

# Mathematics

GCSE

Study Pack

*Measure, Shape*

*and*

*Data Handling*

**HCUC**

A merger between Uxbridge College and Harrow College

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*HCUC offers courses in mathematics at Entry level, Level 1, GCSE and A level. The following resource gives you a taste of some of the topics covered in Functional Skills and GCSE maths lessons. It includes some important facts along with worked examples and exam style questions. The solutions are included for your reference.*

*The purpose of this resource is to give an initial insight into an example lesson. Actual lessons may consist of more activities/use of technology and may be adapted to meet the needs of individual learners.*

*Please note that this GCSE resource is aimed at Grade 2/3 level learners.*

In this pack there are three example lessons

- |                          |   |            |
|--------------------------|---|------------|
| <b><u>Lesson 1:</u></b>  | Measure: Units of Measure and Conversions | page 4-8   |
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# CONVERSIONS

**Measuring Length**

We use a ruler to measure very small items.  
We measure these in millimetres.  
We write this as mm.  
 $10\text{mm} = 1\text{cm}$

We use a ruler to measure some larger items.  
We measure these in centimetres.  
We write this as cm.  
 $100\text{cm} = 1\text{m}$

**Measuring Length**

We use a ruler to measure very small items.  
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We write this as cm.  
 $100\text{cm} = 1\text{m}$

ink saving Eco

**LENGTH**  
**LENGTH**

**1 Talk Time**

**A** 

**B** 

**C** 

**D** 

**E** 

**F** 

**WEIGHT**



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## Measure: Units of measure and conversions

At GCSE learners are expected to be learn about different systems of measure (metric/imperial) and how to convert between these. The following resources show where units of measure are used in real life situations, worked examples and exam style questions at GCSE level are also given.

## **FACTS and EXAMPLES:**

There are two systems of measuring length, weight and capacity (amount of liquid).

The two systems are called the Metric System and the Imperial System.

In the UK we use both the metric and the imperial system.

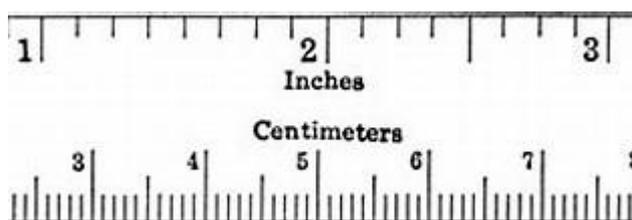
Some metric and imperial units are given in the table below.

<b>LENGTH/DISTANCE</b>			
<b>METRIC</b>		<b>IMPERIAL</b>	
kilometres	km	miles	
metres	m	yards	yds
centimetres	cm	feet	ft
millimetres	mm	inches	ins
<b>WEIGHT</b>			
<b>METRIC</b>		<b>IMPERIAL</b>	
Metric tonne	t	ton	t
kilograms	kg	stones	st
grams	g	pounds	lb or lbs
milligrams	mg	ounces	oz
<b>CAPACITY/ VOLUME</b>			
<b>METRIC</b>		<b>IMPERIAL</b>	
litres	L	gallons	gal
millilitres	ml	pints	pts

## Converting units:

Here are some common conversions. If you need to do any less usual conversions in the exam, the information that you need will be given.

5 miles = 8 km
1 kg = 2.2 lbs
1 inch = 2.54 cm
1 gallon = 4.5 litres
1 litre = 1.75 pints



### Example 1

Complete this table.

Write a sensible unit for each measurement.

	Metric	Imperial
The weight of a turkey	.....	pounds
The volume of water in a swimming pool	.....	gallons
The width of this page	centimetres	.....

### **Solution:**

Complete this table.  
Write a sensible unit for each measurement.

	Metric	Imperial
The weight of a turkey	...kilograms	pounds
The volume of water in a swimming pool	...litres.....	gallons
The width of this page	centimetres	...inches.....

### **Example 2:**

The distance from London to Oxford is 60 miles.

The distance from London to Cambridge is 103 km.

Which city is nearer to London?



### **Solution:**

$5 \text{ miles} = 8 \text{ km}$

$10 \text{ miles} = 16 \text{ km}$

$60 \text{ miles} = 6 \times 16 = 96 \text{ km}$

Oxford is 96 km from London, Cambridge is 103 km from London. So, Oxford is nearer to London than Cambridge.

**Example 3:**

Which bag is heavier?

**BAG A**



**BAG B**



**Solution:**

$$1 \text{ kg} = 2.2 \text{ lbs}$$

$$2.5 \text{ kg} = 2.5 \times 2.2 = 5.5 \text{ lbs}$$

*Bag A weighs 5 lbs*

*So, bag B is heavier.*

## EXAM STYLE QUESTIONS:

Question 1:

A Ford Focus car can hold 15 gallons of petrol. How many litres of petrol can the car hold if 1 gallon is equal to 4.5 L?



Question 2:

Ali is driving in France when he notices a signpost that says: Paris 240 km.

How far away from Paris is Ali in miles?



Question 3:

Monique has just arrived in the UK from France. Today she is shopping in the market, but she is confused. All the weights are in pounds (lbs). Monique buys 8 lbs of potatoes, 3 lbs of tomatoes, 2 lbs of onions, 4 lbs of apples and 5 lbs of bananas. What is the total weight of her purchases in kg?



## **ANSWERS:**

### **Question 1:**

*1 gallon = 4.5 L*

*15 gallons = 15 x 4.5 = 67.5 L*

### **Question 2:**

*8 km = 5 miles*

*80 km = 50 miles*

*240 km = 3 x 80 = 240 miles*

*(240 ÷ 80 = 3)*

*Ali is 240 miles from Paris*

### **Question 3:**

*Total weight = 8+3+2+4+5 = 22 lbs*

*1 kg = 2.2 lbs*

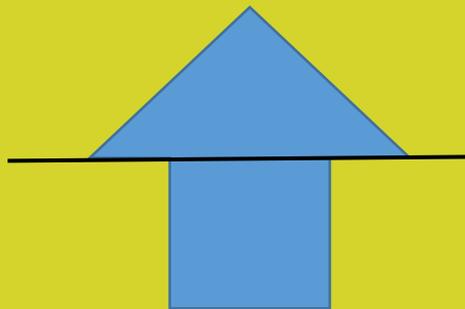
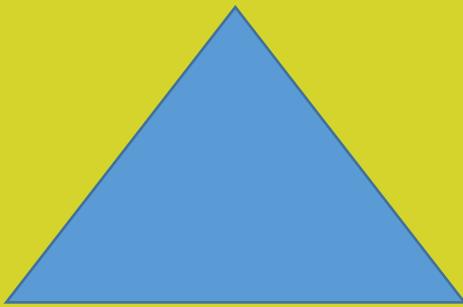
*Weight of purchases = 22 ÷ 2.2 = 10 kg*

## USEFUL LINKS

For further information and more practice questions, check out the following links.

<u>Useful links</u>	<u>Information</u>
<a href="https://www.bbc.co.uk/bitesize/guides/zthsgk7/revision/3">https://www.bbc.co.uk/bitesize/guides/zthsgk7/revision/3</a>	Good revision material at all levels
Corbett Maths: <a href="https://corbettmaths.com/wp-content/uploads/2013/02/metric-units-pdf.pdf">https://corbettmaths.com/wp-content/uploads/2013/02/metric-units-pdf.pdf</a>	Practice worksheets and their answers
Edexcel <a href="https://www.gatewayqualifications.org.uk/webinars/good-practice-in-assessing-entry-level-qualifications/">https://www.gatewayqualifications.org.uk/webinars/good-practice-in-assessing-entry-level-qualifications/</a>	Past exam papers from Edexcel
Skills workshop: <a href="https://www.skillsworkshop.org/category/link-types/learning-resources-external-links/printable-resource-sites/printable-maths-numer">https://www.skillsworkshop.org/category/link-types/learning-resources-external-links/printable-resource-sites/printable-maths-numer</a>	More practice and information on Measure

# Area and Perimeter



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# S h a p e s

## A r e a   a n d   P e r i m e t e r

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## Contents

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## Key words and how it is used in everyday life

Word	Definition
Perimeter	The distance all the way around the outside of a 2D shape.
Area	The area of any 2D shape is the size of the region enclosed within it.
2D shape	2D shape can be drawn flat on a piece of paper.
Compound shape	shape made up of two or more basic shapes

Area and perimeter are used in everyday life hence its inclusion in the GCSE syllabus.

Perimeter is used to calculate a distance around a shape for example, a fence around a garden or how much ribbon is needed to place around a cake.

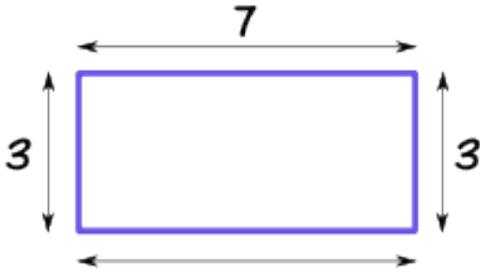
Area is used to calculate space for example, how many tiles needed for a bathroom floor or calculating how much paint is needed to paint a wall.

## What is Area and Perimeter?

### Perimeter:

The **perimeter** is the distance all the way around the outside of a 2D shape. To work out the **perimeter**, add up the lengths of all the sides.

A Perimeter is a one-dimensional measurement. It is a length measured usually in metric units such as cm, m, km



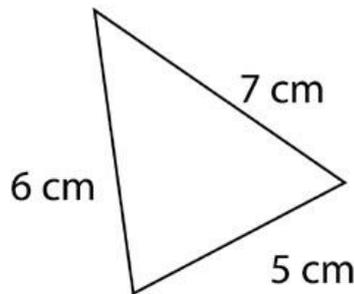
To calculate the perimeter of this rectangle, we will have to add all the sides to get the final answer.

**Answer:  $7 + 7 + 3 + 3 = 20$**

### **Example question 1:**

Calculate the perimeter of this triangle

**Answer:  $6\text{cm} + 5\text{cm} + 7\text{cm} = 18\text{cm}$**



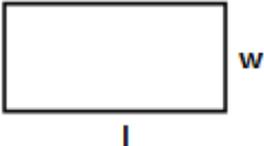
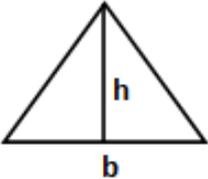
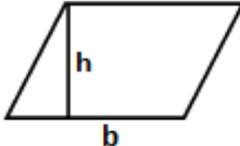
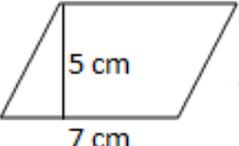
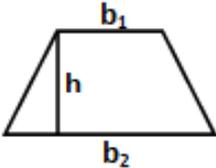
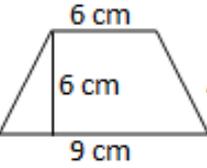
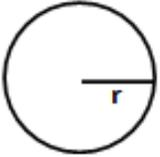
### **Example question 2:**

Anna wants to put fence around her farm land. Length of her garden is 4m and width is 3.5 m. How much fence is needed?

**Answer:  $4\text{m} + 3.5\text{m} + 4\text{m} + 3.5\text{m} = 15\text{m}$**

## Area:

The area of any **2D shape** is the size of the region enclosed within it. To calculate the area of shapes there are specific formulae to be followed as given in the table below

Shape	Formula	Example
Square 	$A = l \times l = l^2$	What is the area of a square of length 4 cm? $A = 4 \times 4 = 16 \text{ cm}^2$
Rectangle 	$A = l \times w$	What is the area of a rectangle of length 7 inches and width 5 inches? $A = 7 \times 5 = 35 \text{ in}^2$
Triangle 	$A = 1/2 \times b \times h$	What is the area of a triangle with height 6 inches and base 5 inches? $A = 1/2 \times 6 \times 5 = 15 \text{ in}^2$
Parallelogram 	$A = h \times b$	 $A = 5 \times 7 = 35 \text{ cm}^2$
Trapezoid 	$A = 1/2 \times h \times (b_1 + b_2)$	 $A = 1/2 \times 6 \times (9 + 6) = 45 \text{ cm}^2$
Circle 	$A = \pi \times r^2$ $(\pi = 3.14 \text{ or } 22/7)$	What is the area of a circle with radius 9 feet? $A = \pi \times 9^2 = 81\pi = 254.34 \text{ ft}^2$

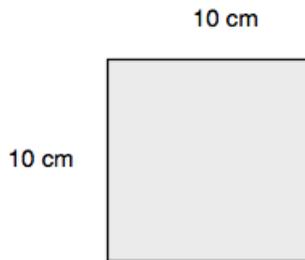
This is a measure of space and as you can see the formula, we have to multiply the 2 dimension therefore the units for the area are squared, for example  $\text{cm}^2$ . We can see this in the worked examples below.

## More worked Example questions

### Example question 1

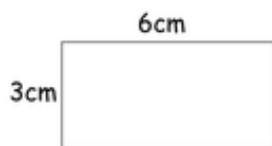
Calculate the area of the following:

**Answer**



$$10\text{cm} \times 10\text{cm} = 100\text{cm}^2$$

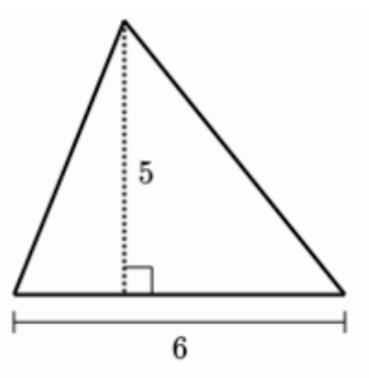
$$\text{cm} * \text{cm} = \text{cm}^2$$



$$3\text{ cm} \times 6\text{ cm} = 18\text{cm}^2$$

### Example question 2

Calculate the area of the following:



**Answer**

$$5 \times 6 = 30\text{cm}^2$$

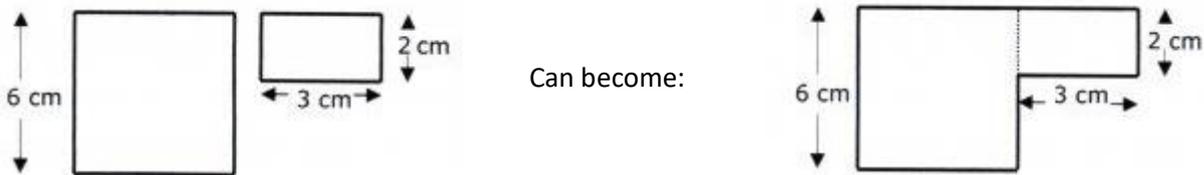
$$30 \div 2 = 15\text{cm}^2$$

**Final answer = 15 cm<sup>2</sup>**

## Compound shape

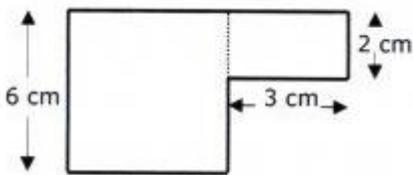
We can build on this knowledge by calculating the area of compound shapes. In real life, many of the shapes we come across are not exact squares, rectangles, etc. They are mixture of 2 or more shapes.

A **compound shape** is made up of two or more basic shapes, for example, a square and a rectangle can create a compound shape such as:



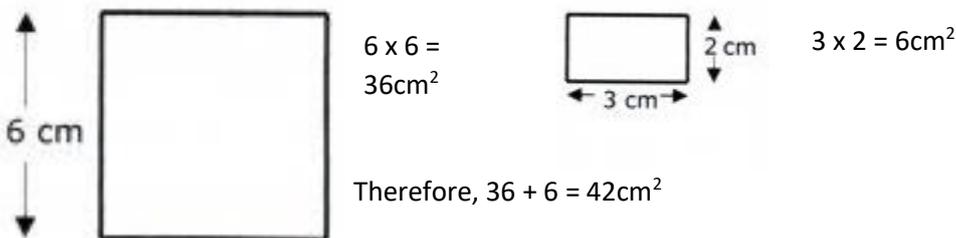
### Example question 1

Calculate the area of the following:



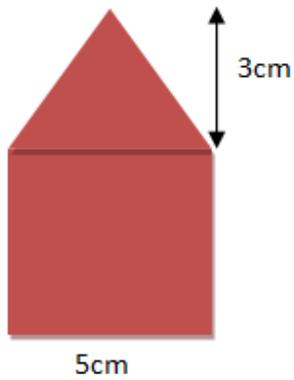
### Answer

As shown in the diagram above we can split this compound shape into two basic shapes and work the areas separately and then add the results.

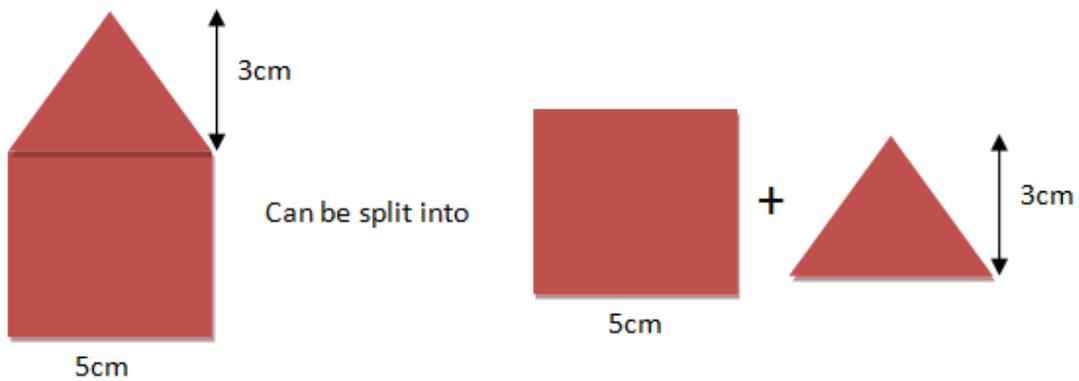


## Example Question 2

Calculate the area of the following:



**Answer**



Square:  $5 \times 5 = 25 \text{ cm}^2$

Triangle:  $5 \times 3 \div 2 = 7.5 \text{ cm}^2$

**Therefore:**

$25 + 7.5 = 32.5 \text{ cm}^2$

## Exam style questions – MathsGenie (Edexcel Exam board)

1.

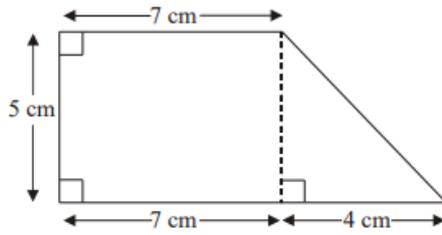


Diagram **NOT** accurately drawn

Work out the area of the shape. 3marks

2.

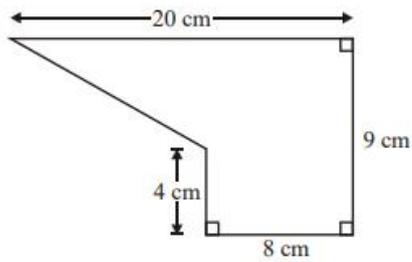


Diagram **NOT** accurately drawn

The diagram shows a shape.  
Work out the area of the shape. 4marks

3. Here is a trapezium.

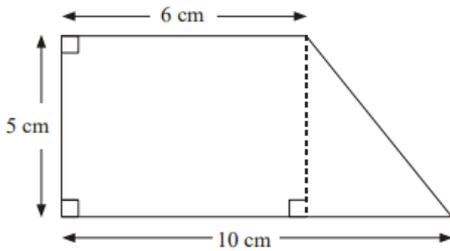


Diagram **NOT** accurately drawn

Work out the area of the trapezium. 2marks

## Answers:

1) *Split shape into a rectangle and a triangle.*

*Area of rectangle ( $5 \times 7 = 35$ ),*

*Area of triangle ( $5 \times 4 \div 2 = 10$ )*

*add both =  $45 \text{ cm}^2$*

2) *Split shape into a rectangle and a triangle.*

*Area of rectangle ( $9 \times 8 = 72$ ),*

*Area of triangle ( $5 \times 12 \div 2 = 30$ )*

*add both =  $102 \text{ cm}^2$*

3) *Split shape into a rectangle and a triangle.*

*Area of rectangle ( $5 \times 6 = 30$ ),*

*Area of triangle ( $5 \times 4 \div 2 = 10$ )*

*add both =  $40 \text{ cm}^2$*

## Useful links

Web links	Information
<a href="https://www.bbc.co.uk/bitesize/topics/zrf3cdm">https://www.bbc.co.uk/bitesize/topics/zrf3cdm</a>	Factual knowledge and practice questions
<a href="https://www.mathsgenie.co.uk/resources/37_area-of-compound-shapes.pdf">https://www.mathsgenie.co.uk/resources/37_area-of-compound-shapes.pdf</a>	Exam papers and practice questions
<a href="https://mathsmadeeasy.co.uk/gcse-maths-revision/areas-of-shapes-gcse-revision-and-worksheets/">https://mathsmadeeasy.co.uk/gcse-maths-revision/areas-of-shapes-gcse-revision-and-worksheets/</a>	Factual knowledge and practice questions
<a href="https://revisionmaths.com/gcse-maths/geometry-and-measures/perimeter">https://revisionmaths.com/gcse-maths/geometry-and-measures/perimeter</a>	Practice worksheets

## References:

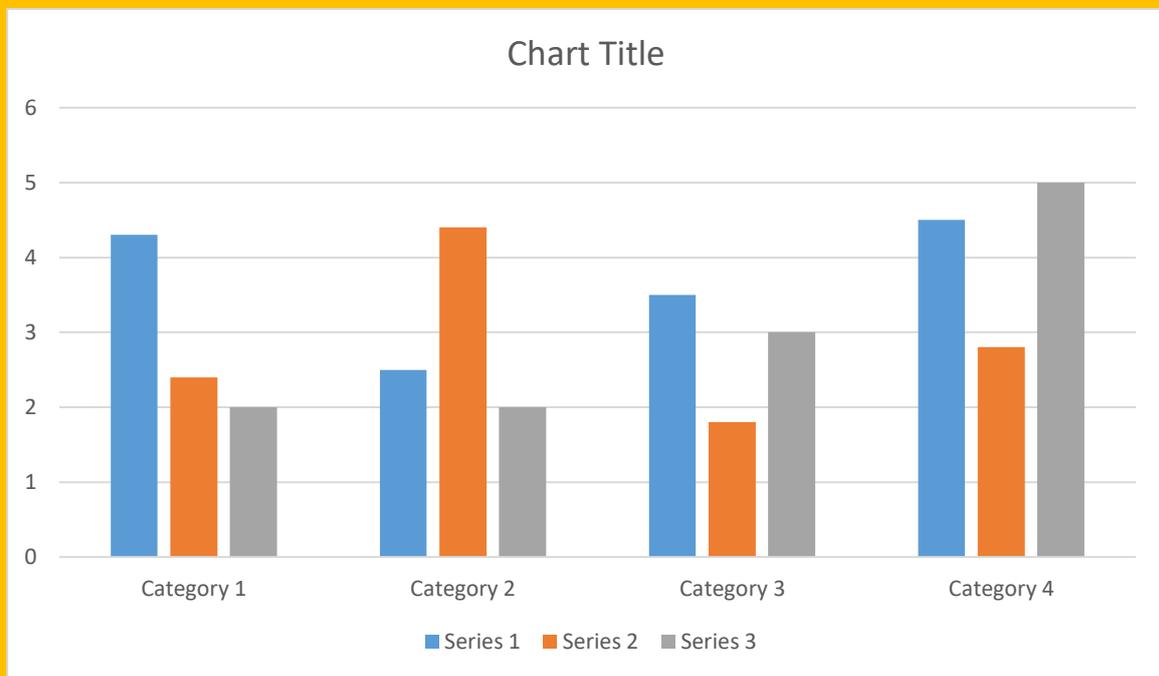
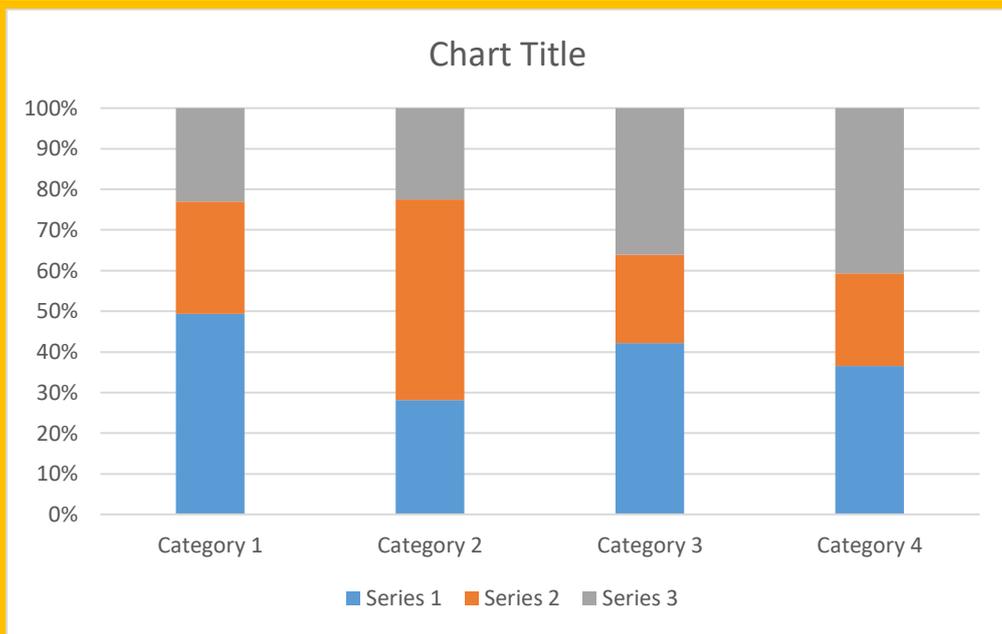
- 1) <https://www.bbc.co.uk/bitesize>
- 2) <https://www.splashlearn.com/math-vocabulary/geometry>
- 3) <https://www.bbc.co.uk/bitesize/subjects/z826n39>
- 4) <https://www.google.com/imghp?hl=en>
- 5) [www.study.com](http://www.study.com)
- 6) [www.revisionmaths.com](http://www.revisionmaths.com)

Data Handling

Bars and Charts

GCSE

Study Resource



# Bar Charts: Dual and Composite

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## Bar charts and Tables

*A good understanding of Maths is important and essential in life, Maths is used in day to day life with things such as managing money, planning your day, and recording data.*

*In this session we will be introducing some ways of collecting data for GCSE, to give you an idea of the course contents, we will be introducing composite bar charts, and using some exam questions for extra practice*

### Keywords for Table and charts

<b>Keyword</b>	<b>Description</b>
Data	Facts and statistics collected together for reference and analysis
Tally	A continuous count of something
Frequency	The number of times a data value occurs
Table	Data arranged into rows and columns
Chart	A graphical representation of data
Pictogram	Representation of data through pictures
Bar chart	A chart that uses bars to represent data in different categories
Compound bar chart	A graph which combines more types of information into one chart

## Bar chart

A **bar graph** (or **bar chart**) is a way of displaying data, typically data split into categories, using bars of different heights. Bar graphs are not the same thing as histograms, and you should make sure **to leave gaps between the bars** when drawing your bar graph so it doesn't look like a histogram.

## **Comparative bar charts**

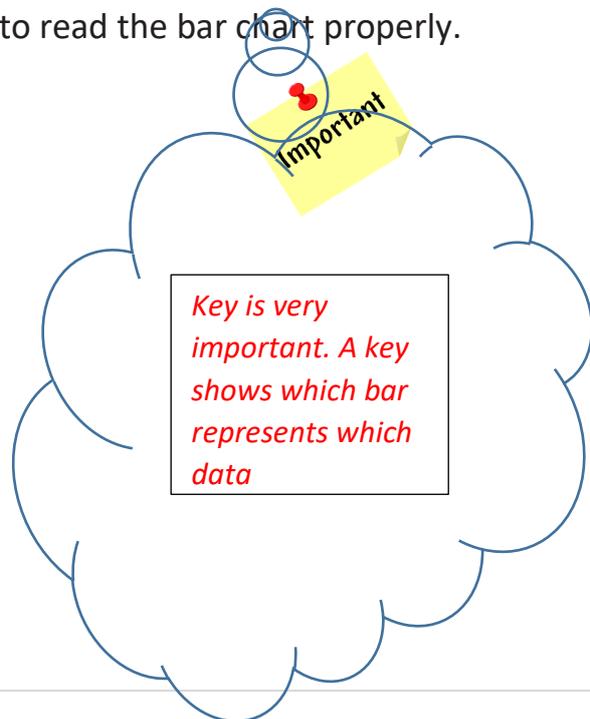
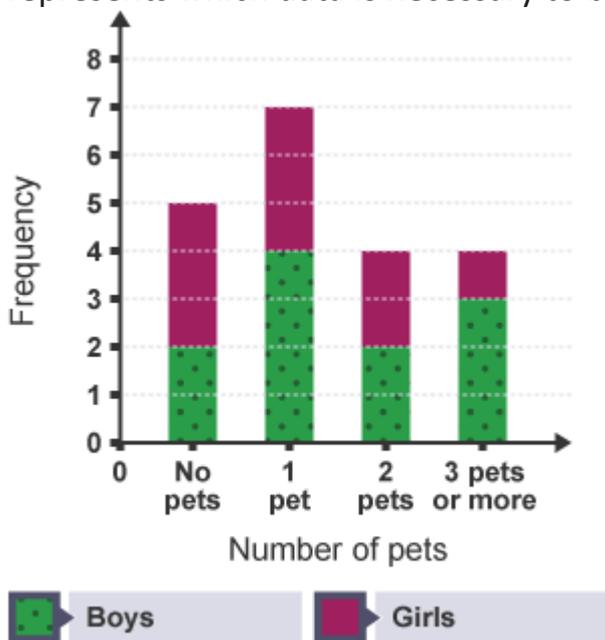
Bar charts may be needed to compare data. A **comparative bar graph** is used to compare two sets of data on the same axis, such as comparing the numbers of pets owned by a class.

Following table gives the information as a table:

	No pets	1 pet	2 pets	3 or more pets
Boys	2	4	2	3
Girls	3	3	2	1

**Composite** bar charts are bar charts where each bar displays multiple data points stacked in a single row or column. This may, for instance, take the form of uniform height bars charting a time series with internal stacked colours indicating the percentage participation of a sub-type of data.

It can show this information which is easy to see at a glance. A key that shows which bar represents which data is necessary to be able to read the bar chart properly.



## Dual bar chart

Bar charts can provide multiple pieces of information.

### Example

This composite bar chart shows income (in £000s) for direct sales and online sales for four companies (A, B, C and D).



- (i) Which company has the highest total sales?

We need to add up the total direct sales and online sales for each company

Company A:  $29 + 25 = 54$   
Company B:  $24 + 28 = 52$   
Company C:  $19 + 30 = 49$   
Company D:  $15 + 25 = 40$

Therefore the answer is Company A.

- (ii) Which company has the highest percentage of online sales?

We are being asked which company has the highest percentage of online sales in total sales. Therefore, we need to calculate what percentage online sales are of total sales for each of the four companies.

From the bar chart, it is clear that we can ignore Company A (because online sales is lower than direct sales)

### Speed Tip!

1. Since we are comparing 'like with like', there is no need to change each figure into its proper units (£000s).
2. Sometimes you can leave out part of the calculations – for example, in part (i) it is obvious from the chart that Company D has lower total sales – so we could just ignore it.

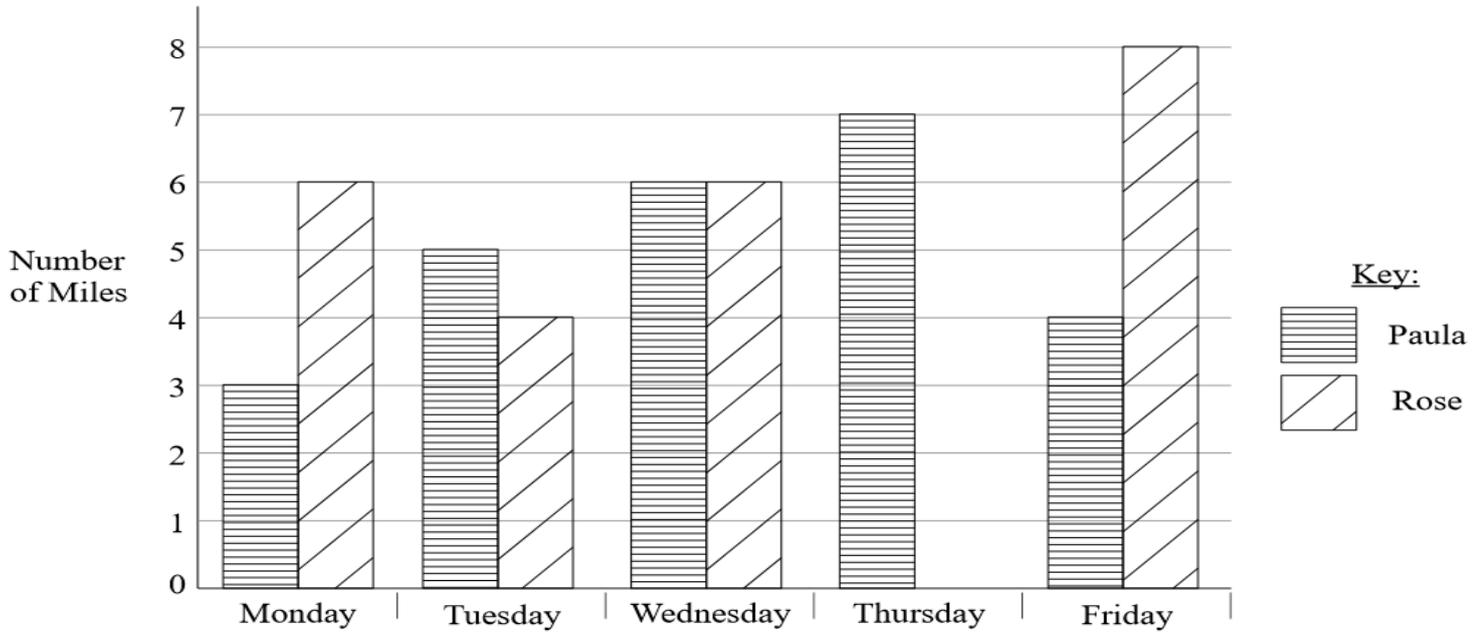
## Answer

Company B	$28 / 52 \times 100 =$	54%
Company C	$30 / 49 \times 100 =$	61%
Company D	$25 / 40 \times 100 =$	63%

Therefore the answer is Company D.

# Exam Style questions

Here is a bar chart showing the number of miles Paula and Rose ran from Monday to Friday in a week.



Rose runs further than Paula on Monday

(a) How much further?

.....  
(1)

Rose ran 6 miles on Thursday

(b) Use this information to complete the bar chart.

(1)

Rose is not going to run on Saturday.

(c) How many miles would Paula have to run on Saturday so that the number of miles she runs from Monday and Saturday is the same as the number of miles Rose runs from Monday to Saturday.

.....  
(2)

# Answer

## Solution Q1

Rose runs further than Paula on Monday

(a) How much further?

$$6 - 3$$

$$\begin{array}{r} \dots\dots\dots 3 \\ \hline \end{array} \quad (1)$$

Rose ran 6 miles on Thursday

(b) Use this information to complete the bar chart.

(1)

Rose is not going to run on Saturday.

(c) How many miles would Paula have to run on Saturday so that the number of miles she runs from Monday and Saturday is the same as the number of miles Rose runs from Monday to Saturday.

$$PAULA : 3 + 5 + 6 + 7 + 4 = 25 \text{ miles}$$

$$ROSE : 6 + 4 + 6 + 6 + 8 = \cancel{28} \text{ miles}$$

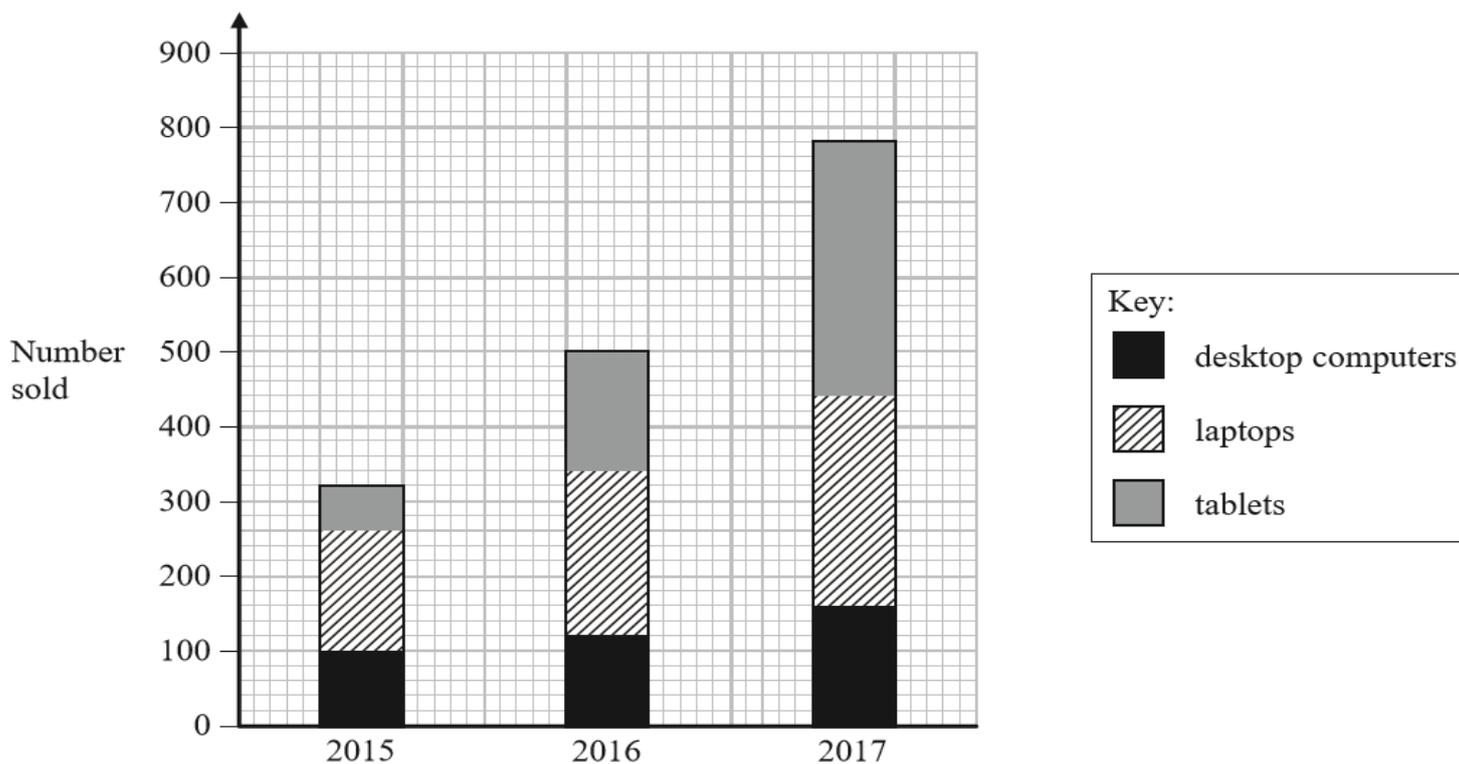
$$30$$

$$30 - 25$$

$$\begin{array}{r} \dots\dots\dots 5 \\ \hline \end{array} \quad (2)$$

Q2 A shop sells desktop computers, laptops and tablets.

The composite bar chart shows information about sales over the last three years.



(a) Write down the number of desktop computers sold in 2015

(b) Work out the total number of laptops sold in the 3 years.

.....  
(3)

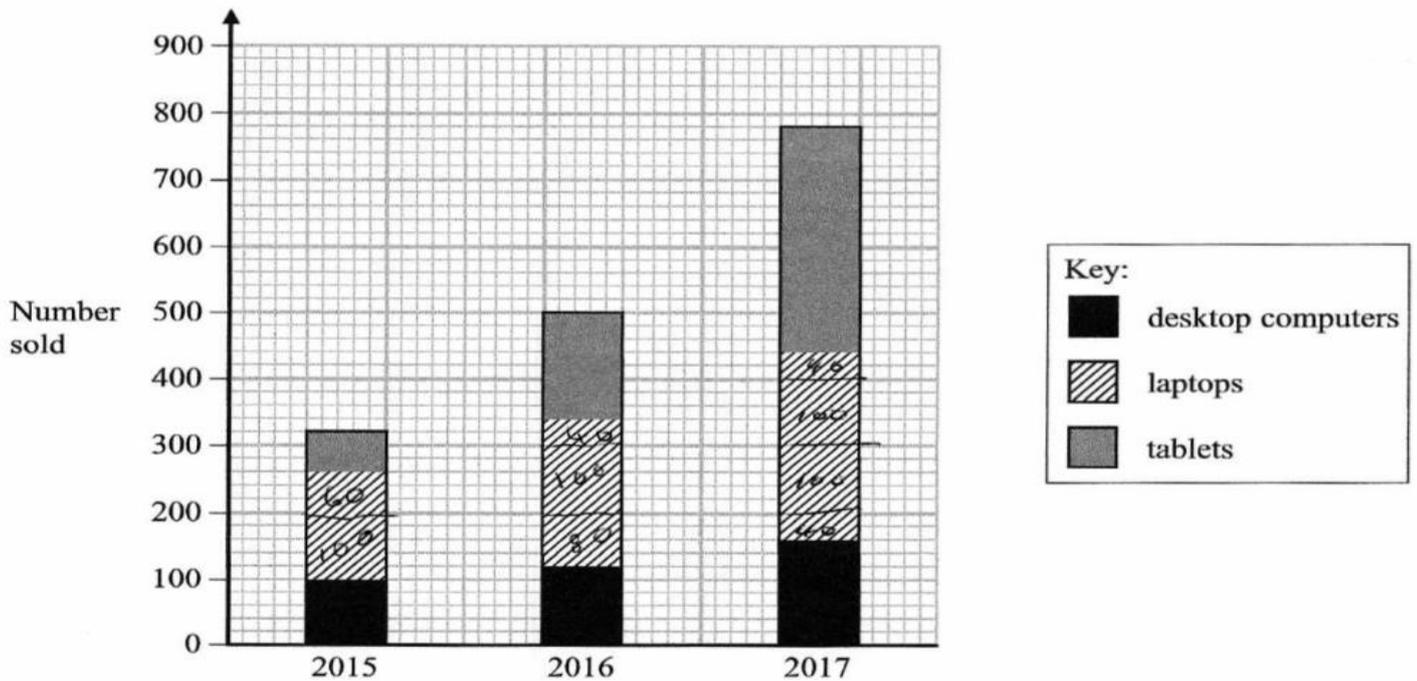
(c) State the item that had the greatest increase in sales over the 3 years.

Give a reason for your answer.

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

## Solution Q2

The composite bar chart shows information about sales over the last three years.



(a) Write down the number of desktop computers sold in 2015

100

(b) Work out the total number of laptops sold in the 3 years.

$$160 + 220 + 280$$

660

(3)

(c) State the item that had the greatest increase in sales over the 3 years.  
Give a reason for your answer.

Tablets. They had lowest sales in 2015 and greatest sales in 2017.

(2)

## Useful websites

Link	Explanation
<a href="https://www.mathsgenie.co.uk/resources/2-bar-charts.pdf">https://www.mathsgenie.co.uk/resources/2-bar-charts.pdf</a>	Exam-style questions
<a href="https://www.khanacademy.org/math/pre-algebra/pre-algebra-math-reasoning/pre-algebra-picture-bar-graphs/v/creating-bar-charts-1">https://www.khanacademy.org/math/pre-algebra/pre-algebra-math-reasoning/pre-algebra-picture-bar-graphs/v/creating-bar-charts-1</a>	Clear video clips to understand the topic well. Extra questions are given in every clip.
<a href="https://mathsmadeeasy.co.uk/gcse-maths-revision/bar-graphs-revision/">https://mathsmadeeasy.co.uk/gcse-maths-revision/bar-graphs-revision/</a>	Revision notes and worksheets can be found here.

## References:

<sup>1</sup> <https://www.bbc.co.uk/bitesize/guides/zc7sb82/revision/4>

1

[https://en.wikipedia.org/wiki/Composite\\_bar\\_chart#:~:text=Composite%20bar%20charts%20are%20bar,a%20sub%2Dtype%20of%20data.](https://en.wikipedia.org/wiki/Composite_bar_chart#:~:text=Composite%20bar%20charts%20are%20bar,a%20sub%2Dtype%20of%20data.)

<sup>1</sup> <http://www.mathcentre.ac.uk/resources/uploaded/8-composite-bar-charts.pdf>

# CONTACT US:

## UXBRIDGE COLLEGE

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### Uxbridge Campus

Park Road,  
Uxbridge,  
Middlesex  
UB8 1NQ

### Hayes Campus

College Way,  
Coldharbour Lane,  
Hayes,  
Middlesex  
UB3 3BB

T +44 (0)1895 853333  
[www.uxbridgecollege.ac.uk](http://www.uxbridgecollege.ac.uk)

## HARROW COLLEGE

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### Harrow-on-the-Hill Campus

Lowlands Road,  
Harrow,  
Middlesex  
HA1 3AQ

### Harrow Weald Campus

Brookhill,  
Harrow Weald,  
Middlesex  
HA3 6RR

T +44 (0) 020 8909 6000  
[www.harrow.ac.uk](http://www.harrow.ac.uk)



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