Functional Skills Mathematics Level 1

Guidance to support teachers and providers with the delivery of Functional Skills Maths at Level 1

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INTRODUCTION

This guide has been created by specialist maths practitioners with considerable experience of delivering Functional Skills Maths in the Further Education sector.

The Department for Education (DfE) guidelines have been used as a framework for the guide and to assist teachers or assessors to deliver the new Functional Skills exam (2019) regardless of the exam board they are using.

Topics have been split into the three main categories:

- Using numbers and the number system
- Using common measures, shape, and space
- Handling information and data.

Each topic will be split based on DfE guidelines, giving an example of application and examples. Suggestions will be offered on teaching materials and misconceptions that are quite common. Each section will focus on problem solving skills and how to apply.

USING NUMBERS AND THE NUMBER SYSTEM

Pg	Topic covered
7	Read, write, order and compare large numbers (up to one million)
9	Recognise and use positive and negative numbers
11	Multiply and divide whole numbers and decimals by 10, 100, 1000
13	Use multiplication facts and make connections with division facts
15	Use simple formulae expressed in words for one or two-step operations
17	Calculate the squares of one-digit and two-digit numbers
19	Follow the order of precedence of operators
21	Read, write, order and compare common fractions and mixed numbers
23	Find fractions of whole number quantities or measurements
25	Read, write, order and compare decimals up to three decimal places
27	Add, subtract, multiply and divide decimals up to two decimal places
29	Approximate by rounding to a whole number or to one or two decimal places
31	Read, write, order and compare percentages in whole numbers
33	Calculate percentages of quantities, including simple percentage increases and decreases by 5% and multiples thereof
35	Estimate answers to calculations using fractions and decimals
37	Recognise and calculate equivalences between common fractions, percentages and decimals
39	Work with simple ratio and direct proportions

USING NUMBERS AND THE NUMBER SYSTEM – WHOLE NUMBERS, FRACTIONS, DECIMALS AND PERCENTAGES DFE GUIDANCE

Using numbers and the number system: learners at Level 1 are expected to be able to count in steps of various sizes, including negative numbers; read write and understand positive whole numbers to one million. They can order and compare whole numbers of any size, and fractions, ratios and decimals and recognise the effect of multiplying and dividing of 10, 100 and 1000. They can identify, compare, and extend a range of numerical and spatial patterns, use, understand and calculate with fractions, decimals and percentages and calculate simple interest. For specific content on numbers and the number system – see below.

Content	
1	Read, write, order and compare large numbers (up to one million)
2	Recognise and use positive and negative numbers
3	Multiply and divide whole numbers and decimals by 10, 100, 1000
4	Use multiplication facts and make connections with division facts
5	Use simple formulae expressed in words for one or two-step operations
6	Calculate the squares of one-digit and two-digit numbers
7	Follow the order of precedence of operators
8	Read, write, order and compare common fractions and mixed numbers
9	Find fractions of whole number quantities or measurements
10	Read, write, order and compare decimals up to three decimal places
11	Add, subtract, multiply and divide decimals up to two decimal places
12	Approximate by rounding to a whole number or to one or two decimal places
13	Read, write, order and compare percentages in whole numbers
14	Calculate percentages of quantities, including simple percentage increases and decreases by 5% and multiples thereof
15	Estimate answers to calculations using fractions and decimals
16	Recognise and calculate equivalences between common fractions, percentages and decimals
17	Work with simple ratio and direct proportions

1. Read, write, order and compare large numbers (up to one million)

Application + Activities

Learners are expected to be able to recognise and work with numbers up to 1 million; being able to read and write the numbers as digits and as words. There is a further expectation that they can recognise place value so they can order and compare numbers based on this.

Learners who are very weak with place value may have to go back to physical and visual demonstrations. Bunching straws into sets of 10 and exploring Hundreds, Tens and Units this way will help. If they are more comfortable with the concept of what numbers represent in place value, you can progress onto tasks that involve moving digits between columns and explore the changes this has made to the values even if the digits are not changing. This will also present an opportunity to explore the impacts of gaps within numbers that get filled with zeros allowing for discussions on how zero is used in common practice.

Tips & Misconceptions

As discussed, place value can cause issues if a learner is not fully confident with it so even with older learners exploring this with manipulatives may be necessary. Otherwise actually getting them to write out the actual values separately for each column will help visualise it for the learner (i.e., 347 is actually a 300, a 40 and a 7).

This can also lead to problems where learners cannot accurately relate a worded number to its appropriate place values. Linking work to the place value columns should help them address this.

It is not as common but zero can be mis-interpreted or even ignored having an impact on the overall perception of a number causing the learner to change the overall value. For learners such as these exploring gaps in number and the purposes of a zero will help address it.

Example & Solution

5. Make the largest and the smallest possible numbers with these digits.

5	3	9	6	2	2

Largest: …………………… Smallest: ……………………

6. What is the value of the digit **8** in the number **308, 769** ?

Answer: ………

7. Fill the gaps below using the **<** and **>** symbols inside the boxes.

34 389 $\boxed{\phantom{<}}$ **34 398**

999 999 $\boxed{\phantom{<}}$ **1 000 000**

5. Largest: 965 322 Smallest: 223 569

6. **8** thousand

7. **34 389** $\boxed{<}$ **34 398**

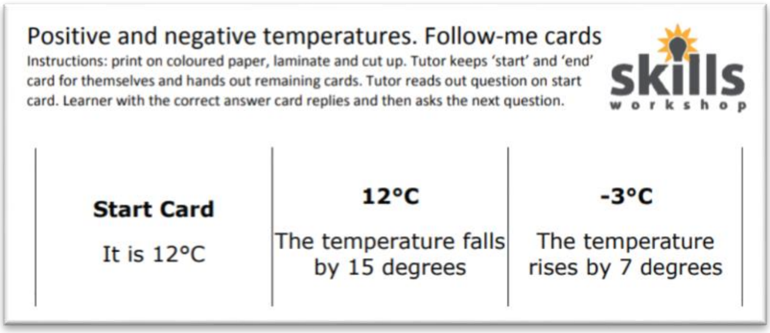
999 999 $\boxed{>}$ **1 000 000**

https://marsmaths.com

2. Recognise and use positive and negative numbers

Application + Activities

Learners are expected to be able to interpret and use positive and negative numbers in practical contexts. Often this can feature in temperature or bank statement style questions



To explore this further, learners can use the below linked set of "follow me" cards as part of a classroom-based activity. Apart from the first and last cards they are shared out amongst the learners. The teacher can start off with the first card and then learners are expected to use that information and apply their cards instructions to find out if they are the next card in line.

For example one learner has "-1°C" and their clue to the next card is "The temperature falls by 11°C". This is great because if a learner is not confident about their card it will promote conversation with those nearest to them.

Having a clearly visible number line when exploring these types of activities can help.

https://www.skillsworkshop.org/resources/positive_negative_temperatures_follow_me_cards

Tips & Misconceptions

Learners can often take numbers at their face value which causes misconceptions. They can sometimes see -3 as being bigger than 2. For a learner facing these issues bringing it back to relatable real-world examples should help them address errors in thinking.

Learners sometimes mix-up both face value and rules for negatives. -4 + 6 can produce both -2 and -10 as incorrect answers due to this. They either add 4 to 6 and remember a single negative makes the answer negative or keep the numbers in order and do the subtract so 4 subtract 6. This can be addressed on a number line and think of the first number (including its sign) as a "starting point" and the second number and its sign are what is happening.

This can then be further confused with rules for negatives when multiplying and dividing. This is best explored by showing that -3 x 2 can also be represented as -3 + -3.

Example & Solution

3. Sally wrote down the temperature at different times on 1st January 2003.

Time	Temperature
midnight	– 6 °C
4 am	–10 °C
8 am	– 4 °C
noon	7 °C
3 pm	6 °C
7 pm	–2 °C

(a) Write down

(i) the **highest** temperature,

.... °C

(ii) the **lowest** temperature.

(2)

(b) Work out the difference in the temperature between

(i) 4 am and 8 am,

.... °C

(ii) 3 pm and 7 pm.

.... °C

(2)

3. Sally wrote down the temperature at different times on 1st January 2003.

Time	Temperature
midnight	– 6 °C
4 am	–10 °C
8 am	– 4 °C
noon	7 °C
3 pm	6 °C
7 pm	–2 °C

(a) Write down

(i) the **highest** temperature,

7 °C

(ii) the **lowest** temperature.

-10 °C **(2)**

(b) Work out the difference in the temperature between

(i) 4 am and 8 am, -4 - -10 = 6 °C

(ii) 3 pm and 7 pm. 6 - -2 = 8 °C

(2)

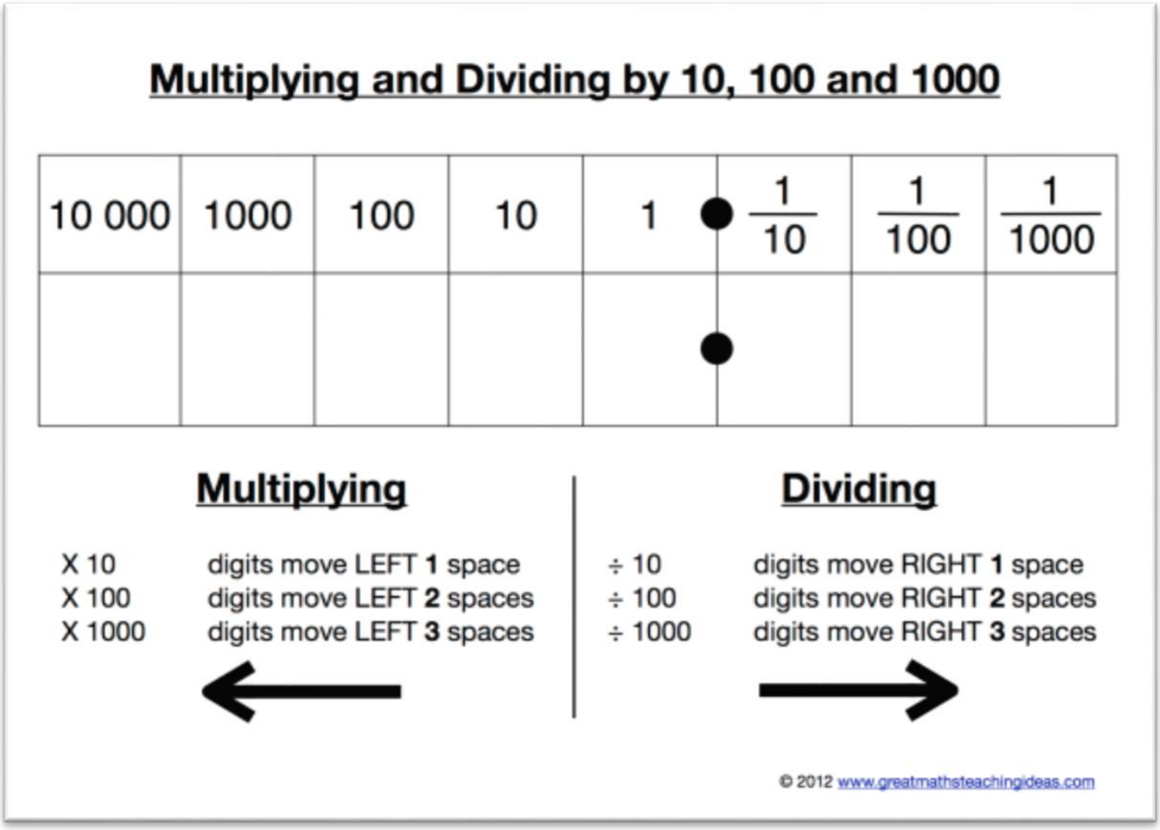
https://www.mathsgenie.co.uk/resources/4_negative-numbers.pdf

3. Multiply and divide whole numbers and decimals by 10, 100, 1000

Application + Activities

Learners are expected to confidently multiply and divide any number by 10, 100 and 1000. Demonstrating this ability with and without a calculator and showing an understanding of the inverse relationship between these

A perfect activity for this links nicely with any place value work you are doing or have done. It involves printing out, laminating and cutting out the below placemat and a lot of separate digits to allow for play and exploration with multiplying and dividing. Learners can manipulate numbers on the sheet or even attempt to do sums that are provided through the link.



http://www.greatmathsteachingideas.com/2012/02/16/a-kinaesthetic-resource-for-multiplying-and-dividing-by-10-100-and-1000/

Tips & Misconceptions

The most common errors fall either with adding zeros incorrectly or moving the decimal place incorrectly. This is mostly rooted in the learners trying to implement a poorly remembered system earlier in their education i.e., times by 10 you just add a zero.

The best way to address this is by working with numbers they are comfortable with and applying x10, ÷10, x100, ÷100 and from there discussing how the numbers change. Once this is established you can add 0.5 to one of their numbers and apply the same processes discussing further what is now happening which should hopefully highlight how the decimal place or place value is changing.

Example & Solution

Fill in the gaps:

67 x 10 = ...	67000 ÷ 10 = ...
67 x 100 = ...	67000 ÷ 100 = ...
67 x 1000 = ...	67000 ÷ 1000 = ...
0.67 x 10 = ...	670 ÷ 10 = ...
0.67 x 100 = ...	670 ÷ 100 = ...
0.67 x 1000 =.........	670 ÷ 1000 = ...

67 x 10 = 670	67000 ÷ 10 = 6700
67 x 100 = 6700	67000 ÷ 100 = 670
67 x 1000 = 67000	67000 ÷ 1000 = 67
0.67 x 10 = 6.7	670 ÷ 10 = 67
0.67 x 100 = 67	670 ÷ 100 = 6.7
0.67 x 1000 = 670	670 ÷ 1000 = 0.67

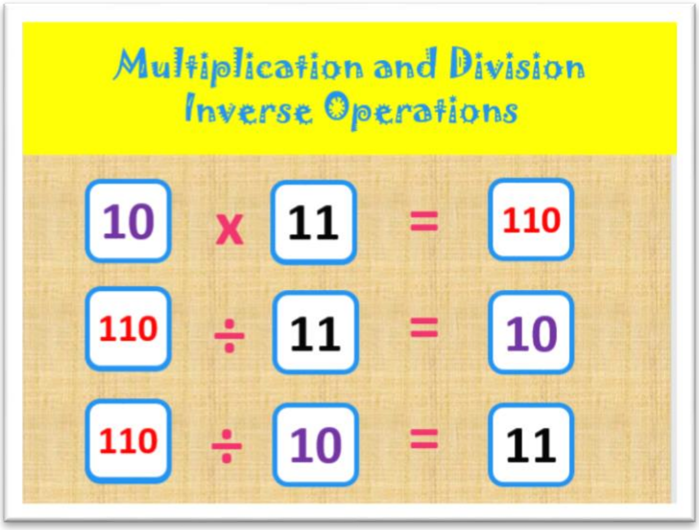
https://marsmaths.com/

4. Use multiplication facts and make connections with division facts

Application + Activities

Learners are expected to be able to recognise and use multiplication facts and the inverse operations of these. This is one way to apply a learner's knowledge to a check the answer to a question.

A perfect activity for this is the following TES resource that across a PowerPoint and differentiated worksheets explores many sums that practice inverted operations for each one. This allows learners to repetitively practice the same processes hopefully allowing them to see and predict these relationships.



https://www.tes.com/teaching-resource/multiplication-and-division-inverse-operations-11382496

Tips & Misconceptions

A learner can sometimes struggle to see multiplication and division as linked operations. They may be comfortable with the facts of multiplication as it has been learnt by rote such as 3 x7 but then do not link 21 ÷ 3. If not addressed this can cause issues further into the curriculum when looking at solving equations as that requires being comfortable with inverse operations.

Learners can be helped to understand this further by just taking a few numbers and just playing around with them and different operations to see what effect it has on the answers.

Example & Solution

3 Rosa makes candles to sell.

Each candle is in the shape of a cuboid of height 8 cm.
The base of each candle is a square of perimeter 20 cm.

Rosa needs to know the volume of one candle.

(a) Work out the volume of one candle.
Remember to give units with your answer.

(3)

☑

(b) Use reverse calculations to show a check of your answer.

(1)

(Total for Question 3 is 4 marks)

Question	Process	Mark	Mark Ref	Evidence
Q3(a)	Process to find length of base	1 or	A	$20 \div 4$ (= 5)
	Process to find volume	2 or	AB	'5' × '5' × 8 (= 200)
	Accurate figure with correct units	3	ABC	200 cm^3
Q3(b)	Valid reverse check	1	D	e.g. '200' ÷ '5' = 40 **and** '40' ÷ '5' = 8 **and** '5'× 4 = 20 NB ft their volume and side length
	Total marks for question	4		

5. Use simple formulae expressed in words for one or two-step operations

Application + Activities

Learners are expected to be able to follow or identify simple formulae in order to find solutions to problems that can be solved systematically. This can be in the form of common formulae such as Speed/Distance/Time and converting between Celsius or Fahrenheit or other systems that have repeatable maths calculations for a solution.

One resource that can help learners practice using formulae for different inputs is a Functional Skills resource based around Formula 1 racing where learners are asked to use formulae to work out fuel requirements, speed and weights etc.

Formula 1 - Functional Maths questions

skills workshop

Name ________________ Date __________

You must show your working out even if you use a calculator.

1. The average length of a lap is 5 km and the number of laps is usually around 60.

   Total distance = 'laps left' x 'average length of lap'

   Calculate how many laps are left if a car has already travelled:

   a) 40 km

   b) 150 km

   c) 0 km

   d) 300 km

   e) 75 km

https://www.skillsworkshop.org/resources/formula_1_functional_maths

Tips & Misconceptions

If it is not clearly stated in what order an equation needs to be worked out incorrect answers can be made. The best ways to address this is to revisit ones where errors are being made quite regularly.

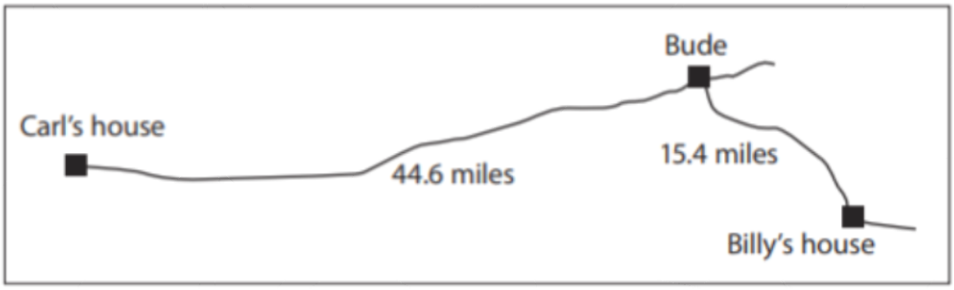
There are then two approaches that can be taken to help overcome difficulties. The first one is to use estimation and logic; for example, distance ÷ speed = time so if speed goes up then start asking learners what impact this will take on how long it takes to complete a journey.

Secondly is applying a flowchart method to the sums helping learners apply a systematic approach to the questions. Help learners imagine the "journey" with the start and finish points with the individual stages in between as boxes.

Example & Solution

5 Billy has invited Carl to the meal.

Carl has this map of the route from his house to Billy's house.



Carl knows his average speed for the journey will be 40 mph.

He uses this rule to find the journey time.

total distance in miles	÷	average speed in mph	=	journey time in hours

Work out the journey time for Carl.

(3)

Question	Skills Standard	Process	Mark	Mark Grid	Evidence
Q5	R1	Begins to work with formula	1 or	P	44.6 + 15.4 (=60) Allow 44.6 ÷ 40 (=1.115) **or** 15.4 ÷ 40 (=0.385) for this mark only
	A4	Full process to work with formula	2 or	PQ	'60' ÷ 40 (=1.5) oe
	I6	Accurate figure	3	PQR	1.5 (hours) oe
		Total marks for question	3		

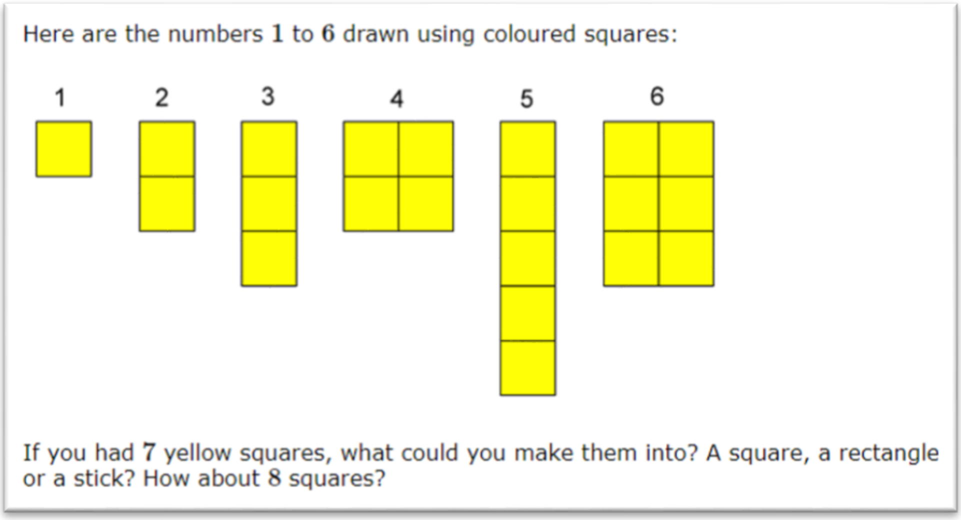
Edexcel Practice Paper Level 1 February 2018

6. Calculate the squares of one-digit and two-digit numbers

Application + Activities

Learners are expected to know, identify and calculate the square numbers for both one- and two-digit numbers. This can be found in both the calculator and non-calculator sections so knowing the square numbers to 12 will be useful.

A good activity for learners to really get to grips with a square number and how it differs from other numbers is the below activity involving squares in different patterns. It asks the learners to explore relationships between the number of squares you have and the shapes that can be made with these; hopefully identifying there are only certain numbers that can generate true squares.



https://nrich.maths.org/5158

Tips & Misconceptions

The most common error to be made with square numbers is to interpret the power of 2 as being the same as multiplying the base number by 2. Possibly the best way to overcome this issue can be approached a few ways. You can look at square numbers in reference to a multiplication grid showing the square numbers on the diagonal, as physical “squares” to work out the areas or to break the square number down into its multiplication sum demonstrating that 4^2 is exactly the same as 4 x 4.

Example & Solution

10. William is thinking of two numbers.
Both numbers are square numbers greater than 1.
The sum of the numbers is 100.

Write down the two numbers.

.... and ....
(2)

10. William is thinking of two numbers.
Both numbers are square numbers greater than 1.
The sum of the numbers is 100.

Write down the two numbers.

36 + 64

36 and 64
(2)

https://corbettmaths.com/wp-content/uploads/2013/02/square-numbers-and-square-roots-pdf1.pdf

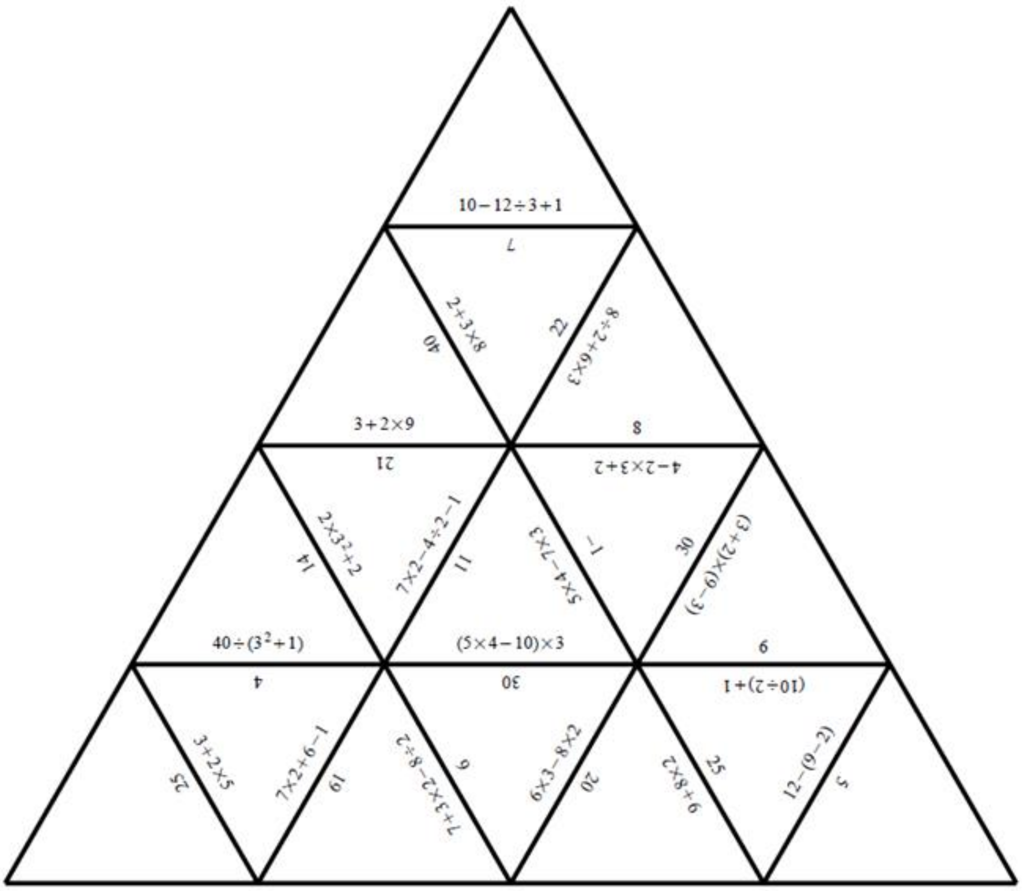
7. Follow the order of precedence of operators

Application + Activities

Learners are expected to be able to use the correct order of operation, justify when the correct order of operation has not been used and use the correct order of operations to find errors in calculations. Working through the BIDMAS formula is like the code cracking and learners really take on the challenge.

Create a Tarsia jigsaw puzzle activity so that it contains 5 mistakes that highlight common misconceptions. Give learners the opportunity to practise how to use order of operations by matching up elements and convince you that each one is incorrect.
Let learners explain the mistake that has been made and then decide what the answer should have been. Similar activities can be found on: https://www.tes.com

To create your own activity in a form of jigsaws or dominos use an editor designed for Teachers of Mathematics available on: http://mmlsoft.com/index.php/products/tarsia



Tips & Misconceptions

When learners complete the given activity, inspire them to review their answers. Learners can find the answer that makes sense to them through reading each other calculations. Encourage learners to write good explanations, so they will be improving their own understanding and helping the other learners.
The classic misconception is that learners are simply carrying out the operation of order, from the left to the right. This suggests that learners are not only forgetting the rules of operations but in misapplying and misunderstanding them following a clear implication in the word ‘BIDMAS’ itself.

Example & Solution

3 Work out $10 \times (3 + 5)$

....

(Total for Question 3 is 1 mark)

(Edexcel Mathematics Foundation May 2019 Paper 1)

Paper: 1MA1/1F				
Question	Answer	Mark	Mark scheme	Additional guidance
3	80	B1	cao	

8. Read, write, order and compare common fractions and mixed numbers

Application + Activities

Learners are expected to be confident with common fractions and mixed numbers; being able to interpret them and understand them well enough to place them in ascending or descending order.

There are two good exercise that can be used in class to help learners develop confidence with this area. Both are from TES and the first one uses the popular Minions from Despicable Me. It promotes discussions over how fractions compare to each other; building on the basic fractions knowledge and applying that to more complex fractions.
https://www.tes.com/teaching-resource/minions-comparing-fractions-6390648

The second one is a cut out and matchup the cards activity where learners are expected to develop confidence through discussions and collaborative activities to match pictures, the mixed number this relates to and the improper fraction also.
https://www.tes.com/teaching-resource/mixed-and-improper-fractions-matchup-11755145

Tips & Misconceptions

The most common area for errors is that learners know that 4 is greater than 2 so therefore 1/4 must be bigger than 1/2 and also, they presume that the value between 1/6 and 1/7 is the same as the value between 1/3 and 1/4 because they apply what they know regarding whole number calculations.

This is a very common area for confusion and can be hard for learners to overcome however some successful strategies can be to demonstrate that 1/2 is 0.5 as a decimal because 1 ÷ 2 = 0.5 this can then be linked with maybe 4/8 is also 0.5 demonstrating that there are fractions with larger numbers that are the same. This process can also be applied to comparing fraction sizes by showing 1/4 is bigger than 2/50 as 1 ÷ 4 = 0.25 and 2 ÷ 50 = 0.04. Be cautious with this approach though as you may find that a learner is also weak on their understanding of decimals which will then need addressing separately.

Another approach to show how fractions compare is to use the traditional method of splitting similar shapes into smaller and smaller fractions to demonstrate how fractions relate to proportions of a shape rather than a concrete number. This can work quite nicely for mixed numbers as it can be easily demonstrated what a “whole” is irrespective of how many parts it has been split into.

Example & Solution

5. Put these fractions in order from the smallest to the largest: **¾, 5/8, 7/10**

....

6. Put these fractions and mixed numbers in order from the largest to the smallest:

8/9, 1 ¾, 1 7/8 , 1 2/3

....

7. Fill in the gaps below using the **<** , **>** , = symbols, fractions and mixed numbers:

2/8		¼
7/8		11/10
9/7	<	....
....	>	1 1/8

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

6. $1\frac{7}{8}, 1\frac{3}{4}, 1\frac{2}{3}, \frac{8}{9}$

7. Fill in the gaps below using the **<** , **>** , = symbols, fractions and mixed numbers:

$\frac{2}{8}$	=	$\frac{1}{4}$
$\frac{7}{8}$	<	$\frac{11}{10}$
$\frac{9}{7}$	<	$\frac{7}{4}$
$1\frac{1}{5}$	>	$1\frac{1}{8}$

9. Find fractions of whole number quantities or measurements

Application + Activities

Learners are expected to be able to calculate any fraction of whole number quantities or measurements.
Create an activity as a handout including a table with fractions of a quantity, bar model and solution. Link the fractions to something that is commonplace in everyday life such as fruit, vegetables to show an amount, e.g., $\frac{1}{9}$ of $\mathbf{45}$ carrots.
Get learners to devise their own questions and then share them with others to explore what each of the others have come up with. What have the learners understood from this activity regarding fractions of a quantity?
Stress learners that to find a fraction of an amount or quantity it is simply a matter of dividing an amount by the 'bottom number' and multiply the amount by the 'top number' and vice versa, e.g. $\frac{1}{9}$ of $\mathbf{45}$ means $\mathbf{45} \div \mathbf{9} \times \mathbf{1}$ or $\mathbf{45} \times \mathbf{1} \div \mathbf{9}$. Encourage learners to understand that 'OF' means 'MULTIPLY', so then they can calculate on fractions, e.g., $\frac{1}{9}$ of $\mathbf{45}$ means $\frac{1}{9} \times \mathbf{45} = \frac{1}{9} \times \frac{45}{1}$.

Here is an example from https://www.piximaths.co.uk/fractions

Question	Bar	Answer
$\frac{1}{9}$ of 45		
$\frac{1}{7}$ of 147		
$\frac{2}{5}$ of 50		
$\frac{3}{5}$ of 125		
$\frac{7}{8}$ of 448		
$\frac{3}{4}$ of 884		
$\frac{2}{7}$ of 112		
$\frac{5}{12}$ of 144		
$\frac{7}{11}$ of 143		

Tips & Misconceptions

Learners are often mistaken and usually divide an amount by 'the number on top' and then multiply by 'the bottom number'. They may even divide the amount by both numerator and denominator which leads to incorrect answers.
The common misconception when finding fractions of quantities is also that learners do not grasp the size of a fraction (sensible solution).

Example & Solution

2 Work out $\frac{1}{3}$ of 24

....

(Total for Question 2 is 1 mark)

(Edexcel Mathematics Foundation November 2020 Paper 3)

Paper: 1MA1/3F				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
2	8	B1	cao	

10. Read, write, order and compare decimals up to three decimal places

Application + Activities

Learners will need to apply place value in numbers with up to three decimal places as read, write and compare any group of decimals.
A good use of understanding place value is to use the monetary system which is familiar to all learners as they will all use it every day.
This could be introduced with different coins to get the learners to understand and grasp the various units.
Emphasise to learners how to use zero as a place holder and stress that they can only use the £ sign or the p sign as appropriate

As an active learning exercise, the cards need to be cut out, put into packs, and given out to learners to match them so they can understand which of the cards matches and why.
Get the learners to have a short discussion what they have understood from completing this activity and what the misconceptions there could be.

50p	£0.50	£0.50p	0.5
0.50	50	£0.5	0.5p
50.0p	£50.0	£05.0	£50

Tips & Misconceptions

Decimals are another way of representing numbers which are not whole numbers and another way of writing fractions. The decimal point separates the whole number from the numbers (parts) less than one. The role of the decimal point is to indicate the unit position (to its left).
The common error is that learners compare whole numbers in decimals and misunderstand the importance of place value. As a result, some of the learners believe that as there are more digits after the decimal point as bigger the number is and vice versa.
Some learners can be confused by an internal zero. Hence, they are not considering the zero as a place holder.
Reciprocal thinking can also be one of the most common misconceptions as learners incorrectly associate decimals with fractions, e.g., 0.3 as representing $\frac{1}{3}$ and 0.4 as representing $\frac{1}{4}$ therefore concluding that 0.3 is larger.

Example & Solution

1 Write the following numbers in order of size.
Start with the smallest number.

0.32 0.4 0.35 0.309

....

(Total for Question 1 is 1 mark)

(Edexcel Mathematics Foundation November 2020 Paper 1)

Paper: 1MA1/1F				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
1	0.309, 0.32, 0.35, 0.4	B1	for 0.309, 0.32, 0.35, 0.4	Accept written in reverse order: 0.4, 0.35, 0.32, 0.309

5 Write down the value of the 7 in the number 8765

....

(Total for Question 5 is 1 mark)

(Edexcel Mathematics Foundation November 2020 Paper 1)

Paper: 1MA1/1F				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
5	700	B1	for 700 Accept 7 hundreds	

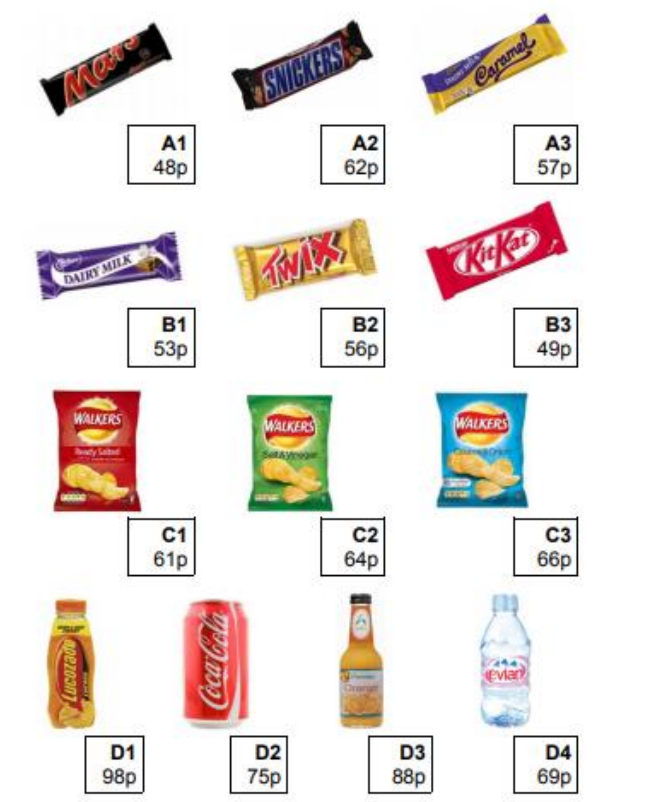
11. Add, subtract, multiply and divide decimals up to two decimal places

Application + Activities

Learners are expected to be able to add, subtract, multiply and divide decimals up to two decimal places. Give learners the opportunity to discuss how they could approach this task by introducing the rules of calculations with decimals.

Choose some questions to start with to allow learners to grasp the idea of operations with decimals. Encourage learners to create their own questions and ask to answer them in pairs. Find a learner who has used a different method to get the answer. Ask learners, as pairs, to discuss the methods they have used and decide which they each prefer.

Similar resources are available on: https://www.skillsworkshop.org/maths



You buy snacks from a vending machine.
The vending machine takes these coins.

1. Work out the total cost of one bottle of orange juice and one bar of Diary Milk.
2. You would like to buy a bag of Salt & Vinegar flavoured crisps, two Snickers bars and three bottles of water. You only have eight 50p coins. Do you have enough money to buy all the items?
3. You bought three items from the vending machine. The first item was 49p. The second item bought was £0.75. The total cost of all three items was £1.85. What was the cost of the third item you bought?
4. You buy a bottle of water every day in a week (7 days) from the vending machine. How much money would you spend?
5. There is one drink in the vending machine that is twice as much expensive as the other item. Identify these two items. Show you working.

Tips & Misconceptions

Ensure learners that there is no need to develop new rules for multiplication and division of decimals because the same digits will be in the answer regardless of the decimal point. The computation can be performed as with whole numbers and the decimal can be placed in the correct position after the procedure is completed.

Stress that for adding and subtracting decimals they need to line up the decimal point. Emphasise that to multiply a decimal by a whole number they first need to multiply without decimal points and then put the decimal point back into the answer. Ensure that learners count how many numbers are after the decimal point in the decimal number that they are multiplying. Their answer should have the same number of digits after the decimal point.
To multiply a decimal by another decimal, learners need to take out the decimal points so that they are whole numbers and apply any method to multiply them. Similarly, as multiplying by a whole number – they need to count the total number of decimal places in both numbers being multiplied and insert the decimal point counting the same number of decimal places, starting at the end of the

answer. Highlight that when dividing decimals by a whole number, learners divide as usual but keep the decimal points aligned. Note that the decimal points are aligned. To divide a decimal by decimal, change the number you are dividing by to a whole number. Do this by multiplying by 10, 100 or 1000. Do the same to the number you are dividing.

Example & Solution

1 Michael wants to buy a new car.

He needs to pay

- a cash deposit of £5875
- £229.20 each month for 24 months.

(a) Work out the total amount Michael will pay.
Show a check of your working. **(4)**

Use the box below to show clearly how you get your answer.

(Edexcel FS Mathematics Level 1 June 2018)

Section A: New car

Question	Skills Standard	Process	Mark	Mark Grid	Evidence
Q1(a)	R1	Begins process to find cost	1 or	A	229.2 × 24 (=5500.8)
	A4	Completes process to find total cost	2 or	AB	'5500.8' + 5875 (=11375.8)
	I6	Accurate figure in correct money notation	3	ABC	£11375.80 Correct money notation
	A5	Valid check	1	D	Valid check, e.g. reverse calculation or estimation

12. Approximate by rounding to a whole number or to one or two decimal places

Application + Activities

Learners are expected to approximate by rounding to the required accuracy. The idea is that learners can estimate calculations and use them in real life problems.
Advise learners to read the question carefully, to identify whether they need to round numbers to a whole number or to one or two decimals places and demonstrate how to work out which digit to consider when rounding up or down.

Activity examples

Arrange learners in teams and give shopping lists to each team. Ask them to round each price to the nearest £**1** or to ten pence and shout out the total, as quickly as they can. The first team with the correct answer could win a point each time.

Tips & Misconceptions

- The key digit is immediately to the right of the place value you are rounding to:
- Round down when the key digit is 1, 2, 3 or 4.
- Round up when the key digit is 5, 6, 7, 8 or 9.

The common misconception is that learners think they need to move the decimal point when rounding. Illustrate the use of a number line to help work out visually the number that is ‘nearest’.

Example & Solution

3 Write 4.666 correct to the nearest whole number.

....

(Total for Question 3 is 1 mark)

(Edexcel Mathematics Foundation November 2020 Paper 1)

Paper: 1MA1/1F				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
3	5	B1	cao	

4

(a) Round 11.348 correct to two decimal places.

(1)

(Edexcel FS Mathematics Level 1 - Sample Assessment – Section A – September 2019)

Process	Mark	Mark Ref	Evidence
Accurate figure	1	A	11.35

13. Read, write, order and compare percentages in whole numbers

Application + Activities

Learners are expected to be able to read, write and order percentages in whole numbers.
Give learners to opportunity to discuss that and explain that “per cent” means out of a hundred and emphasise that percentages are referring to a fraction that is out of one hundred. Instead of writing it as a fraction, we use the per cent symbol (%).

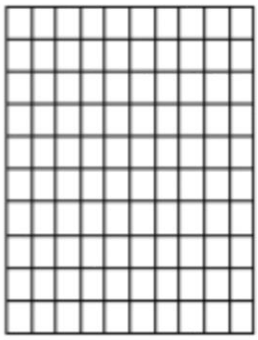
Here are some sample activities: https://www.marsmaths.com

Level 1: Read, write, order and compare percentages in whole numbers

1. Fill in the gaps:

In digits	In words
5%	
	Ten percent
100%	
	One hundred and fifteen percent

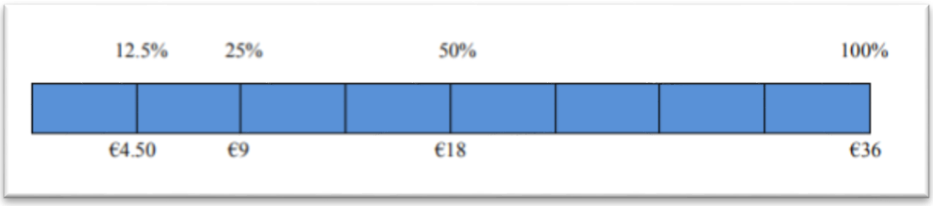
2. Colour in 17% of the grid below.



3. Represent 150% of any shape.

Tips & Misconceptions

A percentage bar can be used to visually represent 0% to 100% of a number; this will help learners’ understanding of the percentage scale in addition to providing learners with a reference point when calculating.



Learners do not usually understand that percent is a number out of one hundred. Some learners believe that percent cannot be greater than 100 and they do not realize that one whole equal 100%.

Example & Solution

4. Order these percentages from the smallest to the largest: **9%, 109%, 90%, 190%**

……………… ……………… ……………… ………………

5. Which is greater: **50% of £100** or **25% of £400**?

…………………………………………………………………………………………

4. 9%, 90%, 109%, 190%

5. 50% of £100 = £50

25% of £400 = £100

So, 25% of £400 is greater

https://www.marsmaths.com

14. Calculate percentages of quantities, including simple percentage increases and decreases by 5% and multiples thereof

Application + Activities

Learners are expected to be able to calculate percentages of given quantities as well as being able to increase and decrease an amount by 5% and multiples thereafter.
Stress that learners can apply the bubble method for 10% - they move from 10% to 1% and 20 % etc then to 15% and so on.
Embed the idea of finding 50% of a quantity by dividing by two and link that to relationship with fractions. Next develop and explore strategies of finding 25% and 75%. Experiment with other percentages and allow learners to discover the methods of calculating the value of percentage increases and decreases.

Arrange learners in teams. Ask them to work out the cost of each holiday and decide which is the best value. There are four possible destinations to choose from, but they need to find the cheapest deal. State that there are 2 adults and 2 children going away for two weeks.

Similar activities can be found on: https://www.tes.com

Thailand

Package Holiday
Adult Price: £500 per week
Child Price: 30% off adult price

Special Offer
2nd Week: 35% off the price of the first week

New York

Package Holiday
Adult Price: £600 per week
Child Price: 55% off adult price

Special Offer
2nd Week: 30% off the price of the first week

Hawaii

Package Holiday
Adult Price: £700 per week
Child Price: 15% off adult price.

Special Offer
2nd Week: Second week free

Australia

Package Holiday
Adult Price: £800 per week
Child Price: 80% off adult price.

Special Offer
2nd Week: 65% off the price of the first week

Tips & Misconceptions

Encourage learners to apply the multiplier method when they are using a calculator. Firstly, ask learners to consider what the overall percentage would be after the figure has had its percentage increase or decrease added or subtracted. Then ask them to convert this amount to a decimal, before finally multiplying by the number in question.

Calculating percentages of quantities, a learner may know they need to divide by 100 then multiply by the number before % sign but do not really understand why? Using everyday scenarios such as booking a holiday, buying furniture, VAT may address this weakness by making it relevant and link to the learners understanding of the concept. A key learning point is to understand how percentages can exceed 100%.

Learners sometimes confuse 70% with a scale of 70 rather than 0.7. It is important to help learners to appreciate that fractions, decimals and percentages are just equivalent ways of writing the same quantity.

Some learners believe that an increase of *n*% followed by a decrease of *n*% restores the amount to its original value.

Example & Solution

Michael wants to buy winter tyres for the car.

The normal price for the tyres is £400
There is a discount of 15% off the normal price.

Michael thinks 15% of £400 is £50

(c) Is 15% of £400 equal to £50?

(2)

(Edexcel FS Mathematics Level 1 June 2018)

Q1(c)	R3	Process to work with percentage	1 or	F	e.g. 15 ÷ 100 × 400 (=60) oe **OR** $\frac{50}{400} = \frac{12.5}{100}$ oe **OR** 50 ÷ 400 (=0.125) **and** 15 ÷ 100 (=0.15) oe
	I6	Correct decision from accurate figures	2	FG	e.g. No **AND** (£)60 **OR** No **AND** 12.5(%) oe **OR** No **AND** 0.125 **and** 0.15 oe

15. Estimate answers to calculations using fractions and decimals

Application + Activities

Learners are expected to estimate answers to their calculation using fractions and decimals. They need to understand that estimating means a rounded figure not the actual figure. Stress that estimation skills are valuable skills in real life.

Ask learners to work out a few examples involving fractions and decimals to compare their estimations with the actual values to grasp the idea and importance of estimations. (see link: https://www.marsmaths.com)

Example	Estimation	Actual value
$\frac{3}{16} \times \frac{7}{13}$		
$\frac{3}{16}$ of 20		
0.45×150		
0.45 of 70		
$\frac{4.34 \times 19.2}{11.2}$		

Tips & Misconceptions

Sensible approximation of an answer helps to resolve problems caused by misconceptions. Ensure learners to recognize the importance of estimating before calculating as it leads to a sensible answer. This way learners will know when they have made an error. Encourage learners to check if their answers are similar to their estimation.
The most common misconception is that learners do not read questions carefully and they calculate using the actual values instead of estimating. Another misconception is that learners struggle with rounding.

Example & Solution

14 A unit of gas costs 4.2 pence.

On average Ria uses 50.1 units of gas a week.
She pays for the gas she uses in 13 weeks.

(a) Work out an estimate for the amount Ria pays.

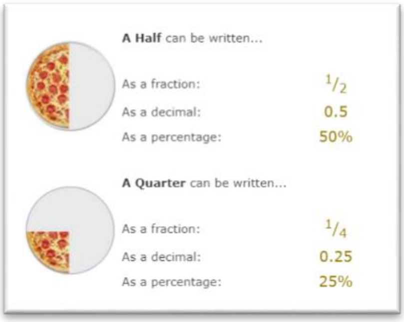
(Edexcel Mathematics Foundation Specimen Papers Set 1)

Paper 1MA1_1F

Question	Working	Answer	Notes	
14 (a)		2000p-2600p	P1	evidence of estimate eg. 4 or 50 or 10 used in calculation
			P1	complete process to solve problem
			A1	2000p-2600p or £20-£26

16. Recognise and calculate equivalences between common fractions, percentages, and decimals

Application + Activities

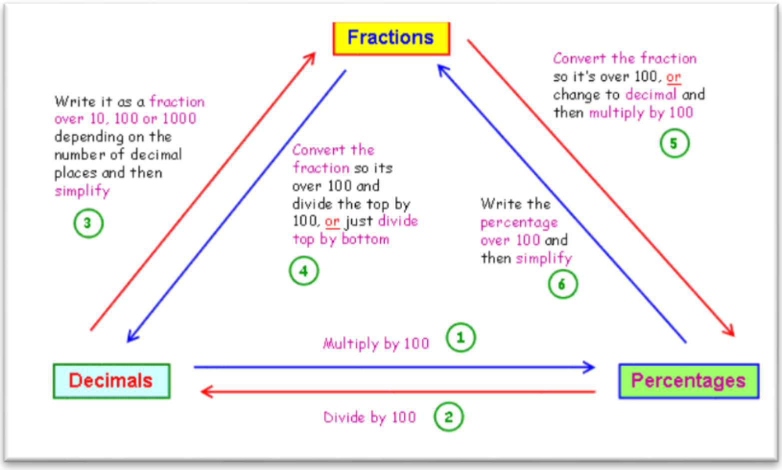


Learners need to be able to recognise and calculate equivalences between fractions, decimals, and percentages. Ensure learners that fractions, decimals, and percentages are just different ways of showing the same value and that the conceptual connections between them are very strong.
They can be written in different forms.
Allow learners to have a good grasp of calculating equivalences between fractions, decimals and percentages.
Here is an excellent interactive resource that helps learners to better understand those visual conversions.
https://www.mathsisfun.com/decimal-fraction-percentage.html

Fractions might be used when telling the time (e.g., $\frac{1}{4}$ past), in shop sale (e.g., $\frac{1}{3}$ off), in recipes (e.g., half a dozen).
Decimals might be used when working with money or to show probability.
Percentages might be used in sales, weather forecasts (to tell the chances of rain), to calculate VAT and income tax. Banks also use percentages for loans rates, mortgages and saving accounts.

Tips & Misconceptions

Stress learners that sometimes in business we may choose between fractions, decimals and percentages to make a sale item look more appealing to customers. For example, 20% off may sound more appealing than $\frac{1}{5}$ off a sale item, even though they are really the same amount.
This diagram might help learners to understand changing between each of them.



Learners use their knowledge of common equivalent fractions and decimals to find the equivalent percentage. A common misconception is that 0.1 is equivalent to 1%. Diagrams may be useful to support understanding the difference between tenths and hundredths and their equivalent percentages. Bar models and other visual representations may be also helpful in supporting their understanding.

Example & Solution

4 Write $\frac{3}{4}$ as a decimal.

....

(Total for Question 4 is 1 mark)

(Edexcel Mathematics Foundation November 2020 Paper 1)

Paper: 1MA1/1F				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
4	0.75	B1	cao	

3 Write 40% as a fraction.

....

(Total for Question 3 is 1 mark)

(Edexcel Mathematics Foundation November 2020 Paper 3)

Paper: 1MA1/3F				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
3	$\frac{40}{100}$	B1	for $\frac{40}{100}$ or any equivalent fraction	

17. Work with simple ratio and direct proportion

Application + Activities

Learners need to be able to use ratio notation, reduce a ratio to its simplest form and divide a quantity into two parts in a given ratio. They are also expected to be able to solve problems involving direct proportion.
Create a matching cards activity in which learners can interpret practical scenarios that implicate proportional relationships in terms of ratios and the total numbers of equal parts involved in them. Ask learners to work in pairs/small groups and discuss how to match ratios (white cards) with the statements about parts (blue cards) and the practical situations and actual amounts which correspond with them (yellow cards).
Some of the details in the scenarios could be adapted to suit their vocational course or learning context.

Here is an example from https://www.skillsworkshop.org

2:1	Altogether, there are three equal parts of the whole amount to think about.	4 out of a group of 6 people live in Tower Hamlets & 2 live in Waltham Forest.
1:3	Altogether, there are four equal parts of the whole to think about.	¼ of the paint mixture is red & ¾ of it is yellow.
7:3	Altogether, there are ten equal parts to think about.	In a factory, 210 of the lightbulbs they tested worked, but 90 didn't.
1:2:3	Altogether, there are six equal parts to think about.	In a recipe, water, sugar & flour are mixed together so that there is three times as much flour as there is water, and half as much water as there is sugar.

Tips & Misconceptions

The frequent error is that learners often write the numbers in a ratio in the wrong order. Some of the learners do not simplify ratios fully and the others try to simplify ratios without ensuring the units are consistent.

Example & Solution

1 Jo works in a cafe.

She sells cups of tea and cups of coffee in the ratio 1:3

On Monday Jo sold a total of 244 cups of tea and cups of coffee.

Jo thinks she must have sold more than 200 cups of coffee.

(a) Is Jo correct?
Show a check of your working. **(4)**

(Edexcel FS Mathematics Level 1 February 2018)

Section A: Cafe

Question	Skills Standard	Process	Mark	Mark Grid	Evidence
Q1(a)	R2	Starts to work with ratio	1 or	A	244 ÷ (3+1) (=61) **OR** 200 ÷ 3 (=66.66…) **OR** 3 ÷ (3+1) (= 0.75) **or** 200 ÷ 244 (=0.819…)
	A4	Full process to find figures to compare	2 or	AB	'61' × 3 (=183) **OR** 244 – '61' (=183) **OR** 244 ÷ (3+1) (=61) **and** 200 ÷ 3 (=66.66…) **OR** '66.66' × (3+1) (= 266.66..) **OR** 3 ÷ (3+1) (= 0.75) **and** 200 ÷ 244 (=0.819…) **OR** 200 + '61' (=261) **OR** (244 – 200) × 3 (=132) oe
	I6	Correct conclusion with accurate figures	3	ABC	No **AND** 183 (cups of coffee) **OR** No **AND** 61 **and** 66(.6..) **or** 67 (cups of tea) **OR** No **AND** 266 (.66…) (in total) **OR** No **AND** 0.8(19672) **and** 0.75 **OR** No **AND** 261(in total) **OR** No **AND** 132 (cups of coffee)
	A5	Valid check	1	D	Valid check e.g. alternative method or reverse calculation

SKILLS CHECKLIST

Use the below checklist to complete an initial diagnostic and to track progress throughout using a RAG system.

LEARNER NAME: ....

Level 1 – using numbers and the number system – *whole numbers, fractions, decimals and percentages*	Initial Diagnostic	Review 1	Review 2	Review 3
1. Read, write, order and compare large numbers (up to one million)				
2. Recognise and use positive and negative numbers				
3. Multiply and divide whole numbers and decimals by 10, 100, 1000				
4. Use multiplication facts and make connections with division facts				
5. Use simple formulae expressed in words for one or two-step operations				
6. Calculate the squares of one-digit and two-digit numbers				
7. Follow the order of precedence of operators				
8. Read, write, order and compare common fractions and mixed numbers				
9. Find fractions of whole number quantities or measurements				
10. Read, write, order and compare decimals up to three decimal places				
11. Add, subtract, multiply and divide decimals up to two decimal places				
12. Approximate by rounding to a whole number or to one or two decimal places				
13. Read, write, order and compare percentages in whole numbers				
14. Calculate percentages of quantities, including simple percentage increases and decreases by 5% and multiples thereof				
15. Estimate answers to calculations using fractions and decimals				
16. Recognise and calculate equivalences between common fractions, percentages and decimals				
17. Work with simple ratio and direct proportions				

USE OF COMMON MEASURES, SHAPE AND SPACE

Pg	Topic covered
44	Calculate simple interest in multiples of 5% on amounts of money
46	Calculate discounts in multiples of 5% on amounts of money
48	Convert between units of length, weight, capacity, money time
58	Recognise and make use of simple scales on maps and drawings
60	Calculate the area and perimeter of simple shapes including those that are made up of a combination of rectangles
64	Calculate the volumes of cubes and cuboids
66	Draw 2-D shapes and demonstrate an understanding of line symmetry and knowledge of the relative size of angles
70	Interpret plans, elevations, and nets of simple 3-D shapes
72	Use angles when describing position and direction, and measure angles in degrees + Bearings

DFE Guidance for Measure, Shape and space .

Use of common measures, shape and space: learners at Level 1 are expected to be able to work out simple relationships between common units of measurement to define quantities, also involving mathematical terms for position and direction. They can apply and use calculations with common measures including money, time, length, weight and capacity. They can visualise, draw and describe 2-D and 3-D shapes and use properties of 2-D shapes in calculations.

Content	
18	Calculate simple interest in multiples of 5% on amounts of money
19	Calculate discounts in multiples of 5% on amounts of money
20	Convert between units of length, weight, capacity, money time
21	Recognise and make use of simple scales on maps and drawings
22	Calculate the area and perimeter of simple shapes including those that are made up of a combination of rectangles
23	Calculate the volumes of cubes and cuboids
24	Draw 2-D shapes and demonstrate an understanding of line symmetry and knowledge of the relative size of angles
25	Interpret plans, elevations, and nets of simple 3-D shapes
26	Use angles when describing position and direction, and measure angles in degrees

18.Calculate simple interest in multiples of 5% on amounts of money

Application + Activities

Learners will need to be able to calculate percentages [see ***using numbers and the number system – 14: Calculate percentage of quantities*** document for support]. Simple interest in multiples of 5% relates to calculating 5%, 10% etc.

Learners must first find out the percentage of the amount and then simply **add it on** to the original amount. Level 1 learners do not need to understand compound interest.
The term “Interest” is new to 2019 specification.

Activity examples

Review percentages using a simple percentage table [fig 1] as this will help them to clearly understand the percentage change.

A simple activity to explain this could involve bank accounts and interest rates or interest rates on loans. This activity [fig 2] is a simple question building up in skill from finding out for one year, then increasing for the 4.

Examples:

Copy and complete the table. There are a few answers already done for you:

	10%	20%	50%	5%	45%	95%
£240	*£24*					
£60				*£3*		
£22	*£2.20*					

Fig 1

A) James wants to buy a hat. It costs £12 but has 25% off. How much will James have to pay for the hat?

B) Ahmed puts £120 into a simple interest account the bank. He earns 5% of £120 each year. He takes all the money out after 4 years.
   I. How much interest did he earn in 1 year?

   II. How much money did he withdraw, in total, after the 4 years?

Fig 2 [HCUC L1 revision]

Tips & Misconceptions

Learners will need an underpinning knowledge of percentages to grasp this concept. This topic could be taught in line with ***using numbers and the number system – 14 : Calculate percentage of quantities*** *[found in using numbers and the number system document].*

A common misconception with percentages is Dividing by 10 makes 10%, so dividing by 5 makes 5% or dividing by 20 makes 20% etc.

Example & Solution

Fiona gets a loan for £1700 for 3 years at 5% per year **simple** interest.

Work out the total interest Fiona must pay.

____

____

____

____

Answer £ ____

(Total 3 marks)

Exam paper example adapted from Pearsons, Edexcel functional skills exam paper

Question	Process	Mark	Evidence
	Work out percentage by multiplying or diving methods	M1	1700 × 0.05 or 85 or 1700 × 1.05 or 1785 or 5(%) × 3 or 15(%) or 1700 ÷ 100 x 5 Or 1700 ÷ 10 ÷ 2
	Multiply method by 3	M1 dep	1700 × 0.05 × 3 or their 85 × 3 or (their 1785 – 1700) × 3 or 1700 × (their 15 ÷ 100)
		A1	255
	Additional guidance	M1 M1 A0 M1 M1	Answer of 1955 with or without 255 seen in working 1700 × 3 = 5100 and their 5100 × 0.05

Example solution for the question above adapted from Pearsons, Edexcel functional skills exam paper.

19. Calculate discounts in multiples of 5% on amounts of money

Application + Activities

Like section 19, Learners will need to understand percentages to understand discount [see ***using numbers and the number system – 14: Calculate percentage of quantities*** document for support]. Like simple interest, discount will need to be calculated in multiples of 5% relates to calculating 5%, 10% etc.

Learners must first find out the percentage of the amount and then simply **take it away** from the original amount.

Activity examples

Fig 3. Looks at a common question that is easily adapted to vocational. Pictures of "shopping" are used, with price and discount to be applied. This allows the teacher to design a simple sheet looking at products the learner may see in vocational (i.e.,. bricks, pipes, hair dye, paint etc) and common prices.
Fig 4 compares the same product with different prices and discounts applied. Again, you could adapt this for vocation with similar products from different shops.

Examples:

Fig 3. Brick shopping example

Fig 4 Open university: comparing percentage discounts]]

Tips & Misconceptions

Common misconception is that learners confuse Discount and interest. A glossary of terms will help to clear this up.

Could be taught with -**18. Calculate simple interest in multiples of 5% and u*sing numbers and the number system – 14 : Calculate percentage of quantities.***

Example & Solution

Nicola wants to buy 30 litres of white paint.

She sees this special offer.

White paint

10 litre tin

usual price £38

15% discount

Nicola uses this special offer.

She has a budget of £100 for the paint.

Does Nicola have enough money to buy 30 litres of white paint?

Exam question from Pearsons, Edexcel functional skills maths

Question	Process	Mark	Mark Grid	Evidence
	Begins to work with percentage discount	1 or	A	38×0.15 (= 5.7) **OR** $1 - 0.15$ (= 0.85) **OR** '114' $\times$ 0.15 (= 17.1)
	Full process to work with percentage discount	2	AB	38×0.85 (= 32.3) oe **OR** '114' $\times$ 0.85 (= 96.9) oe
	Process to find total cost with or without discount or find the amount of budget left	1	C	$38 \times 30 \div 10$ (= 114) **OR** '32.3' $\times$ 30 $\div$ 10 (= 96.9) **OR** 100 – '32.3' – '32.3' – '32.3' (= 3.1)
	Valid decision with accurate figure	1	D	Yes **AND** (£)96.9(0) **OR** Yes **AND** (£)3.1(0) (spare)
	Total marks for question	**4**		

Solution for question above taken from Pearsons, Edexcel functional skills maths

20.1 Convert between units of length, weight, capacity, money and time, in the same system: UNITS OF LENGTH

Application + Activities

Level 1 focuses on units of length in the metric system. Learners will need to develop an understanding of metric units and use the correct and most sensible units. i.e., a table could be measured in M or cm but not KM).
Learners should have access to rulers and measuring equipment. Learners should also be taught the words and units to match – CM = centimeter.

Activity examples

Fig 5. Completing a table to show the differences is a good place to start. Learners can fill in the blanks following conversion.
Fig 6. Follow me cards: Each card will have a measure in one unit and the learner must find the measure in a different unit. This allows for collaboration but can be done alone. Cards found here : https://www.skillsworkshop.org/resources/follow_me_cards_measuring

Examples:

Millimetres (mm)	Centimetres (cm)	Metres (m)	Kilometres (km)
		0.04	
600			
	340		
			0.23

Fig 5 [example taken from Twinkle resource]

Fig 6 [Skills workshop follow me cards]

Tips & Misconceptions

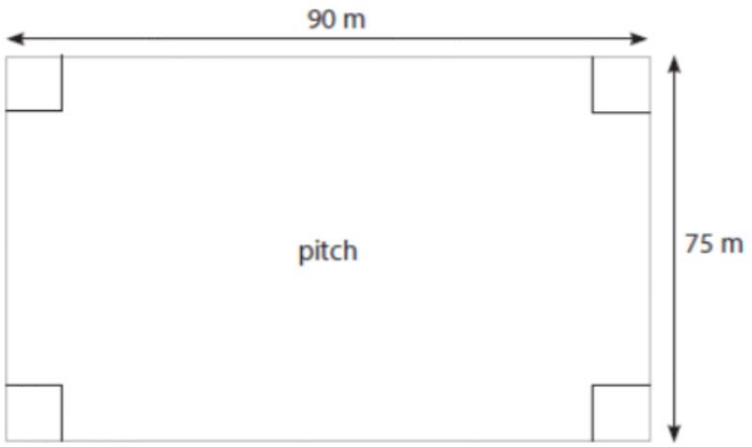
Briefly introduce learners to Imperial units of measures and compare it with metric as learners may not understand measures differ. Compare CM /M to Inches and feet and why we use both. Due to their similarities, it is good to teach weight, capacity, and length around the same time.

Identify the root words to help learners remember. For example, CENT = 100, link it to percentages or years in a century. A common mistake is miscalculation of decimals. For example, 1.2m is commonly represented as 102 cm.

Example & Solution

ıli is preparing for a race.
ıe runs laps around a football pitch to prepare for the race.

'he length of each lap is the total distance along the four edges of the pitch.



ıli needs to run at least 10 km.

a) What is the minimum number of complete laps Ali should run?

Exam question from Pearsons, Edexcel functional skills maths

Question	Process	Mark	Mark Grid	Evidence
(a)	Works with consistent units	1	A	e.g. 10 000 (m) or 0.09 (km) or 0.075 (km) May be seen in subsequent working
	Works with perimeter	1 or	B	75 + 90 + 75 + 90 (=330) oe
	Full process to find the minimum number of laps	2 or	BC	'10 000' ÷ 330 (=30.3) oe
	Accurate figure	3	BCD	31 (laps)
(b)	Valid check	1	E	e.g. 31 × 330 (=10230) or 30 × 330 (=9900)
	Total marks for question	5		

Solution for question above taken from Pearsons, Edexcel functional skills maths

20.2 Convert between units of length, weight, capacity, money, and time, in the same system: UNITS OF WEIGHT

Application + Activities

Level 1 focuses on units of weight in the metric system. Learners will need to develop an understanding of metric units and use the correct and most sensible units. i.e., ingredients for one cake could be measured in g not KG).
Learners could have access to scales or weights to help them. Learners should also be taught the words and units to match – KG =Kilograms.

Activity examples

Fig 7. An effective starting activity to put into KG and G. An extension on this table could be to add mg.
Fig 8. This activity requires learners to do a bit of research, looking at world records. Asking them about the weight of certain world record attempts, they can google the weight and convert between units.

Examples:

kilograms (kg)	grams (g)
	30
4	
0.6	
	3700

Fig 7 [[example taken from Twinkle resource]

Heaviest Bench Press weight = ________________g = _____________kg

Heaviest Carrot = _______________mg = ___________________kg

Lightest Baby = __________________g = ____________________kg

Heaviest Blue Whale = ____________________g = ____________________kg

Heaviest Pumpkin = = ____________________g = ____________________kg

Fig 8 [world record activity]

Tips & Misconceptions

Briefly introduce learners to Imperial units of measures and compare it with metric as learners may not understand measures differ. Compare Stone and pounds to grams and how we use them both. Due to their similarities, it is good to teach weight, capacity, and length around the same time.

Identify the root words to help learners remember. For example, CENT = 100, link it to percentages or years in a century. A common mistake is miscalculation of decimals. For example, 1.2KG is commonly represented as 1002 g.

Example & Solution

Alia wants to send a parcel to her friend.
The parcel is 2 jars of honey in a box.

Each jar of honey weighs 625 grams.
The empty box weighs 70 grams.

Alia finds the following prices for sending parcels.

	weight of parcel	
type of postage	**less than 1000 g**	**1000 g to 2000 g**
first class standard	£3.40	£5.50
second class standard	£2.82	£3.82
first class signed for	£4.40	£6.50
second class signed for	£2.90	£3.90

Alia wants to send the parcel first class standard.

How much will it cost to send this parcel using first class standard?

(2)

Exam question from Pearsons, Edexcel pre 2019 functional skills maths

R1	Process to begin to work with weight	1 or	L	2 × 625 + 70 (= 1320) oe **OR** 2 × 625 (= 1250) oe **OR** 1000 – 625 (=375) oe **OR** 1000 – (625 + 70)(=305) **OR** 2000 – (2 × 625 + 70) (= 680) Allow 625 + 70 (=695) **OR** 2 × (625 + 70) (=1390)
I6	Indicates correct postage cost	2	LM	(£) 5.5(0) **AND** 1320 **OR** (£) 5.5(0) **AND** 1250 **OR** (£) 5.5(0) **AND** 375 **OR** (£) 5.5(0) **AND** 305 **OR** (£) 5.5(0) **AND** 680

Solution for question above question from Pearsons, Edexcel pre 2019 l functional skills maths

20.3 Convert between units of length, weight, capacity, money and time, in the same system: UNITS OF CAPCITY

Application + Activities

Level 1 focuses on units of capacity in the metric system. Learners will need to develop an understanding of metric units and use the correct and most sensible units for the capacity. Learners could have access to jugs or bottles to demonstrate differences in capacity. Learners should also be taught the words and units to match – L =Litres.

Activity examples

Fig 9 : Activity is a simple table. It will allow learners to compare metric units of capacity and fill in the missing gaps.
Fig 10: A puzzle solving activity involving converting units of capacity. Each “drink” is given a unit as cl, ml or L. Learners must convert to answer questions. Extensions could add extra liquids or ask for answers in specific units (i.e., Litres). Real life drinks/bottles could be used instead of pictures to add to interactivity

Examples:

Complete this table.

Millilitres (ml)	Centilitres (cl)	Litres (l)
50		
		1.5
	300	
	84	
1000		
		0.25

Fig 8[example taken from Twinkle resource]

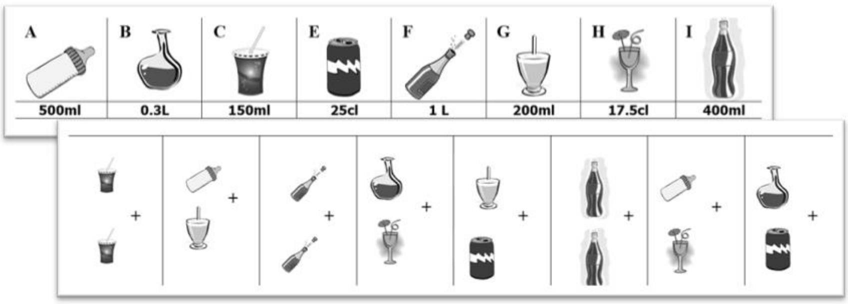


Fig 9 [HCUC L1 revision]

Tips & Misconceptions

Briefly introduce learners to Imperial units of measures and compare it with metric as learners may not understand measures differ. Compare Pints to Liters and how we use them both. Due to their similarities, it is good to teach weight, capacity, and length around the same time.

Identify the root words to help learners remember. For example, CENT = 100, link it to percentages or years in a century. A common mistake is miscalculation of decimals. For example, 1.2L is commonly represented as 1020 ml.

Example & Solution

Clive plans to walk with a friend along the Cliffs of Moher.

Clive wants to carry a total of at least 3 litres of liquid to drink on the walk.

He has

2 large bottles of water (750 ml each)
2 small bottles of water (500 ml each)
2 cans of soft drink (330 ml each).

(a) Does Clive have a total of at least 3 litres of liquid? **(4)**

Exam question from Pearsons, Edexcel pre 2019 functional skills maths

Skills Standard	Process	Mark	Mark Grid	Evidence
R3	Uses consistent units	1	J	e.g. 3000(ml) **OR** 0.75(l) **OR** 0.5(l) **OR** 1(l) **OR** 1.5(l) **OR** 0.33(l) **OR** 0.66(l) May be seen in subsequent working
R2	Starts process to add capacities or to subtract capacities from total	1 or	K	e.g. 750 × 2 (=1500) oe **OR** 500 × 2 (=1000) oe **OR** 330 × 2 (=660) oe **OR** '3000' – 750 – 750 (=1500) oe **OR** 750 + 500 (=1250) **OR** 750 + 500 + 330(=1580)
A4	Complete process to find figures to compare	2 or	KL	e.g. '1500' + '1000' + '660'(=3160 ml) oe **OR** '3000' – '1500' – '1000' – '660'(=–160 ml) oe **OR** '(750 + 500 + 330)' × 2(=3160)
I6	Correct conclusion with accurate figures	3	KLM	Yes **and** 3160 (ml) **and** 3000 (ml) **OR** Yes **and** 3.16 (l) **OR** Yes **and** 160 (ml) (over) oe **OR** Yes and 3(l) 160 (ml)

Solution for question above question from Pearsons, Edexcel pre 2019 l functional skills maths

20.4 Convert between units of length, weight, capacity, money and time, in the same system: UNITS OF MONEY

Application + Activities

Level 1 can focus on conversion of money from pound to pence using decimals. Questions may focus on comparing one product in pence to another in pounds to see what the better value is. This introduces simple currency conversions with given rates.

Activity examples

Fig 10: A simple matching card activity. Learners must match the words with the pence values and the pounds and pence. This can be made more difficult by having calculations on, such as “£3.50 + 390p =” and then matching with the answer.
Fig 11: Simple conversion to other currency. This activity requires learners to look up current conversion rates with questions. The questions can be edited to be vocationally relevant, such as ordering bricks from Canada, or beauty supplies from United States.

Examples:

Five pounds and ninety-five pence	£5.95	595p
Seven pounds and twenty-six pence	£7.26	£3.50 + 376p
Five pounds	£5.00	£0.50 + 450p
One pound and ninety-nine pence	£1.99	199p
Nine pounds and ninety nine pence	£9.99	999p

Fig 10

Research todays current conversion for the below currencies

Currency	Code	1GBP
Australian Dollar	AUD	
Canadian Dollar	CAD	
Euro	EUR	
United States Dollar	USD	
Indian Rupee	INR	

Miquel is setting off from London for a business trip to France. He converts £100 to euros. How many euros will he receive?
You are going to India on a business trip next week. You have £400 to take. How many Rupees would you have?
Colin is going on holiday to Florida. He converts £570 to US dollars. How many dollars will he receive?
You are buying an electric saw from America. It costs $450. How any GBP is this?
You are ordering two new beauty lamps from Europe. They cost €50 each. What is the total cost in GBP?

Fig 11

Tips & Misconceptions

Calculating with decimals is the most common misconception. Learners will calculate 1.2 , which should be £1.20, however may put £1.02. With this learners will need to look at place value, especially when it comes to money, Learners struggle with using the correct unit of currency and may answer “£1.20p” so need to be taught the extra p is not needed when using currency units.

Example & Solution

Sally has solar panels on her roof.

She is paid 18 pence for every unit of electricity made by her solar panels.

The number of units of electricity made by the solar panels is shown on a meter.

Here is her meter at the end of 2014

3463

Here is her meter at the end of 2015

6502

How much should Sally be paid, in total, for the electricity made in 2015?
Give your answer to the nearest £10

[3 marks]

Exam question adapted from AQA functional pre 2019 series skills maths

4(d)	**Alternative Method 1**		
	6502 – 3463 or 3039	M1 *Ra*	
	(P =) 18 × their 3039 (÷ 100) or 0.18 × their 3039 or 54 702 or 547.02	M1 *Aa*	their 3039 can be 9965
	(£)550 or 55000p	A1 *I*	

4(d)	**Alternative Method 2**		
	18 × 3463 or 62 334 or 0.18 × 3463 or 623.34 or 18 × 6502 or 117 036 or 0.18 × 6502 or 1170.36	M1 *Ra*	
	their 117 036 – their 62 334 or 54 702 or their 1170.36 – their 623.34 or 547.02	M1 *Aa*	
	(£)550 or 55000p	A1 *I*	

20.5 Convert between units of length, weight, capacity, money and time, in the same system: UNITS OF TIME

Application + Activities

Within level 1, learners will look at common **times** in units of 5's or 10's. Learners will be expected to calculate fractions and decimals of time using common and simple fractions i.e., ½ an hour, ¼ past the hour or 1 ½ hours. Learners should be able to convert between analogue and digital clocks

Activity examples

Fig 12: A matching activity linking the analogue to digital clock. Could be done in pairs or individually. Resource from TES : https://www.tes.com/teaching-resource/matching-activity-analogue-to-digital-time-6423168
Fig 13: An adaption of the simple table completing activity. This one requires pairs to work together

Fig 12

Time	Fraction of the Hour	Calculation	Decimal Time (to 2sf)
30 minutes			
	15/60		
			3.5 hours
4 hours 20 mins			
		4 + (5 ÷ 60)	

Fig 13 [HCUC L1 revision]

Tips & Misconceptions

Learners should be introduced through time and fractions using a clock face. This will allow them to see the concept of ½ an hour, ¼ of an hour etc, as you can physically cut the clock face in half/ shade the clock face.
A common misconception with time is decimals. For example, learners may complete a calculation with the answer of 1.5 hours, they will answer this as 1 hour, 50 minutes. Teaching learners to convert by multiplying the 0.5 by 60 to give them their answer will help with calculator questions.

Example & Solution

The friends play 4 games of snooker in $2\frac{1}{2}$ hours.

The first game lasts for 45 minutes.

Talvin says

"Each of these games lasted a mean time of 45 minutes."

(c) Is Talvin correct?
Show why you think this. **(3)**

Use the box below to show clearly how you get your answer.

Exam question from Pearsons, Edexcel pre 2019 functional skills maths

R2	Works with consistent units	1	P	e.g. 150 (mins) **or** 3 (hr) **or** 0.75 (hr) **or** $\frac{3}{4}$ (hr) **or** 30 (mins)
A4	Process to work with mean or mean time	1 or	Q	e.g.'150' ÷ 4 (=37.5) **OR** 150 ÷ 45 (=3.3..) **OR** 45 × 4 (=180) **OR** ('150' – 45) ÷ 3 (=35)
I6	Valid decision with accurate figures	2	QR	e.g. No **AND** 37.5 (min) **OR** No **AND** 3(.3.. games) **OR** No **AND** 180 (min) **and** 150 (min) oe **OR** No **AND** 3 (hr) **OR** No **AND** 35 (min average for other 3 games)

Solution for question above question from Pearsons, Edexcel pre 2019 l functional skills maths

21. Recognise and make use of simple scales on maps and drawings

Application + Activities

Level 1 will look at very simple scale on a map for example, 1:50. Units used are metric and **will not** look at imperial on L1. Learners need to understand measures on the paper represent a unit of measures in a real-life scenario. Scales are shown as ratio so a brief recap on ratio and proportion will be beneficial [**see u*sing numbers and the number system* :17. Work with simple ratio and direct proportions].**

Learners could be introduced to scale using real life scenarios, such as designing a salon or rearranging a workspace.

Activity examples

Fig 14: Maps. You can find maps using Google maps and add the scale yourself. You can then set a series of questions based around the maps, such as measuring to scale the distance from A to B. This is an easy activity to make relevant to learners as maps can be of their hometown.

Fig 15. Scale drawing of the classroom environment. Ask learners to measure the perimeter of the room and decide on a scale, they will then sketch the drawing to scale. This works well if it is vocationally based, i.e.,. a workshop or salon.

Fig 14

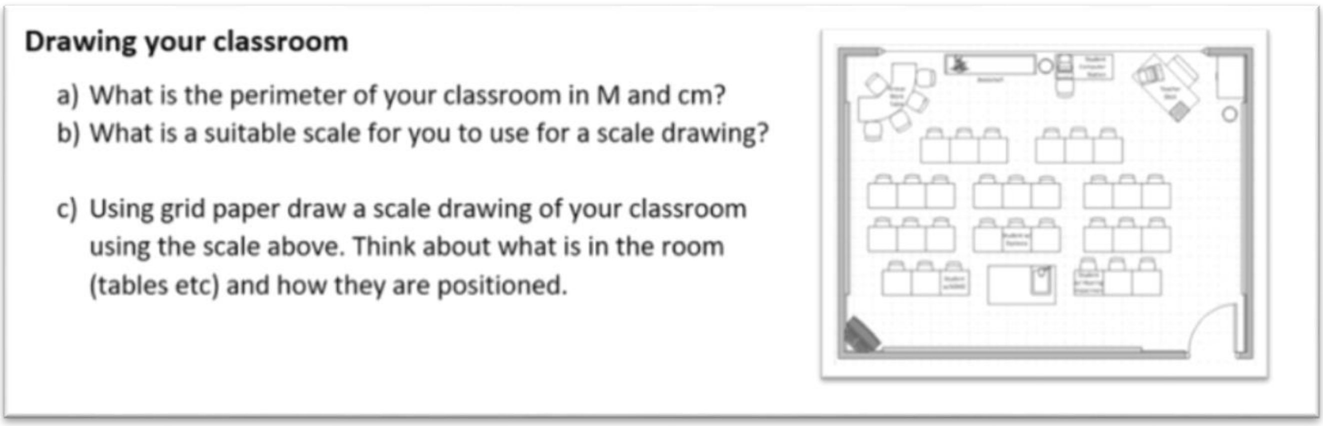


Fig 15

Tips & Misconceptions

A common misconception is the conversion of units, learners often struggle to understand that 1:50 means 1 unit on paper is the same as 50 units real life/on the ground.
Learners can struggle with the idea of dividing or multiplying when converting units, such as KM to cm or mm to M. An underpinning knowledge of unit conversion and understanding that more mm in 1 cm

will help learners when it comes to this skill.

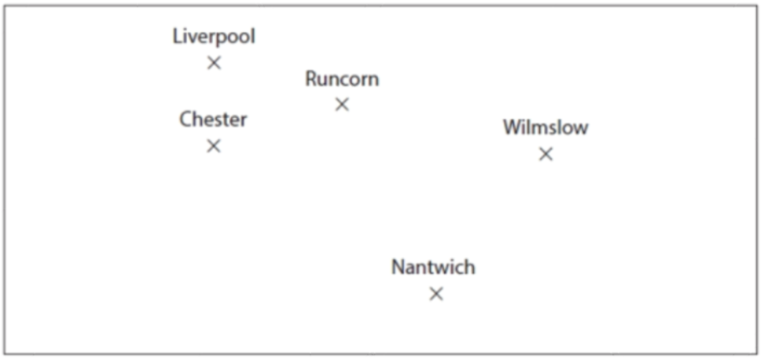
Example & Solution

Alan works at a warehouse in Runcorn.

A furniture company needs deliveries from

- Runcorn to Liverpool
- Runcorn to Nantwich.

Alan needs to work out the total delivery charge for these deliveries.
He uses this map.



Scale 1 cm on the map is 10 km on the ground

Alan uses these delivery charges.

distance from Runcorn	**charge (£)**
less than 20 km	9.99
20 km – 35 km	14.99
over 35 km	24.49

Work out the total delivery charge.
Show how you get your answer.

(4)

Exam question from Pearsons, Edexcel functional skills maths

Question	Process	Mark	Mark Grid	Evidence
	Accurate measurements	1 or	A	2.7 ± 0.2 (cm) **and** 4.2 ± 0.2 (cm)
	Begins to work with scale	2	AB	'2.7' × 10 (=27) or '4.2' × 10 (=42)
	Process to find total cost	1 or	C	'14.99' + '24.49' (= 39.48) ft their distances
	Accurate figure from their measurement	2	CD	39.48
	Total marks for question	**4**		

22.1 Calculate the area and perimeter of simple shapes including those that are made up of a combination of rectangles: AREA

Application + Activities

Level 1 will look at area of simple shapes and composite shapes. These include squares, rectangles, parallelograms, and triangles. Level 1 learners do not need to calculate area of a circle.
Learners will need to understand the formulas of area for the shapes. BXH, or ½ BXH for triangles. With composite shapes, learners will need to understand the need to cut the shapes into separate rectangles in order to calculate area, then combine the answers back together.
It is also important for learners to understand the term “Squared”- cm^2, mm^2 or m^2.

Activity examples

Fig 16. Use squares. For this activity, introduce learners to area using squares. This allows learners to understand the concept of “squares”. Lego blocks work well to help tactile learners. Set them up in the same pattern and they can count the bumps.

Fig 17. Area with flag. This activity can be found on TES looking at area in an interesting way, on flags. Learners answer different questions about the area of each flag. See more here: https://www.tes.com/teaching-resource/areas-of-flags-6327719

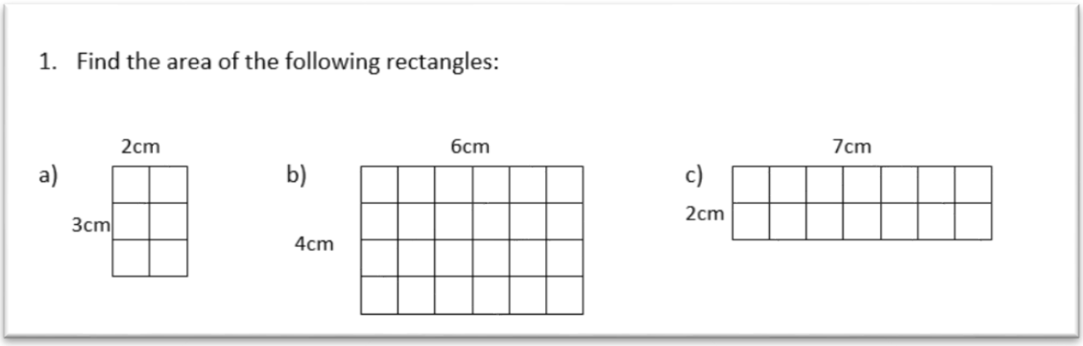


Fig 16

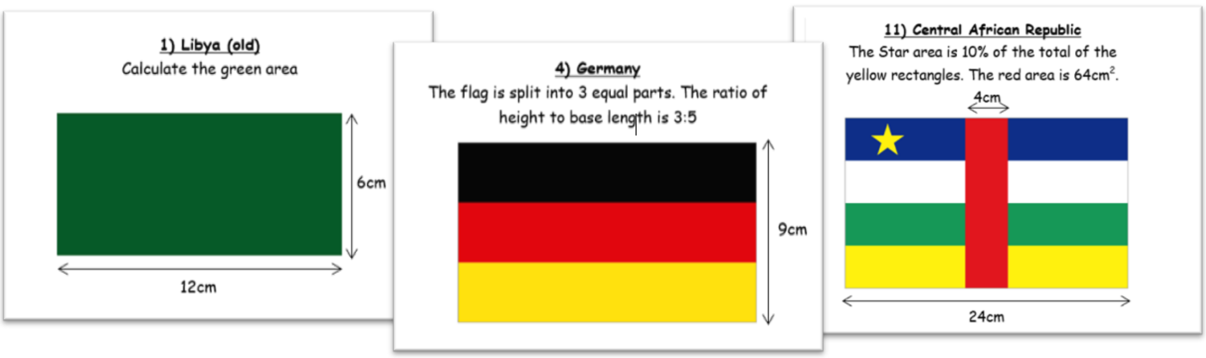


Fig 17

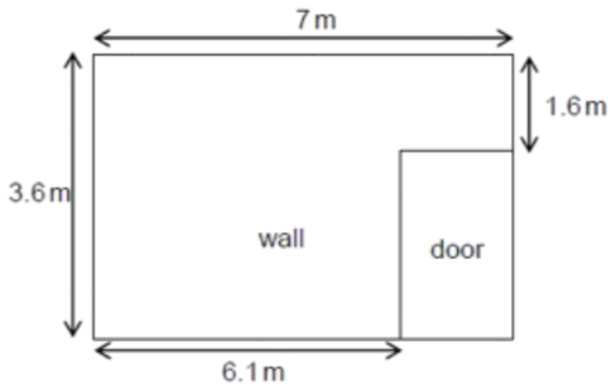
Tips & Misconceptions

Many will calculate perimeter when they need to calculate area. A distinction between the two is needed for learners to grasp this skill. Another misconception is that they must multiply all numbers that are on the shape rather than following BxH.
Remind learners that only 2 numbers need to be multiplied for area. A good way to show

this is to relate to the “Squared”, it is a 2 so only 2 numbers multiply together.

Example & Solution

Luke wants to cover this wall with blue paint.



He will buy blue paint in 2.5 litre tins.

Each 1 litre of blue paint will cover 8 m^2 of the wall.

How many tins of blue paint does Luke need to buy?

(5)

Exam question from Pearsons, Edexcel functional skills maths

Question	Process	Mark	Mark Grid	Evidence
	Process to find a missing length	1	A	7 – 6.1 (= 0.9) **OR** 3.6 – 1.6 (= 2)
	Process to find one relevant area	1 or	B	e.g. 3.6 × 6.1 (= 21.96) **or** 1.6 × 7 (= 11.2) **or** 1.6 × ‘0.9’ (= 1.44) **or** ‘2’ × 6.1 (= 12.2) **or** 7 × 3.6 (= 25.2) **or** ‘2’ × ‘0.9’ (= 1.8)
	Full process to find total area or total paint needed	2	BC	e.g. (3.6 × 6.1) + (1.6 × ‘0.9’) (= 23.4) **or** (1.6 × 7) + (‘2’ × 6.1) (= 23.4) **or** (7 × 3.6) – (‘2’ × ‘0.9’) (= 23.4) **OR** ‘1.4’+ ‘1.525’ (= 2.925)
	Process to work with proportion	1	D	e.g. {Area} ÷ 8 (= 2.925) **OR** {Area} ÷ 2.5 ÷ 8 (= 1.17) oe **OR** ‘11.2’ ÷ 8 (= 1.4) **or** ‘12.2’ ÷ 8 (= 1.525)
	Accurate figure	1	E	2
	Total marks for question	5		

Solution for question above question from Pearsons, Edexcel functional skills maths

22.2 Calculate the area and perimeter of simple shapes including those that are made up of a combination of rectangles: PERIMETER

Application + Activities

Learners will need to understand and recognise perimeter on squares, rectangles, triangles and composite shapes. Learners need to understand the need to simply walk around the edges of the shapes and add them up.
It will be beneficial to teach about parallel lines, and how one side of a rectangle = the same as the other side. This will help their understanding if only 2 sides are given. **Teach section 24. Draw 2-D shapes and demonstrate an understanding of line symmetry and knowledge of the relative size of angles. This will support with underpinning knowledge.**

Activity examples

Fig18 : Perimeter with real rooms . Give learners plan views of rooms and ask them to work out the perimeter of the room. This would work well if it was contextualised to suit their vocational course. https://www.tes.com/teaching-resource/3-differentiated-perimeter-worksheets-for-y4-d2-6037912
Fig 19: Perimeter exploration. Learners will look at objects around the room and work out the perimeter. Expand on this by using different units of measures and different objects from the learners vocation.

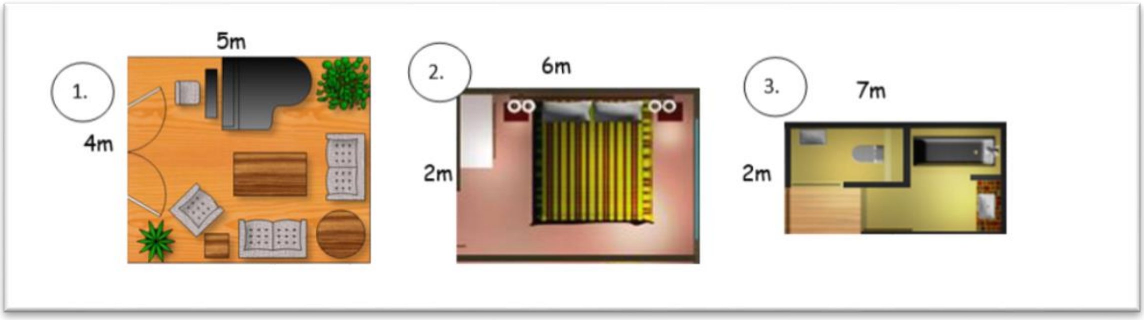


Fig 18

Perimeter Exploration

Object		**Object**	
Length		**Length**	
Width		**Width**	
Perimeter		**Perimeter**	
Object		**Object**	
Length		**Length**	
Width		**Width**	
Perimeter		**Perimeter**	

Fig 19

Tips & Misconceptions

A common misconception is the confusion between Area and Perimeter. Learners must be able to make a distinction between these two subjects to grasp perimeter questions.
On questions with rectangles showing only 2 sides, learners will often only add these 2

sides. Learners need to understand that these shapes are parallel, and sides will be the same, adding up all sides of the shapes.
.

Example & Solution

A farmer has a rectangular field.
The field is 300 m long and 200 m wide.

(a) Calculate the perimeter of the field.

(2)

.... m

The farmer is buying fence panels.
He needs a total length of 200 m of fence panels.

Each fence panel is 2.5 m in length.

(b) Work out how many fence panels the farmer will need to buy.

(2)

....

(Total for question = 4 marks)

Exam question from Pearsons, Edexcel functional skills maths

Question	Process	Mark	Mark Grid	Evidence
(a)	Process to find perimeter	1 or	A	$(200 \times 2) + (300 \times 2)$ (= 1000) oe
	Accurate figure	2	AB	1000
(b)	Process to find number of fence panels	1 or	C	$200 \div 2.5$ (= 80) oe **OR** uses a full build up method (allow 1 arithmetic error)
	Accurate figure	2	CD	80
	Total marks for question	**4**		

Solution for question above question from Pearsons, Edexcel functional skills maths

23.Calculate the volumes of cubes and cuboids

Application + Activities

Learners will need to understand the concept of 3D shapes and how this differs from 2D shapes. It is a good example to have physical representation in the form of a box or cube to show learners this concept quickly. Learners will need to understand volume and how to calculate with the correct formula – BXHXW.
It is best to start with area and show that volume is just one dimension, so it is just one extra measurement. Level 1 learners only need to understand cubes and cuboids, no other 3D shapes needed at this level.

Activity examples

Fig 20: Start learners of by using cubes to teach the idea of volume. Stick them together to count the cubes (similar to area but in a 3D space). Lego or blocks could be used for lower level learners.
Fig 21: Crossword. Learners will fill in a crossword with numbers calculated from the volume of a cuboid. It is a good activity to get learners thinking adding problem solving elements to it. Resource from TES https://www.tes.com/teaching-resource/ks3-volume-of-a-cuboid-lesson-6422467

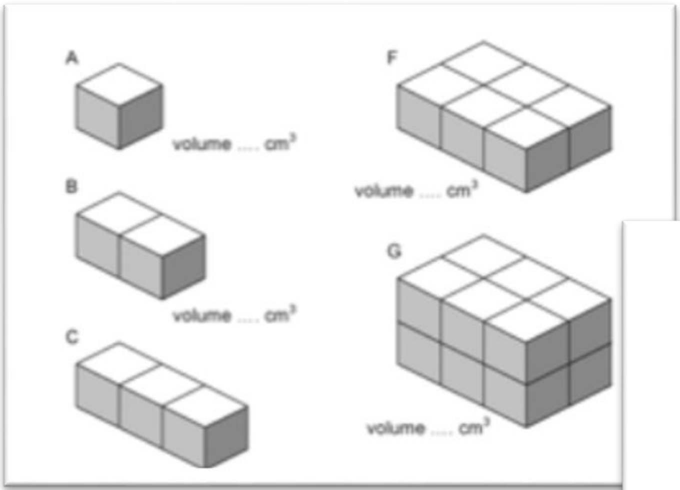


Fig 20

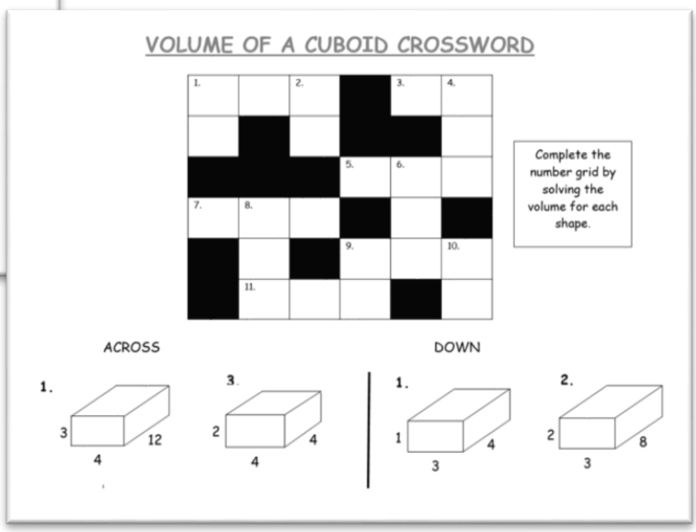


Fig 21

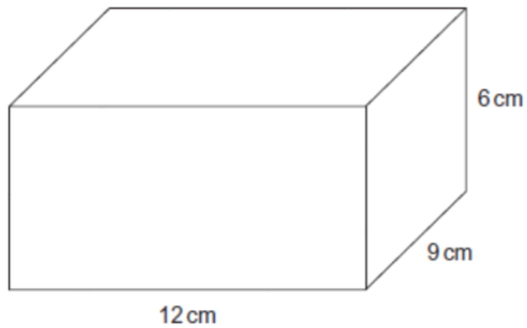
Tips & Misconceptions

If extra numbers are given, learners may get confused and multiply all numbers together. Learners may grasp if you refer to the “cubed” being a 3, means only times 3 numbers (Length, width and height).
If only one measurement is given on a cube, learners may get confused and be unable to

identify what the other sides may be. Identify to a learner that in this case, it is a cube, so all sides are the same.

Example & Solution

Here is a cuboid.



(a) Work out the volume of the cuboid.
State the units of your answer.

(3)

(b) The cuboid is completely filled with identical cubes.
The length of each cube is a whole number of centimetres **greater than** 1

How many cubes are used?

(3)

Exam question adapted from AQA GCSE foundation question

$6 \times 12 \times 9$

oe

M1

648

A1

cm^3

A1

Finds 3 as the HCF or 3×4, 3×3, 3×2

M1

$2 \times 4 \times 3$

Their $648 \div 3^3$ or their $648 \div 27$

M1

24

SC2 81 if $2 \times 2 \times 2$ cube used, could be implied by $648 \div 8$

A1

Solution for question above adapted from AQA GCSE foundation question

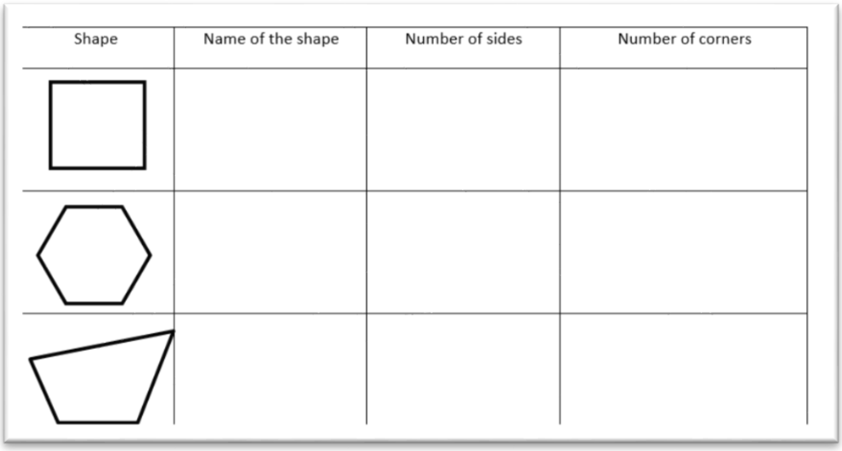
24.1 Draw 2-D shapes and demonstrate an understanding of line symmetry and knowledge of the relative size of angles: 2D SHAPES

Application + Activities

This section is best to be taught either at the start of geometry lessons or in conjunction with other sections. Learners will need to identify basic 2D shapes, including their names and differences.
Learners will be introduced to the idea of vertices and edges (and faces when discussing the 3D construct). Learners should be able to discuss the amount of points and sides a shape has and name mathematical shapes. These should involve squares, triangles, rectangles, circles, parallelograms, and other polygon shapes.

Activity examples

Fig 22: A simple activity showing names of shapes, number of sides and numbers of corners. Learners see the shape and fill in the properties. Replace "corners" with vertices for higher achieving learners.
Fig 23: Classifying triangles. This activity looks at dotted paper, drawing 12 different triangles and naming the different types. This could be expanded to different shapes, showing vertices and sides. [https://www.tes.com/teaching-resource/classifying-2d-shape-6356267]



Shape	Name of the shape	Number of sides	Number of corners

Fig 22

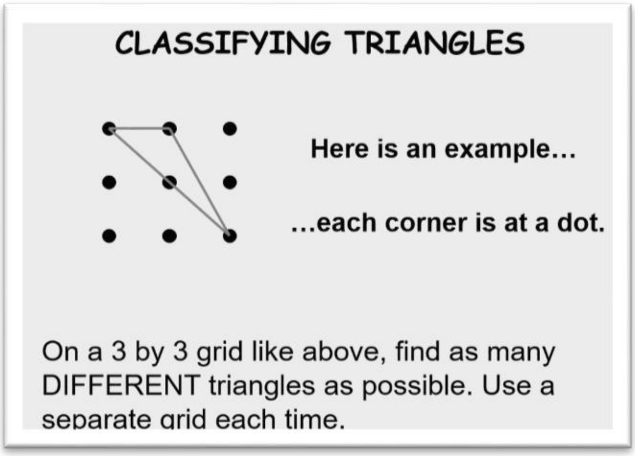


Fig 23 [activity from TES]

Tips & Misconceptions

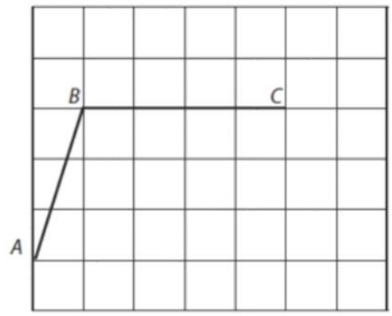
Learners will often confuse vertices with sides, it is important that learners can differentiate when describing shapes.

Learners may confuse pentagon and hexagon with each other. Teach about shapes before introducing learners to area, perimeter, and symmetry.

Example & Solution

Karen is a cake designer.
She is designing different shaped cakes.

AB and *BC* are two sides of a parallelogram.



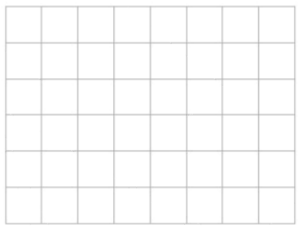
(a) On the grid, complete the parallelogram.

(1)

(a)	Correct solution	1	A	Select shape 1

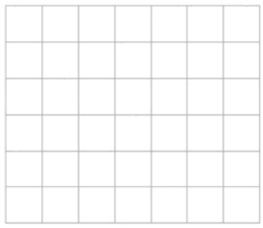
Exam question and solution from Pearsons, Edexcel functional skills maths

a) On the grid of centimetre squares, draw an isosceles triangle.



(1)

b) On the grid of centimetre squares, draw a rectangle with a perimeter of 10 cm.



(2)

(Total for Question is 3 marks)

		Working	Answer	Mark	Notes
	(a)		Isosceles triangle	1	B1 for isosceles triangle
	(b)		Rectangle with perimeter 10 cm	2	M1 for any rectangle or for a shape with perimeter 10 cm A1 cao

Exam question and solution from AQA GCSE foundation maths

24.2 Draw 2-D shapes and demonstrate an understanding of line symmetry and knowledge of the relative size of angles: SYMMETRY

Application + Activities

Symmetry within level 1 is related heavily with 2D shapes. Symmetry will only appear as lines of symmetry and is related to descriptions of shapes. It is key learners understand what symmetry is as this will help underpin knowledge of perimeter/area and volume.
Parallel lines can also be discussed here.

Activity examples

Fig 24 shows squares ask learners to draw the reflection. Use mirrors to start and then develop from there. T
here are many tasks you could do with symmetry. The first is to get mirrors/ use phones turned off as mirrors to show how symmetry works with a variety of everyday shapes / objects.
Activity: : Fold a piece of paper in half, get the learner to draw in wet paint on one side of the folder paper. Fold it over to reveal a pattern that has a line of symmetry down the middle. You can vary the difficulty of this by adding extra folds or using geometric shapes.

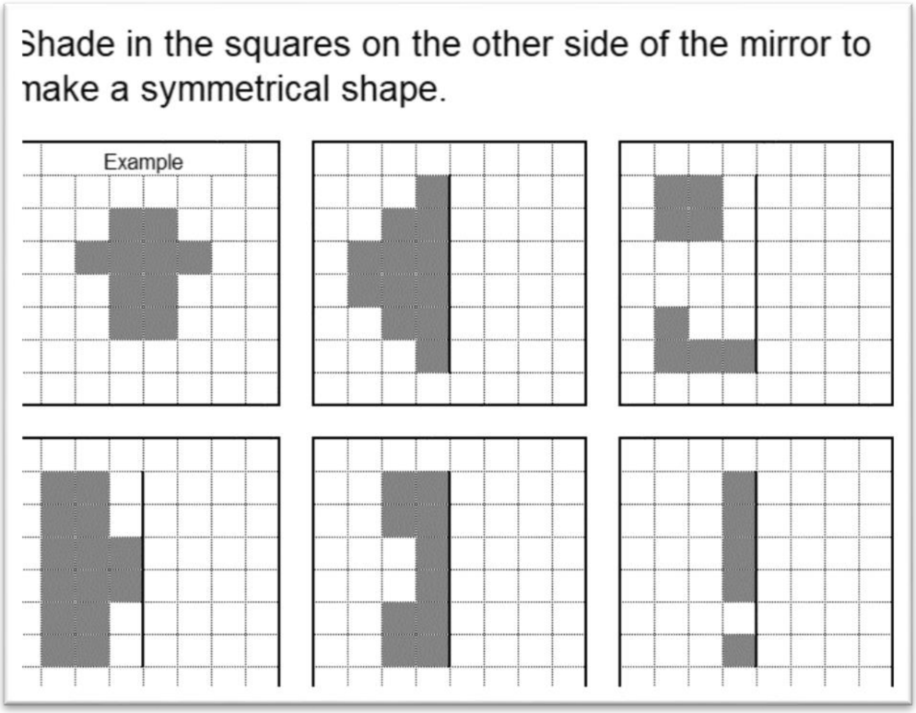


Fig 24

Tips & Misconceptions

Shapes with multiple lines of symmetry may be an issue and learners may only be able to identify one. They can easily spot vertical and horizontal lines, however they often miss diagonals.
Learners may insert lines of symmetry into shapes that do not exist, such as parallelograms.

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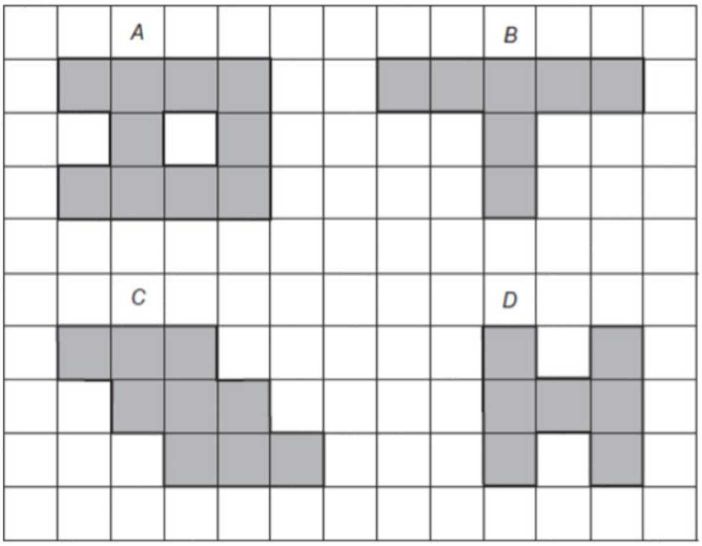
Example & Solution



Circle your answers for each part.

(a) Which of these shapes have line symmetry?

A B C D

(2)

Question adapted from AQA GCSE foundation question

Q2.

(a) A, B and D

B1 for 2 correct and no incorrect

B2

Solution for question above adapted from AQA GCSE foundation question

25.Interpret plans, elevations, and nets of simple 3-D shapes

Application + Activities

Level 1 learners will need to look at plans, elevations and nets of cubes and cuboids. Learners will need to understand what the plan is and what the elevations are. Using 3D objects, such as cubes will help with special awareness and help learners visualise all sides of the 3D shape. Learners will need to use abstract thinking and imagine pulling shapes apart , in the form of nets and then piece it back together. This skill is best taught after ***21. Recognise and make use of simple scales on maps and drawings.***

Activity examples

Fig 26 : Cubes. Similar to volume, use cubes with shapes that are different on the front, sides and top. Allow learners to draw these using square paper. Extension on this could be to use real life objects so they can visualise.
Fig 27 : Exploration. Ask learners to draw how they think the net will look on squared paper. Cut them out and see if they fit together. Learners will be able to see how the shape will look flat and 3D.

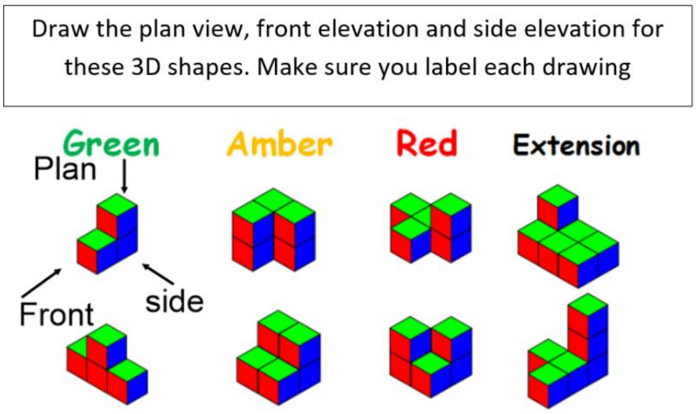


Fig 26

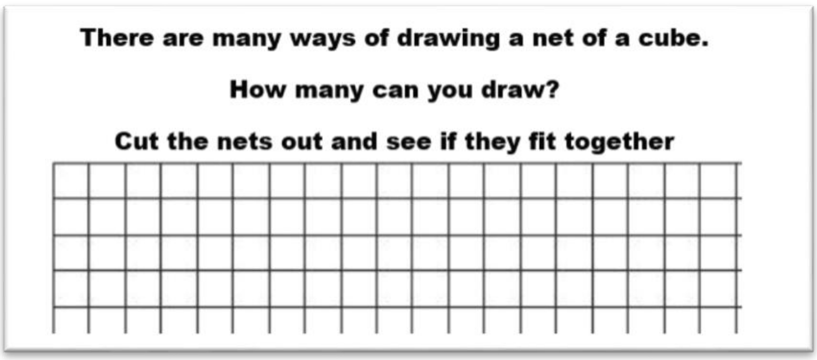


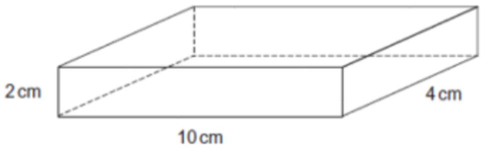
Fig 27

Tips & Misconceptions

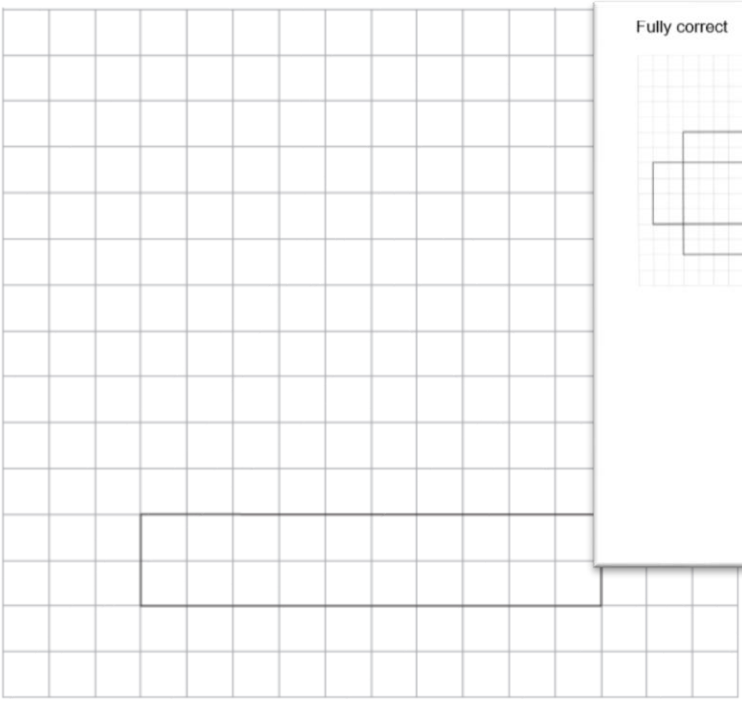
A very common misconception here is viewing from different sides and the concept of special awareness. Learners may not be able to view the shapes from different views or broken apart like a net in abstract form. It is best to teach this subject using tactile objects so that learners can view the shape from different points of view.
Have learners create their own nets out of paper and piece it together, they will be able to physically see the concept.

Example & Solution

A tray for holding paper clips is an **open** cuboid.

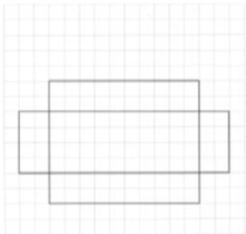


Complete a net for the tray on the grid.



(Total 3 marks)

Fully correct



B2 adding a 10 by 4 rectangle and two 4 by 2 rectangles in correct positions

or

adding a 10 by 4 rectangle and 4 by 2 rectangle and 10 by 2 rectangle in correct positions

B1 adding a 10 by 4 rectangle in correct position

SC2 Fully correct follow through net for 10 by x by 2 cuboid with

$x \neq 4$

B3

[3]

Exam question and solution adapted from AQA GCSE foundation question

Josh is designing gift boxes.
He designs these boxes.

Josh needs to know the shape of the boxes from different views.

shape 1 shape 2 shape 3 shape 4

Place the correct numbers in the space to complete the sentences.

(a) Shape .... is the plan view of the cylinder.

(b) Shape .... is the front view of the triangular pri

Question	Process	Mark	Mark Grid	Evidence
(a)	Correct solution	1	A	Select shape 1
(b)	correct solution	1	B	Select shape 4

Exam question and solution from Pearsons, Edexcel functional skills maths

26.1 Use angles when describing position and direction, and measure angles in degrees: ANGLES

Application + Activities

Angles within level 1 requires learners to have basic knowledge of angles. Learners will need to measure angles using protractors and be able to explain the difference between acute, right, and obtuse angles and demonstrate within regular and irregular polygons.

Activity example
Use a piece of string and a pin to demonstrate a quarter turn, half turn and full turn, how each quarter turn describes 90°, how two quarter turns describe 180° and four quarter turns describe 360°.
Fig 28: Learners draw their own angles. Ask learners to draw a number of different lines that join together at a point. Learners will then use the protractor to correctly measure these lines.
Fig 29: Travel around the world. Learners use protractors to measure the reflex angles at the given port on the map. https://www.tes.com/teaching-resource/measuring-and-drawing-angles-with-a-protractor-6364096

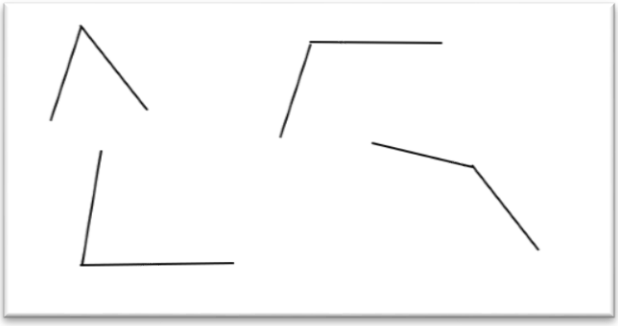


Fig 28

Fig 29

Tips & Misconceptions
Learners must understand the correct use of a protractor. If they do not have this core skill, they will struggle with the concepts. Learners may not position the protractor correctly, or if they do, they will read from the wrong direction giving them an incorrect angle. This will come to learners with practice.

.

Example & Solution

Here is a regular hexagon.

(c) What type of angle is angle x?
Tick the correct answer.

(1)

right angle	acute angle	reflex angle	obtuse angle

(c)	Fully correct solution	1	C	4 (faces) 6 (edges) 4 (vertices)

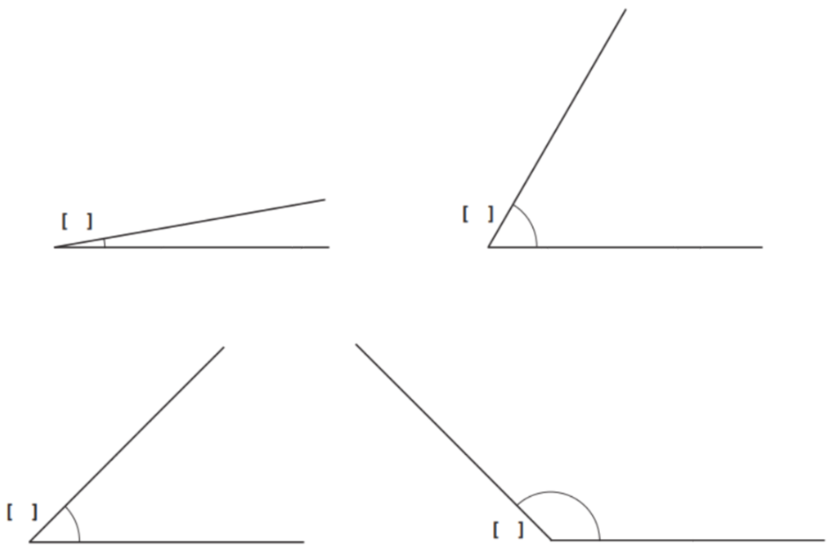
Exam question and solution from Pearsons, Edexcel functional skills maths

Talvin wants the white ball to move at a 45° angle to the edge of the table.

(b) Which of these angles is 45°?

(1)

Tick [✓] to show your answer.



I6	Indicates correct angle	1	N	Indicates 45 degree angle

Exam question and solution from Pearsons, Edexcel functional skills maths

26.2 Use angles when describing position and direction, and measure angles in degrees: BEARINGS

Application + Activities

The DFE guidance includes bearings as part of angles. Bearings are only included in some exam boards (Edexcel and others) so be aware of the exam board before including it. Bearings is new to the 2019 spec. Learners are required to understand what a bearing is and how to calculate. Learners need to identify that bearings are 3-digit figures, measured clockwise from north.
Learners will need to understand angles to grasp bearings, so this is best to be taught afterwards or alongside.

Activity examples
Fig 28: Learners need to understand the steps of measuring bearings.
Fig 29: Maps. Similar to scale in section 21, real life maps of the learners home town will help them to familiarise themselves with the skill. After going through the basics of bearings, use a map of their hometown and ask bearing questions about going from one point to another to practice.

1) Bearings are a measure of direction taken **from North**
2) Bearings are always measured in a **clockwise** direction
3) Bearings are always written in **3 figures**.

Fig 28

Measure the bearing and distance of Tower Hill from Old Street
Measure the bearing and distance of Westminster from Bond Street

Fig 29

Tips & Misconceptions

Bearings often use the terms **"From"** rather than **"To"**. For example, a question may say "find the bearing of A from B" which learners will confuse as finding the bearings from A to B.
Learners may not use the protractor correctly, so they will need ample practice to develop this skill.

Example & Solution

6 Ben is an activity leader.
He is planning a team-building event for a group of people.
Ben has this part of a map.

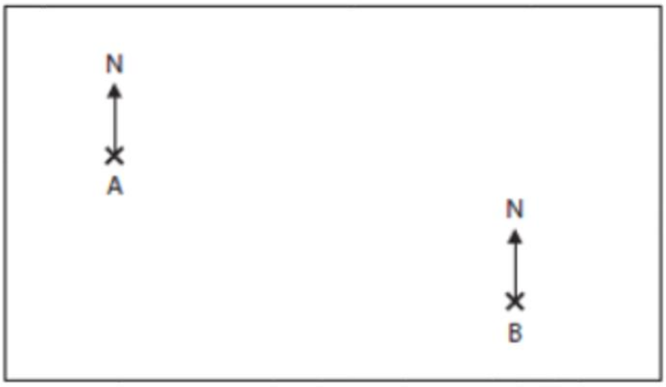


Diagram drawn accurately

Key: 1 cm on the map is 1000 m on the ground

The group will start at point A and walk directly to point B.

Ben needs to write instructions to give to the group.
The instructions need to include the

- bearing
- distance to be walked.

(a) Write the instructions for the group.
Remember to give units with your answer.

(4)

Exam question adapted from AQA GCSE foundation maths

Question	Process	Mark	Mark Ref	Evidence
Q6(a)	Angle measured correctly as a bearing from north	1	A	110° allow ±2° tolerance
	Measures distance between point A and point B	1	B	6.5 (cm) allow ±2 mm tolerance oe May be implied by subsequent working
	Process to work with scale	1 or	C	{length} × 1000 (= 6500) oe Allow length from 6 to 7 cm
	Accurate figure from their measurement with units	2	CD	e.g. 6500 m **or** 6.5 km
Q6(b)	Process to work with range	1 or	E	53 – 26 (= 27) **OR** 53 – shortest time = 26 **or** 26 + shortest time = 53
	Accurate figure	2	EF	27
	Total marks for question	**6**		

Solution for question above adapted from AQA GCSE foundation maths

SKILLS CHECKLIST

Use the below checklist to complete an initial diagnostic and to track progress throughout using a RAG system.

LEARNER NAME: ....

		Initial Diagnostic	Review 1	Review 2	Review 3
18.Calculate simple interest in multiples of 5% on amounts of money					
19.Calculate discounts in multiples of 5% on amounts of money					
20.Convert between units	length				
	weight				
	Capacity				
	Money				
	Time				
21.Recognise and make use of simple scales on maps and drawings					
22.Calculate the area and perimeter of simple shapes including those that are made up of a combination of rectangles	Area				
	Perimeter				
23.Calculate the volumes of cubes and cuboids					
24.Draw 2-D shapes and demonstrate an understanding of line symmetry and knowledge of the relative size of angles	2D shapes				
	Line of Symmetry				
25.Interpret plans, elevations, and nets of simple 3-D shapes					
26.Use angles when describing position and direction, and measure angles in degrees					

HANDLING INFORMATION AND DATA

Pg	Topic covered
79	Represent discrete data in tables, diagrams and charts including
89	Group discrete data and represent grouped data graphically
91	Find the mean and range of a set of quantities
95	Understand probability on a scale from 0 (impossible) to 1 (certain) and use probabilities to compare the likelihood of events
97	Use equally likely outcomes to find the probabilities of simple events and express them as fractions

DFE Guidance for Handling information and data

Handle information and data: learners at Level 1 are expected to be able to select, construct and interpret a range of statistical diagrams in various contexts; select and use methods and forms to present and describe outcomes. They can extract and interpret information from tables, diagrams, charts and graphs; apply simple statistics and recognise features of charts to summarise and compare sets of data; recognise and use the probability scale and interpret probabilities. For specific content on information and data – see below.

Content	
27	Represent discrete data in tables, diagrams and charts including
28	Group discrete data and represent grouped data graphically
29	Find the mean and range of a set of quantities
30	Understand probability on a scale from 0 (impossible) to 1 (certain) and use probabilities to compare the likelihood of events
31	Use equally likely outcomes to find the probabilities of simple events and express them as fractions

27.1 Represent discrete data in tables, diagrams, and charts: PICTOGRAMS

Learners will need to be able to extract and interpret as well as collect and record discrete data from lists, tables and charts such as tally charts, bar charts, pie charts, line graphs and pictograms. Learners need to be able to remember the essential features of diagrams, charts and graphs and be able to choose the most suitable way of representing raw data.

Application + Activities

Give learners the opportunity to discuss how they could approach this task by introducing the key features of a pictogram. Discuss why the key is important and how they can work with the values that they have been given. Choose simple values like these to start with to allow learners to grasp the concept of showing half symbols, then expand to quarters.
Encourage learners to use simple symbols.

Dominoes sell 50 pizzas on Monday, 30 on Tuesday, 40 on Wednesday and 15 on Thursday.

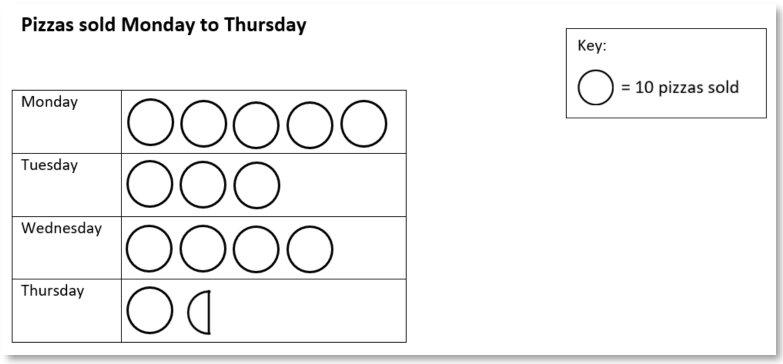
Draw a pictogram to represent this information.

Pizzas sold Monday to Thursday

Key:

Monday	
Tuesday	
Wednesday	
Thursday	

Solution:



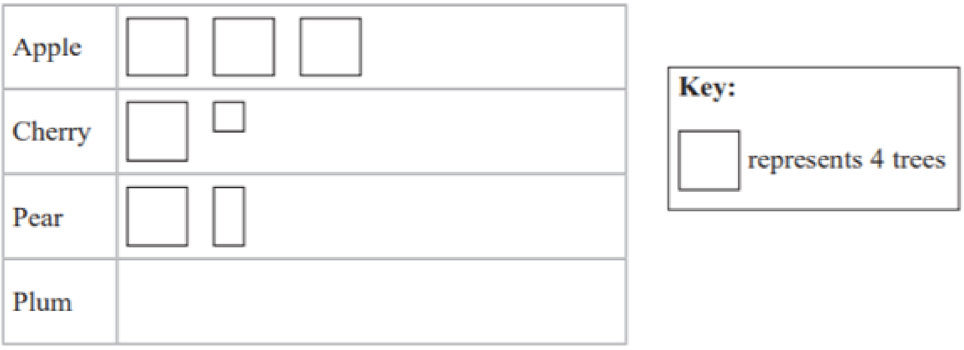
Tips & Misconceptions

Often when working with pictograms, learners ignore the key when interpreting the data. Remind learners to pay particular attention to the key and not assume that each symbol or picture equals one item.
Make a close link to fractions to ensure that learners are able to interpret fractions of symbols such as halves and quarters.
Revise fractions as a starter activity to ensure learners are competent when tackling the questions.
Also make the link to multiples as learners will need to be able to work with these in order to establish a key that will work for the values given in the task.

Example & Solution

7 There are only apple trees, cherry trees, pear trees and plum trees in an orchard.

The pictogram shows information about the numbers of apple trees, cherry trees and pear trees in the orchard.



There is a total of 30 trees in the orchard.

Complete the pictogram.

(Total for Question 7 is 3 marks)

(Edexcel Mathematics Foundation November 2018 Paper 1)

7		M1	for use of scaling, eg at least one of 12, 5, and 6 **or** 23 **OR** for using the representation, eg $\frac{30}{4}$ (= 7.5) or 5.75	May be seen on diagram.
		M1	for subtracting their total number of trees from 30, eg 30 – "23" (= 7) **OR** for subtracting the total number of squares from 7.5, eg 7.5 – "5.75" (= 1.75)	"23" must be from addition of 12, 5 and 6 Award 2 marks for 7 seen provided unambiguous "5.75" must be from addition of correct decimals/fractions
		C1	oe	May be alternative representations, eg one square + half square + quarter square or squares may be divided into 4 sections. Any orientation acceptable.

27.2 Represent discrete data in tables, diagrams, and charts: TALLY CHARTS

Application + Activities

Often Tally charts are now referred to as grouped frequency tables (refer to number 28 in this booklet – representing grouped data) so ensure you discuss what this means with your learners. Often learners misinterpret the frequency column, discuss this before you allow them to create their own tables or complete activities given by you.

Ask learners to discuss with a partner or small group on the kind of data that they could collect such as different colour cars in a small section of the car park, how learners travel to college or other information that they may want to collate.
They can then go and collect all the data and represent it in a tally chart. Here is an example question:

Collect the following data and create a tally chart to represent this data:

How do you travel to college?

	Tally	Frequency
Bus		
Taxi		
Train		
Walk		
Bicycle		
Car		
Motorbike		

Tips & Misconceptions

Ensure that the learners are able to interpret their own (or another group's) tally chart by giving them questions such as 'how many more learners travel to college by bus compared to by car?' or 'what fraction of learners travel by car to college?' This will allow them to incorporate their knowledge of the basic operations as well as fractions and show the understanding of the data represented.

Introduce learners to grouped data in relation to frequency tables as many exam questions will refer to grouped data. Please see below an example exam question.

Example & Solution

6 Martyn is a groundsman at a sports club.

He records the percentage of grass coverage in 12 places on a sports pitch.

Martyn lists the results.

grass coverage (%)

55	32	64	45
49	18	83	74
27	91	40	62

Martyn starts to show this information in a grouped frequency table.
He will use five groups of equal size.

(a) Complete the grouped frequency table for Martyn.

(3)

grass coverage (%)	tally	frequency
1 to 20	I	1
	total	

(Edexcel FS Mathematics Practice Paper Level 1 Set 2)

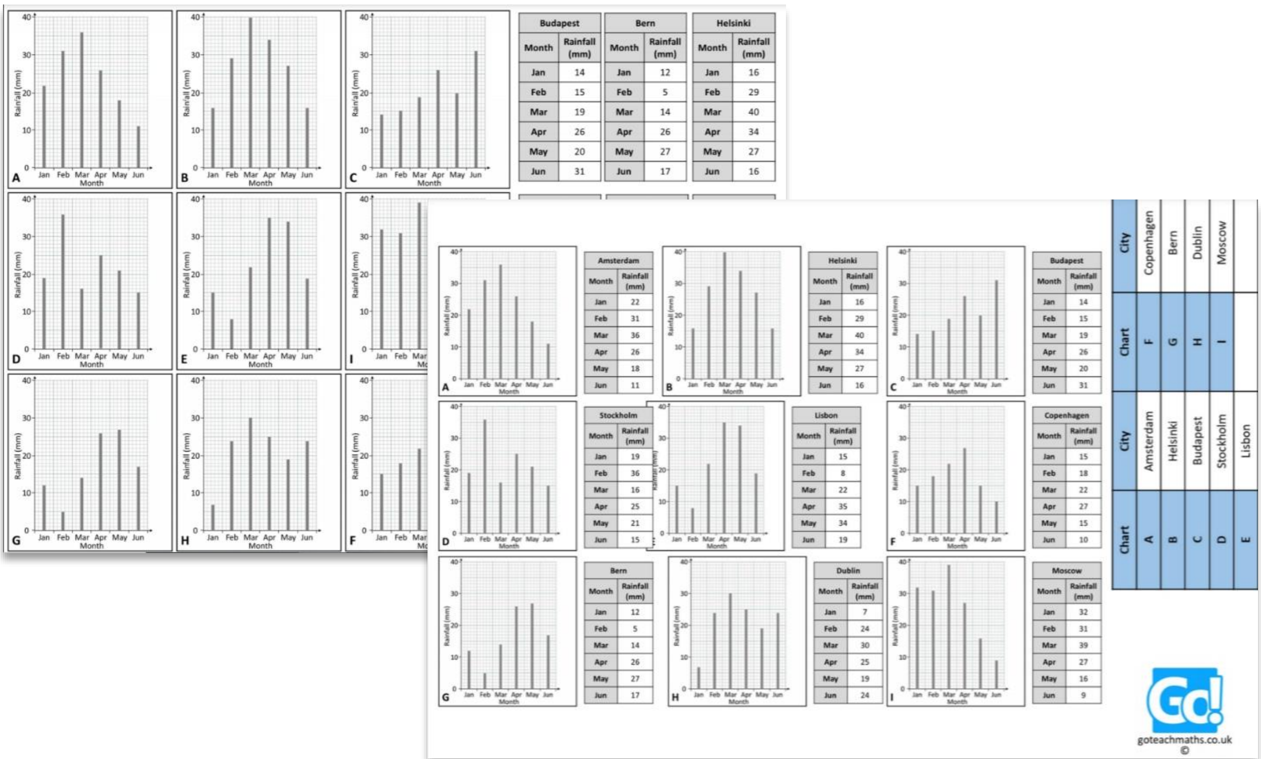
Question	Process	Mark	Mark Grid	Evidence
Q6(a)	Process to show groups	1	A	Labels all missing groups e.g. 21 to 40, 41 to 60, 61 to 80, 81 to 100
	Begins to place data into table	1 or	B	Populates table with at least 2 correct frequencies for their groups.
	Correctly completed table	2	BC	Populates table with the data correctly (see table below) NB Condone missing or incorrect tallies as long as frequency is correct

grass (%)	tally	frequency
1 to 20	I	1
21 to 40	III	3
41 to 60	III	3
61 to 80	III	3
81 to 100	II	2
	total	12

27.3 Represent discrete data in tables, diagrams, and charts: BAR CHARTS

Application + Activities

Prepare cards showing a range of graphs and charts with features missing or mistakes, and make another set of 'category' cards showing types of missing features or mistakes, for example, There's no title, The vertical axis does not have a label. The vertical scale is incorrect. There is no key. Ask learners, in pairs or groups, to match each graph or chart card to the matching explanation card. If you lack time to create your own, here is an example matching activity from www.goteachmaths.co.uk.



Tips & Misconceptions

There are a range of misconception that need to be addressed when working with bar charts. Ensure that all learners understand the importance of labelling all axes as data cannot be interpreted otherwise. Remind learners that a bar chart also requires a title.

When completing bar charts, ensure learners use rulers.

Learners often struggle with scale, ensure that they are fully aware of the importance of scale (ie each square on the graph paper is worth 2 units) and that even spacing is important. Remind learners that bars should be of even width and discuss when bars should have gaps between them and when it is appropriate to group bars together. This will need particular attention.

Discuss with learners whether a bar chart is always the best option or whether there are other representations that may used for a particular activity.

Introduce learners to examples that combine different data collation models. Please see below an example exam question, combining tally charts and bar charts.

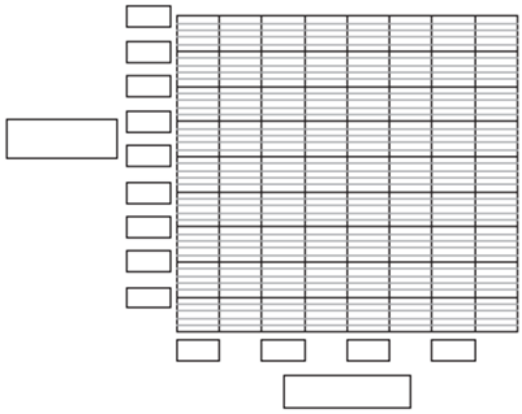
Example & Solution

2 The table gives some information about the number of visits to a gym last month.

number of visits	tally	frequency
1 – 5	𝍸 𝍸	
6 – 10	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 |||	
11 – 15	𝍸 𝍸 𝍸 𝍸 ||	
more than 15	𝍸 𝍸 |	

(a) Complete the frequency column. **(1)**

(b) On the grid, draw a suitable graph for this information. **(3)**



(Total for Question 2 is 4 marks)

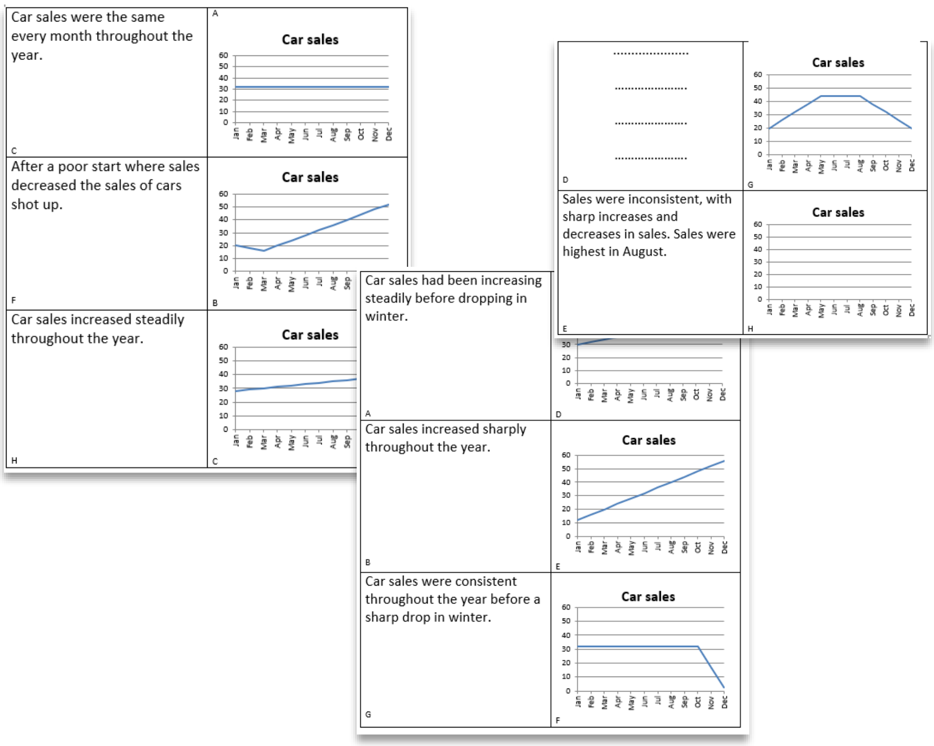
(Functional-Skills-Mathematics-Level1-Practice-paper-SecB-Sept-2019)

Question	Process	Mark	Mark Grid	Evidence
Q2	Completes the frequency column	1	A	10, 43, 22, 11
	Begins to draw graph or bar chart	1 or	B	One of: Linear scale Completes labels on horizontal and vertical axes Accurate plotting
	Develops graph or bar chart	2 or	BC	Two of: Linear scale Completes labels on horizontal and vertical axes Accurate plotting
	Fully correct graph or chart	3	BCD	All of: Suitable linear scale Completes labels on horizontal and vertical axes Accurate plotting Minimum labels 1-5, 6-10, 11-15, >15, number of visits, freq
	Total marks for question	4		

27.4 Represent discrete data in tables, diagrams and charts: LINE GRAPHS

Application + Activities

Create some matching cards that show line graphs and a matching set of cards with interpretations of the data to allow learners to practice how to interpret and use data from line graphs. Here is an example from TES (Line graph card match by Rich Fawcett)



Another useful activity is to use conversion graphs. Ensure learners make the connections between conversion graphs and ratio and proportion, their knowledge of converting between several units such as British pounds and Euros or Dollars, miles and kilometres, pounds and kilogram etc.

Tips & Misconceptions

Similarly to bar charts, emphasise the importance of titles and especially labels on the axes. Stress that being precise when working with the values and the scale of these. Misunderstanding of the scale can cause difficulties when working out a problem.

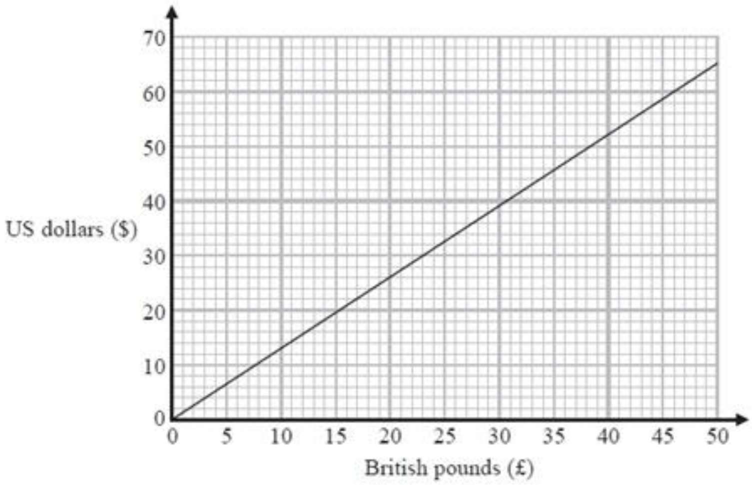
Ensure learners understand how to read the values correctly of each axis, reading across and down or vice versa and that learners mark graphs as they are reading.
Stress the importance of taking accurate readings.

Ensure learners pay particular attention to the units of measurement and ensure that these do not get mixed up (see exam sample question – confusing £ and $)

Ensure learners always use a rule for accuracy.

Example & Solution

This graph can be used to change between US dollars ($) and British pounds (£).



Rosie bought a ring in the USA.
She paid 345 US dollars.

Work out in pounds the amount Rosie paid for the ring.

£ ....

(Total for question = 3 marks)

(Edexcel GCSE Foundation Paper 3, November 2020)

Question	Answer	Mark	Mark scheme	Additional guidance
	258 to 275	M1	for taking a correct reading from the graph that shows conversion of an amount in \$ to £	
		M1	for a complete method eg attempts to read from the graph at using numbers that sum to 345 **and** finds the sum of their readings eg 6 × 50 + 45	Must be a complete method to get to 345
		A1	for answer in the range 258 to 275	Condone incorrect money notation if the meaning is clear

27.5 Represent discrete data in tables, diagrams, and charts: PIE CHARTS

Application + Activities

Start with a simple activity introducing pie charts such as the activity below. This will support learners to get used to not just creating pie charts but also how to interpret them. Gradually these tasks can grow in difficulty but ensure that the basics are secure. Fractions and percentages are a large part of this topic so stress the importance of these to the learners.

1.) Think of a question that you could ask people in your class or at home.

Which of these is your favourite colour?
Which of these music options do you listen to the most?
Which if these cars would you most like to own?
Which if these drinks is your favourite?

2.) Come up with some good options for answers (no more than 5).
3.) Create a table in which you can record your results.

Which of these is your favourite drink	
Water	
Fanta	
Coke	
Orange Juice	
Team/Coffee	

4.) Ask 16 people, make sure you count your results.
5.) Draw a pie chart to show your results. Start by drawing a large circle. Then split it into two halves. Then split it into four quarters. Now into even eighths and finally into sixteenths.

6.) Colour your chart according to your results and remember to add a key.
7.) Write 4 questions to ask other people about your pie chart to allow them to interpret your data.

Start with an activity that reminds learners of what they need to pay particular attention to when working with pie charts such as: adding to find the total, dividing 360° (and discuss why), multiply by the frequency (discuss why), how to use the protractor to draw the correct angle and labelling the sectors.

Tips & Misconceptions

When working with pie charts, ensure that you explain the importance of they to the learners. Stress that without a key, a pie chart cannot be interpreted.

Ensure that you re-introduce fractions and percentages (covered under the number booklet) as well as angles (angles around a point specifically) either as a starter activity or as a flipped learning activity. Learners need to be able to work out and interpret simple fractions ($\frac{1}{2}$and $\frac{1}{4}$), percentages and degrees in order to answer pie chart problem solving questions. Remind learners that the values will always add up to 100%.
It is important that learners again, make the links between charts and proportion and that a pie chart represents these.

Before learners construct a pie chart, ensure that they can use a compass and a protractor competently and urge learners to use a ruler. Use some time to practice the use of compass and protractor to avoid difficulties later on, especially when reading angles and marking them correctly.

Remind learners to always label the pie charts accurately and again remind them to use an appropriate key.

Example & Solution

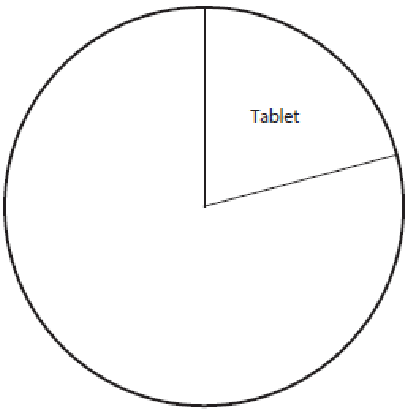
5 Jimmy works in a shop.
He has this information about the 72 items sold last week.

Item	Number sold	Angle size
Tablet	15	75
Phone	44	
Laptop	13	

Jimmy starts to display this information in a pie chart.

Complete the pie chart for Jimmy.

(3)



(Total for Question 5 is 3 marks)

(Pearson Edexcel FS-Maths-Level-1-Sample-Assessment-Material-pre-pub)

Question	Process	Mark	Mark Ref	Evidence
Q5	Begins to work with angles or proportion	1 or	A	e.g. $360 \div 72$ (= 5) **OR** $75 \div 15$ (= 5) **OR** $44 \div 72$ (= 0.61..) **or** $13 \div 72$ (= 0.18..) May be seen in subsequent calculations
	Process to find one angle or draw 1 angle correctly	2 or	AB	e.g. ‘5’ × 44 (= 220) oe **OR** $13 \div 72 \times 360$ (= 65) oe May be indicated by one accurately drawn angle
	Fully correct and labelled pie chart	3	ABC	220^0 **and** 65^0 **and** labelled correctly ($\pm 2^0$)
Total marks for question		3		

28. Group discrete data and represent grouped data graphically

Application + Activities

Allow learners to discover what discrete data and grouped data means. Also remind learners of the meaning of frequency. Remind learners of the importance of labels and the title for their chart. As this unit follows the introduction and teaching of representing discrete data, learners could discuss in pairs or groups how to tackle a question such as the activity below:

Here are marks that students have scored during a GCSE Maths test. The maximum marks they could score is 9. There were 15 students in the class.

Marks scored:
6, 5, 3, 5, 7, 8, 6, 5, 6, 2, 4, 6, 6, 6, 5

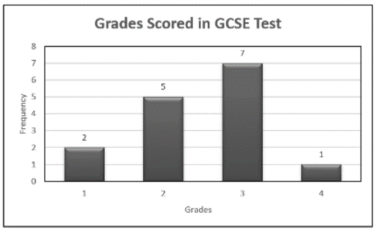
Here is a breakdown of how many marks equal a grade:

Marks and Grade:
Grade 1: 0 - 3 marks
Grade 2: 4 – 5 marks
Grade 3: 6 – 7 marks
Grade 4: 8 – 9 marks

1.) In your pairs/groups design a suitable data collection table.
2.) Create a graph representing your grouped data.

Possible Solution:

Grade/Marks	Tally	Frequency
1 (0-3)	II	2
2 (4-5)	~~IIII~~	5
3 (6-7)	~~IIII~~ II	7
4 (8-9)	I	1

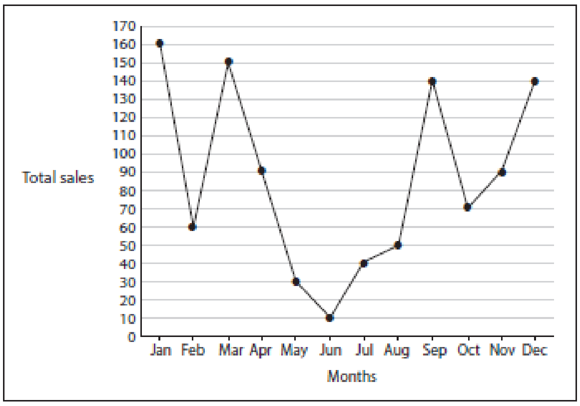


Tips & Misconceptions

Often learners struggle with making sense of the discrete data provided and how to manipulate this in order to group the data.
Spend time to work through examples of discrete data such as the marks given in the activity above.
Allow learners to draw conclusions on what grouped data represents and how this can be shown in a graph or chart. Learners need to be able to discuss and interpret data in order to fully access problems such as the activity given.

Example & Solution

5 Kate has this information about the total monthly sales for a shop in 2018



Kate needs to put this information in a table.
The table must show the total sales for each quarter of the year.

quarter 1 (Jan to Mar)
quarter 2 (Apr to Jun)
quarter 3 (Jul to Sep)
quarter 4 (Oct to Dec)

Draw and complete a suitable table for Kate.

(3)

(Total for Question 5 is 3 marks)

(Functional-Skills-Mathematics-Level1-Practice-paper-SecB-Sept-2019)

Question	Process	Mark	Mark Grid	Evidence
Q5	Begins to group data	1 or	A	e.g. 160 + 60 + 150 (=370)
	Accurate total for each quarter	2	AB	Q1 = 370, Q2 = 130, Q3 = 230, Q4 = 300
	Designs suitable table	1	C	Table with input opportunities for Q1, Q2, Q3, Q4 and sales completed with their values for Q1, Q2, Q3, Q4
	Total marks for question	**3**		

29.1 Find the mean and range of a set of quantities: MEAN

Learners will need to be able to calculate the mean and the range, working with both integers as well as decimal values. Learners need to recognise that zero counts as part of the data and this needs to be taking into consideration when calculating the mean as well as the range.
This units lends itself well to show connections between topics and remind learners of the basic operations.

Application + Activities

A range of activities can be used for working with the mean average. All learners could be asked to give their age, shoe size, height or other data. This can then be collated and the mean can be calculated. Depending on the category chosen non-calculator as well as calculator skills can be developed using whole numbers and decimals.
Another activity could be matching cards where learners have different sets, such as cards with data, a question, adding values and dividing by the total. Learners could then match the cards and put them in order. Discussing in pairs or small groups will allow for differentiation, as would the number of cards distributed to learners.

Here is an example of another activity that we used in section 28, amended to fit this topic.

Here are marks that students have scored during a GCSE Maths test. The maximum marks they could score is 9. There were 15 students in the class.

Marks scored:
6, 5, 3, 5, 7, 8, 6, 5, 6, 2, 4, 6, 6, 6, 5

Calculate the mean average score of this class.

Tips & Misconceptions

Learners often make calculation errors, adding and/or dividing, especially without a calculator. Give ample time to practice these skills. Allow learners to also use estimation before using a calculator. This will allow them to work with estimation and interpret their answers.
Many learners are unsure which numbers to divide by, practice these skills with them – use discussion-based activities for learners to explore why values are added and divided. A deep understanding will minimise misconceptions and errors later on. Also remind learners to include zeros when working with the mean. Give examples of this.
Stress the importance of reading questions carefully and to check their answers.

Example & Solution

10 Sarah has a snack at work each day.

She has this information about the snacks she had last week.

day	Mon	Tue	Wed	Thu	Fri
snack	banana	chocolate	biscuit	cake	crisps
number of calories	105	260	49	257	234

Sarah thinks the mean number of calories in these snacks is more than 200

Is she correct?
Show why you think this. (3)

(Total for Question 10 is 3 marks)

(Functional-Skills-Mathematics-Level1-Practice-paper-SecB-Sept-2019)

Question	Process	Mark	Mark Grid	Evidence
Q10	Begins process to work with mean	1 or	A	105 + 260 + 49 + 257 + 234 (= 905) **OR** 200 × 5 (=1000)
	Full process to work with mean	2 or	AB	'905' ÷ 5 (=181) **OR** 105 + 260 + 49 + 257 + 234 (= 905) **and** 200 × 5 (=1000)
	Valid decision with accurate figure	3	ABC	No **AND** 181 (calories) No **AND** 1000 (calories) **and** 905 (calories)
	Total marks for question	**3**		

29.2 Find the mean and range of a set of quantities: RANGE

Application + Activities

The range is the average that learners generally find easier although it can appear in the non-calculator element of the exam papers. Ensure that you allow learners ample opportunity to practice their non-calculator skills with integers as well as decimal values.

Introduce the range and ask learners to collate some data in their class such as shoe sizes, heights etc and to calculate the range.

Once you have covered both averages, mean and range, you could use the following activity to consolidate learning. Create as many cards as you feel your group of learners will need and allow them to discuss in pairs or small groups how best to find the missing number:

In your pairs or small groups, look at these cards. Each card gives you the range and the mean of a set of data. When looking at the data, you will notice that one value is missing and has been replaced by a question mark.

a) Discuss how you can find the missing number using the knowledge you now have of the mean and the range.
b) Find all the missing numbers.

Mean: 3 **Range:** 4 5, 1, ?, 2	**Mean:** 6 **Range:** 10 9, 7, 11, ?, 2	**Mean:** 6 **Range:** 6 3, 8, 5, ?, 5, 6

Tips & Misconceptions

Learners often find it difficult to extract data from tables. Ensure you spend time on extracting data from tables when calculating the range. As with the mean average, learners often overlook the zero values so stress that these need to be taken account of when calculating the range.

Work with integers as well as decimals and ensure that learners are competent when working without a calculator as often range questions will appear in the non-calculator section of the exam papers such as the following exam question example.

Example & Solution

1 Jack is keeping a record of the number of steps he takes each day.

Monday	8 565 steps
Tuesday	14 707 steps
Wednesday	15 323 steps
Thursday	9 788 steps
Friday	12 482 steps

(a) Work out the range of the number of steps.

(2)

.... steps

(b) Show a check of your answer.

(1)

(Total for Question 1 is 3 marks)

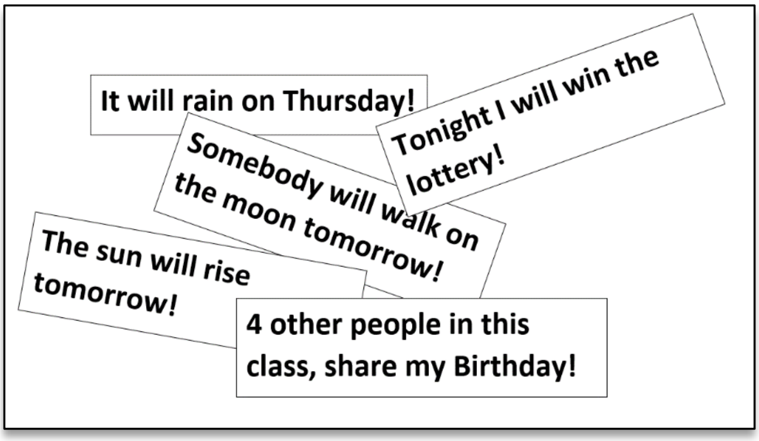
Functional-Skills-Mathematics-Level1-Practice-paper-SecA-Sept-2019)

Question	Process	Mark	Mark Grid	Evidence
Q1(a)	Process to calculate range	1 or	A	15323 – 8565 (=6758) **OR** Clearly identifies 15323 **and** 8565
	Accurate figure supported by working	2	AB	6758
Q1(b)	Valid check	1	C	e.g. 6758 + 8565 = 15323 **or** 15000 – 8000 = 7000
	Total marks for question	**3**		

30. Probability - likelihoods of events

Application + Activities

Distribute post-it notes to learners. Give learners scenarios and ask them to write each on a separate post-it note.
Draw a line on the whiteboard and label with probable outcomes such as 'certain', 'likely', 'equal' or 'evens', 'unlikely' and 'impossible'.
Ask learners to place their post-it notes in the appropriate place on the whiteboard. You can also do this in small groups using an A4 sheet for the outcomes and ask learners to place their post-it notes or create cards that learners can place on the correct part of the line.



Tips & Misconceptions

When working with probability at L1 it is important to keep these simple, the likelihoods of events need to be reinforced, especially when working with 'equal' or 'evens' as learners often tend to focus on 50/50.
Learners can get confused between estimating probability and measuring probability. Stress that using the correct language and terminology is important and that reading the question carefully will allow learners to avoid mistakes.
Learners also need to be able to make the connection between the likelihood and the calculation of probability. Ensure learners are able to interpret simple fraction values such as ¼ or ¾ and which likelihood these would relate to in a given scenario.

Example & Solution

The probability that a visitor buys a soft drink at the show is $\frac{3}{4}$

(b) Which of these describes this probability?

(1)

Tick [✔] a box to show your answer.

[ ] impossible

[ ] unlikely

[ ] even chance

[ ] likely

[ ] certain

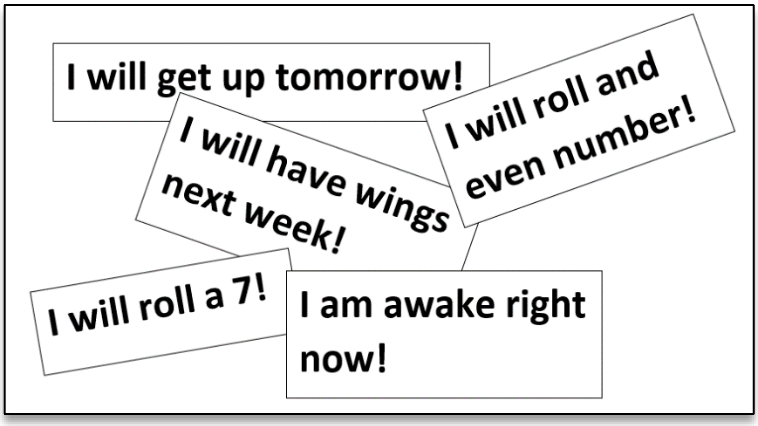
(Total for Question 10 is 3 marks)

(Pearson Edexcel FS-Maths-Level-1-Sample-Assessment-Material-pre-pub)

Q10(b)	Selects correct word to describe likelihood	1	C	Likely
	Total marks for question	**3**		

Application + Activities

Allow learners to discover measuring probability through calculation. Simple examples such as tossing a coin or rolling a die could be used with a similar display as previously used for introducing likelihoods. The use of a whiteboard or an A4 sheet of paper for a number line (0, ½ and 1) and post-it notes or cards with simple statements such as ‘ I will get up tomorrow’, ‘I will roll an even number’.



Tips & Misconceptions

When working with probability learners need to be introduced to examples that they can relate to, especially at Level 1. Examples such as tossing a coin (heads or tails) and when rolling a die can make an easy introduction and allow learners to make connections with probability and fractions, decimals and percentages.
Ensure you revisit fractions, stressing the importance of learners really grasping the concept of equivalent fractions and how to simplify. Give an example where simplifying is relevant such as ‘I will roll an even number’ = 3/6 – ½ or ‘I will roll a number greater than 4’ = 2/6 = 1/3.

Example & Solution

10 Oscar is organising a show.

Visitors to the show choose their seats at random.
There are 350 seats available.
These seats are numbered from 1 to 350

Oscar places a prize under each of the seats numbered 17 to 25

(a) What is the probability that the first visitor chooses a seat with a prize?

(2)

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

(Pearson Edexcel FS-Maths-Level-1-Sample-Assessment-Material-pre-pub)

Question	Process	Mark	Mark Ref	Evidence
Q10(a)	Gives a probability using total number of seats or identifies the correct number of seats with a prize	1 or	A	$\frac{a}{350}$ **and** $a < 350$ **OR** 9 (seats) indicated
	Accurate probability	2	AB	$\frac{9}{350}$ oe ISW incorrect simplification of their fraction

SKILLS CHECKLIST

Use the below checklist to complete an initial diagnostic and to track progress throughout using a RAG system.

LEARNER NAME: ....

		Initial Diagnostic	Review 1	Review 2	Review 3
27.Represent discrete data in tables, diagrams and charts including	27.1 pictograms				
	27.2 tally charts				
	27.3 bar charts				
	27.4 line graphs				
	27.5 pie charts				
28.Group discrete data and represent grouped data graphically					
29.Find the mean and range of a set of quantities	29.1 Mean				
	29.2 Range				
30.Understand probability on a scale from 0 (impossible) to 1 (certain) and use probabilities to compare the likelihood of events					
31.Use equally likely outcomes to find the probabilities of simple events and express them as fractions					

PROBLEM SOLVING

pg	Topic covered
102	Clumsy Clive
103	Group Discussions
107	Reasoning approach
110	SSDD approach
111	SCAFFOLDING questions
113	RUCSAC
114	Goal Free problems

DFE GUIDANCE FOR PROBLEM SOLVING

Level 1 - solving mathematical problems and decision-making learners at Level 1 are expected to be able to:

- Read, understand and use mathematical information and mathematical terms used at this level
- Address individual problems as described above; • Use knowledge and understanding to a required level of accuracy
- Analyse and interpret answers in the context of the original problem
- Check the sense, and reasonableness, of answers; and
- Present results with appropriate explanation and interpretation demonstrating simple reasoning to support the process and show consistency with the evidence presented. The context of individual problems at this level will require some comprehension in order for the learner to be able independently to identify and carry out an appropriate mathematical approach.

Application + Activities
A key part within problem solving is mistakes and understanding where the issues could appear. Learners need to understand the question and pick it apart to find the most important aspects. Identifying misconceptions and common errors will allow them to think further into the question and understand where they could possibly go wrong.

The following are curated example activities to help support learners with problem solving.

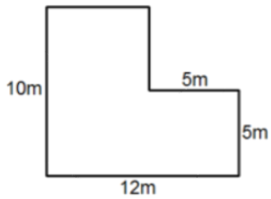
1. “Clumsy Clive”

This is an example of a common way to tackle misconceptions. Provide the learner with a question with a given answer. The learner is to pick apart “Clive’s” answers and actively seek the true answer. Learners must say their answers and the mistake that has been made. Clumsy Clive has produced many resources for GCSE level on TES: https://www.tes.com/teaching-resource/clumsy-clive-on-perimeter-area-and-volume-11591754 , however the concept works well within functional skills as questions are wordier and require dissecting and thinking.
To create your own, take a common exam question. Use the mark scheme and change it following common errors. Use this as “Clives” answer.

Fig 1

Question 2:

The diagram below shows the plan of a playground:



It costs £7.49 per square metre to resurface the playground.
How much will it cost to resurface the whole playground?

Clive’s answer:	*Your answer:*
Find the area of the playground: $10 \times 12 - 5 \times 7 = 85m^2$ Cost: 85×7.49 Answer: £636.65	

What mistake has Clive made?

2. Group discussions

Another way of encouraging leaners to progress their problem-solving skills is small group discussion activities.
Print one of the questions below on the large piece of paper, split the class into groups of 3 or 4 and issue them with one of the printouts, flipchart paper and different coloured pens. The groups then have 15 minutes to write out their "solution".

Teams then rotate their solutions around teams maybe 2 or 3 times allowing other teams a chance to critique or improve on the new solution they are presented with. To conclude the session the teams would get their original solution back. Display the mark scheme on the board for them to gauge how well they did and whether any of the advice from the other teams was useful to them. Promote deeper thinking by asking teams to state why/why not in responses to how they approached the questions.

The examples below are Level 2 questions as they pose not only the greatest challenge but also the greatest learning rewards for a task done well with teamwork. Entry level workers are usually supported by higher L1 workers to be able to take an active part in this activity. As is typical at this level of challenge though it may require a lot of support from you constantly visiting tables and prompting them with things that does not give away answers but ensures their problem solving is at least progressing and not stagnating.

2 Mo manages track repairs.
He needs to order 60 tonnes of stones for a track repair.

The stones are sold in full cuboid containers.
A full container of stones is 80 cm by 80 cm by 70 cm.

Mo knows that

- 1 m^3 of the stones weighs 1.8 tonnes
- each container of stones costs £45.16

Mo wants to order the smallest number of containers of stones as possible.

Work out the total cost of the containers of stones Mo needs to order. **(6)**

Edexcel FS Maths Level 2 July 2018

Question	Skills Standard	Process	Mark	Mark Grid	Evidence
Q2	R1	Uses consistent units	1	G	e.g. 0.8 (m), 0.7(m), 1 000 000(cm^3) oe may be seen or implied in subsequent working
	A4	Process to find volume of one container or volume of stones needed	1 or	H	'0.8' × '0.8' × '0.7' (=0.448) oe **OR** 60 ÷ 1.8 (=33.33..)
	A4	Develops solution	2 or	HJ	'0.448' × 1.8 (=0.8064) **OR** '0.8' × '0.8' × '0.7' (=0.448) oe **and** 60 ÷ 1.8 (=33.33..)
	R2	Full process to find the total number of containers needed	3	HJK	60 ÷ '0.8064' (=74.40..) **OR** '33.33..' ÷ '0.448' (=74.40..) **OR**
	I6	Full process to find the total cost	1 or	L	'75' × 45.16 (=3387)
	I6	Accurate figure	2	LM	(£)3387
		Total marks for question	**6**		

Josh wants to make the lamp purple.
He will use dye to make the plastic purple.

Josh will mix red dye with green dye and blue dye in the ratio 9 : 3 : 15 to make purple dye.

Josh uses 30 litres of green dye.

(b) How many litres of purple dye will Josh make with the 30 litres of green dye?
Show a check of your working. **(5)**

Edexcel FS Maths Level 2 July 2018

Q4(b)	R2	Begins to work with ratio	1 or	D	e.g. 9 + 3 + 15 (=27) **OR** 30 ÷ 3 (=10) **OR** 90 **or** 150 **OR** 3:1:5
	R3	Develops solution	2 or	DE	e.g. 9 + 3 + 15 (=27) **and** 30 ÷ 3 (=10) **OR** 90 **and** 150 **OR** 3 + 1 + 5 (=9)
	A4	Full process to find total amount of dye	3 or	DEF	e.g. '27' × '10' (=270) oe **OR** '90' + 30 + '150' (=270) **OR** '9' × 30 (=270)
	I6	Correct answer	4	DEFG	270
	A5	Valid check	1	H	Valid check, e.g. reverse calculation or alternative method

The Lawson family want to go to the safari park.
They see this online offer.

Safari Park

Admission Prices

	peak	off peak
adults	£17.80	£14.50
children (aged 3 and over)	£12.50	£10.25
children (under 3)	FREE	FREE
senior citizen (65 and over)	£13.50	£10.25
family (2 adults and 2 children)	£56.00	£44.00

peak Saturday and Sunday
off peak Monday to Friday

Buy online and save 18% off the normal ticket price

The Lawson family are 2 adults, 2 children over the age of 3 and 1 senior citizen.
They will visit the safari park on Sunday.

Mrs Lawson uses the online offer to pay for the tickets for all the family.
She wants to pay as little as possible.

How much will Mrs Lawson pay in total for all the tickets? **(5)**

Edexcel FS Maths Level 2 June 2018

Question	Skills Standard	Process	Mark	Mark Grid	Evidence
Q4	I6	Works with correct figures from the table	1	A	56 **and** 13.5 May be seen in a later calculation
	R3	Begins to work with percentages	1 or	B	e.g. 18 ÷ 100 × '56' (= 10.08) **OR** (100 – 18) ÷ 100 (=0.82) oe
	A4	Full process to work with percentages	2	BC	e.g. '56' – '10.08' (=45.92) **OR** 0.82 × '56' (= 45.92) oe Allow percentage discount with any figure in the table
	R2	Process to find total cost of tickets with or without discount or total discount for the correct number and category of people	1	D	e.g. '45.92' + '11.07' (=56.99) **OR** '56' + '13.50' (=69.5) **OR** '10.08' + '2.43' (=12.51)
	I6	Accurate figure in correct money notation	1	E	£56.99
		Total marks for question	5		

Adam works for a car trading company.

He has this information about the number of cars sold by the company in the first six months of 2017

	Jan	Feb	Mar	Apr	May	Jun
Number of cars sold	31	28	46	52	44	62

Adam says

The mean number of cars sold each month in this period was more than 42

The number of cars sold in June 2017 was more than $\frac{1}{5}$ of the number of cars sold from the beginning of January to the end of June.

(a) Is Adam correct?
Show why you think this. (4)

Edexcel FS Maths Level 2 May 2018

Question	Skills Standard	Process	Mark	Mark Grid	Evidence
Q1(a)	R3	Process to work with mean	1	A	(31 + 28 + 46 + 52 + 44 + 62) ÷ 6 (=43.83..) **OR** 31 + 28 + 46 + 52 + 44 + 62 (=263) **AND** 42 × 6 (=252)
	A4	Process to work with fraction	1	B	62 ÷ '263' (=0.23..) **OR** '263' ÷ 5 (=52.6) **OR** '263' ÷ 62 (= 4.2..)
	I6	Accurate figure found	1 or	C	43(.83..) **or** 263 **and** 252 **OR** 0.23(57..) oe **or** 52(.6) **OR** 4.2(..)
	I7	Correct answer with accurate figures	2	CD	Yes **AND** 43(.83..) **AND** 0.23(57..) oe (**and** 0.2 oe) **or** 52(.6) (**and** 62 can be indicated in the table) **or** 4.2(..) explained **OR** Yes **AND** 263 **and** 252 **AND** 0.23(57..) oe (**and** 0.2 oe) **or** 52(.6) (**and** 62 can be indicated in the table) **or** 4.2(..) explained

3. Reasoning Approach

This approach is based on getting learners to critique solutions and correcting them. Here are some example problems with solutions that are incorrect. Learners will then find the correct solution for each one. They can then compare their own solutions with someone else's. Teachers should use active questioning to promote deeper thinking throughout the activity.

https://www.ocr.org.uk/Images/73734-smp-problem-solving-tasks-for-functional-skills-maths.pdf

B

Hattie has a full bag of plain flour that weighs 1.5 kg.
She measures out 120 g of flour.

How much flour is left in the bag?

> *$1.5 \times 100 = 150$*
> *$150 - 120 = 30$*
>
> *So 30 g of flour is left.*

A

Meera buys a cup of tea that costs 95p and a sandwich that costs £2.25.
How much does she spend altogether?

> *$95 + 2.25 = 97.25$*
>
> *So she spends £97.25.*

C

Five friends are out for a meal.
They decide to share the cost of the meal equally.
The total bill is £66.34.

They want to know how much each should pay.

> *$66.34 \div 5 = 13.268$*
>
> *So each pays £13.268.*

D

Heather earns £28 000 per year.
She earns £5000 per year more than Gordon.

How much does Gordon earn per year?

> *$28\,000 + 5000 = 33\,000$*
>
> *So Gordon earns £33 000 per year.*

E

A box of cereal weighs 750 g.
Julie eats 60 g of this cereal each day.

How long will one box of cereal last her?

$750 \times 60 = 45\,000$

So the box will last her 45 000 days.

F

Joe works part-time 3 days a week in a school.
The cost of his bus fares each day is £3.20.
The summer term is 13 weeks long.

How much will Joe spend on bus fares for the whole term?

$3.20 \times 13 = 41.6$

So the cost of the bus fares will be £41.60.

G

Hayley has one cup of fruit tea in the afternoon each day.
She works out that each tea bag costs 4.4p.

She wants to know how much she will spend on this fruit tea in a year.

There are 365 days in a year.
$4.4 \times 365 = 1606$

So the cost of the tea will be £1606.

H

Ken has a recipe for summer fruit dessert.
Here is the list of ingredients.

Summer fruit dessert
Serves 6

3 peaches
6 apricots
6 large plums
225 g blueberries
175 g raspberries
50 g sugar

He wants to know how much sugar he needs for a fruit dessert for 12 people.

$50 \times 12 = 600$

So he needs 600 g of sugar.

(I)
Zoya has 4 planks, each 3 metres long.
How many planks 2 metres long can she saw from them?

$4 \times 3 = 12$
$12 \div 2 = 6$

So she can saw 6 planks.

(J)
A group of 210 students is going on a school trip in buses.
Each bus can carry 48 students.

How many buses will the school need to hire?

$210 \div 48 = 4.375$

So the school will need to hire 4 buses.

(K)
Colin pays £250 each year to be a member of a swimming club.
How much does he pay for each week?

There are 52 weeks in one year.
$52 \div 250 = 0.208$

So he pays about £0.21 each week.

(L)
Marcel needs a rope 20 metres long to stretch between two buildings.
He only has shorter pieces of rope.
Each of these pieces is 2.5 metres long.

How many of these pieces of rope will he need to use?

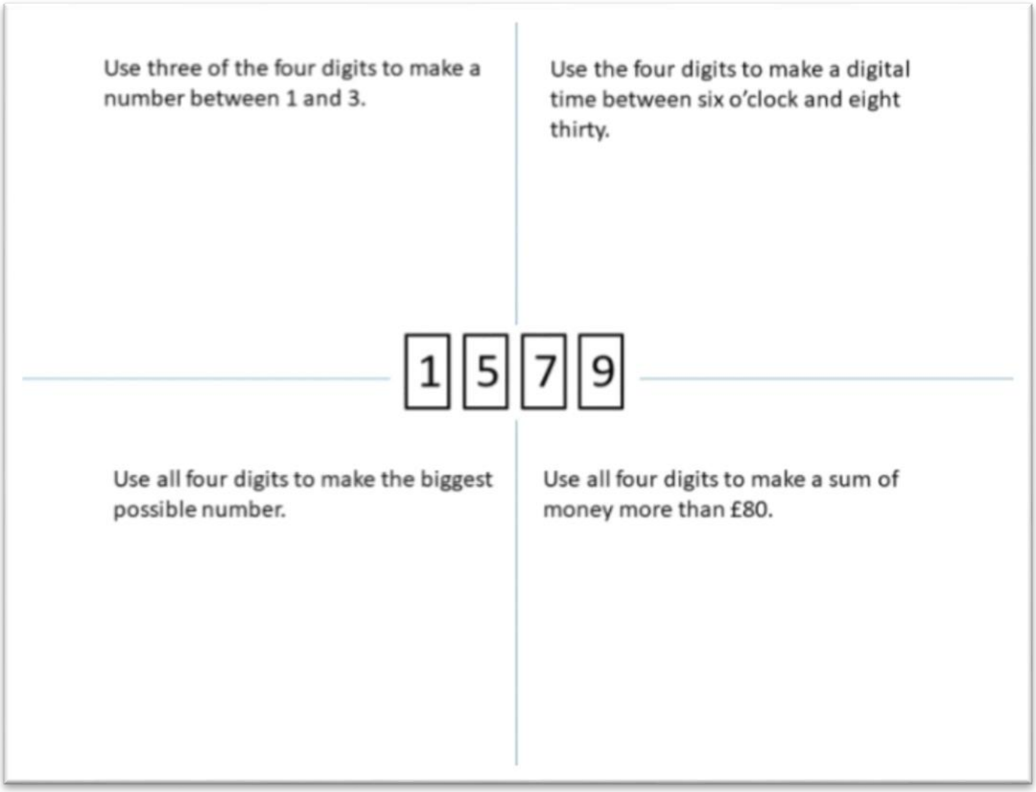
$20 \div 2.5 = 8$

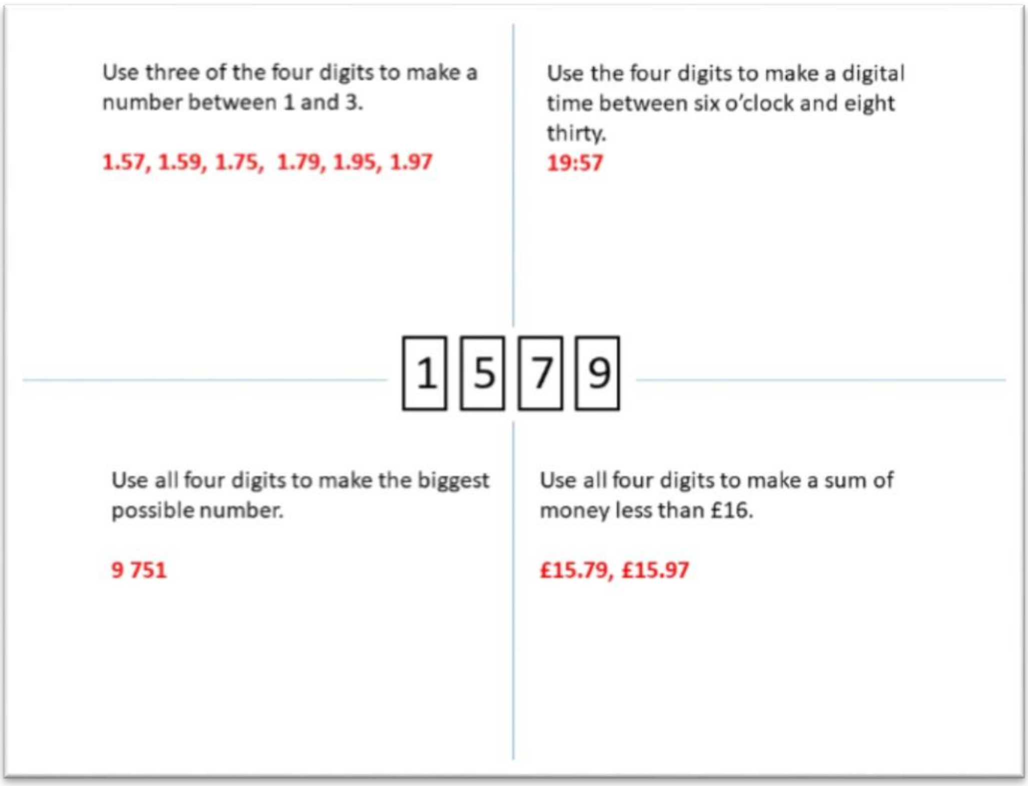
So he will need 8 of these pieces of rope.

4. SSDD Problems

SSDD Problems *('Same Surface, Different Depth')* - https://ssddproblems.com

They are a special set of problems that may look the same at first glance, but which require different mathematical ideas to solve them.





5. Scaffolding questions

One approach to problem solving for functional skills learners is to allow them to start by scaffolding questions.
Learners will be given an exam question and in pairs or small groups they can work through this question together. They will also be given cards with sequenced steps in order for them to solve the problem successfully.
Learners can discuss how to put these cards in the most sensible order and then work through each step.
Throughout the year, learners will need these scaffolding aids less and less as they will start to depict questions independently.
Here are 2 example questions including scaffolding questions.

Here is a plan of Martin's driveway.

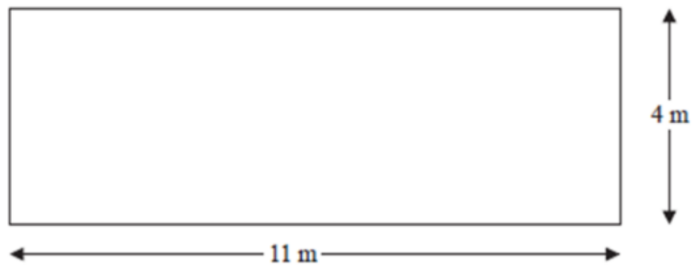


Diagram **NOT** accurately drawn

Martin is going to cover his driveway with gravel.
The gravel will be 6 cm deep.

Gravel is sold in bags.
There are 0.4 m^3 of gravel in each bag.
Each bag of gravel costs £38

Martin gets a discount of 30% off the cost of the gravel.

Work out the total amount of money Martin pays for the gravel.

Convert cm into m

Calculate overall volume

Calculate amount of bags needed

Calculate overall cost of bags needed

Calculate discount

Write a sentence answering the question

Mr Watkins needs to buy some oil for his central heating.

Mr Watkins can put up to 1500 litres of oil in his oil tank.
There are already 850 litres of oil in the tank.
Mr Watkins is going to fill the tank with oil.

The price of oil is 67.2p per litre.
Mr Watkins gets 5% off the price of the oil.

How much does Mr Watkins pay for the oil he needs to buy?

Calculate the amount of oil needed

Calculate 5% of the oil price per litre

Calculate the price of oil per litre after the discount

Calculate what Mr Watkins pays for the amount of oil needed

Write a sentence answering the question

Level 1 Functional Skills is filled with questions that learners will have to pull apart and understand what they are about. This is where RUCSAC comes in. This acronym is a useful way for learners to remember how to answer questions effectively.

The RUCSAC acronym stands for :-
Read, Underline, Choose, Solve, Answer, Check.

R	Read the question carefully	Find the important information - underline it!
U	Understand the question	What do you have to find out? Draw a 'picture' of the question, if it helps.
C	Choose the correct method of calculation	+ - x ÷ What method is best for you to use?
S	Solve the problem	Show every step and keep your working out neat.
A	Answer the question	Read the question again - have you answered it? Make the answer clear.
C	Check your answer	Does it make sense? Find a way to check - estimate or use the inverse.

The RUCSAC framework

Using RUCSAC

The best way to develop using RUCSAC is to give learners an opportunity to use it themselves. Give them worded questions and highlighters and pick apart the questions. You can start by discussing them as a group and then from there give them an opportunity to answer. An example of question and discussion shown below.

There are 62 students in the orchestra and twice that number in the band.
There are 38 boys and 13 girls in the choir.
If each student only participates in one group, how many students total are there in the orchestra, the band, and the choir?

Step 1 – Find the number of students in the band.

2 x 62 = 124

Step 2 – Find the number of students in the choir.

38 + 13 = 51

Step 3 – Find the total number of students.

124 + 62 + 51 = 237

Step 4– Answer = ***237 students***

7. Goal free problems

Using goal free problems allows learners to look at problems without restricting their thinking. Learners can look at what they have been given and think about everything that they can recall on topics involved without focussing on one specific goal.
These problems allow learners to develop independent thinking skills, problem solving skills as well as reasoning and communication skills.

http://goalfreeproblems.blogspot.com/

Seeta is organising a concert to raise money for a school and for a hospital.

A total of $\frac{1}{20}$ of the money received from selling tickets will be spent on hiring a hall.

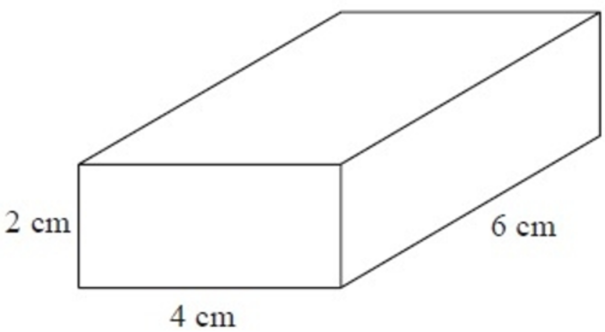
The rest of the money received from selling tickets will be given to the school and to the hospital in the ratio 2:3

Seeta expects to sell 1000 tickets at £23.50 each.

Work out what you can from this information.

Here is a box in the shape of a cuboid.

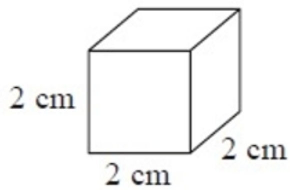
Diagram **NOT** accurately drawn



The box is made to hold cubes.

Each cube has edges of length 2 cm.

Diagram **NOT** accurately drawn



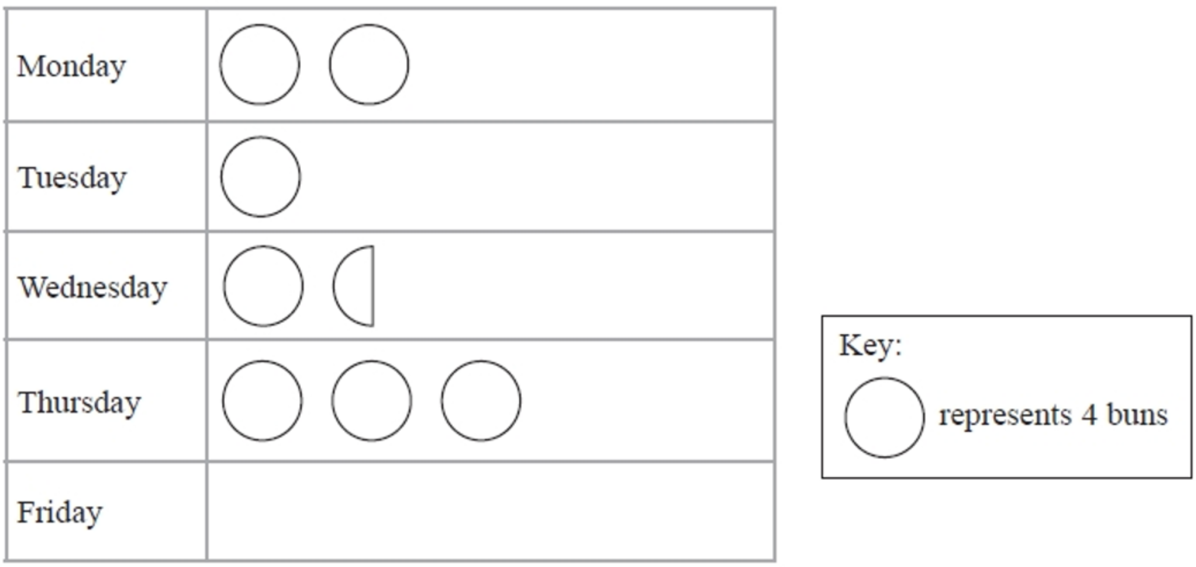
Work out what you can from this information.

Matthew has five cards.
Each card has a number on it.

2	**3**	**6**	**7**	**7**

Work out what you can from this information.

The pictogram gives information about the number of buns Sujata sold in her shop on each of four days last week.



On Friday last week Sujata sold 16 buns.

Work out what you can from this information.

LINKS AND OTHER RESOURCES

https://corbettmaths.com/
Home to thousands of maths resources: Videos, Worksheets, 5-a-day, Revision Cards and much more.

https://marsmaths.com/
Functional skills and GCSE online videos and questions for all learners. Entry 1, 2, 3, Level 1 and 2.

https://nrich.maths.org/
Thousands of free online mathematics resources developed by the University of Cambridge to enrich the mathematical experiences of all.

https://www.examwizard.co.uk
Exam Wizard is a free exam preparation tool containing a bank of past Edexcel exam questions, mark schemes and examiners' reports.

https://www.goteachmaths.co.uk/
Ready-to-use mathematics resources for Key Stage 3, Key Stage 4 and GCSE maths classes.

https://www.mathsbot.com/
Interactive tools and activities with 100's of randomly generated questions and answers.

https://www.mathsgenie.co.uk/
Maths Genie is a free GCSE and A Level revision site.
It has past papers, mark schemes and model answers to GCSE and A Level exam questions.

https://www.mathsisfun.com/
Math explained in easy language, plus puzzles, games, worksheets and an illustrated dictionary.
For K-12 kids, teachers and parents.

https://www.piximaths.co.uk/
PixiMaths has a lot of resources as well as SOWs and assessments for the new 9-1 maths GCSE.

https://www.skillsworkshop.org/
The home of free adult literacy, numeracy and Functional Skills resources since 2001.

https://www.tes.com/teaching-resources/
Tes provides a range of primary and secondary school teaching resources including lesson plans, worksheets and learner activities for all curriculum subjects.

http://mmlsoft.com/index.php/products/tarsia
Formulator Tarsia known earlier as Formulator Jigsaw is an editor designed for Teachers of Mathematics creating the activities in a form of jigsaws or dominos etc for later use in a class.

http://www.greatmathsteachingideas.com/
A professional learning blog sharing great ideas and resources with maths teachers.

:

Thank you

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