Resources	Links to prior learning/ objectives	Vocabulary:
Protractors, 100 squares, place value counters, clocks, rulers, axis, graphs, multiplication squares, Cuisenaire, cubes	Identifying and naming different angles and the properties associated with each. ~ Angle facts. ~ Properties of rectangles- perimeter. ~ Basic introduction to line graphs and continuous data. ~ Multiplication facts up to 12 x 12. ~ Factors and multiples. ~ Using manipulatives to demonstrate mathematical concepts. ~ Mental strategies for calculation.	Angle, degree, estimate, compare, acute, obtuse, reflex, properties, missing lengths, solve, compare, sum, difference, line graphs, maximum/minimum value, scale, prime number, composite number, square number, cube number, multiply, divide, factors, multiples, convert, time, minutes, seconds, hours, interpret, tables,
	Mastery: (where to find some resources) • Teaching for Mastery • White Rose **New and old documents** • Mastery maths stickers • Nrich (curriculum mapping)	

Objectives and Teaching

Week 1

Barriers to ARE (misconceptions)

Use of protractor
Understanding of the key vocabulary/ mixing up what terminology means.
Visualisation of angles and identifying whether they are greater than or less than given criteria for each type of angle.
Knowledge of key properties of a rectangle.
Accuracy with counting when identifying missing lengths and angles.

Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
Use the properties of rectangles to deduce related facts and find missing lengths and angles

- To know angles are measured in degrees
- To know how to estimate acute, obtuse and reflex angles
- To develop the skill of comparing acute, obtuse and reflex angles
- To know how to use the properties of rectangles to find missing lengths
- To know how to use the properties of rectangles to find missing angles

Fluency	Problem Solving	Reasoning
If one angle in a triangle is 38° and another is 68°, what type of angle will the third be?		

Tick all the obtuse angles

47° 107°

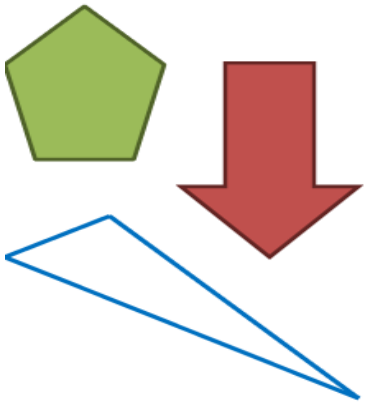
98° 90°

Which number is an angle?

79.4 -60

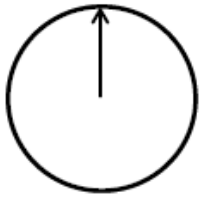
Explain why.

Estimate and measure the angles in these shapes.



Record your results in a table.
Work out how close you were.
Did you notice anything or find any easier?

Cut out a circle with a spinner in the centre.



Odd one out.

180° 45°

79° 225°

Explain why.

Put the arrow in the starting position above. Turn over a flash card with an angle on. Estimate the given angle by moving the spinner. Check how close you are.

Week 2

Barriers to ARE (misconceptions)

Reading the graph

Understanding of key language- compare, sum, difference

Skills in calculations

Interpreting a graph.

Reading a scale, recognising the intervals and understanding what each axis represents.

Recognising that the data is continuous.

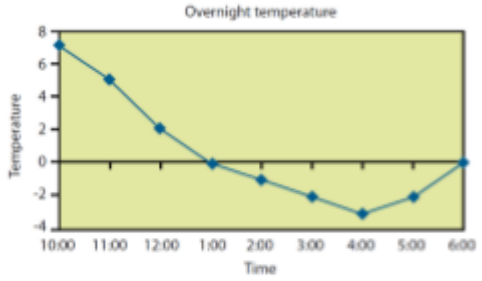
Understanding the terminology within the questions- difference/ sum/ comparison.

Solve comparison, sum and difference problems using information presented in a line graph

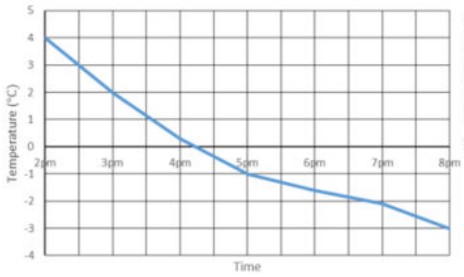
- To know how to solve comparison problems using line graphs
- To know how to solve sum problems using line graphs
- To know how to solve difference problems using line graphs
- To know which calculation and method is needed to solve line graph problems

Fluency	Problem Solving	Reasoning
	Carry out your own exercise experiment and record your heart rate on a graph like the one shown. How does it compare?	

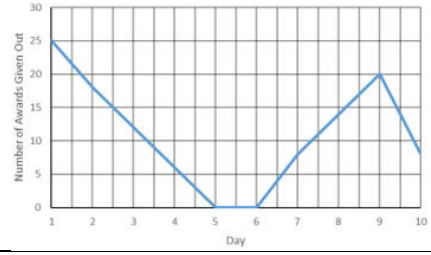
Use the line graph to answer the following questions:



- What was the highest/lowest temperature? What time did they occur?
- What is the difference between the highest and lowest temperature?
- How long did the temperature stay at freezing point or less?



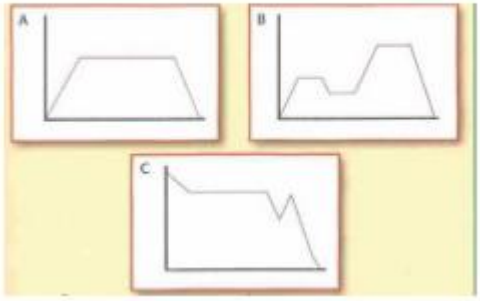
What was the lowest temperature recorded on the graph?
What was the time when freezing point was reached?



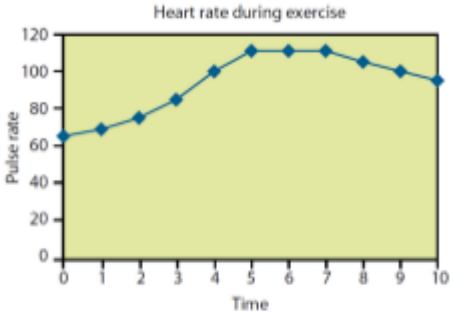
How many children got the award on day 9?
How many more children got the award on day 1 than on day 7?

Here is a line graph showing a bath time. Can you write a story to explain what is happening in the graph?

Can you write a story for the three graphs below?



Use the line graph to answer the following questions:



How long did it take for the pulse rate to reach the highest level? Explain using the graph to help.

When do you think the person stopped exercising? Convince me.

Estimate what the pulse rate was after 2 and a half minutes. How did you get an accurate estimate?

Week 3

Barriers to ARE (misconceptions)

Understanding of the vocabulary and mixing terminology up.
Multiplication knowledge.
Using known facts and making links between these and prime numbers.

Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
Establish whether a number up to 100 is prime and recall prime numbers up to 19

- To know how to find multiples of whole numbers.
- To know how to find factors of any number.
- To know how to find common factors.
- To know how to identify prime numbers to 100.
- To know how to find prime factors

Fluency

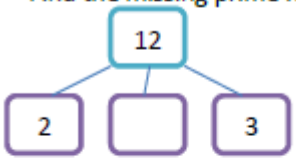
- What is special about these numbers?

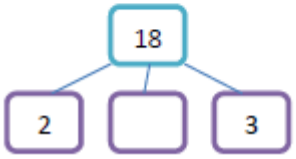
7 17 37 47

- Put these numbers into 2 groups. Label the groups.

11	10	21	31
9	13	47	35

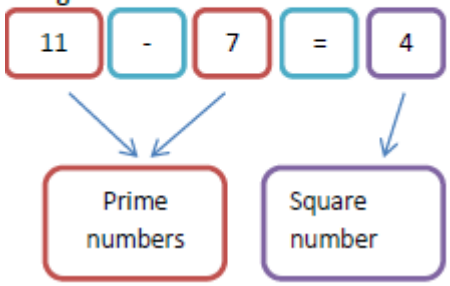
Find the missing prime factors.





Problem Solving

How many square numbers can you make by either adding two prime numbers together or by subtracting one prime number from another
e.g.



Investigate how many prime numbers are between 2 consecutive multiples of 10. Include 0 and 10.
Is there a pattern?

On a set of flashcards, write a different number on each. Ask a partner to do the same.
Shuffle them and take half each. Take turns to turn them over. Say either 'prime' or 'not prime' when a number is turned over. Whoever ends with the most cards, wins.

Reasoning

Explain why 1 isn't a prime number.

- Katie says,

All prime numbers have to be odd.

Do you agree? Convince me.

Her friend, Abdul, says,

That means 9, 27 and 45 are prime numbers.

Explain Abdul's mistake and correct it.

Always, sometimes, never
When you add 2 prime numbers together the answer will be even.

- Fill in the missing prime numbers

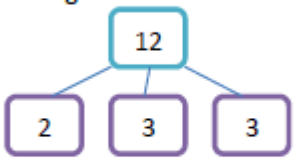
2	3		7	11	

19		13		7	5

Find all the prime numbers between 60 and 80.

What is the 16th prime number?

Prime factors are the prime numbers that multiply together to make a number e.g.



Is it possible to make every number by multiplying prime numbers together?

Fill in the missing numbers so that the calculation creates a prime number.

19 – ▭ = ▭

Is this the only option?

Andy says,

> I subtracted an odd number to find a prime number.

Is this possible? How many ways could he have done this?
Explain your answer.

What number am I?
I am a prime number. I am a 2 digit number.
Both my digits are the same.

Explain why there is only one option.

Week 4

Barriers to ARE (misconceptions)

Understanding of the vocabulary and mixing terminology up.
Multiplication knowledge.
Using known facts and making links between these and squared/cubed numbers.
Application of their understanding of square and prime numbers.

Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes.

- To understand what a square number is.
- To understand what a cube number is.
- To develop the skill of solving problems involving…

Fluency

Work out:

6^2=
3^3=
4 squared =
8 cubed =

Fill in the missing answers from the grid below:

4^2	4 x 4 x 4	64
7^2	7 x 7	
2^7	2 x 2 x 2 x 2 x 2 x 2 x 2	
5^3		
3^6		
	4 x 4 x 4 x 4	
		8
6^3		

Problem Solving

Last year my age was a square number.
Next year it will be a cube number.
How old am I?
How long must I wait until my age is both a square number and a cube?

How many square numbers can you make by adding prime numbers together?

Here's one to get you started.

2 + 2 = 4

Can you arrange the numbers 1 to 17 in a row so that each adjacent pair adds up to a square number?

3 6 10

3 + 6 = 9
6 + 10 = 16

Use number cards 1 – 17 to help you solve the problem.
Can you arrange them in more than one way? If not, can you explain why?

Reasoning

Julian thinks that 4^2 is 16.
Do you agree?
Convince me.

True or False

Square and Cubed numbers are always positive.

Always, Sometimes, Never.

A square number has an even number of factors.

Which is bigger?

3^2 2^3

Show your working.

Jack thinks that the numbers both equal 6.
Explain to Jack what he has done wrong.

Order the digits to make a three digit number that is divisible by 3 and when you remove the final digit it is divisible by 2.

1	2	3

Using the digits 1 – 4, order the digits to make a four digit number that is divisible by 4 and when you remove the final digit it is divisible by 3 and if you remove the third digit it is divisible by 2.
Do the same with five digits, starting with a five digit number that is divisible by 5.

Here are three number cards.

A	B	C

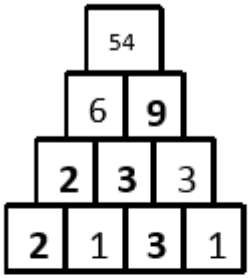
A + B + C = square number
A + B = square number
B + C = square number
A + C = 5 less and 6 more than square numbers
What are the values of A, B and C?

Six children are taking part in a lottery game at school.
They have lotto balls with the numbers 1-50 on them.
They have decided to split the balls between them using the rules below.

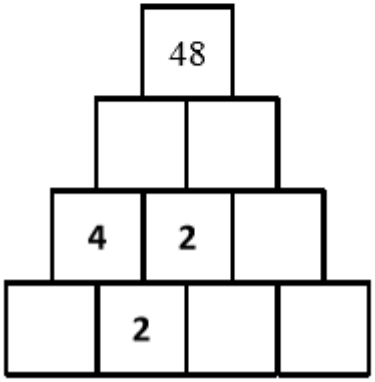
Child A will have all the factors of 36.
Child B will have all the prime numbers.
Child C will have all the multiples of 5.
Child D will have all the square numbers.
Child E will have all the factors of 50.
Child F will have all the multiples of 3.

Are there any balls that need to be shared between two or more children?
Which child gets the most?
Which child gets the least?
Are any balls left over?

Here is a multiplication pyramid.
Each number is made by multiplying the two numbers below.



Use this to complete this multiplication pyramid.



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Week 5

Barriers to ARE (misconceptions)

Mental strategies, using known and derived facts to calculate more complex calculations.
Multiplication knowledge.
Holding more than one step in their head.
Using the most efficient methods.

Multiply and divide numbers mentally drawing upon known facts

- To develop the skill of solving problems involving inverse operations.
- To develop the skill of mental multiplication using known facts.
- To develop the skill of mental division using known facts.

Fluency

8 x 6 = 48.
Use this to help you find the answers to the number sentences:
48 ÷ 6 =
6 x 80 =

Write down five multiplication and division facts that use the number 48.

If I know 8 x 36 = 288, I also know 8 x 12 x 3 = 288 and 8 x 6 x 6 = 288.
If you know 9 x 24 = 216, what else do you know?

40 cupcakes cost £3.60
How much do 20 cupcakes cost?
How much do 80 cupcakes cost?
How much do 10 cupcakes cost?

Problem Solving

If 8 x 24 = 192, how many other pairs of numbers can you write that have the product of 192?

Here is part of a multiplication grid.

×	4	5	6	7	8	9
4		20				
5	20					
6						
7						
8						
9						

Shade in any other squares that have the same answer as the shaded square.

Multiply by 2 and 3 using the direction of the arrows to complete the grid.

		x2		
	3	6	12	
	9	18	36	
x3	27			

Reasoning

How can you use 10 x 7 to help you find the 9th multiple of 7?

Find the answer:

2 x 11 =	4 x 11 =
2 x 12 =	4 x 12 =
2 x 13 =	4 x 13 =

What is the connection between the results for the two times table and the four times table?

If 2 x 144= 288, what is 4 times 144?

To multiply a number by 25 you multiply by 100 and then divide by 4.
Use this strategy to solve.
84 x 25
28 x 25
5.6 x 25

10 times a number is 4350, what is 9 times the same number?
Explain your working.

Week 6 **Barriers to ARE (misconceptions)**	Assessment week- areas of misconceptions	
Fluency	**Problem Solving**	**Reasoning**
Week 7 **Barriers to ARE (misconceptions)** Understanding of the relationship between time facts. Applying their understanding of time to reading and interpreting timetables. Using base ten rather than a base 60 system- counting 100 minutes rather than 60 minutes in an hour when calculating difference between times. Calculation errors. Reading digital and 24-hour time. Understanding how to interpret a table- where to look for given information.	Solve problems involving converting between units of time. Complete, read and interpret information in tables, including timetables. • To develop the skill of converting between • To know how to read and interpret information in tables. • To develop the skill of solving problems using information in tables.	
Fluency	**Problem Solving**	**Reasoning**

Complete, read and interpret information in tables including timetables.

	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	07:23	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

Use the timetable to the left to answer the following questions:

On the 06:35 bus, how long does it take to get from Shelf Roundabout to Bradford Interchange?

Can you travel to Woodside on the 07:43 bus?

Which journey takes the longest time between Shelf Village Hall and Bradford Interchange, the bus that leaves SVH at 06:46 or the bus that leaves SVH at 07:23?

Order the journey times on the timetable from longest to shortest. Can you explain why you think the buses take different lengths of time?

Three trains travel from Halifax to Leeds on the same morning. The Express leaves Halifax 10 minutes after the All Stations train, but arrives at Leeds 10 minutes before it. The All Stations takes 50 minutes to reach Leeds and arrives at 10:30. The Goods train leaves 20 minutes before the All Stations and arrives at Leeds 20 minutes after the Express.

Work out the timetable. That is; what time does each train leave Halifax and what time does each train arrive at Leeds Station?

Use the timetable to the left to answer the following questions:

If you needed to travel from Halifax Bus Station to Odsal and had to arrive by 08:20, which would be the best bus to catch? Explain your answer.

Which journey takes the longest time from Halifax Bus Station to Bradford Interchange?

Hannah works a 10 minute walk from Bradford Interchange. She has to start work at 08:00. She is on the 07:10 bus from Halifax which is running 5 minutes late. Will she make it to work on time? Explain your reasoning.