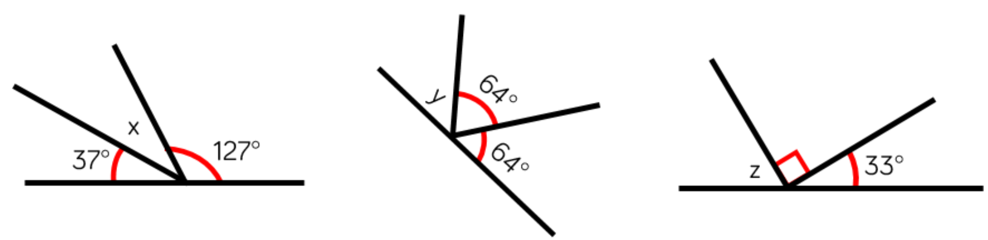
There are ______right angles on a straight line.

There are ______degrees on a straight line.

Calculate the missing angles.



Calculate the missing angles.

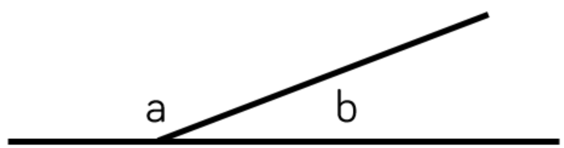


Is there more than one way to calculate the missing angles?

Angles on a Straight Line

Reasoning and Problem Solving

Here are two angles.



Angle b is a prime number between 40 and 50

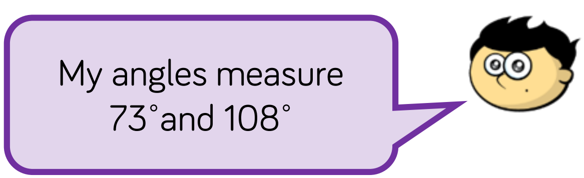
Use the clue to calculate what the missing angles could be.

b = 41°, a = 139°

b = 43°, a = 137°

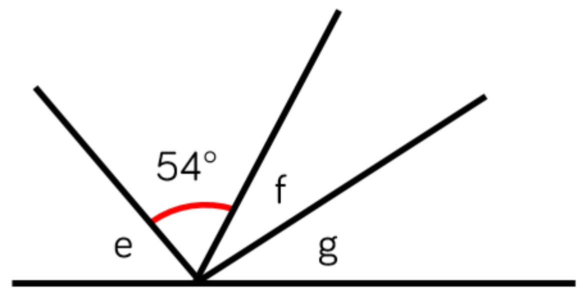
b = 47°, a = 133°

Jack is measuring two angles on a straight line.



Explain why at least one of Jack's angles must be wrong.

His angles total more than 180°.



- The total of angle f and g are the same as angle e
- Angle e is 9° more than the size of the given angle.
- Angle f is 11° more than angle g

Calculate the size of the angles.

Create your own straight line problem like this one for your partner.

e = 63°

f = 37°

g = 26 °

Angles around a Point

Notes and Guidance

Children need to know that there are 360 degrees in a full turn. This connects to their knowledge of right angles, full turns and compass points.

Children need to know when they should measure an angle and when they should calculate the size of angle from given facts.

Mathematical Talk

How many right angles are there in $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}$ of a full turn?

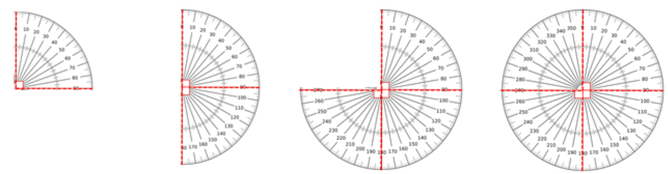
If you know a half turn/full turn is 180/360 degrees, how can this help you calculate the missing angle?

What is the most efficient way to calculate a missing angle? Would you use a mental or written method?

When you have several angles, is it better to add them first or to subtract them one by one?

Varied Fluency

Complete the sentences.



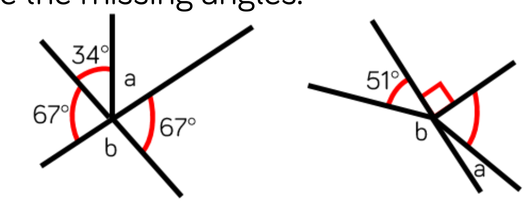
$\frac{1}{4}$ of a turn = 1 right angle = 90°

$\frac{1}{2}$ of a turn = __ right angles = _____°

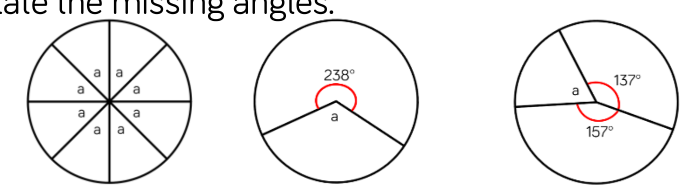
$\frac{\square}{\square}$ of a turn = 3 right angles = _____°

A full turn = __ right angles = _____°

Calculate the missing angles.

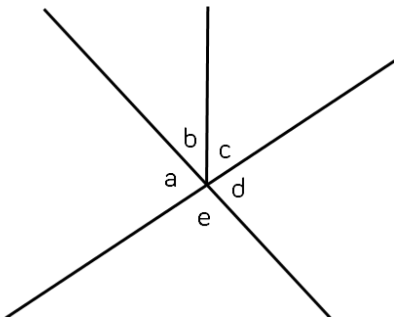
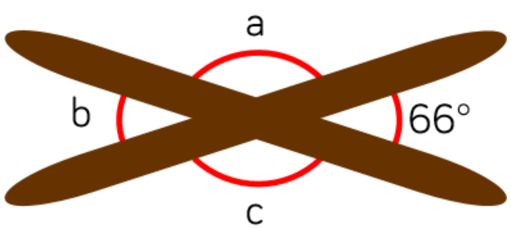


Calculate the missing angles.



Angles around a Point

Reasoning and Problem Solving

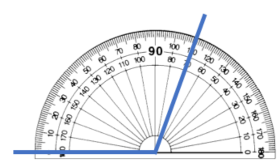
 $a + b + c + d + e = 360^\circ$ $d + e = 180^\circ$ Write other sentences about this picture.	Various answers e.g. $a + b + c = e + d$ $360^\circ - e - d = 180^\circ$ Etc.
Two sticks are on a table. Without measuring, find the three missing angles. 	$a = 114^\circ$ $b = 66^\circ$ $c = 114^\circ$

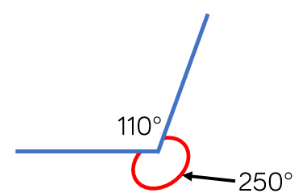
Eva says,

My protractor only goes to 180 degrees, so I can't draw reflex angles like 250 degrees.

Rosie says,

I know a full turn is 360 degrees so I can draw 110 degrees instead and have an angle of 250 degrees as well.





Use Rosie's method to draw angles of:

- 300°
- 200°
- 280°

Triangles

Notes and Guidance

Teachers might start this small step by recapping the definition of a polygon. An activity might be to sort shapes into examples and non-examples of polygons.
Children will classify triangles for the first time using the names 'isosceles', 'scalene' and 'equilateral'. Children will use rulers to measure the sides in order to classify them correctly.
Children will compare the similarities and differences between triangles and use these to help them identify, sort and draw.

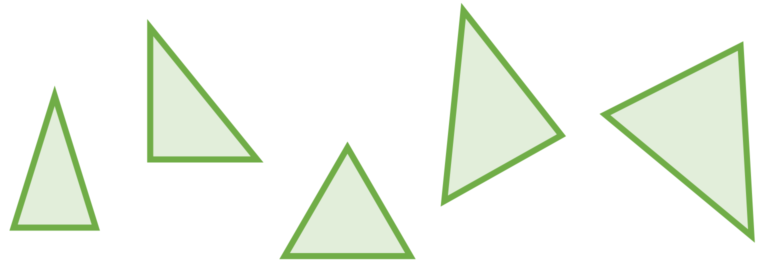
Mathematical Talk

What is a polygon? What isn't a polygon?
What are the names of the different types of triangles?
What are the properties of an isosceles triangles?
What are the properties of a scalene triangle?
What are the properties of an equilateral triangle?
Which types of triangle can also be right-angled?
How are the triangles different?
Do any of the sides need to be the same length?

Varied Fluency

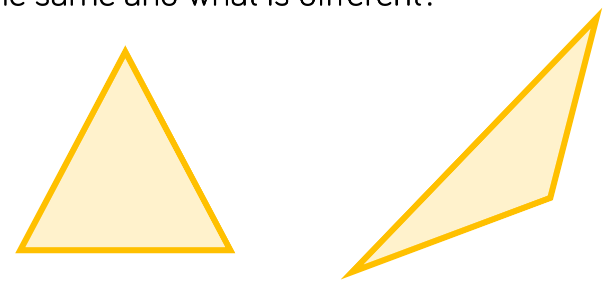
R

- Label each of these triangles: isosceles, scalene or equilateral.



Are any of these triangles also right-angled?

- Look at these triangles.
What is the same and what is different?

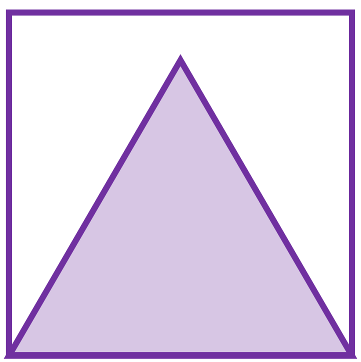


- Using a ruler, draw:
  - An isosceles triangle
  - A scalene triangle

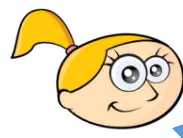
Triangles

Reasoning and Problem Solving

Here is a square.
Inside the square is an equilateral triangle.
The perimeter of the square is 60 cm.
Find the perimeter of the triangle.



The perimeter of the triangle is 45 cm.



Eva

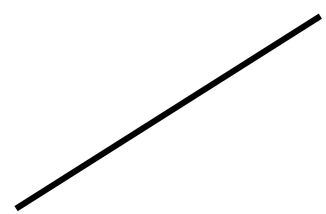
If I use 6 straws to make a triangle, I can only make an equilateral triangle.

Investigate whether Eva is correct.

Eva is correct. 2, 2, 2 is the only possible construction. 1, 1, 4 and 1, 2, 3 are not possible.

Draw two more sides to create:

- An equilateral triangle
- A scalene triangle
- An isosceles triangle



Which is the hardest to draw?

Children will draw a range of triangles. Get them to use a ruler to check their answers. Equilateral will be difficult to draw accurately because the angle between the first two sides drawn, must be 60°

Quadrilaterals

Notes and Guidance

Children name quadrilaterals including a square, rectangle, rhombus, parallelogram and trapezium. They describe their properties and highlight the similarities and differences between different quadrilaterals.
Children draw quadrilaterals accurately using knowledge of their properties.
Teachers could use a Frayer Model with the children to explore the concept of quadrilaterals further.

Mathematical Talk

What's the same about the quadrilaterals?

What's different about the quadrilaterals?

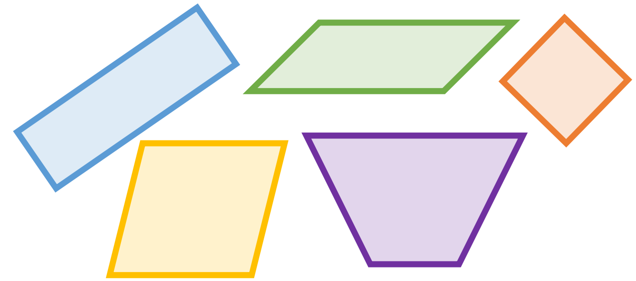
Why is a square a special type of rectangle?

Why is a rhombus a special type of parallelogram?

Varied Fluency

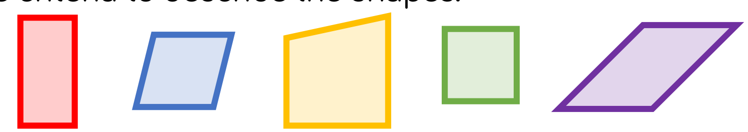
R

- Label the quadrilaterals using the word bank.



trapezium
square
rhombus
rectangle
parallelogram

- Use the criteria to describe the shapes.



four sides	2 pairs of parallel sides	four equal sides
polygon	1 pair of parallel sides	4 right angles

Which criteria can be used more than once?
Which shapes share the same criteria?

- Draw and label:
  - a rhombus.
  - a parallelogram.
  - 3 different trapeziums

Quadrilaterals

Reasoning and Problem Solving

Complete each of the boxes in the table with a different quadrilateral.

	4 equal sides	2 pairs of equal sides	1 pair of parallel sides
4 right angles			
No right angles			

Which box cannot be completed? Explain why.

	4 equal sides	2 pairs of equal sides	1 pair of parallel sides
4 right angles			
No right angles			

Children can discuss if there are any shapes that can go in the top right corner. Some children may justify it could be a square or a rectangle however these have 2 pairs of parallel sides.

You will need:

Some 4 centimetre straws
Some 6 centimetre straws

How many different quadrilaterals can you make using the straws?

Calculate the perimeter of each shape.

Square: Four 4 cm - perimeter is 16 cm or four 6 cm- perimeter is 24 cm
Rectangle: Two 4 cm and two 6 cm- perimeter is 20 cm
Rhombus: Four 4 cm - perimeter is 16 cm
Four 6 cm straws- perimeter is 24 cm
Parallelogram: Two 4 cm and two 6 cm - perimeter is 20 cm
Trapezium: Three 4 cm and one 6 cm- perimeter is 18 cm

Lengths and Angles in Shapes

Notes and Guidance

Children look at squares and rectangles on a grid to identify right angles.
Children use the square grids to reason about length and angles, for example half a right angle is 45 degrees.
Children should be confident in understanding parallel and perpendicular lines and right angles in relation to squares and rectangles.

Mathematical Talk

Look at the rectangle and square, where can you see parallel lines? How many right angles do they have?

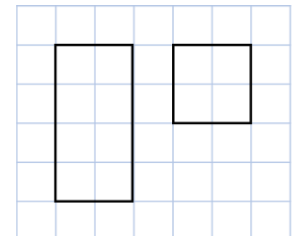
What can you say about the lengths of the sides in a rectangle or in a ______?

If I fold a square in half diagonally to make a triangle, what will the size of the angles in the triangle be?

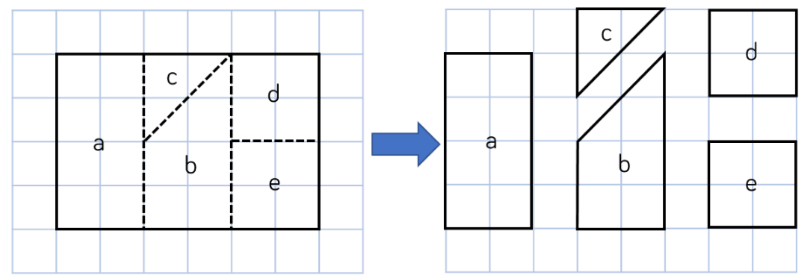
Using what you know about squares and rectangles, how can you calculate the size of the angles?

Varied Fluency

- Look at the square and the rectangle.
What's the same? What's different?

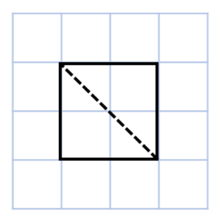


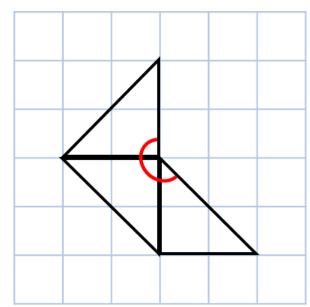
- Calculate the size of the angles in each shape.



What's the same? What's different?

- Here is a square cut into two triangles.





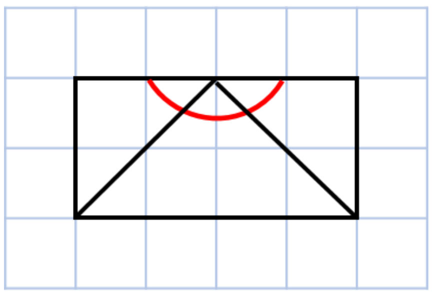
Use the square to calculate the size of the angle.

White Rose Maths

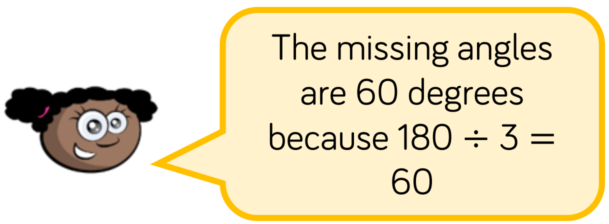
Lengths and Angles in Shapes

Reasoning and Problem Solving

Whitney is calculating the missing angles in the shape.



She says,

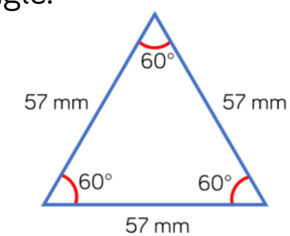


Do you agree?
Explain why.

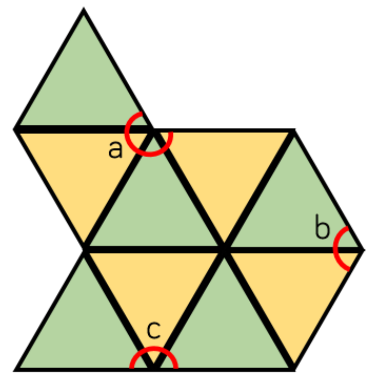
Whitney is wrong. The angles are not equal.

The angles will be worth 45°, 90° and 45° because the line shows a square being split in half diagonally. This means 90° has been divided by 2.

Alex has this triangle.



She makes this composite shape using identical triangles to the one above.



- Calculate the perimeter of the shape.
- Calculate the missing angles.

Use your own triangle, square or rectangle to make a similar problem?

Perimeter = $57 \times 9 = 513$ mm

$a = 60 \times 4$

$a = 240^\circ$

$b = 60 \times 2$

$b = 120^\circ$

$c = 60 \times 3$

$c = 180^\circ$

Regular & Irregular Polygons

Notes and Guidance

Children distinguish between regular and irregular polygons. They need to be taught that "regular" means all the sides and angles in a shape are equal e.g. an equilateral triangle and a square are regular but a rectangle and isosceles triangle are irregular polygons.
Once they are confident with this definition they can work out the sizes of missing angles and sides.

Mathematical Talk

What is a polygon?

Can a polygon have a curved line?

Name a shape which isn't a polygon.

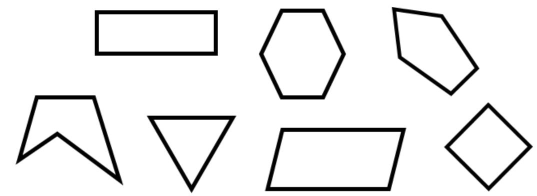
What makes a polygon irregular or regular?

Is a square regular?

Are all hexagons regular?

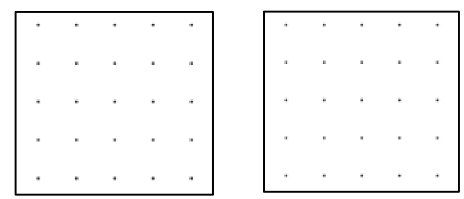
Varied Fluency

- Sort the shapes in to irregular and regular polygons.

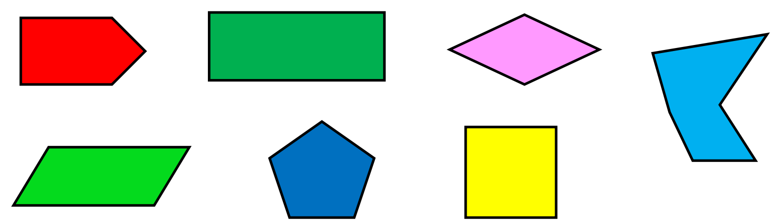


What's the same? What's different?

- Draw a regular polygon and an irregular polygon on the grids.



- Look at the 2D shapes. Decide whether the shape is a regular or irregular polygon. Measure the angles to check.



Regular & Irregular Polygons

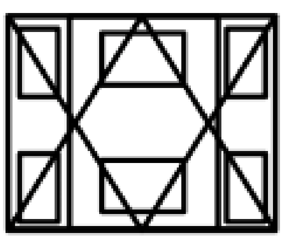
Reasoning and Problem Solving

Always, sometimes or never true?

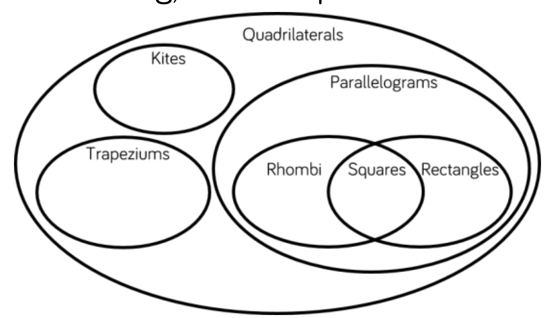
- A regular polygon has equal sides but not equal angles.
- A triangle is a regular polygon.
- A rhombus is a regular polygon.
- The number of angles is the same as the number of sides in any polygon.

- Never true – equal sides and equal angles.
- Sometimes true – equilateral triangles are, isosceles are not.
- Sometimes true – if the rhombus has right angles and is a square.
- Always true.

How many regular and irregular polygons can you find in this picture?



Cut out lots of different regular and irregular shapes. Ask children to work in pairs and sort them into groups. Once they have sorted them, can they find a different way to sort them again?
Children could use Venn diagrams and Carroll diagrams to deepen their understanding, for example:



	Regular polygon	Irregular polygon
Has at least one right angle		
Has no right angles		

Multiple responses

Reasoning about 3-D Shapes

Notes and Guidance

Children identify 3-D shapes, including cubes and cuboids, from 2-D shapes. They should have a secure understanding of language associated with the properties of 3-D shapes, for example, faces, curved surfaces, vertices, edges etc.

Children also look at properties of 3-D shapes from 2-D projections, including plans and elevations.

Mathematical Talk

What's the difference between a face and a curved surface?

Name some 3-D solids which have curved surfaces and some which don't.

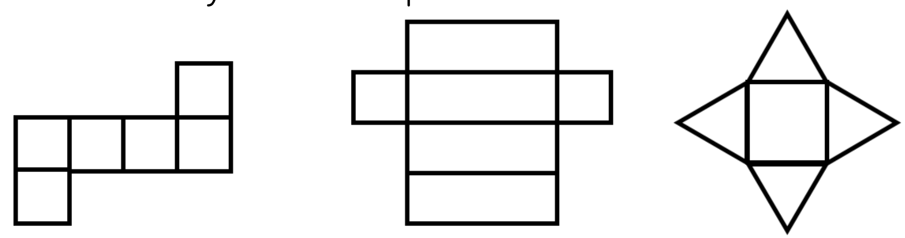
What faces can we see in the net? What shape will this make?

Which face will be opposite this face? Why?

Can we spot a pattern between the number of faces and the number of vertices a prism or pyramid has?

Varied Fluency

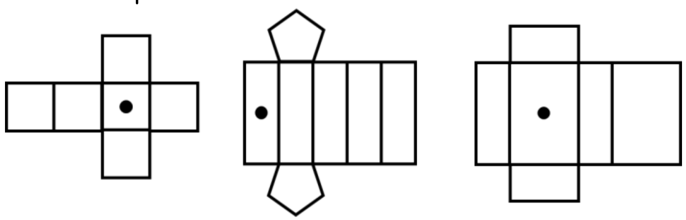
- Look at the different nets. Describe the 2-D shapes used to make them and identify the 3-D shape.



- Use equipment, such as Polydron or 2-D shapes, to build the 3-D solids being described.
  - My faces are made up of a square and four triangles.
  - My faces are made up of rectangles and triangles.

  Can the descriptions make more than one shape?

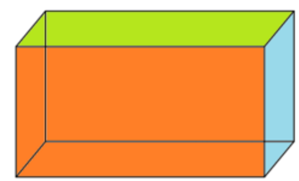
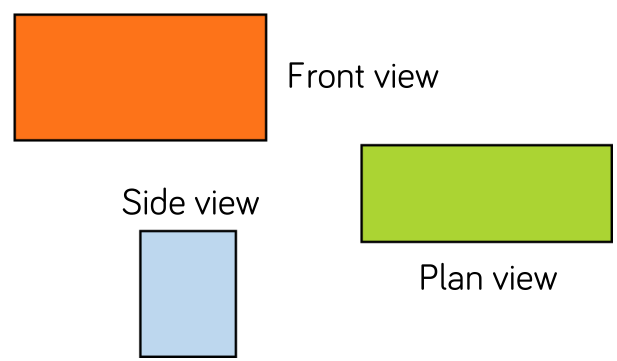
- Draw another dot on the nets so the dots are on opposite faces when the 3D shape is constructed.



Reasoning about 3-D Shapes

Reasoning and Problem Solving

Amir says, If two 3-D shapes have the same number of edges, then they also have the same number of vertices.  Do you agree? Explain why.	No. If the 3-D shape is a prism then there will be more vertices than edges. Children could investigate this and look for a pattern.
Create cubes and cuboids by using multilink cubes. Draw these on isometric paper. Would it be harder if you had to draw something other than squares or rectangles?	Multiple responses.

Using different 3-D solids, how can you represent them from different views? Work out which representation goes with which solid. For example,   	Children may explore a certain view for a prism and discover that it could always look like a cuboid or cube due to the rectilinear faces.

Summer - Block 3

Position & Direction

White Rose Maths

Overview

Small Steps

- Describe position (R)
- Draw on a grid (R)
- Position in the first quadrant
- Translation
- Translation with coordinates
- Lines of symmetry (R)
- Complete a symmetric figure (R)
- Reflection
- Reflection with coordinates

Notes for 2020/21

Children have looked at plotting and reading coordinates in year 4 and this should be revisited before moving on to year 5 content.

You might notice that the order of reflection and translation has been changed, this is so clearer links can be made between reflection and previous learning on symmetry.

Describe Position

Notes and Guidance

Children are introduced to coordinates for the first time and they describe positions in the first quadrant.

They read, write and use pairs of coordinates. Children need to be taught the order in which to read the axes, x-axis first, then y-axis next. They become familiar with notation within brackets.

Mathematical Talk

Which is the x-axis?

Which is the y-axis?

In which order do we read the axes?

Does it matter in which order we read the axes?

How do we know where to mark on the point?

What are the coordinates for ______?

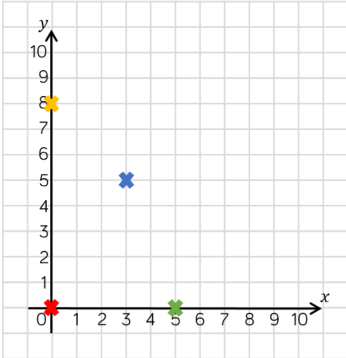
Where would (__ , __) be?

Varied Fluency

R

- Create a large grid using chalk or masking tape. Give the children coordinates to stand at. Encourage the children to move along the axis in the order they read them.

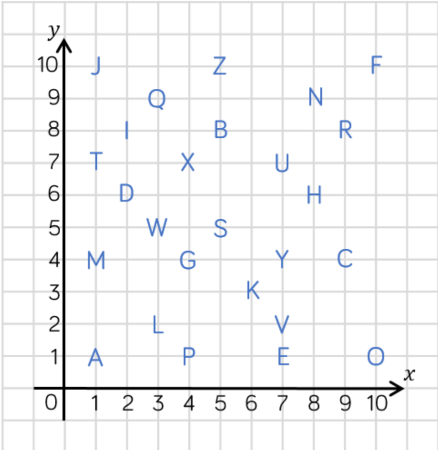
- Write the coordinates for the points shown.



✖ (__ , __) ✖ (__ , __)

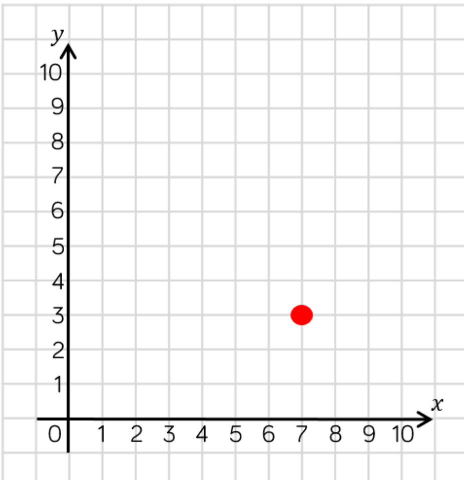
✖ (__ , __) ✖ (__ , __)

- Write out the coordinates that spell your name.



Describe Position

Reasoning and Problem Solving



The point is plotted at (7, 3)

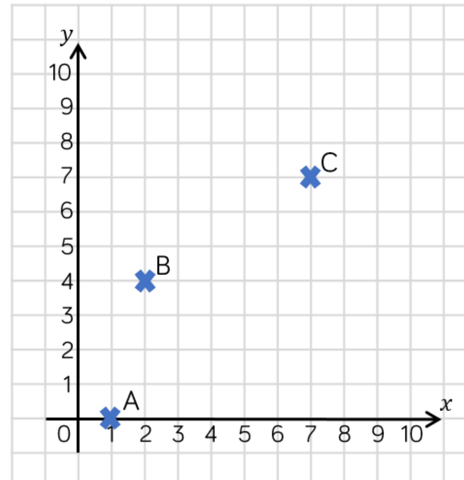
Teddy

Rosie

The point is plotted at (3, 7)

Who is correct?
What mistake has one of the children made?

Teddy is correct. Rosie has read the y-axis before the x-axis.



Which clue matches which coordinate?

Clue 1	My x coordinate is half of my y coordinate.
Clue 2	My y coordinate is less than my x coordinate.
Clue 3	Both my coordinates are prime numbers.

Clue 1 - B
Clue 2 - A
Clue 3 - C

Draw on a Grid

Notes and Guidance

Children develop their understanding of coordinates by plotting given points on a 2-D grid.

Teachers should be aware that children need to accurately plot points on the grid lines (not between them).

They read, write and use pairs of coordinates.

Mathematical Talk

Do we plot our point on the line, or next to the line?

How could we use a ruler to help plot points?

In which order do we read and plot the coordinates?

Does it matter which way we plot the numbers on the axis?

What are the coordinates of ______?

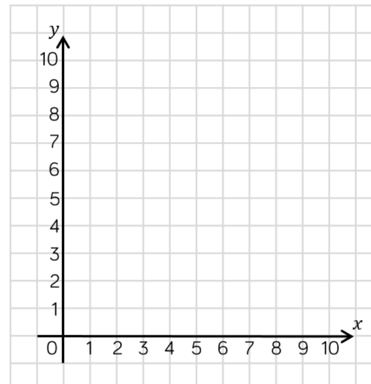
Where would (__, __) be?

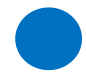
Can you show _____ on the grid?

Varied Fluency

R

- Draw the shapes at the correct points on the grid.



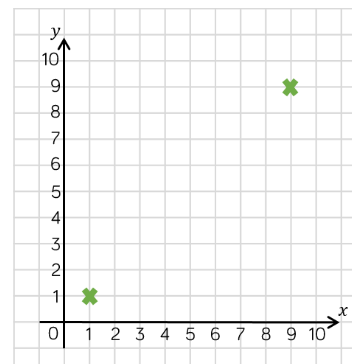
 (7, 8)

 (4, 6)

 (9, 1)

 (10, 0)

- Plot two more points to create a square.



- Plot these points on a grid.

(2, 4) (4, 2) (5, 8) (7, 6)

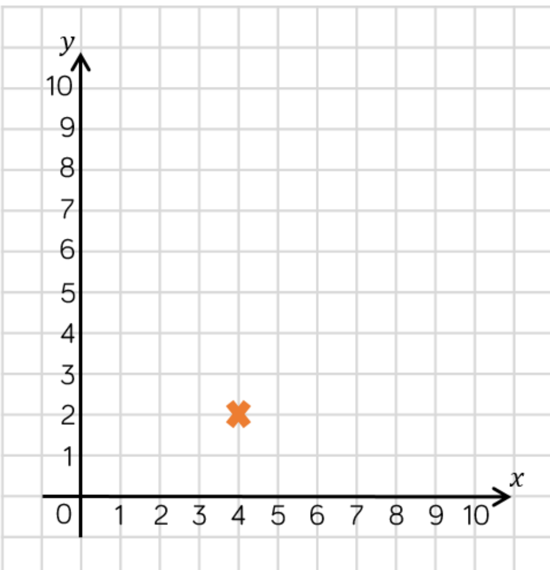
What shape has been created?

Draw on a Grid

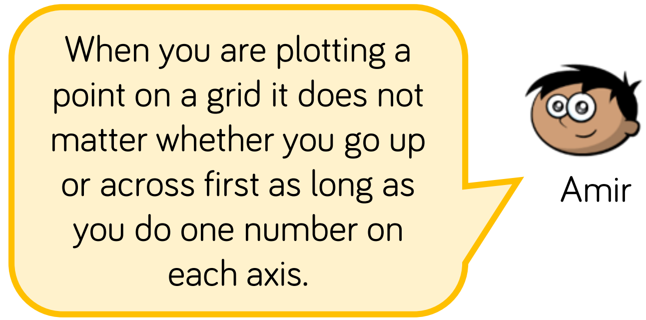
Reasoning and Problem Solving

R

What shapes could be made by plotting three more points?



The children could make a range of quadrilaterals dependent on where they plot the points.
If children plot some of the points in a line they could make a triangle.



Do you agree with Amir?
Convince me.

Amir is incorrect. The x-axis must be plotted before the y-axis.
Children prove this by plotting a pair of coordinates both ways and showing the difference.

Always, Sometimes, Never.

The number of points is equal to the number of vertices when they are joined together.

Sometimes.
If points are plotted in a straight line they will not create a vertex.

Position in the 1st Quadrant

Notes and Guidance

Children recap their use of coordinates from Year 4.

They start with an understanding of the origin (0, 0), before moving onto reading other coordinates. They understand that the first number represents the x-coordinate and the second number represents the y-coordinate. Teachers might explain how a coordinate is fixed (does not move) whereas a point can be plotted at different coordinates, so it can be moved.

Mathematical Talk

Which of the numbers represents the movement in the direction of the x-axis (from the origin)? Which of the numbers represents the movement on the y-axis (from the origin)?

Does it matter which way around coordinates are written?

Look at the point I have marked, what are the coordinates of this point?

If I moved the point one place to the left, what would be different about the coordinates? If I moved the point down one, what would be different about the coordinates?

Varied Fluency

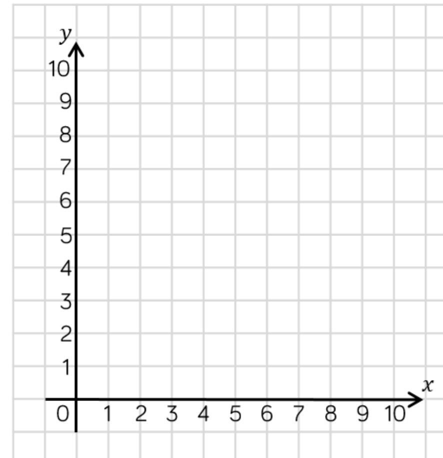
Plot the following points on the grid.

(3, 5)

(4, 4)

(0, 2)

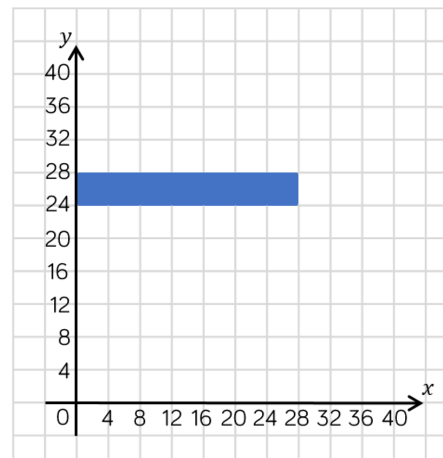
(4, 0)



What are the coordinates of the vertices of the rectangle?

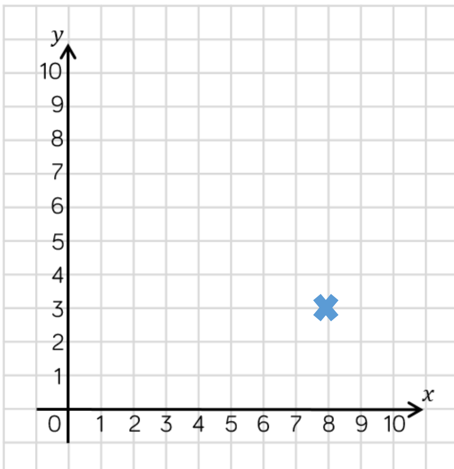
(,) (,)

(,) (,)



Position in the 1st Quadrant

Reasoning and Problem Solving



The point is at (8, 3)

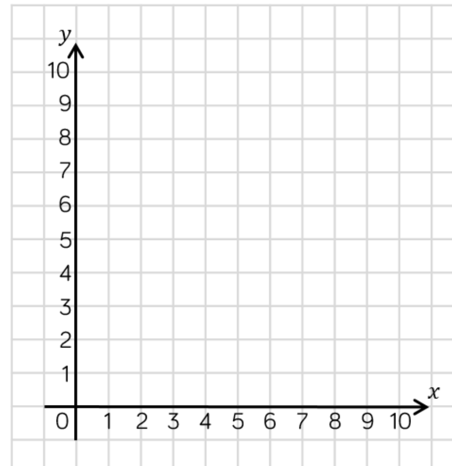
Mo

The point is at (3, 8)

Alex

Who do you agree with? Can you spot the mistake the other child has made?

Mo is correct. Alex has made a mistake by thinking the first number is the y-coordinate.



Annie is finding co-ordinates where the x-coordinate and the y-coordinate add up to 8.

For example: (3, 5) $3 + 5 = 8$

Find all of Annie's coordinates and plot them on the grid. What do you notice?

Now do the same for a different total.

Annie's coordinates form a diagonal line (8, 0) to (0, 8)

Translation

Notes and Guidance

Children learn to translate shapes on a grid.

Children could focus on one vertex at a time when translating.

Attention should be drawn to the fact that the shape itself does not change size nor orientation when translated.

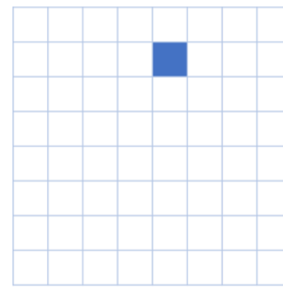
Mathematical Talk

What does translate mean?

Look what happens when I translate this shape. What has happened to the shape? Have the dimensions of the shape changed? Does it still face the same way?

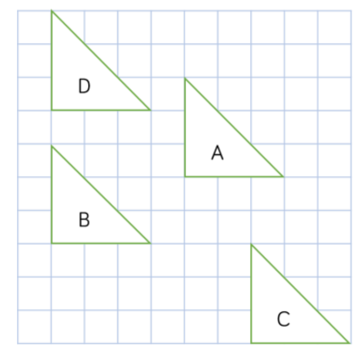
Are there any other ways I can get the shape to this position?

Varied Fluency

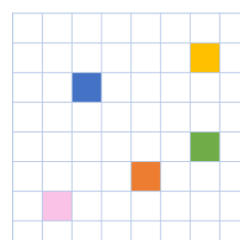


A square is translated two squares to the right and three down.
Draw the new position of this square.

Describe the translation of shape A to shape B, C and then D. Use the stem sentence to help you.
Shape A has been translated ________ left/right and ________ up/down.



Match the translations.



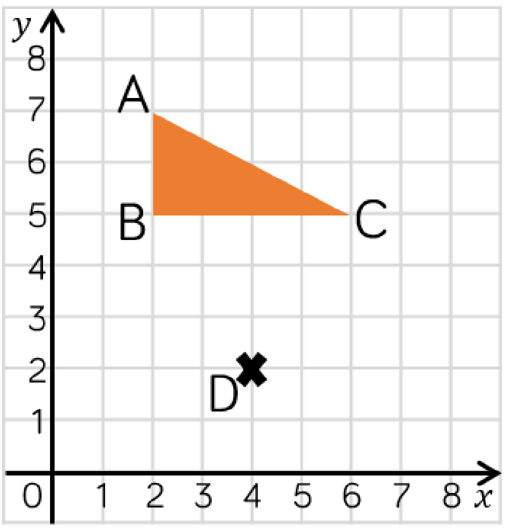
4 right, 2 down

2 left, 3 up

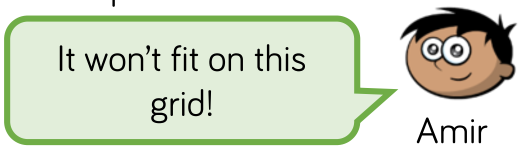
5 left, 5 down

Translation

Reasoning and Problem Solving

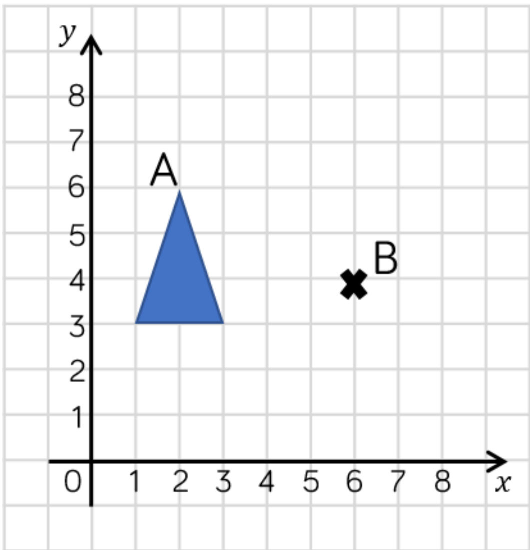


Triangle ABC is translated so that point B translates to point D



Do you agree with Amir?
Explain your thinking.

Amir is incorrect, the shape is translated two to the right and three down. It will fit on this grid.



A triangle is drawn on the grid.
It is translated so that point A translates to point B.

What would be the coordinates of the other vertices of the translated triangle?

(7, 1)

(5, 1)

Translation with Coordinates

Notes and Guidance

Children translate coordinates and also describe translations of coordinates.

Attention should be drawn to the effect of the translation on the x-coordinate and the y-coordinate. For example, how does a translation of 3 up affect the x and y-coordinate?

Mathematical Talk

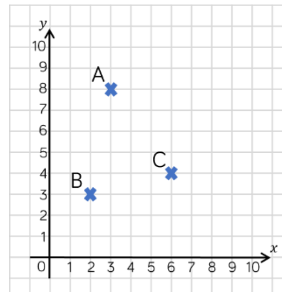
If we move this point down, what will happen to its coordinates? What if it moves up?

If I move the point two right, what will happen to the coordinates?

If these are the translated coordinates, what were the original coordinates?

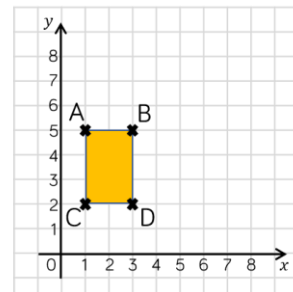
Varied Fluency

- Translate each coordinate 2 down, 1 right. Record the coordinates of its new position.



	Before translation	After translation
A	(3, 8)	
B		
C		

- Rectangle ABCD is translated so vertex C is translated to (3, 5). Describe the translation. What are the coordinates of the other vertices of the translated rectangle?



- Translate the coordinates below.

(3, 6) → 3 left → (,) → 1 up → (,)

(5, 7) → 2 right → (,) → 4 down → (,)

White Rose Maths

Translation with Coordinates

Reasoning and Problem Solving

These three coordinates have all been translated in the same way.

(_ , _) → (3 , 1)

(_ , 5) → (4 , 3)

(4 , _) → (6 , 1)

Can you work out the missing coordinates?

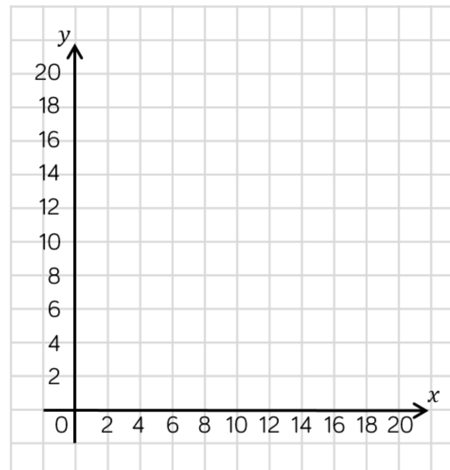
Describe the translation.

Translation 2 right 2 down.

(1 , 3) → (3 , 1)

(2 , 5) → (4 , 3)

(4 , 3) → (6 , 1)



A rectangle is translated two to the left and 4 up.

Three of the coordinates of the translated rectangle are: (6, 8) (10, 14) and (10, 8).

What are the coordinates of the original rectangle?

(8, 10) (12, 10)

(8, 4) (12, 4)

Lines of Symmetry

Notes and Guidance

Children find and identify lines of symmetry within 2-D shapes. Children explore symmetry in shapes of different sizes and orientations. To help find lines of symmetry children may use mirrors and tracing paper.
The key aspect of symmetry can be taught through paper folding activities. It is important for children to understand that a shape may be symmetrical, but if the pattern on the shape isn't symmetrical, then the diagram isn't symmetrical.

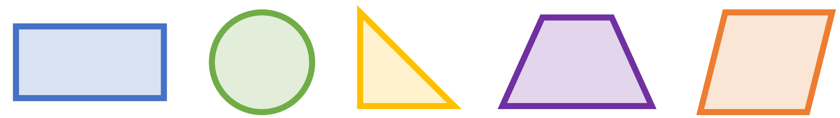
Mathematical Talk

Explain what you understand by the term 'symmetrical'.
Can you give any real-life examples?
How can you tell if something is symmetrical?
Are lines of symmetry always vertical?
Does the orientation of the shape affect the lines of symmetry?
What equipment could you use to help you find and identify lines of symmetry?
What would the rest of the shape look like?

Varied Fluency

R

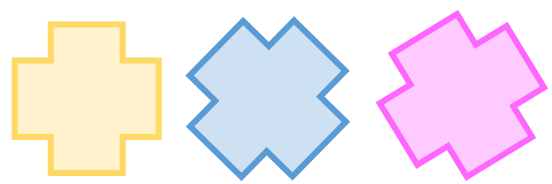
- Using folding, find the lines of symmetry in these shapes.



- Sort the shapes into the table.

	1 line of symmetry	More than 1 line of symmetry
Up to 4 sides		
More than 4 sides		

- Draw the lines of symmetry in these shapes (you could use folding to help you).

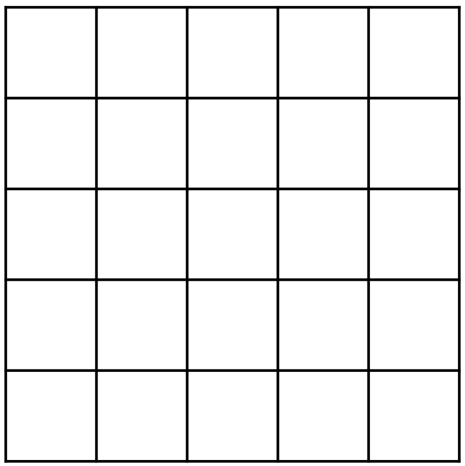


What do you notice?

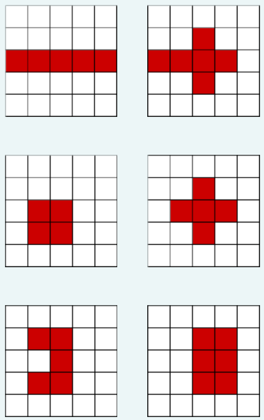
Lines of Symmetry

Reasoning and Problem Solving

How many symmetrical shapes can you make by colouring in a maximum of 6 squares?



There are a variety of options. Some examples include:



A triangle has 1 line of symmetry unless you change the orientation.

Is Jack correct? Prove it.

Jack is incorrect. Changing the orientation does not change the lines of symmetry. Children should prove this by drawing shapes in different orientations and identifying the same number of lines of symmetry.

Always, Sometimes, Never.

A four-sided shape has four lines of symmetry.

Sometimes, provided the shape is a square.

Symmetric Figures

Notes and Guidance

Children use their knowledge of symmetry to complete 2-D shapes and patterns.

Children could use squared paper, mirrors or tracing paper to help them accurately complete figures.

Mathematical Talk

What will the rest of the shape look like?

How can you check?

How can you use the squares to help you?

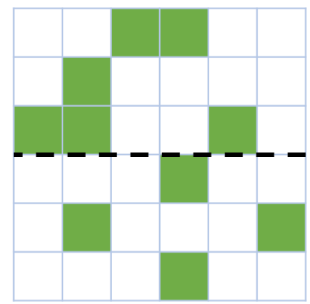
Does each side need to be the same or different?

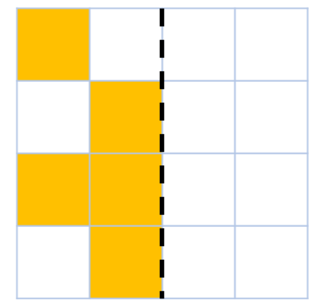
Which lines need to be extended?

Varied Fluency

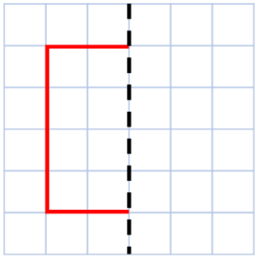
R

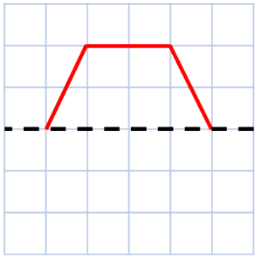
- Colour the squares to make the patterns symmetrical.

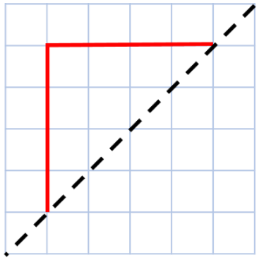




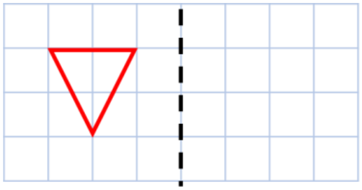
- Complete the shapes according to the line of symmetry.

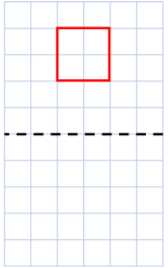






- Reflect the shapes in the mirror line.





Symmetric Figures

Reasoning and Problem Solving

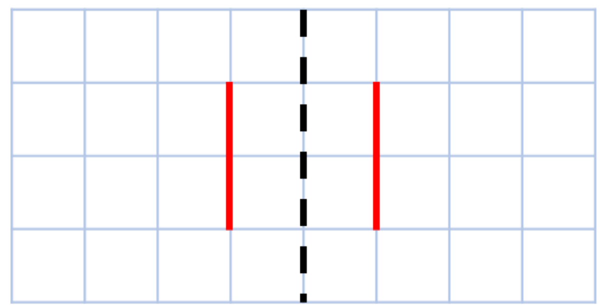
Dora

When given half of a symmetrical shape I know the original shape will have double the amount of sides.

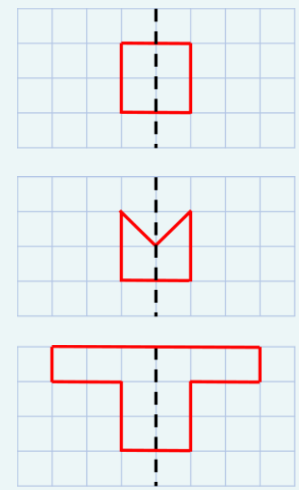
Do you agree with Dora?
Convince me.

Dora is sometimes correct. This depends on where the mirror line is. Encourage children to draw examples of times where Dora is correct, and to draw examples of times when Dora isn't correct.

How many different symmetrical shapes can you create using the given sides?



Children will find a variety of shapes. For example:



Reflection

Notes and Guidance

Children reflect objects using lines that are parallel to the axes. Children continue to use a 2-D grid and coordinates in the first quadrant. Teachers might want to encourage children to use mirrors, or to count how far the point is away from the mirror line, so that they can work out where the reflected point will be located. Children should be introduced to the language object (name of shape before reflection) and image (name of shape after reflection).

Mathematical Talk

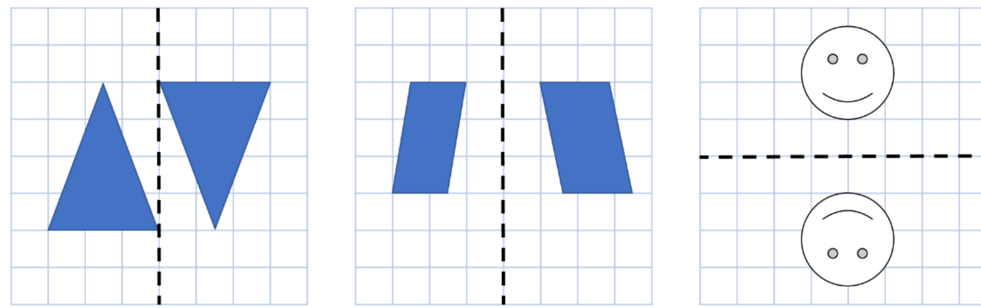
When I reflect something, what changes about the object? Is it exactly the same?

What are the coordinates of this point? If I reflect it in the mirror line, what are the new coordinates?

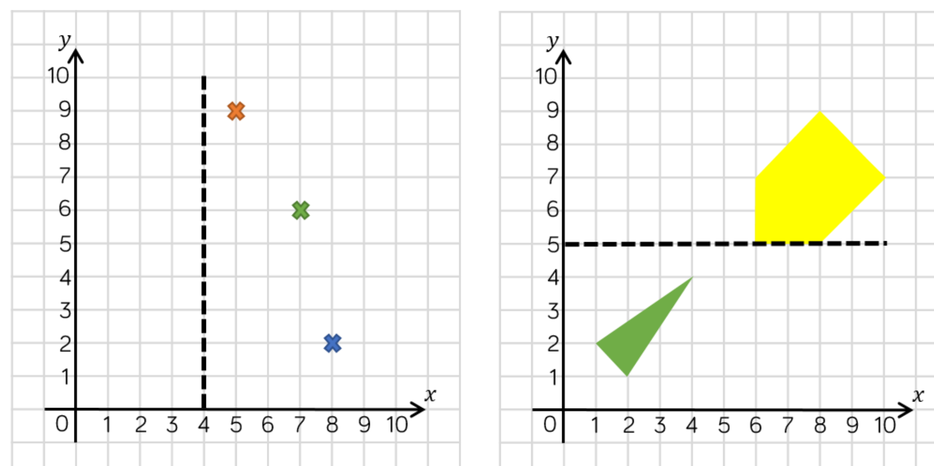
If I reflect this point/shape in a vertical/horizontal mirror line, what will happen to the x-coordinate/y-coordinate?

Varied Fluency

Which of the diagrams show reflections in the given mirror line?



Reflect the coordinates and the shapes in the mirror line.



Reflection

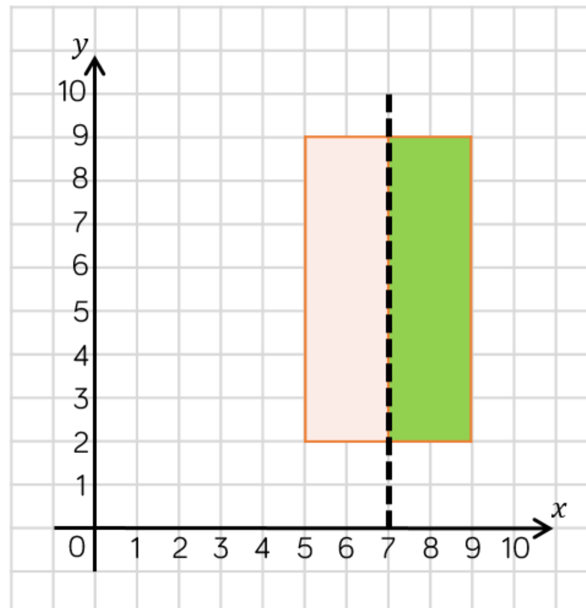
Reasoning and Problem Solving

When you reflect a shape, its dimensions change.

Dora

Do you agree with Dora?
Explain your thinking.

Dora is incorrect, the shape's dimensions do not change, only its position is changed.



The rectangle is pink and green.
The rectangle is reflected in the mirror line.
What would its reflection look like?

The shape would remain in the same position, although the colours would be swapped – green on the left and pink on the right.

Reflection with Coordinates

Notes and Guidance

Teachers should explore what happens to points when they are reflected in lines parallel to the axes.

Children might use mirrors to do this. This might be done through investigation where children record coordinates of vertices of the object and coordinates of vertices of the image in a table.

Mathematical Talk

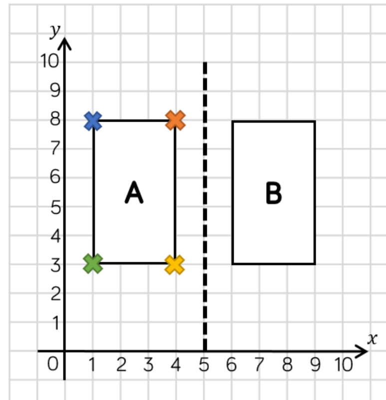
What is the x-coordinate for this vertex? What is the y-coordinate for this vertex?

If we look at this point, where will its new position be on the image, when it is reflected? What's different about the coordinates of the object compared to the coordinates of the image?

Do you always need to use a mirror? How else could you work out the coordinates of each vertex?

Varied Fluency

Object A is reflected in the mirror line to give image B. Write the coordinates of the vertices for each shape.



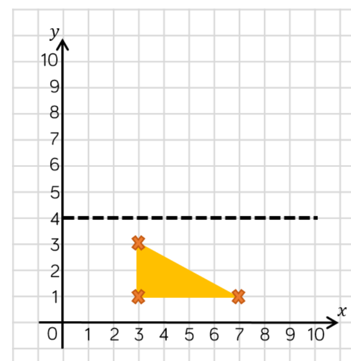
	Original Coordinate	Reflected Coordinate

Write the coordinates of the image after the object (triangle) has been reflected in the mirror line.

(,)

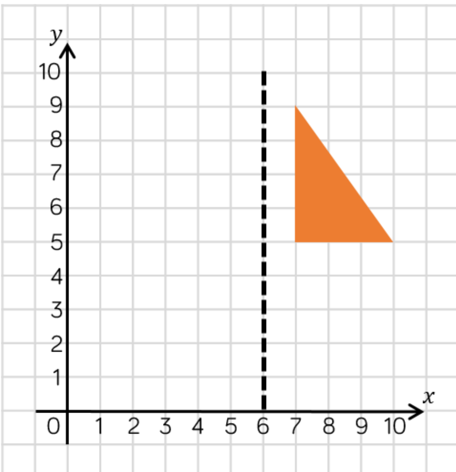
(,)

(,)



Reflection with Coordinates

Reasoning and Problem Solving

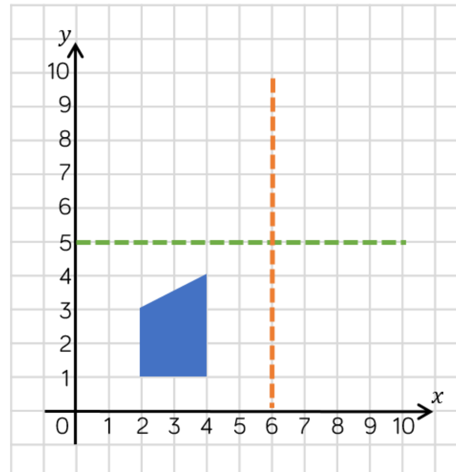


Eva reflects the shape in the mirror line. She thinks that the coordinates of the vertices for the reflected shape are:

(5, 5) (2, 5) (2, 9)

Is Eva is correct?
Explain why.

The (2, 9) coordinate is incorrect, it should be (5, 9).



This is a shape after it has been reflected. This is called the image.

Use the grid and the marked mirror lines to show where the original object was positioned.

Is there more than one possibility?

There are two possibilities for the object.

Summer - Block 4

Converting Units

Overview

Small Steps

- Kilometres (R)
- Kilograms and kilometres
- Millimetres and millilitres
- Metric units
- Imperial units
- Converting units of time
- Timetables

Notes for 2020/21

Children have converted between metres and kilometres in year 4 and now build on this to look at other conversions. It is a good idea to recap the small step on kilometres to reinforce the idea of the prefix 'kilo-' meaning 'thousand'.

White Rose Maths

Kilometres

Notes and Guidance

Children multiply and divide by 1,000 to convert between kilometres and metres.
They apply their understanding of adding and subtracting with four-digit numbers to find two lengths that add up to a whole number of kilometres.
Children find fractions of kilometres, using their Year 3 knowledge of finding fractions of amounts. Encourage children to use bar models to support their understanding.

Mathematical Talk

Can you research different athletic running races? What different distances are the races? Can you convert the distances from metres into kilometres? Which other sports have races over distances measured in metres or kilometres?
If 10 children ran 100 metres each, how far would they run altogether? Can we go outside and do this? How long do you think it will take to run 1 kilometre?
How can we calculate half a kilometre? Can you find other fractions of a kilometre?

Varied Fluency

R

Complete the statements.

3,000 m = ___ km

5 km = ___ m

500 m = ___ km

9,500 m = ___ km

8 km = _______ m

3 km + 6 km = _______ m

250 m = ______ km

4,500 m – 2,000 m = _____ km

Complete the bar models.

3 kilometres	
	1,800 metres

___ km	
2,870 m	4,130 m

Use <, > or = to make the statements correct.

500 m ◯ $\frac{1}{2}$ km

7 km ◯ 800 m

5 km ◯ 500 m

Kilometres

Reasoning and Problem Solving

Dexter and Rosie walk 15 kilometres altogether for charity.
Rosie walks double the distance that Dexter walks.
How far does Dexter walk?

Rosie walks 10 km.

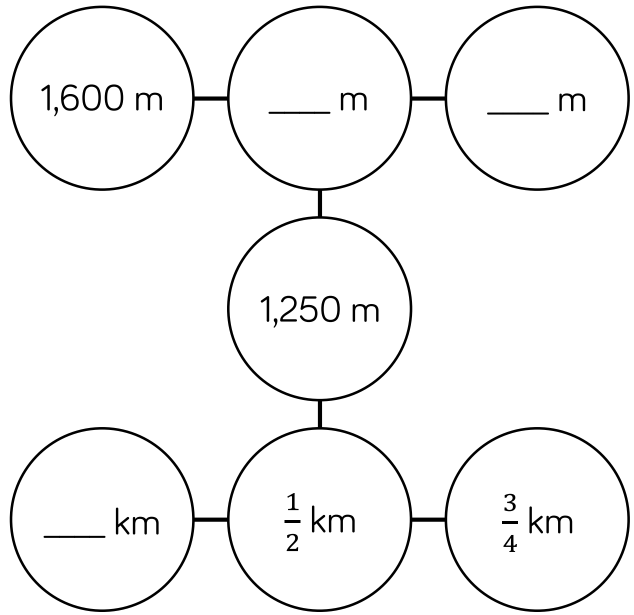
Dexter walks 5 km.

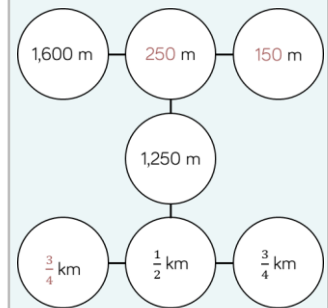
Dexter and Rosie each raise £1 for every 500 metres they walk.
How much money do they each make?

Rosie raises £20

Dexter raises £10

Complete the missing measurements so that each line of three gives a total distance of 2 km.





Kilograms and Kilometres

Notes and Guidance

Children focus on the use of the prefix 'kilo' in units of length and mass, meaning a thousand. They convert from metres to kilometres (km), grams to kilograms (kg) and vice versa. It is useful for children to feel the weight of a kilogram and various other weights in order for them to have a better understanding of their value.

Bar Models or double number lines are useful for visualising the conversions.

Mathematical Talk

What does 'kilo' mean when used at the start of a word?

Complete the stem sentence:

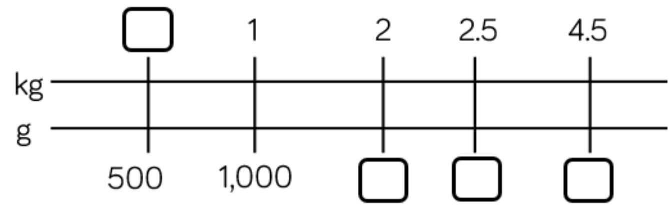
There are ______ grams in ___ kilograms.

How would you convert a fraction of a kilometre to metres?

What is the same and what is different about converting from kg to g and km to m?

Varied Fluency

- Find the missing values on the double number line.



Write your conversions as sentences.

- Complete the missing information.

$\frac{1}{10}$ kilogram = $\square$ grams $\frac{3}{10}$ km = $\square$ metres

7 kg + $\frac{1}{4}$ kg = $\square$ g 12 km + $\square$ km = 12,500 m

- Compare the measurements using <, > or =

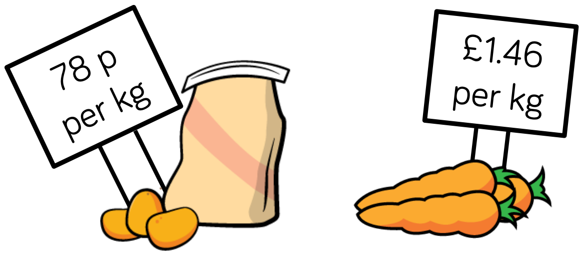
5 kg ◯ 4,500 g 12 kg ◯ 12,000 g

3.7 km ◯ 370 m 37,000 m ◯ 3.7 km

Kilograms and Kilometres

Reasoning and Problem Solving

Amir buys 2,500 grams of potatoes and 2,000 grams of carrots.



He pays with a £5 note.
How much change does he get?

Amir receives

13 p change.

Eva is converting measurements.
She says,

Which conversions could Eva have completed?

- 3 km → 3,000 m
- 3,000 m → 3 km
- 5,500 g → 5.5 kg
- 2.8 kg → 2,800 g

Eva could have converted 3,000 m to 3 km or 5,500 g to 5.5 kg.

White Rose Maths

Milligrams and Millilitres

Notes and Guidance

Children focus on the use of milli- in units of length and mass.
They understand that milli- means $\frac{1}{1,000}$.
They convert from metres to millimetres (mm), litres to millilitres (ml) and vice versa.
Using rulers, metre sticks, jugs and bottles helps children to get a better understanding of the conversions.

Mathematical Talk

Can you complete the stem sentences to convert from millimetres to metres…

What does 'milli' mean when used at the start of a word?

Would it be appropriate to measure your height in millimetres?

Where have you seen litres before?

Varied Fluency

Complete the conversions.

1,000 mm = 1 m
5,000 mm = ☐ m
50,000 mm = ☐ m
500 mm = ☐ m
5,500 mm = ☐ m

1,000 ml = 1 l
☐ ml = 3 l
☐ ml = 30 l
300 ml = ☐ l
☐ ml = 0.3 l

Complete the missing information

$\frac{1}{1,000}$ m = ☐ mm $\frac{1}{100}$ m = ☐ mm $\frac{1}{10}$ m = ☐ mm

3 l + $\frac{1}{4}$ l = ☐ ml 2 l + ☐ ml = 2,500 ml

Compare the measurements using <, > or =

2 l ◯ 1,500 ml 60 l ◯ 6,000 ml

2.8 m ◯ 280 mm 3,700 m ◯ 3.7 mm

Milligrams and Millilitres

Reasoning and Problem Solving

Cola is sold in bottles and cans.

330 ml
48 p

1.25 litres
£1.59

Alex buys 5 cans and 3 bottles.
She sells the cola in 100 ml glasses.
She sells all the cola.
How many glasses does she sell?

Alex charges 50 p per glass.
How much profit does she make?

Alex sells 54 glasses.

Alex makes £19.83 profit.

Ribbon is sold in 225 mm pieces.
Teddy needs 5 metres of ribbon.
How many pieces does he need to buy?

Teddy would like to make either a bookmark or a rosette with his left over ribbon. Which can he make?

To make 5 bookmarks you will need:
1.2 metres of ribbon
1 pair of scissors

To make 1 mini rosette you will need:
4 pieces of ribbon cut to 35 mm
A stapler

Teddy buys 23 pieces of ribbon.

Teddy will have 175 mm left over.

A bookmark needs 240 mm, and a rosette needs 140 mm so he can make the rosette.

Metric Units

Notes and Guidance

Children convert between different units of length and choose the appropriate unit for measurement. They recap converting between millimetres, metres and kilometre to now include centimetres (cm).

Children see that they need to divide by different multiples of 10 to convert between the different measurements.

Mathematical Talk

What is the same and what is different about these conversions?

- Converting from cm to m
- Converting from m to cm

What does 'centi' mean when used at the start of a word?

Which unit of measure would be best to measure: the height of a door frame, the length of a room, the width of a book?

Varied Fluency

- Measure the height of the piles of books in centimetres.

Find the difference between the tallest and shortest pile of books in millimetres.

- Line A is 6 centimetres long.
Line B is 54 millimetres longer than line A.
Line C is $\frac{2}{3}$ of line B.
Draw lines A, B and C.

- Here are the heights of 4 children.

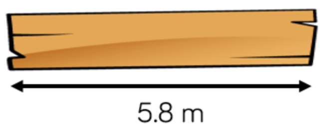
Whitney	Jack	Rosie	Mo
1.3 m	124 cm	1.32 m	141 cm

Put the children in height order, starting with the shortest.
Write their heights in millimetres.

Metric Units

Reasoning and Problem Solving

A plank of wood is 5.8 metres long.



Two lengths are cut from the wood.

175 cm $3\frac{4}{5}$ m

How much of the wood is left?

There is 25 cm left.

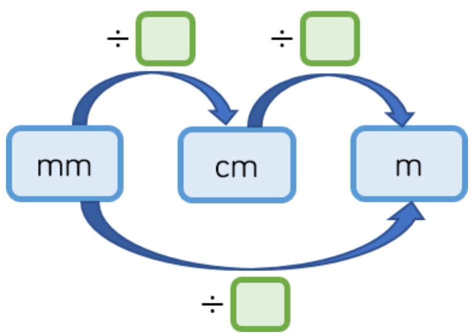
A 10 pence coin is 2 mm thick.

Eva makes a pile of 10 pence coins worth £1.30

What is the height of the pile of coins in centimetres?

The pile of coins is 2.6 cm tall.

Complete the conversion diagram.



Can you make a diagram to show conversions from m and cm to mm?

÷ 10   ÷ 100

÷ 1,000

Dora says,

> One metre is 100 times bigger than one centimetre.
> One centimetre is 10 times bigger than one millimetre.
> So, one metre is 110 times bigger than one millimetre

Is Dora correct?

Explain your answer.

Dora is incorrect. She has added the number of times bigger together rather than multiplying.

One metre is 1,000 times bigger than one millimetre.

Imperial Units

Notes and Guidance

Children are introduced to imperial units of measure for the first time. They understand and use approximate equivalences between metric units and common imperial units such as inches, pounds (lbs) and pints.
Using the measurements in the classroom, such as with rulers, pint bottles, weights and so forth, helps children to get an understanding of the conversions.
1 kg is sometimes seen as approximating to 2.2 lbs.

Mathematical Talk

What do we still measure in inches? Pounds? Pints?

Why do you think we still use these imperial measures?

What does approximate mean?

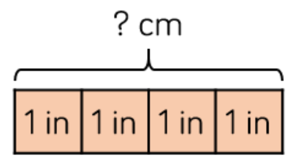
Why do we not use the equals (=) sign with approximations?

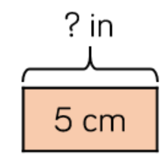
How precise should approximation be?

Varied Fluency

One inch is approximately 2.5 centimetres
1 inch ≈ 2.5 cm

Use the bar models to help with the conversions.





16in ≈ ☐ cm
15in ≈ ☐ cm
33in ≈ ☐ m

10cm ≈ ☐ in
1cm ≈ ☐ in
5.5m ≈ ☐ in

1 kilogram is approximately 2 pounds
1 kg ≈ 2 lbs

Use this information to complete the conversions.

2 kg ≈ ☐ lbs
☐ kg ≈ 22 lbs

5 kg ≈ ☐ lbs
55 kg ≈ ☐ lbs

There are 568 millilitres in a pint.
How many litres are there in:

2 pints | 5 pints | 0.5 pints | 2.5 pints

Imperial Units

Reasoning and Problem Solving

Jack's house has 3 pints of milk delivered 4 times a week. How many litres of milk does Jack have delivered each week?  He uses about 200 ml of milk every day in his cereal. Approximately, how many pints of milk does Jack use for his cereal in a week?	12 pints is approximately 6,816 millilitres, or 6.8 litres. $200 \times 7 =$ 1,400 ml $1400 \div 568 =$ 2.46 pints So Jack uses approximately 2 and a half pints.
 • Dora weighed 7.8 lbs when she was born. • Amir weighed 3.5 kg when he was born. Who was heavier, Dora or Amir? Explain your answer.	Children convert both measures to the same unit. Dora weighed approximately 3.9 kg and Amir weighed 3.5 kg so Dora was heavier.

White Rose Maths

Converting Units of Time

Notes and Guidance

Children convert between different units of time including years, months, weeks, days, hours, minutes and seconds.
Bar modelling will support these conversions.
Use of time lines, calendars, clocks is recommended to enhance pupils' understanding.
It is worth reminding pupils that time is not decimal so some methods may not be effective for conversions.

Mathematical Talk

How many months / weeks / days are there in a year?

How many hours / minutes / seconds are there in a day?

Can 21 days be written in weeks? Can 25 days be written in weeks? Explain your answers.

Is 0.75 hours the same as 75 minutes? Why or why not?

Varied Fluency

- Complete the conversions.

  1 year = ☐ months

  ☐ years = 24 months

  ☐ years = 60 months

  2.5 years = ☐ months

  3 years 2 months = ☐ months

  ☐ years ☐ months = 75 months

- Complete the table.

Days	Weeks / Weeks and Days
42 days	
	5 weeks and 5 days
	10 weeks and 5 days
100 days	

- Use this information to complete the conversions.

  $\frac{1}{3}$ hour = ☐ minutes

  3 ☐ and 24 ☐ = 204 ☐

  1.5 minutes = ☐ seconds

  1.05 minutes = ☐ seconds

Converting Units of Time

Reasoning and Problem Solving

Teddy's birthday is in March.
Amir's birthday is in April.
Amir is 96 hours older than Teddy.
What dates could Teddy and Amir's birthdays be?

28th March and 1st April

29th March and 2nd April

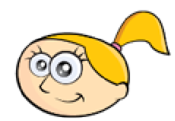
30th March and 3rd April

31st March and 4th April

Three children are running a race.

- Whitney finishes the race in 3 minutes 5 seconds.

- Eva finishes the race in 192 seconds.



- Alex finishes the race in 2 minutes and 82 seconds.

Who finishes the race first?

Whitney: 3 min 5 s

Eva: 3 min 12 s

Alex: 3 min 22 s

Whitney finishes the race first.

Timetables

Notes and Guidance

Children use timetables to retrieve information. They convert between different units of time in order to solve problems using the timetables.
Children will be tempted to use the column method to find the difference between times. Time lines are a more efficient method since time is not decimal.
Children create their own timetables based on start and end times of their day.

Mathematical Talk

When do we use timetables in every day life?

How do we know where the important information is on the timetable?

When does column method not work for finding the difference between times?

Varied Fluency

Use the timetable to answer the questions.

Bus Timetable					
Halifax Bus Station	06:05	06:35	07:10	07:43	08:15
Shelf Roundabout	06:15	06:45		07:59	08:31
Shelf Village Hall	06:16	06:46	07:35	08:00	08:32
Woodside	06:21	06:50	07:28		
Odsal	06:26	06:55	07:33	08:15	08:45
Bradford Interchange	06:40	07:10	07:48	08:30	09:00

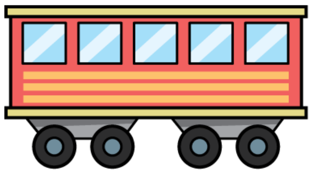
Is the time to get from Shelf Roundabout to Bradford Interchange the same for every bus?
Why might the time not always be the same?
Why are some of the times blank?

There are five TV programmes on between 17:00 and 23:00
The News starts at 6 p.m. and lasts for 45 minutes.
Mindless is on for 1 hour and ends at 18:00.
Junk Collectors is on for 75 minutes and starts straight after The News.
Catch Up is on for 300 seconds and starts at 20:00
The Thirsty Games is on for 175 minutes and ends at 23:00
Make a timetable for the evening TV.

Timetables

Reasoning and Problem Solving

Three trains travel from Halifax to Leeds on the same morning: the express train, the slow train and the cargo train.



The express train leaves Halifax 10 minutes after the slow train, but arrives at Leeds 10 minutes before it.
The slow train takes 50 minutes to reach Leeds and arrives at 10:33
The cargo train leaves 20 minutes before the slow train and arrives at Leeds 39 minutes after the Express.

What time does each train leave Halifax and what time does each train arrive at Leeds Station?

The slow train leaves Halifax at 9:43 and arrives in Leeds at 10:33

The express train leaves Halifax at 9:53 and arrives in Leeds at 10:23

Goods train leaves Halifax at 9:23 and arrives in Leeds at 11:02

Make a timetable of your school day.

Calculate how many hours each week you spend on each subject.
Can you convert this into minutes?
Can you convert this into seconds?

If this is an average week, how many hours a year do you spend on each subject?
Can you convert the time into days?

Answers will vary depending on the school day.

Summer - Block 5

Volume

Overview

Small Steps

- What is volume?
- Compare volume
- Estimate volume
- Estimate capacity

Notes for 2020/21

Here children are reintroduced to the idea of volume but in a more formal way than they have seen previously.

White Rose Maths

What is Volume?

Notes and Guidance

Children understand that volume is the amount of solid space something takes up. They look at how volume is different to capacity, as capacity is related to the amount a container can hold.
Children could use centimetre cubes to make solid shapes. Through this, they recognise the conservation of volume by building different solids using the same amount of centimetre cubes.

Mathematical Talk

Does your shape always have 4 centimetre cubes? Do they take up the same amount of space?
How can this help us understand what volume is?

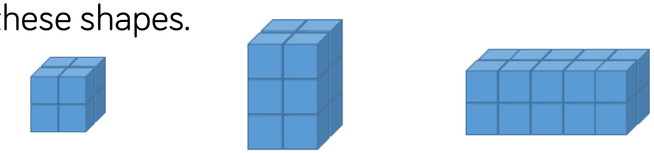
If the solid shapes are made up of 1 cm cubes, can you complete the table?
Look at shape A, B and C. What's the same and what's different?

How is capacity different to volume?

Varied Fluency

- Take 4 cubes of length 1 cm. How many different solids can you make? What's the same? What's different?

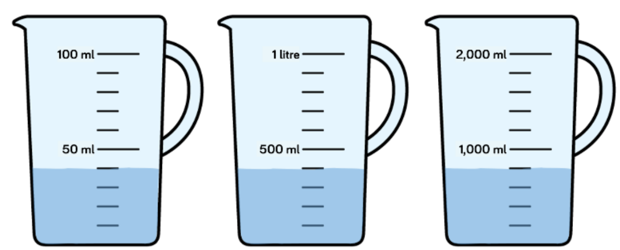
- Make these shapes.



Complete the table to describe your shapes.

Shape	Width (cm)	Height (cm)	Length (cm)	Volume (cm^3)
A				
B				
C				

- Compare the capacity and the volume. Use the sentence stems to help you.



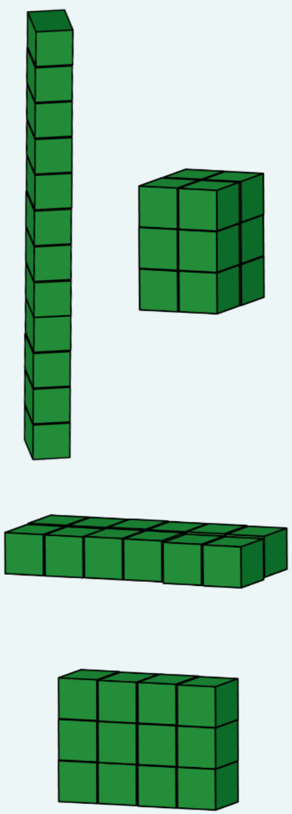
Container ___ has a capacity of ____ ml
The volume of water in container ___ is ___ cm^3

What is Volume?

Reasoning and Problem Solving

How many possible ways can you make a cuboid that has a volume of 12 cm^3?

Possible solutions:



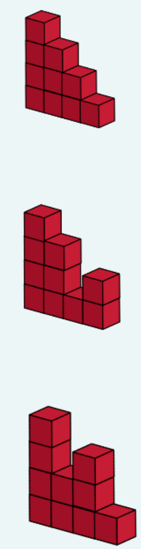
My shape is made up of 10 centimetre cubes.

The height and length are the same size.

What could my shape look like?

Create your own shape and write some clues for a partner.

Possible solutions include:



Compare Volume

Notes and Guidance

Children use their understanding of volume (the amount of solid space taken up by an object) to compare and order different solids that are made of cubes.

They develop their understanding of volume by building shapes made from centimetre cubes and directly comparing two or more shapes.

Mathematical Talk

What does volume mean?
What does cm^3 mean?

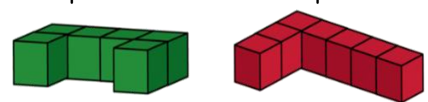
How can we find the volume of this shape?
Which shape has the greatest volume?
Which shape has the smallest volume?

Do we always have to count the cubes to find the volume?

Varied Fluency

- Work out the volume of each solid.

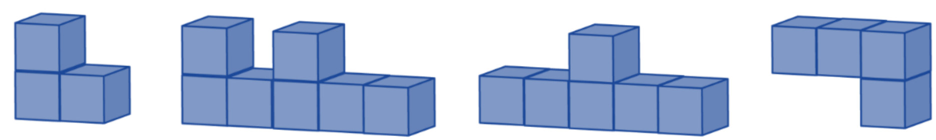
  Shape A   Shape B

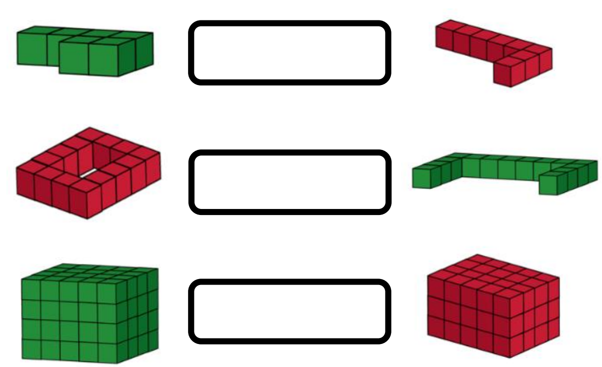
  Shape A has a volume of ___ cm^3
  Shape B has a volume of ___ cm^3

  Which has the greatest volume?

- Look at the 4 solids below. Put the shapes in ascending order based on their volume.

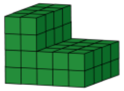
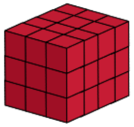
  

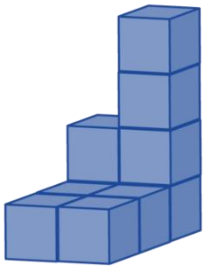
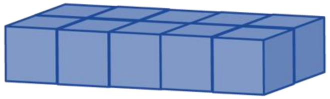
- Count the cubes to find the volume of the shapes and use 'greater than', 'less than' or 'equal to' to make the statements correct.

Compare Volume

Reasoning and Problem Solving

Shape A has a height of 12 cm. Shape B has a height of 4 cm. Dora says Shape A must have a greater volume. Is she correct? Explain your answer.	Dora is incorrect e.g. Shape A 12 cm × 1 cm × 2 cm = 24 cm^3 Shape B 4 cm × 9 cm × 2 cm = 72 cm^3
Amir, Whitney and Mo all build a shape using cubes. Mo has lost his shape, but knows that it's volume was greater than Whitney's, but less than Amir's. Amir's  Whitney's  What could the volume of Mo's shape be?	The volume of Amir's shape is 56 cm^3 The volume of Whitney's shape is 36 cm^3 The volume of Mo's shape can be anywhere between.

Eva has built this solid:  Tommy has built this solid:  Eva thinks that her shape must have the greatest volume because it is taller. Do you agree? Explain your answer.	Eva is incorrect, both solids have an equal volume of 10 cm^3. Children might want to build this to see it.

Estimate Volume

Notes and Guidance

Children estimate volume and capacity of different solids and objects.
They build cubes and cuboids to aid their estimates.
Children need to choose the most suitable unit of measure for different objects e.g. using m^3 for the volume of a room.
Children should understand that volume is the amount of solid space taken up by an object, whereas capacity is the amount a container can hold.

Mathematical Talk

What is the difference between volume and capacity?

Do you need to fill the whole box with cubes to estimate its volume?

Would unit to measure would you use to estimate the volume of the classroom?

Varied Fluency

- Estimate and match the object to the correct capacity.

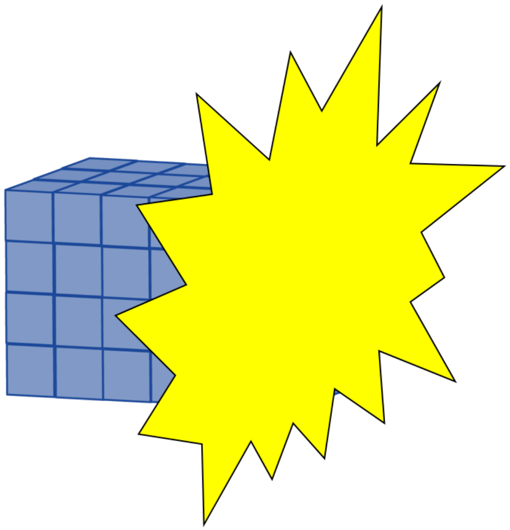
3,600 cm^3	1,000 cm^3	187,500 cm^3

- Use a box or drawer from your classroom.
Use cubes to estimate the volume of the box or drawer when it is full.

- Estimate then work out the capacity of your classroom.

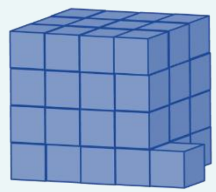
Estimate Volume

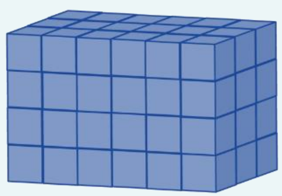
Reasoning and Problem Solving



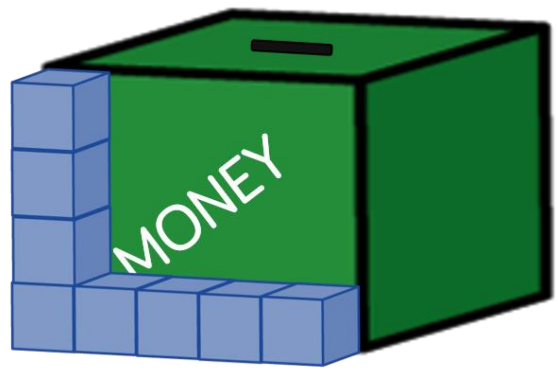
Each of the cubes have a volume of 1 m^3
The volume of the whole shape is between 64 m^3 and 96 m^3
What could the shape look like?

Any variation of cubes drawn between the following:





Jack is using cubes to estimate the volume of his money box.



He says the volume will be 20 cm^3

Do you agree with Jack?
Explain your answer.

What would the approximate volume of the money box be?

Jack is incorrect because he has not taken into account the depth of the money box.

The approximate volume would be 80 cm^3

White Rose Maths

Estimate Capacity

Notes and Guidance

Children estimate capacity using practical equipment such as water and rice.

Children explore how containers can be different shapes but still hold the same capacity.

Children will understand that we often use the word capacity when referring to liquid, rather than volume.

Mathematical Talk

Can I fill the tumbler so it is ___ full?
Compare two tumblers, which tumbler has more/less volume? Do they have the same capacity?

Can we order the containers?

If I had ___ ml or litres, which container would I need and why?

How much rice/water is in this container? How do you know?

Varied Fluency

Use five identical tumblers and some rice.

- Fill a tumbler half full.
- Fill a tumbler one quarter full.
- Fill a tumbler three quarters full.
- Fill a tumbler, leaving one third empty.
- Fill a tumbler that has more than the first but less than the third, what fraction could be filled?

Show children 5 different containers.
Which containers has the largest/smallest capacity?
Can we order the containers?
If I had ___ ml/l, which container would I need and why?
Fill each container with rice/water and estimate then measure how much each holds.

Match the containers to their estimated capacity.

5,000 ml | 500 ml | 5 ml

Use this to help you compare other containers. Use 'more' and 'less' to help you.

Estimate Capacity

Reasoning and Problem Solving

Give children a container. Using rice, water and cotton wool balls, can children estimate how much of each they will need to fill it? Discuss what is the same and what is different. Will everyone have the same amount of cotton wool? Will everyone have the same amount of rice? Will everyone have the same amount of water?	Possible response: Explore how cotton wool can be squashed and does not fill the space, whereas water and rice fill the container more.	Give children a container. Using rice/water and a different container e.g. cups, discuss how many cups of rice/water we will need to fill the containers. Link this to the capacity of the containers.	Various different answers.