Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 1: Number Properties and Approximations

You should already know:

- ***The multiplication tables up to 12 × 12***
- ***How to multiply and divide whole numbers.***

Multiples of Whole Numbers

When you multiply any two whole numbers together, the answer is a multiple of both of those numbers. For example, when you multiply 5 and 7: 5 × 7 = 35, so 35 is a multiple of 5 and a multiple of 7. Multiples are like times tables, for example, the first five multiples of 7 are 7, 14, 21, 28, and 35. The lowest common multiple (LCM) of two numbers is the lowest integer that is a multiple of both numbers.

Find the LCM of 12 and 18.

Write out the multiples of 12 and 18 until you get a common value.

Multiples of 12 = {12, 24, 36, 48 ...}
Multiples of 18 = {18, 36, 54 ...}
36 is the smallest number that is in both lists, so 36 is the LCM.

Factors of Whole Numbers

A factor is any whole number that divides into another whole number exactly, with no remainder. For example, the factors of 20 are all the numbers we can divide 20 by to get a whole number solution, so 1, 2, 4, 5, 10 and 20.
1 is always a factor of any number, and so is the number itself. When finding factors, look for factor pairs to try and avoid missing any out.

Find the HCF of 45 and 60.

Write out the factors of 45 and 60 and look for the highest common value.

Factors of 45 = {1, 3, 5, 9, 15, 45}
Factors of 60 = {1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60}
15 is the largest number that is in both lists, so 15 is the HCF.

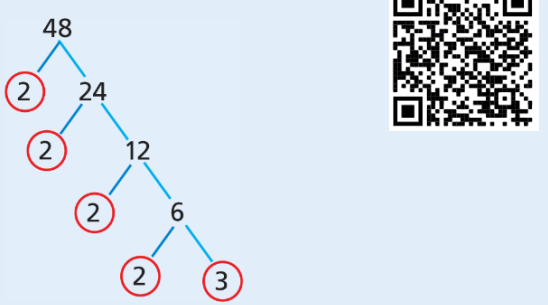
Prime Numbers

A prime number is an integer (whole number) that has only two factors; itself, and 1. There is no easy rule that helps you work out the prime numbers, so it is useful to learn the first few. The prime numbers up to 50 are: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47. These numbers do not appear in any multiplication table other than the 1x table and their own. Note that 1 is not a prime number, as it only has one factor (itself). 2 is the only even prime number – can you figure out why?

Prime Factors, LCM and HCF

A prime factor of an integer is a factor that is also a prime number. Therefore, the prime factors of an integer are the prime numbers that will multiply together to give that integer. For example:
6 can be written as a product of its prime factors, as 2 × 3.
12 can be written as a product of its prime factors, as 2 × 2 × 3, or $2^2 \times 3$.
One useful way to find the prime factors of any integer is to draw up a factor tree, like the one shown.
Prime factors are useful in helping find the lowest common multiple and highest common factors of large numbers, to find out how to do this, scan the QR code.
(Link: https://www.bbc.co.uk/bitesize/guides/zqrcwxs/revision/4)

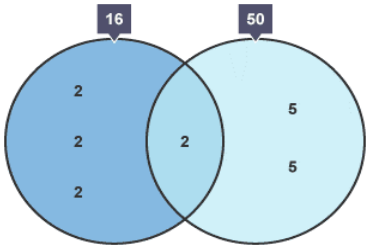
A Factor Tree



Keep splitting values into factors until the ends of all branches are prime numbers.

$48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$

Find out what this Venn Diagram is used for by scanning the QR code.



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Topic 1: Number Properties and Approximations (Continued….)

Rounding numbers to the nearest 10, 100, 1,000

To round to the nearest ten, look at the digit in the tens column. To round to the nearest hundred, look at the digit in the hundreds column. For the nearest thousand, look at the digit in the thousands column. Then do the following:

- draw a vertical line to the right of the place value digit that is required
- look at the next digit
- if it's 5 or more, increase the previous digit by one
- if it's 4 or less, keep the previous digit the same
- fill any spaces to the right of the line with zeros.

Round 4,853 to the nearest 10, 100 and 1,000.

- 485|**3** to the nearest 10 is 4,850
- 48|**5**3 to the nearest 100 is 4,900
- 4|**8**53 to the nearest 1,000 is 5,000

Round 76,982 to the nearest 10, 100 and 1,000.

- 7698|**2** to the nearest 10 is 76,980
- 769|**8**2 to the nearest 100 is 77,000
- 76|**9**82 to the nearest 1,000 is 77,000

Rounding to decimal places

To round to a decimal place:

- look at the first digit after the decimal point if rounding to one decimal place or the second digit for two decimal places
- draw a vertical line to the right of the place value digit that is required
- look at the next digit
- if the next digit is 5 or more, increase the previous digit by one
- if it's 4 or less, keep the previous digit the same
- remove any numbers to the right of the line

Round 248.561 to 1 decimal place, then round it to 2 decimal places:

- 248.5|**6**1 to 1 decimal place is 248.6
- 248.56|**1** to 2 decimal places is 248.56

Notice that your answer should have the same number of decimal places as the approximation asked for.

Round 0.08513 to 1 decimal place and then to 2 decimal places:

- 0.0|**8**513 to 1 decimal place is 0.1
- 0.08|**5**13 to 2 decimal places is 0.09

Rounding to significant figures:

The method of rounding to a significant figure is often used as it can be applied to any kind of number, regardless of how big or small it is.

When a newspaper reports a lottery winner has won £3 million, this has been rounded to one significant figure. It rounds to the most important figure in the number.

To round to a significant figure:

- look at the first non-zero digit if rounding to one significant figure
- look at the digit after the first non-zero digit if rounding to two significant figures
- draw a vertical line after the place value digit that is required
- look at the next digit
- if the next digit is 5 or more, increase the previous digit by one
- if it is 4 or less, keep the previous digit the same
- fill any spaces to the right of the line with zeros, stopping at the decimal point if there is one

Round 53,879 to 1 significant figure, then 2 significant figures.

- 5|**3**879 to 1 significant figure is 50,000
- 53|**8**79 to 2 significant figures is 54,000

Notice that the number of significant figures in the question is the maximum number of non-zero digits in your answer.

Round 0.005089 to 1 significant figures, then 2 significant figures.

- 0.005|**0**89 to 1 significant figure is 0.005
- 0.0050|**8**9 to 2 significant figures is 0.0051

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson

Topic 1: Number Properties and Approximations (Continued….)

Approximating Calculations

Sometimes it is a good idea to estimate the value of a calculation rather than work it out exactly. In this situation, round the numbers in the question before performing the calculation. When approximating, numbers are rounded to one significant figure. The 'approximately equal to' sign, ≈, is used to show that values have been rounded.

Estimate the value of 23×67.

Rounding to 1 significant figure gives: $20 \times 70 = 1,400$

Therefore: $23 \times 67 \approx 1,400$

Estimate: $\frac{423-98}{16.4}$

Rounding to 1 significant figure gives:
$\frac{400-100}{20} = \frac{300}{20} = \frac{30}{2} = 15$

Therefore: $\frac{423-98}{16.4} \approx 15$

Limits of Accuracy and Error Intervals

To describe all the possible values that a rounded number could be, we use limits of accuracy. The lower limit is the smallest value that would round up to the estimated value. The upper limit is the smallest value that would round up to the next estimated value.

For example, a mass of 70 kg, rounded to the nearest 10 kg, has a lower limit of 65 kg. (because 65 kg is the smallest mass that rounds to 70kg to the nearest 10 kg.) The upper limit is 75 kg, because 75 kg is the smallest mass that would round up to 80kg.

This can be shown as an **error interval** – which is the difference between the highest value and the lowest value (using inequality symbols): $65 \text{ kg} \leq \text{weight} < 75 \text{ kg}$.

A quick way to calculate upper and lower bands is to halve the degree of accuracy specified, then add this to the rounded value for the upper limit and subtract it from the rounded value for the lower limit. ***For example:***

140 cm, measured to the nearest 10 cm:

The degree of accuracy is nearest 10 cm.

$10 \text{ cm} \div 2 = 5 \text{ cm}$

Upper limit = $140 + 5 = 145 \text{ cm}$

Lower limit = $140 - 5 = 135 \text{ cm}$

8.4 cm, measured to the nearest 0.1 cm:

The degree of accuracy is nearest 0.1 cm.

$0.1 \text{ cm} \div 2 = 0.05 \text{ cm}$

Upper limit = $8.4 + 0.05 = 8.45 \text{ cm}$

Lower limit = $8.4 - 0.05 = 8.35 \text{ cm}$

You should now be able to:

- *Recognise multiples of the first ten whole numbers.*
- *Find factors of numbers less than 100.*
- *Recognise two digit prime numbers.*
- *Work out the prime factors of numbers.*
- *Work out the LCM and HCF of two numbers.*
- *Identify the number of decimal places.*
- *Round numbers to a given number of decimal places or significant figures.*
- *Use approximations to estimate the answers to calculations.*
- *Use inequality notation to specify the error interval due to rounding.*

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 2: Decimal Calculations

Adding and Subtracting Decimals:

Adding and subtracting decimals works exactly the same way as adding and subtracting whole numbers or integers. When adding and subtracting decimals it is important to keep the decimal points in line with each other.

Example: Calculate 3.6 + 14.73. Make sure that units line up with units, tenths line up with tenths and so on. Use zeros as placeholders if you need to.

$$\begin{array}{r} 03.60 \\ +\ 14.73 \\ \hline 18.33 \\ {\scriptstyle 1} \end{array}$$

You should already know:

- ***How to multiply and divide whole numbers.***
- ***How to multiply and divide by powers of 10.***

Multiplying Decimals:

Multiplying decimals works the same way as multiplying whole numbers. When multiplying decimals, add up the number of digits after the decimal points in the question. This number tells you the number of decimal places you should have in your answer. So, if the question includes one decimal place in total, then the answer must include one decimal place, 19.2. If the question has two decimal places in total, then the answer must have two decimal places, 11.76.

Example: What is 3.72 × 2.3?

First, do the calculation with whole numbers, so work out 372 × 23. Note that there are three decimal places in the calculation (3.72, 2.3), so there needs to be three decimal places in the answer. The answer is therefore 8.556.

$$\begin{array}{r} 372 \\ \times\ 23 \\ \hline 1116 \\ {\scriptstyle 2} \\ 7440 \\ {\scriptstyle 1} \\ \hline 8556 \end{array}$$

Dividing decimals by integers:

Dividing decimals by whole numbers works the same way as dividing whole numbers except, just like addition and subtraction of decimals, the decimal point must be kept in line.

Example: Work out 4.14 ÷ 3.

$$\begin{array}{r} 1.38 \\ 3\overline{)\,4.{\scriptstyle 1}1{\scriptstyle 2}4} \end{array}$$

Dividing decimals by decimals:

Equivalent fractions can be used to divide numbers by decimals.

For example, 4 ÷ 0.2 is the same as $\frac{4}{0.2}$. First, note that 0.2 has one decimal place, so multiply the numerator and denominator by 10 to get a whole number.

This gives: $\frac{40}{2}$ (which is equivalent to 40 ÷ 2) Next, work out 40 ÷ 2. 40 ÷ 2 = 20, so 4 ÷ 0.2 must also equal 20.

$18.9 \div 0.09$ is the same as $\frac{18.9}{0.09}$.

1. Note that 0.09 has two decimal places, so multiply the denominator by 100 to get a whole number. Multiply the numerator by 100 as well in order to make an equivalent fraction. This gives $\frac{1,890}{9}$.
2. Next work out $1,890 \div 9$.

$$1,890 \div 9 = 18.9 \div 0.09 = 210$$

You should now be able to:

- ***Add and subtract decimals***
- ***Multiply decimals with integers***
- ***Multiply decimals with decimals***
- ***Divide decimals by integers***
- ***Divide decimals by decimals.***

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 3: Statistical Diagrams

You should already know:

- ***How to use a tally for recording data.***
- ***How to read information from charts and tables.***

Frequency Tables

A frequency table is a way of organising collected data. To do this we draw a table with three columns:
The first column is for the different items in the data set.
The second column is for the tally marks.
The last column is the frequency column where we can add up the tally marks and write in the corresponding frequencies.
We can add up all of the frequencies to find the total frequency of the set of data.
For example, organise the colours of the 12 shirts in a wardrobe into a frequency table.
blue pink blue white white blue black white blue pink blue white

Colour	Tally marks	Frequency
Black	|	1
Blue	𝍸	5
Pink	||	2
White	||||	4
		Total = 12

Numerical data can also be organised into grouped data.
Here the data is put into different classes with class intervals.
For example, a grouped frequency table showing the heights of 15 students.

Height, h cm	Frequency
$130 < h \leq 140$	3
$140 < h \leq 150$	7
$150 < h \leq 160$	5
	Total = 15

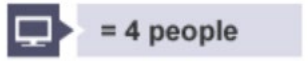
Pictograms

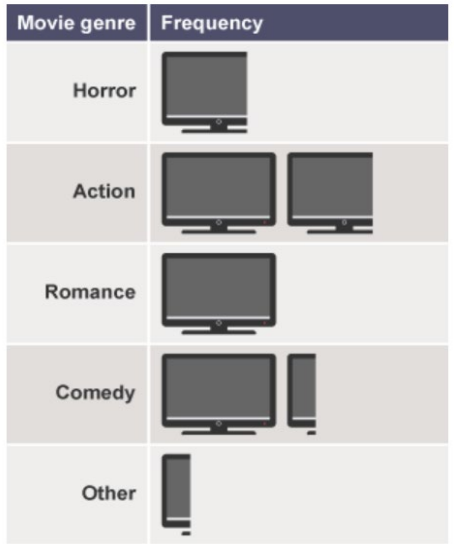
A pictogram is a frequency table in which the frequency of each type of data is shown by a repeated symbol. The symbol itself may represent a single item or a number of items The key tells you how many items the symbol represents.

20 pupils were asked about their favourite type of film. The table shows their responses. This can be shown on a pictogram.

Movie genre	Frequency
Horror	3
Action	7
Romance	4
Comedy	5
Other	1

Pictogram showing favourite movie genres:





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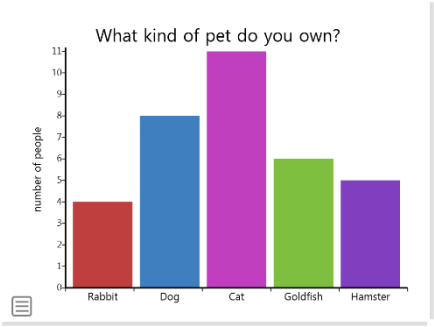
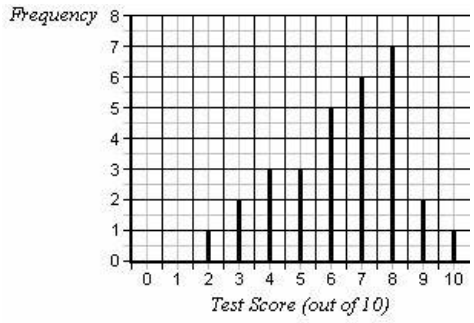
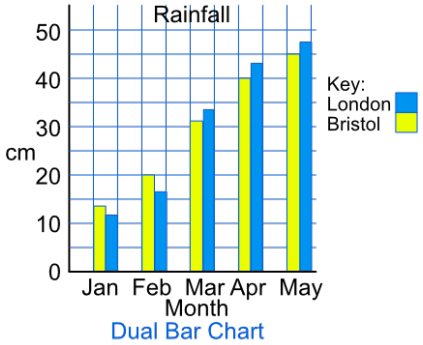
Topic 3: Statistical Diagrams (Continued..)

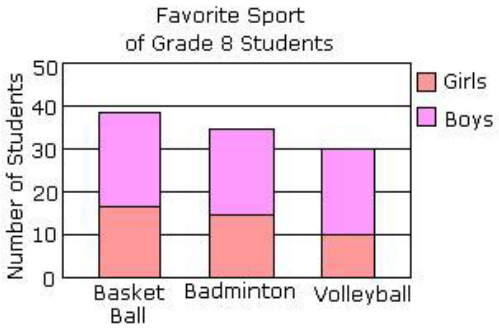
Bar Charts

A bar chart is a series of bars or blocks of the same width, separated by narrow gaps of equal width, that represent frequencies.
Vertical line charts are similar but have vertical lines as opposed to bars.
A dual bar chart compares multiple sets of related data, and will need a key. The bars sit side by side. You can also use composite bar charts to compare data, this again will need a key. Here you have a running total and can compare more than two variables, for example gender and favourite sports.





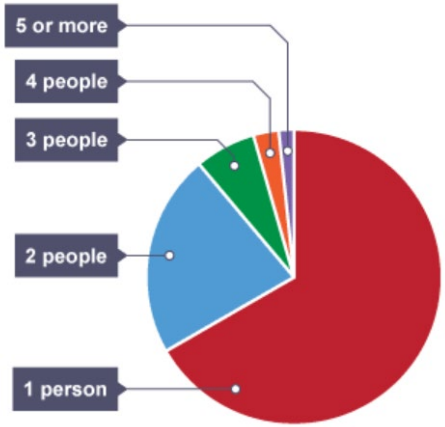




Pie Charts

A pie chart is a circular chart. It shows the proportion of each group at a glance. Remember that there are 360° in a circle so each group in the pie chart will be a proportion of 360°. To look at an example of how a pie chart is created, scan the QR code.

(Link: https://www.bbc.co.uk/bitesize/guides/zxwxfcw/revision/4)



You should now be able to:

- *Draw frequency tables for sets of data.*
- *Draw and interpret pictograms, bar charts and vertical line charts.*
- *Draw and interpret pie charts.*

Maths
Support and application

Year 9F
Term 1

Vocabulary	Wider Research	Apply
Topic 1: Multiple Factor Highest Common Factor Lowest Common Multiple Prime Number Factor Tree Prime Factor Index Form Decimal Round Significant Figure Approximate Estimate Error Interval Inequality ***Topic 2:*** Decimal Decimal Place Place Value Tenths Hundredths Divisor Equivalent Fraction Integer ***Topic 3:*** Frequency Tally Bar Chart Pictogram Pie Chart Proportion Line Graph	***Topic 1:*** **Highest Common Factor Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/11/Common-factors-and-HCF-pdf.pdf **Lowest Common Multiple Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/11/Common-multiples-and-LCM-pdf.pdf **Prime Factors Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2013/02/product-of-primes-pdf3.pdf **Rounding Questions and Video Examples:** https://www.mathsgenie.co.uk/rounding.html **Approximations Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/10/Estimation-pdf.pdf **Error Intervals Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2019/02/Error-Intervals.pdf ***Topic 2:*** **Adding Decimals Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/09/Adding-Decimals-pdf.pdf **Subtracting Decimals Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/09/Subtracting-Decimals-pdf.pdf **Multiplying Decimals Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/01/multiplying-decimals-textbook-pdf.pdf **Dividing Decimals by Whole Numbers Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/11/Dividing-Decimals-by-whole-numbers-pdf.pdf **Dividing Decimals by Decimals Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/09/Dividing-by-Decimals-pdf.pdf ***Topic 3:*** **Frequency Tables Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2013/02/tally-charts-pdf1.pdf **Pictograms Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2019/01/Pictograms-pdf.pdf **Bar Charts Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2019/02/Bar-Charts.pdf **Pie Charts Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2019/01/Drawing-Pie-Charts.pdf	***Topic 1:*** a) Find the smallest even number that is a multiple of 11 and a multiple of 3. b) Work out the largest factor that 9 and 12 have in common. c) Write down all the prime numbers between 20 and 30. d) Write down the prime factors of 280. e) Round 6267 to the nearest 10, 100 and 1000. f) Round 0.977 to 2 dp. g) Round 57,123 to 1 and 2 significant figures. h) Approximate the solution to 3508×2.79. i) A length of string is 10cm, rounded to the nearest cm. Write down the error interval of the length of string. ***Topic 2:*** a) $0.56 + 1.6$ b) $0.94 + 4.8 + 12.09 + 5.63$ c) $40.5 - 7.258$ d) 173.2×3 e) 6.3×2.46 f) $0.072 \div 6$ g) $2.4 \div 0.08$ ***Topic 3:*** a) Ask ten people their favourite sport and draw a frequency table showing this information. b) Draw a bar chart showing this information. c) Create a pictogram to display the data. d) Draw a pie chart to show the proportions of people who liked each sport.