

MATHEMATICS NOTES Form 2

Booklet 1

Ms. G. Bonnici

Name : _____

Class: _____




Mathematics is the alphabet in which God has written the Universe.

Galileo Galilei



Working with Numbers



We are learning to:			
Understand how Indices work			
Use the index laws for multiplication and division			
Understand the zero power and indices in brackets			
Work with negative indices			
Work with numbers in the Standard Form			
Round numbers to a given Place Value			
Use Decimal Places and Significant Figures to make estimations			



Chapter 1, Pg. 20: Working with Numbers

$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$ can be written as 3^7

Can you find another way of writing the following?

$5 \times 5 \times 5 \times 5 \rightarrow$ _____ $7 \times 7 \times 7 \rightarrow$ _____

$2 \times 2 \times 2 \times 11 \times 11 \times 11 \times 11 \rightarrow$ _____

$a \times b \times a \times b \times a \times b \rightarrow$ _____

Is 3^4 equal to 3×4 ?

$$3^2 \times 3^5 = \underline{\hspace{2cm}} = 3^{\square}$$

What happens to the powers when multiplying two indices with the same base?

How can we write the following?

$$7^2 \times 7^5 \rightarrow \underline{\hspace{4cm}}$$

$$2^5 \times 2^6 \times 2^4 \rightarrow \underline{\hspace{4cm}}$$

Check what happens when we divide two indices with the same base.

$$7^8 \div 7^3$$

Examples:

$$4^3 \times 4^5 \rightarrow \underline{\hspace{2cm}}$$

$$6^5 \div 6 \rightarrow \underline{\hspace{2cm}}$$

$$x^3 \times x^4 \times x^5 \rightarrow \underline{\hspace{2cm}}$$

$$3x^5 \times 4x^4 \div 6x^3 \rightarrow \underline{\hspace{2cm}}$$

$$\frac{18x^2y^3}{6xy^2} \rightarrow \underline{\hspace{2cm}}$$

$$\frac{15a^3b^9}{ab^5} \rightarrow \underline{\hspace{2cm}}$$

Find the value of n:

$$3^n \times 3^8 = 3^{14}$$

$$3^n \div 3^8 = 3^{14}$$

$$x^6 \times x^n \div x^4 = x^{10}$$

Write the first two laws of Indices here:

Law for Multiplication

Law for Division

Work out the following with the expansion method, and then by the Law for Division:

$$3^5 \div 3^5$$

By expansion

By Law for Division

What do you conclude by these two answers?

3rd Index Law



Examples:

Find the value of the following:

$$10^{-3} \rightarrow$$

$$5^{-2} \rightarrow$$

$$25^{-1} \rightarrow$$

$$\left(\frac{3}{4}\right)^{-3} \rightarrow$$

$$\left(\frac{7}{8}\right)^{-2} \rightarrow$$

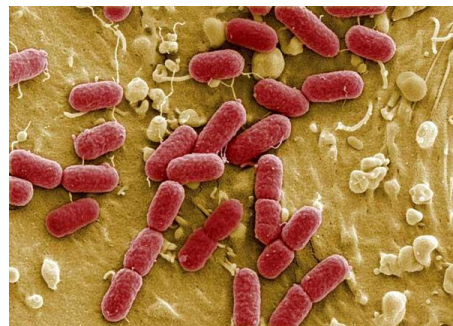
Simplify: $\frac{(10b^{-2})^4}{(5b^3)^3}$

Standard Form



Saturn is the largest planet in the solar system. It is about 120,000km across and 1,400,000,000km away from the Sun.

The photo shows Escheria coli bacteria. These bacteria are commonly known in relation to food poisoning as they can cause serious illness. Each bacterium is about 0.000001m long.



You can also remember that:

Very Large Numbers have a **Positive Power** when in Standard Form.

Very Small Numbers have a **Negative Power** when in Standard Form.

Now try these out:

Ordinary Number	Index Number
0.00056	
0.0000073	
	1.6×10^5
	2.7×10^{-4}
123 000 000	
0.05	
	4.763×10^{-2}



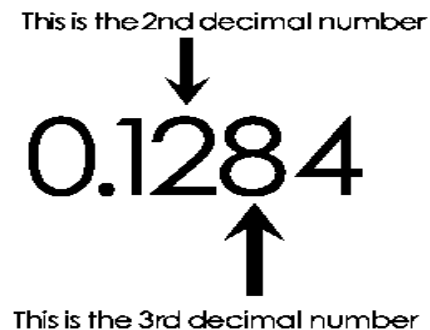
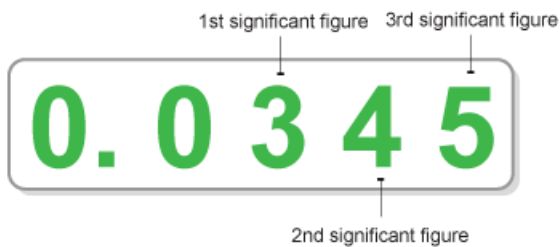
On your calculator you can write a number in the Standard Form using the



Rounding up Numbers

The first significant figure is the first non-zero digit in a number.

The first decimal place is the first digit immediately after the point.



Round up the following Numbers:

6735

Nearest 1000
or 1sf:

Nearest 100
or 2sf:

Nearest 10
or 3sf:

27.83652

2 sig. fig.

3sf or 1dp:

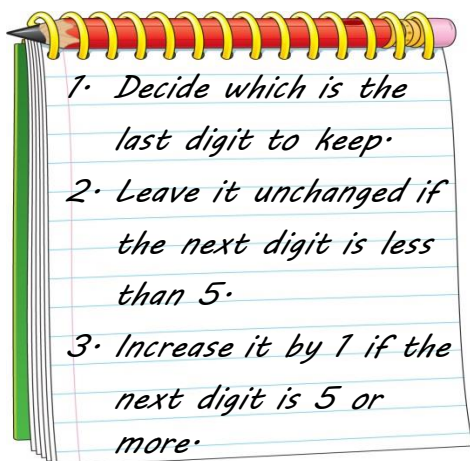
4sf or 2dp:

0.0507

1sf or 2dp:

2sf or 3dp:

Reminder: How to round numbers:



MTH_EN_801_021 Rounding Numbers RLO2 At the Greengrocer
MTH_EN_804_051 Rounding Numbers to a given number of dp. RLO2

Rough Estimates

We make an estimate when we need to calculate something without having a calculator at hand.

To simplify things we **round up each number to 1 sig. fig.** at the start.



Examples:

Give an estimate to the following and then find the exact answers using your calculator.

$$\begin{array}{r} 0.048 \times 3.275 \\ \hline 0.367 \end{array}$$



The Area of this metal machine part is given by calculating:

$$\frac{3.142 \times (0.2954)^2}{2.26} \text{ cm}^2$$

Estimate this area to one significant figure then find the exact answer using your calculator.



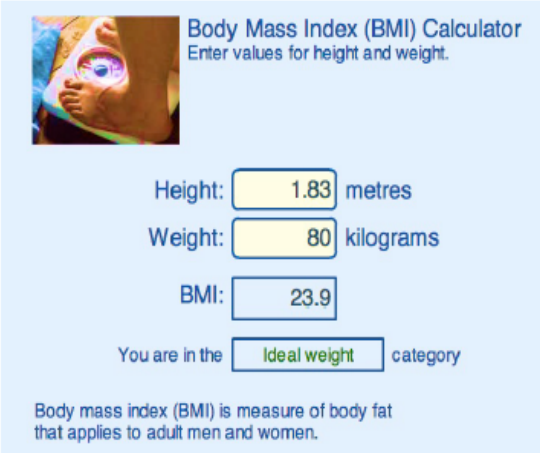
STP 8, Pg. 40, Investigation 1

Body Mass Index

This calculator shown is used on websites to help an adult decide if he or she is overweight.

What values of the BMI indicate whether an adult is underweight, overweight, obese, or very obese?

Investigate how the calculator works out the BMI from the height and weight.



Body Mass Index (BMI) Calculator
Enter values for height and weight.

Height: metres
Weight: kilograms
BMI:

You are in the category

Body mass index (BMI) is measure of body fat that applies to adult men and women.

Note for pupils:

If you put your own details into this calculator, *don't take the results too seriously!* It is designed for adults *who have stopped growing* and will give misleading results for children or teenagers!

Legs Eleven



Take a four-digit number: 3527.

Move the first digit to the back of the queue and move the rest along, giving 5273.

Now add your two numbers.



Now try a few other four-digit numbers. What do all your answers have in common?




Why?

Does it work for two-digit, three-digit, five-digit, 38-digit ... numbers?

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Area and Volume



We are learning to:			
Make unit conversions			
Find the Area and Perimeter of 2D shapes			
Find the Area and Perimeter of Compound Shapes			
Find the Shaded Area			
Find Volumes of Cubes and Cuboids			
Find the volume of a Prism			
Relate Volume and Capacity			

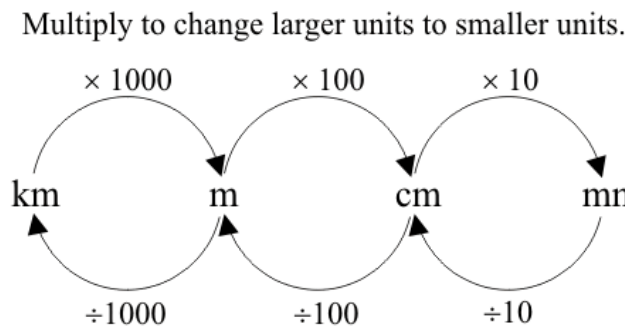


Chapter 7, Pg. 138: Area of triangles and parallelograms
Chapter 18, Pg. 348: Volumes

Lengths and Distances can be measured in:



Conversions between one unit and another can be done as follows:



Convert the following measurements:

km	m	cm	mm
6.125			
	3.7		
		354.3	
			7568

Reminders:

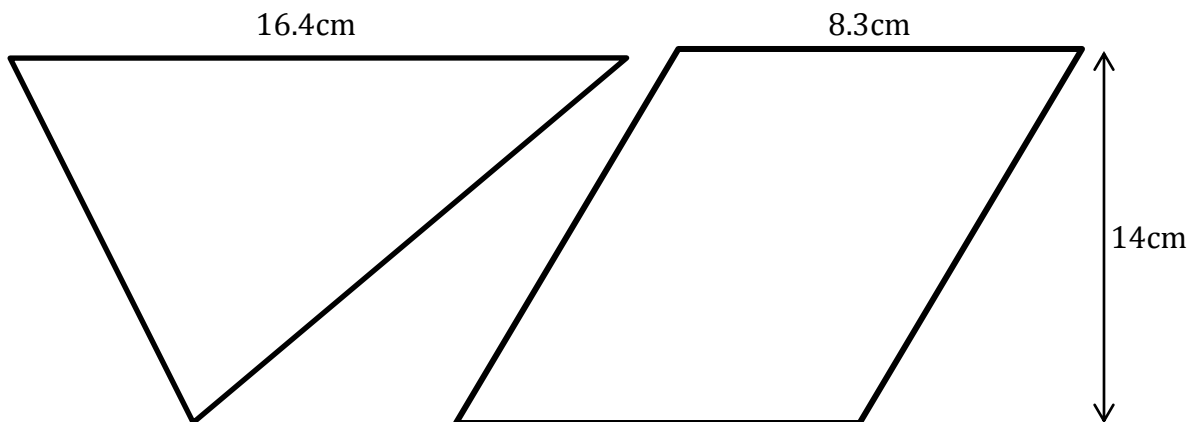
Area of a Square / Rectangle = Length \times Breadth

Perimeter of a Square / Rectangle = $(L + B) \times 2$

Area of a Triangle = $\frac{\text{Base} \times \text{Height}}{2}$

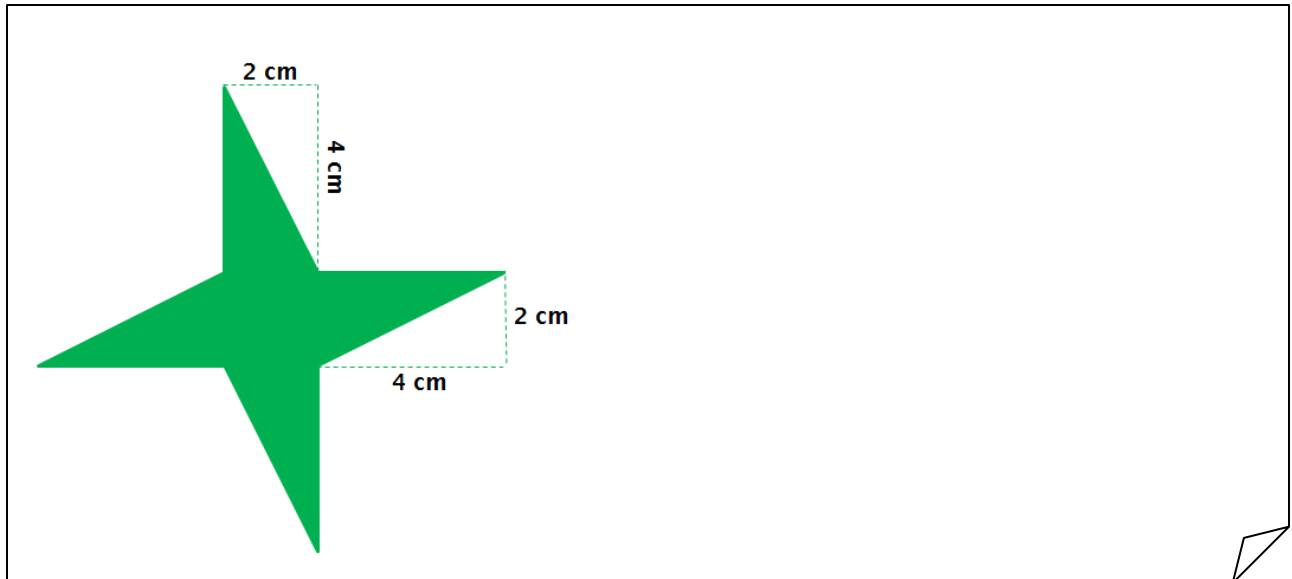
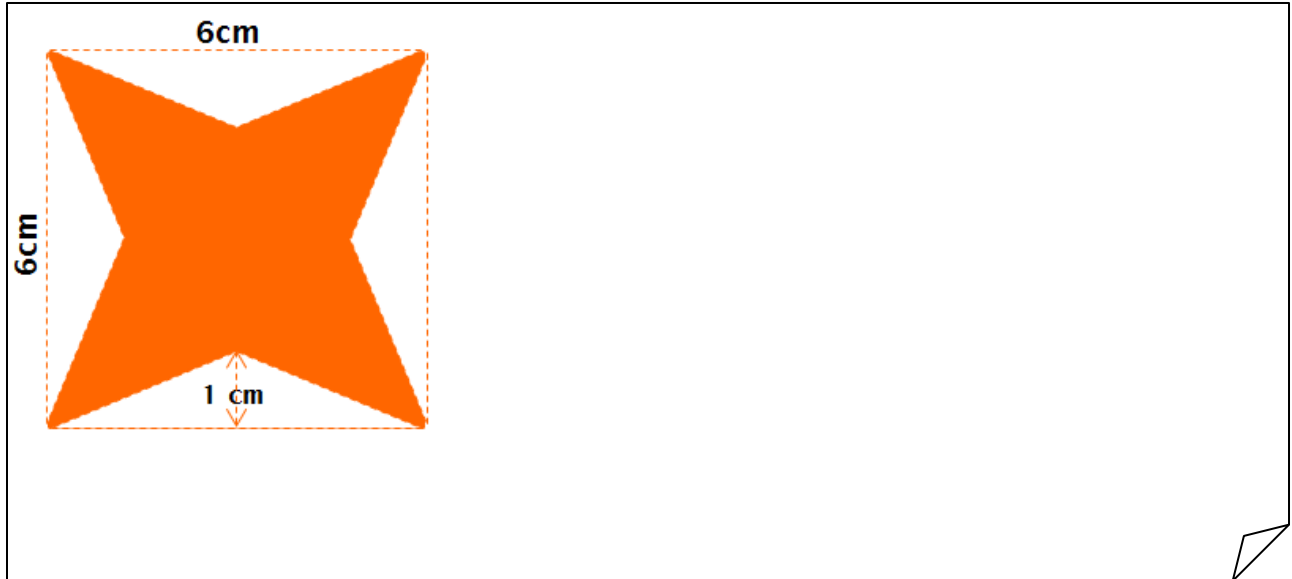
Paralellogram / Rhombus

Area = Base \times Perpendicular Height





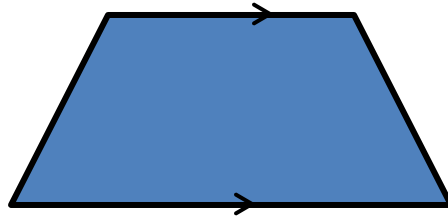
Examples: Find the Area of these Shapes



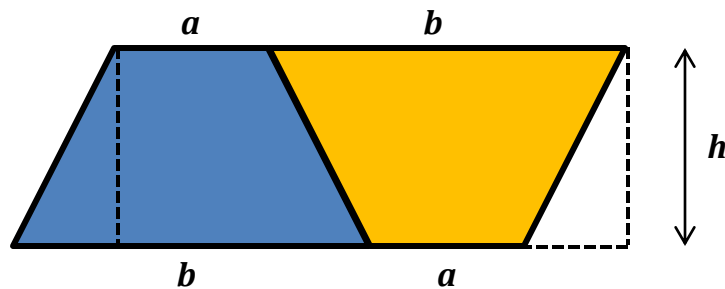
People have always needed to measure areas and volume. From earliest times, farmers wanted to know the area of their fields to see how many crops they could grow or animals they could support. When land is bought and sold, the cost depends on the area. In everyday life for instance, you need to find the area to work out how many tiles to buy to cover a floor.

The Area of a Trapezium

A trapezium is a four-sided shape with one pair of parallel sides.



1. Take two different coloured papers and cut 2 trapeziums of the same size, one of each colour.
2. Label the parallel sides a and b and the height h .
3. Join them to each other, one of them inverted as shown in the picture below.



4. Cut the small triangle on the left hand side and place it at the other end on the right hand side as shown by the dotted lines.
5. The two trapeziums now form another shape. What shape is it?

Shape _____

Length _____

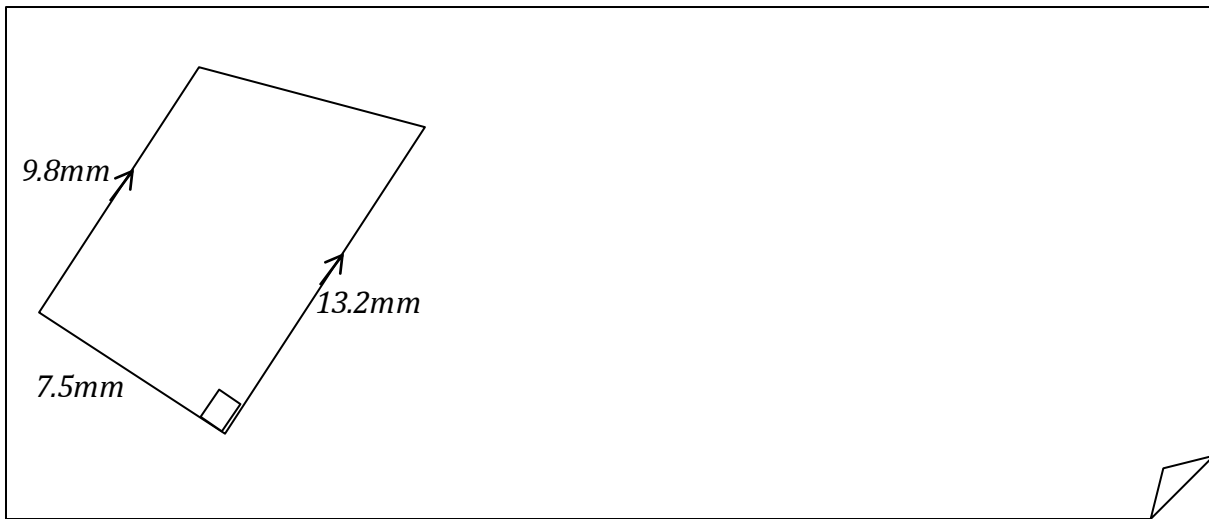
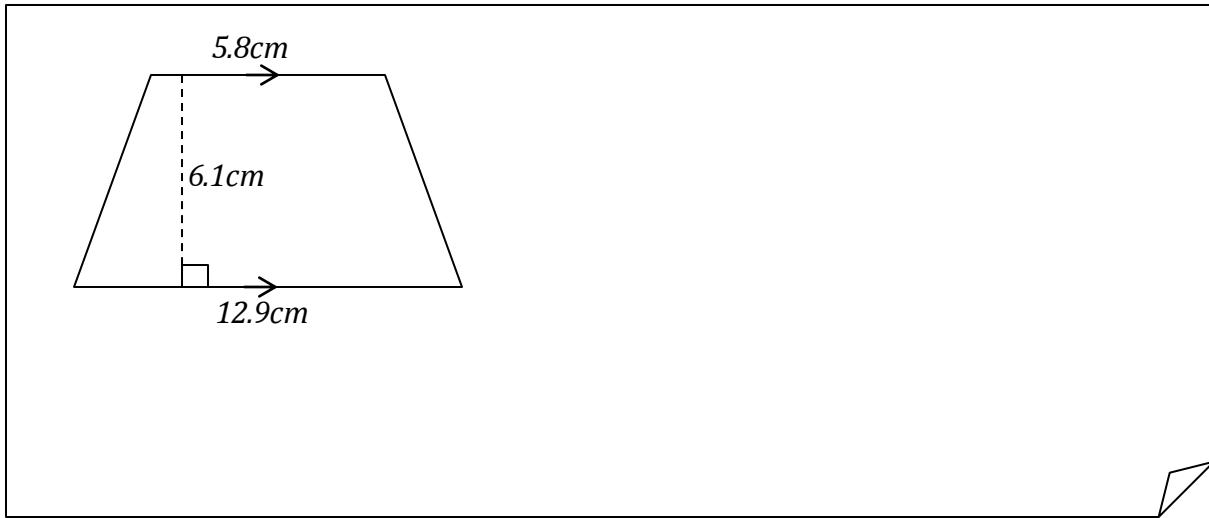
Breadth _____

Area _____

6. The Area found is equivalent to two trapeziums. What would be the area of ONE trapezium?

Area of Trapezium

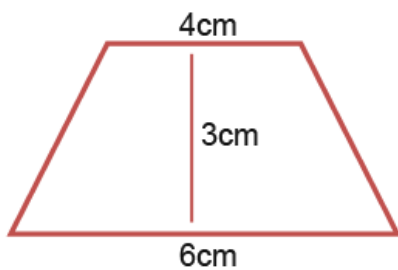
Examples: Find the Area of the Trapezia



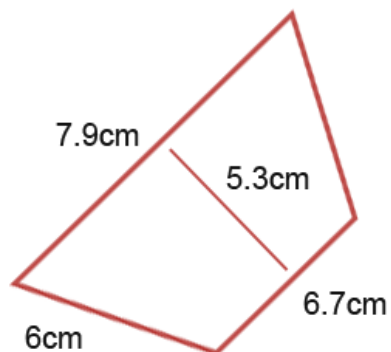
Exercise

Find the Area of these trapezia:

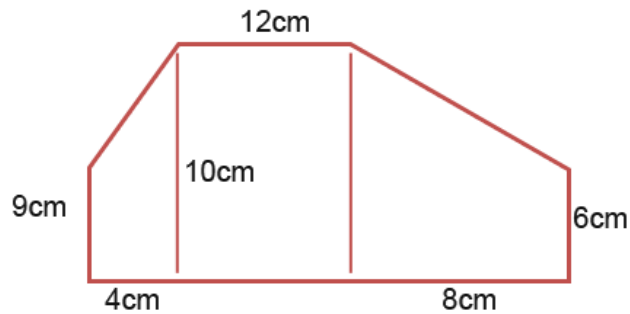
1.



2.



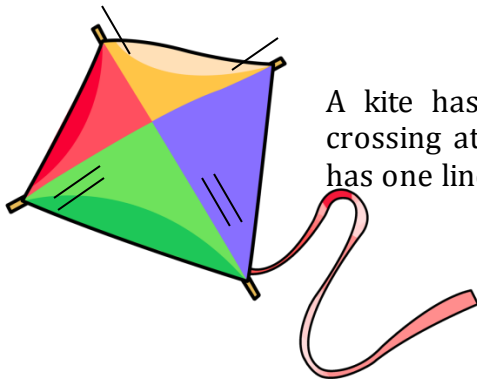
3. The diagram below shows the cross-section of a wall. Work out the Area of the wall.



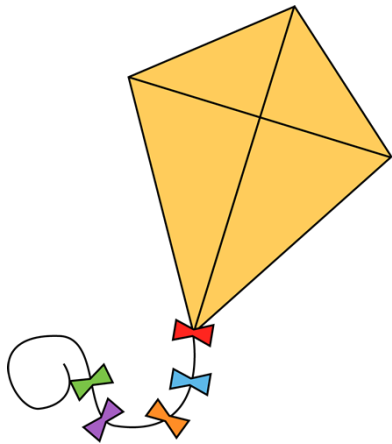
5. Find the area of a trapezium whose parallel sides are 38.7 cm and 22.3 cm, and the distance between them is 16 cm.

6. The area of a trapezium is 1080 cm^2 . If the lengths of its parallel sides are 55.6 cm and 34.4 cm, find the distance between them.

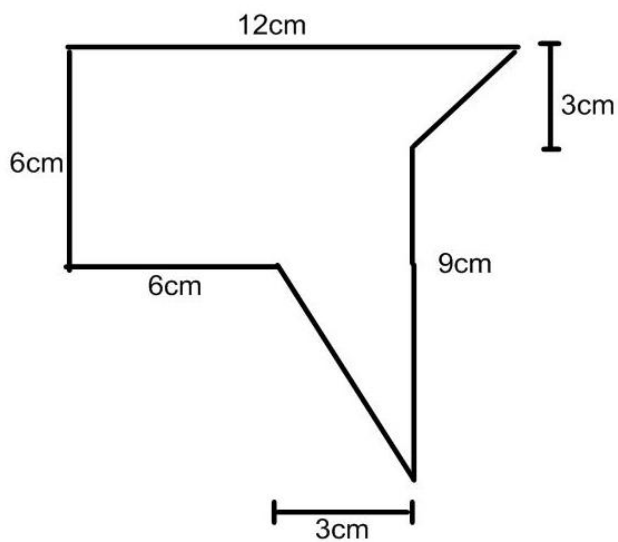
The Area of a Kite and other Compound Shapes



A kite has two pairs of equal sides with the diagonals crossing at right-angles. Opposite angles are equal and it has one line of symmetry.



Find the Area of a Kite with diagonals 15.8cm and 8.6cm.



Find the Area of this compound shape.

12.4cm

6.2cm

6.2cm

12.4cm

Find the Area and Perimeter of this Compound Shape.

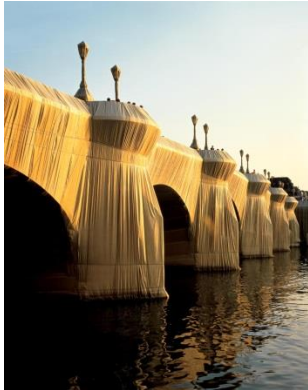
15cm

24cm

7cm 26cm 7cm

Find the Area of this Pentagon.

The Surface Area of Solid Shapes

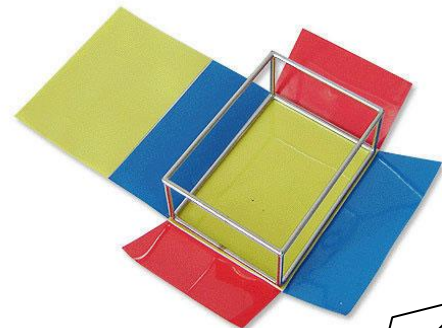
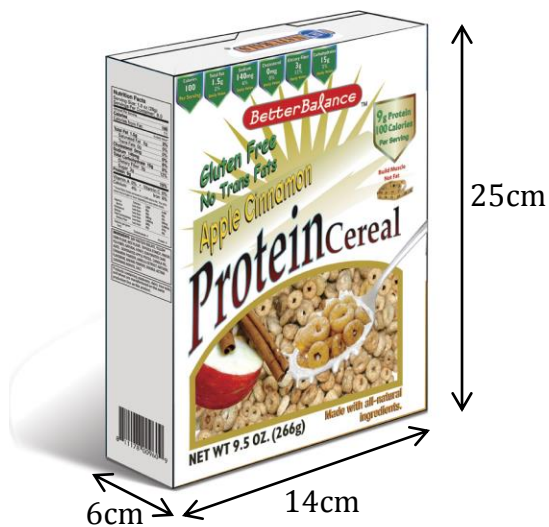


The photo shows a work of art by the artists Christo and Jeanne-Claude in which they wrapped the Pont Neuf Bridge in Paris in $40,876\text{m}^2$ of silky golden fabric. To wrap this structure, they needed to work out the surface area and calculate the amount of fabric required.



MTH_EN_806_041 Surface Area of a Cube and Cuboid
RLO 2: Surface Area of a Cuboid

Find the Surface Area of this Cereal Packet.



A net like this one might help.

Find the surface Area of a cube with side 7cm.

Find the Surface Area of this Toblerone Chocolate Bar.



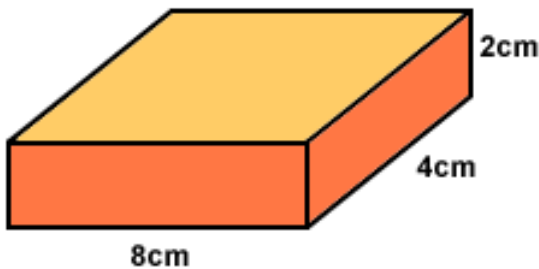
Volume

Volumes are important too. Volumes tell us how much space there is inside any structure or solid. Whether it is a house, aeroplane, car or office, the volume is important. In some countries there are regulations about the number of people who can use an office, based on the volume of the room.



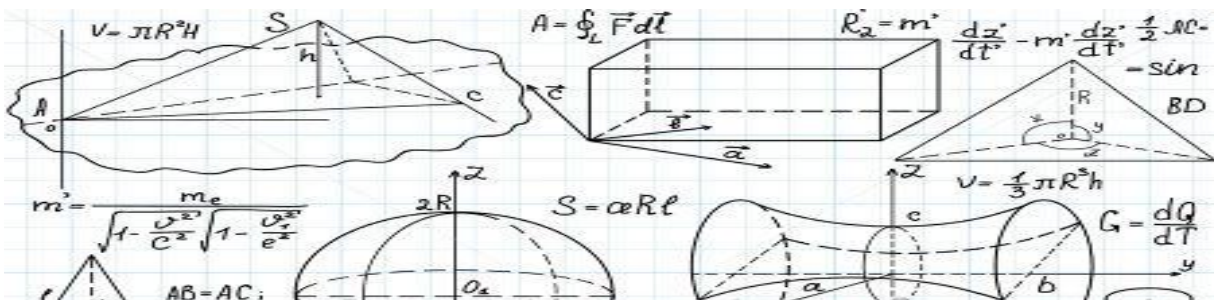
Volumes of containers for liquids also need to be measured. Think, for example of a car fuel tank, the water tank in a building or an aquarium. It is important to be able to calculate the capacity of all these things.

Till now you can find the volume of cubes and cuboids.

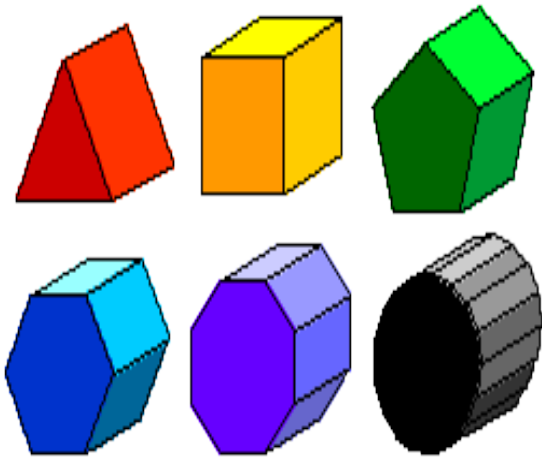


Now you will learn other formulae that can be used to calculate volumes of different shapes, based on a few measurements. Many of these formulae were first worked out thousands of years ago. They are still in use today because they are important in everyday life.

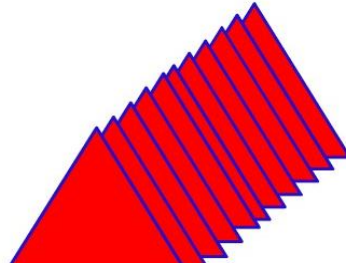
The process of calculating areas and volume using formulae is called Mensuration.



The Volume of a Prism

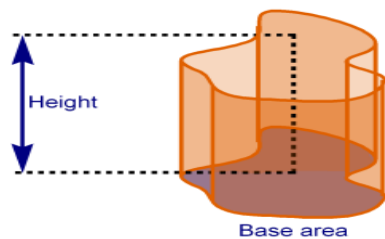


Prisms are shapes with uniform Cross-Section. That means that if I slice a prism into 2D slices, the shapes I would get are all identical in shape and size.

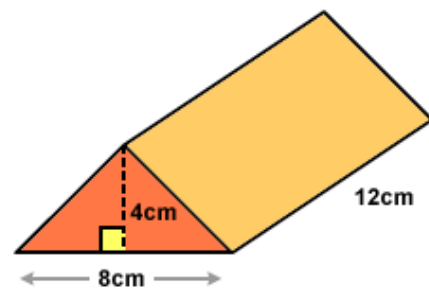


MTH_EN_806_061 Volume of a Prism
RLO 1 & 2: Identifying a Prism / The Volume of a Prism

The Volume of a Prism =

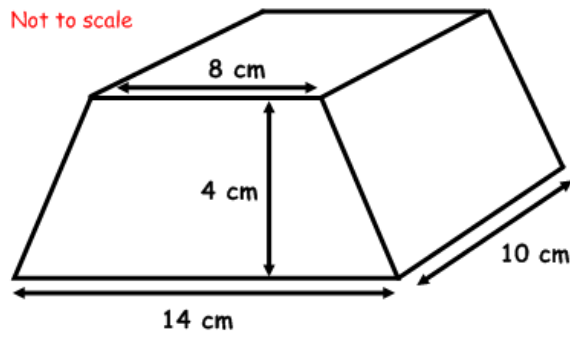


Find the Volume of this Prism:

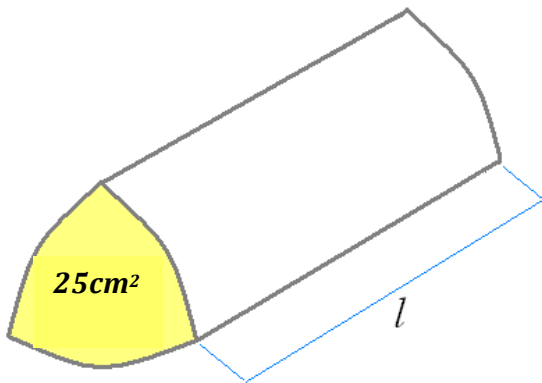


Find the volume of this prism:

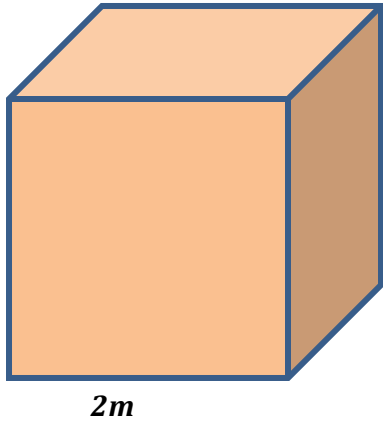
Not to scale



This prism has a Cross-Sectional Area of 25cm^2 . Its volume is 325cm^3 . Can you find its length?



Unit Conversions in Area and Volume



This cube has side 2m.

Its Volume is _____m³.

2m = _____ cm = _____ mm

The volume in cm³ is _____cm³.

The volume in mm³ is _____mm³.

Therefore: 1m³ = _____cm³ = _____mm³

Now repeat with the Area of one square face:

Therefore: _____ m² = _____ cm² = _____ mm²

Convert the following Area Measurements:

m ²	cm ²	mm ²
1.25		
	513.6	
		98241.8

... and the following Volume Measurements:

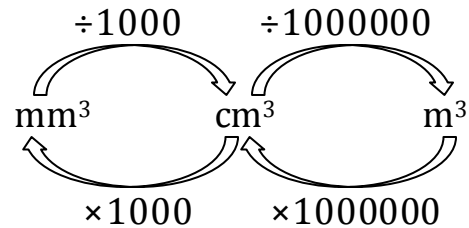
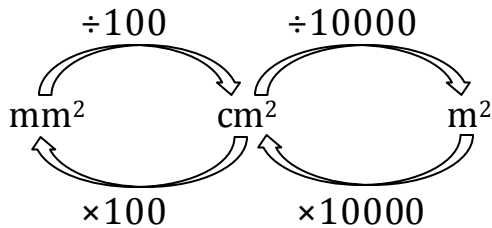
m^3	cm^3	mm^3
7.34		
	5346.8	
		76367.2

Exercise

Make the following unit conversions. Use your calculator and where necessary leave answers in the Standard Form.



$245mm^2$	cm^2	m^2
mm^3	cm^3	$0.003m^3$
mm^2	$346cm^2$	m^2
$456mm$	cm	m
$56 mm^3$	cm^3	m^3
mm^3	cm^3	$4m^3$
mm^2	cm^2	$34m^2$
mm	$8cm$	m



Volume and Capacity



Capacity is the amount of liquid that a container can hold. This is measured in litres (*l*) or millilitres (*ml*)

A millilitre is a very small amount of liquid.

Here is a millilitre of milk in a teaspoon.

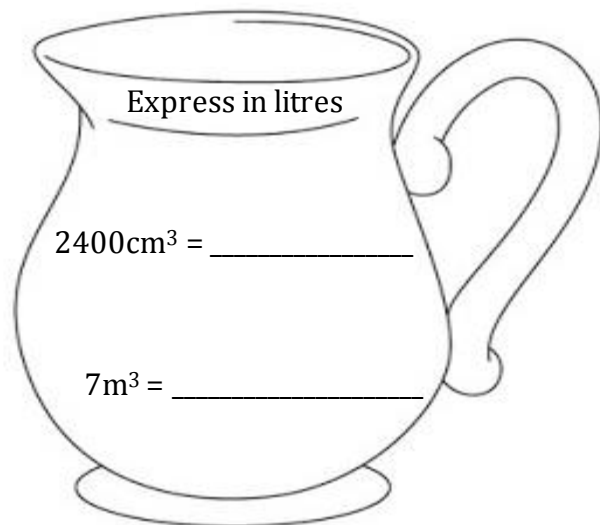
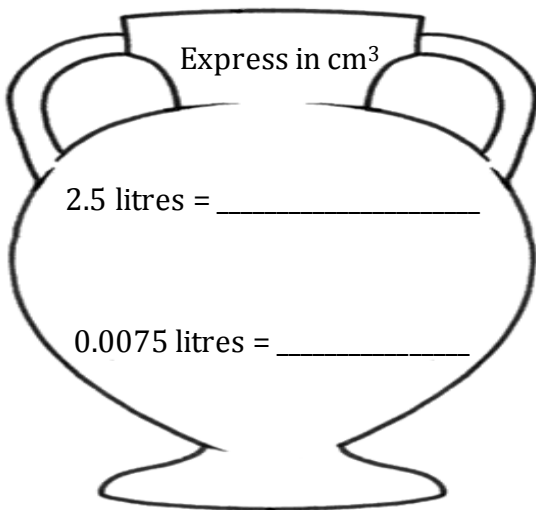
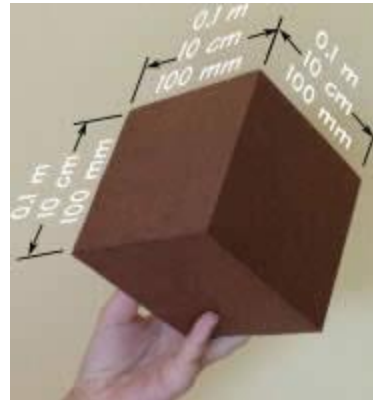


A litre is made up of 1000 millilitres and would fill in a jar like this one. Milk and soft drinks are often sold in litres.

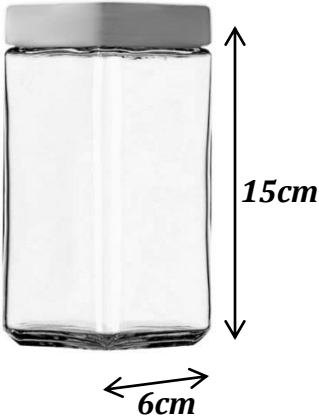
A cube with sides 10cm can contain 1l of liquid

Therefore:

$$1000\text{cm}^3 = 1000\text{ml} = 1 \text{ litre}$$




Examples:



The base of this jar is a square with side 6cm. The height of the jar is 15cm.

What is the capacity this jar? Give your answer in *ml* and in *l*.

Would 7 buckets holding 10l each would be enough to fill in this aquarium with the given dimensions?



STP 8, Pg. 378, Investigation 1

Cuboids



Find a cuboid (with edges of whole number lengths) that has a surface area of exactly 100 square units.

Is there more than one?

Can you find them all?

Can you provide a convincing argument that you have found them all?

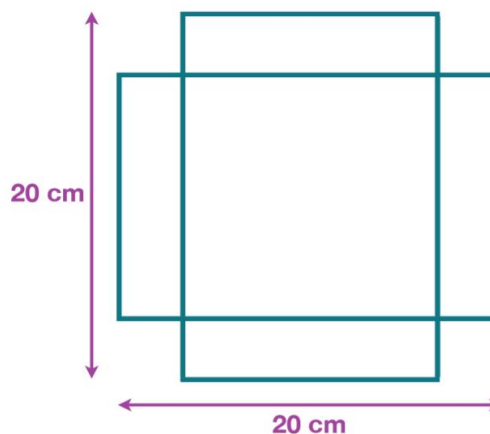
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Cuboid Challenge



You can make an open box from a 20cm by 20cm piece of card by cutting out four squares and folding the flaps.




What's the biggest volume of box you can make in this way?



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Fractions and Percentages

We are learning to:			
Work with the four operations using Fractions			
Understand what we mean by a Percentage			
Understand the relationship between Percentages, Fractions and Decimals			
Find the percentage of a quantity			
Make one quantity as a percentage of another quantity			
Work out a percentage increase or decrease			
Use percentages to solve problems			



Chapter 3; Pg. 51: Multiplication and Division of Fractions
Chapter 4; Pg. 65: Fractions and Percentages

The word 'percent' comes from the Latin word "per centum" where centum stands for one hundred. Therefore, when you are saying 'percent' you are really saying 'per hundred'. A quantity can be described as **an amount out of 100** and the result is more known as the percentage. In fact any quantity being described as a percentage makes use of the unit %.



MTH_EN_803_061 Adding and Subtracting two Mixed Numbers
RLO 2: Adding and Subtracting Mixed Numbers - Harder Examples

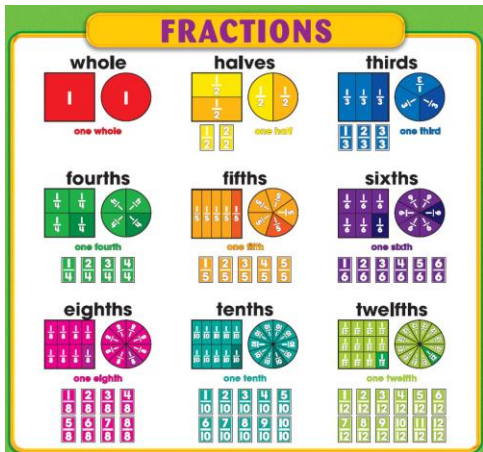
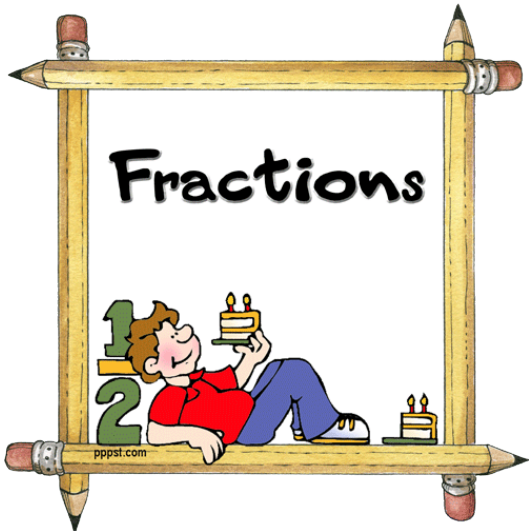
MTH_EN_803_101 Dividing one fraction by another fraction
RLO 2: Dividing Fractions

Revision of Fractions

$$8\frac{1}{5} + 2\frac{7}{10} - 3\frac{1}{2}$$

$$\frac{2}{5} \times \frac{11}{14} \div \frac{4}{7}$$

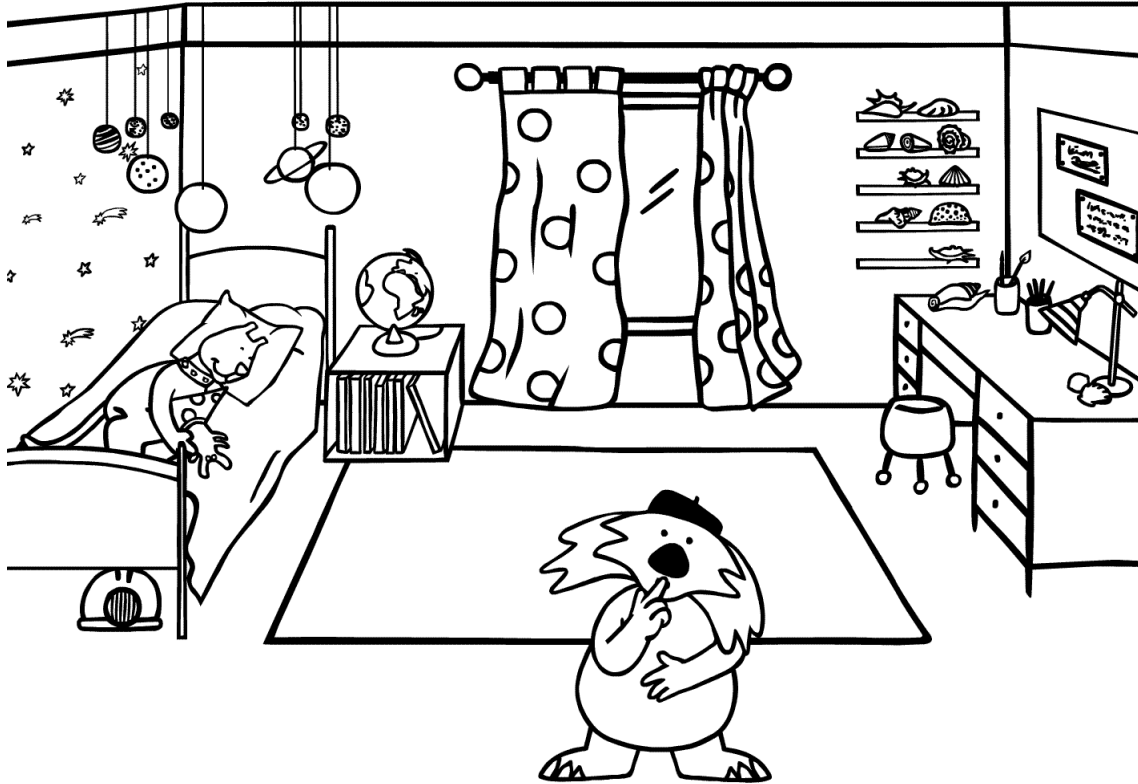
$$5\frac{5}{6} \div 3\frac{1}{4} \times 1\frac{5}{8}$$



$$3\frac{1}{2} \div \left(2\frac{1}{8} - \frac{3}{4}\right)$$

BEDROOM PAINTING

James Calleja



Amanda decides to paint her bedroom.

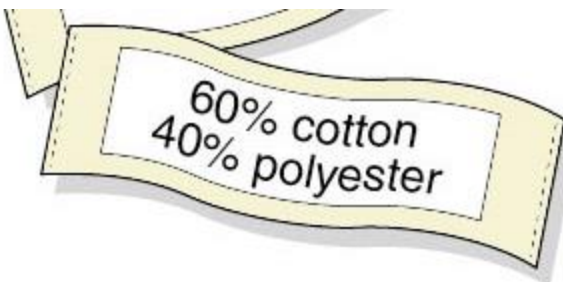
She asks her elder brothers Paul and Mark to help her out.

Paul can paint the room by himself in 3 hours; Mark can do it in 4 hours while it would take Amanda 6 hours to finish the same job.

If they all work together and do not get in each other's way, how long will it take them to paint Amanda's bedroom?

Introduction to Percentages

Look at the following logos. What do these percentages mean to you?



<https://www.youtube.com/watch?v=JeVSmq1Nrpw>

Examples

If 85% of the population of Malta has internet access, what is the percentage of the population who do not have internet access?



According to the most recent statistics 72.5% of the female Maltese population is brunette and 18.2% are blondes. What percentage of the female Maltese population is red headed?

Percentages, Fractions and Decimals

28% can be written:

as a fraction: $28\% = \frac{28}{100} = \frac{7}{25}$

... or as a decimal: $28\% = \frac{28}{100} = 0.28$



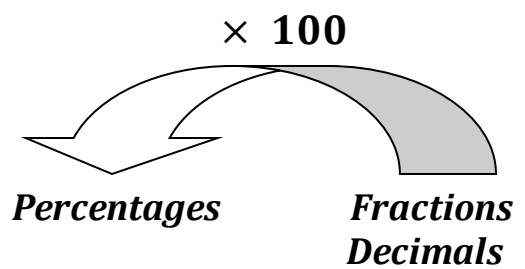
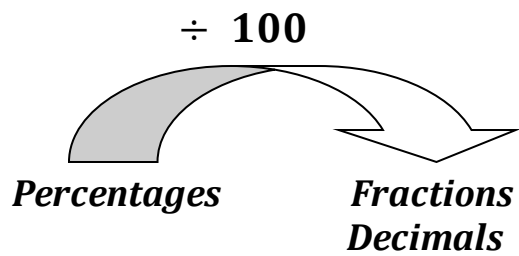
MTH_EN_805_011 Change percentages to fractions and decimals and vice-versa
RLOs 1 & 2: *Converting and grouping fractions, decimals and percentages*

Example: Complete this table

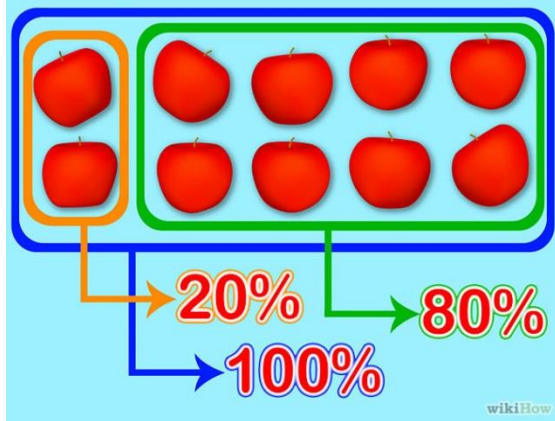
Fraction	Decimal	Percentage
$\frac{1}{2}$		
	0.25	
		75%
$\frac{1}{3}$		
	0.6	
	0.1	
		20%
		6 ½ %
$3\frac{1}{8}$		
		125%



Reminder: You can make use of the following rule



Percentages of a Quantity



How do you work out 20% of 10?

... and 80% of 10?



MTH_EN_705_101 – Percentage of a Quantity
RLOs 1 & 2 – Let's play dominoes / Bingo

In one year, 90% of the total Avonmouth Harbour catch of 800 tonnes was wet fish. The rest was shellfish. What weight of shellfish was caught?



_____ tonnes of shellfish

Now find the weight of each type of wet fish caught.

Fish	%	Weight
Cod	15%	
Haddock	10%	
Plaice	9%	
Herring	12%	
Mackarel	48%	
Coalfish	6%	



Work out these percentages using a calculator:

55.2% of €38900

142% of 125000cm



One quantity as a Percentage of another



MTH_EN_805_021 Express one quantity as a percentage of another

RLOs 1 & 2 – Expressing one quantity as a percentage of another / The Music Shop Sale

Examples

In a concert hall, 184 are men, 172 are women and 44 are children. What percentage of all the people in the hall are:

a) children

b) adults



A chef bought 7kg of cheese for his cooking. What percentage of this cheese did he use for the following:

	Weight	%
Pies	1.5kg	
Cheese fondue	2.4kg	
Pizza	700g	
Left Over		



Percentage Increase and Decrease

Increase £100
by 10%

£110



The price of an item increases by 10%. This means that the item is €10 more expensive for every €100 in the original cost.

What would be the new price of a refrigerator costing €300 if Eco-Tax increases the price by 10%?

A Percentage Increase in the prices occurs when we pay tax on the items we buy (VAT). You are the sales person in charge to find the new prices for these items when tax is applied.



...and what happens if during a sale the price decreases by 25%?



The price of a jacket is €46 before the sale. How much would I pay if the price decreases by 25% during the sale?

Example

The population of a town decreases by 17% in one year. What is the new population if the year before this was made up of 15,500 people?

A cake weighs 2.5kg. How much will it weigh after 16% of it is eaten?



Collect references to percentages in newspapers and magazines. Stick the cuttings on a chart and investigate what each reference means. Report the meaning of each in your own words on the chart next to each newspaper cutting.

Peaches Today, Peaches Tomorrow



A monkey has 75 peaches. Each day, he kept a fraction of his peaches, gave the rest away, and then ate one.

These are the fractions he decided to **keep**:

$$\frac{1}{2} \quad \frac{1}{4} \quad \frac{3}{4} \quad \frac{3}{5} \quad \frac{5}{6} \quad \frac{11}{15}$$

In what order did he use the fractions so that he was left with just one peach at the end?

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Counting Fish



We need to estimate the fish population in a lake.

We catch 40 fish and tag them so that they can be identified if caught again.

The fish are then released and one week later we again catch 40 fish and look to see how many are tagged.

How could this help us come up with a figure for the fish population in the lake?

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Solve the following Equations:

$x + 3 = 7$	$3x = 7$	$8 - 2p = 10$
$5(a + 3) = 18$	$4 - d = 5d + 1$	$5(3y + 2) = 13y + 4$

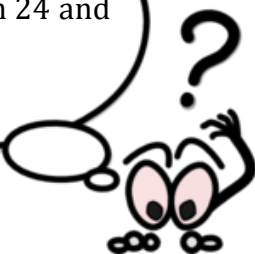
I double a number x and add 8. The answer is 25.



I multiply a number p by 7 and subtract the result from 15. The result is 20.



I subtract three times a number x from 24 and get 51.



*MTH_EN_814_041 Use Equations to solve problems.
RLO 2 Equations with one unknown on both sides + Assessment*



Algebra has been around since well before 200 AD when Diophantus first used letters and symbols to represent unknown numbers. However, as early as 1800 BC, Babylonian mathematicians were solving complex linear and quadratic equations. Around 800 AD Abu Ja'far Muhammad ibn Musa al-Khwarizmi from Baghdad, introduced the word "Algebra" which derives from the Arabic *al-jabr* meaning 'the reunion of broken parts'. This is a page from his books.

More work with Expressions

Expressions can be multiplied together or divided by each other. What you do to normal numbers you can do to expressions as well.

$3p \times 4q$	$3x \times 2y \times 5x^3$	$4x^5 \div 2x^2$
$2a \times 3b \div 12a^2b^3$	$\frac{125x^2y^3z^4}{25xyz}$	$\frac{25x}{4} \div \frac{15x^2}{16}$

Factorizing Expressions

$3(x + 5)$ can be written as $3x + 15$



Can you find a way of doing the reverse process?



MTH_EN_810_031 Factorising Expressions
RLO 1 & 2: Factorising fully linear Expressions / Match the factors

Now try to factorize the following Expressions:

$4x - 10$	$15x + 12$	$12a - 18$
$36 + 24b$	$6x + 4y$	$12x - 24xy$

$2(y+3)$ $2y+6$

Expand (arrow from left to right)

Factor (arrow from right to left)

Factorising
 $= 5e + 15$
 $5(e + 3)$

Divide out

Algebraic Fractions



This bag contains 8 sweets when it is $\frac{1}{3}$ full. How many sweets does it contain when completely full?

If the number of sweets when full is x , write an equation with the information given. Solve for x , using an Algebraic Method.

Examples

$\frac{x}{4} = 13$	$\frac{2y}{3} = 8$	$-25 = \frac{x}{5}$
--------------------	--------------------	---------------------

A boy is $\frac{1}{5}$ the age of his grandfather. If the boy is 13 years old, write down an equation and solve it to find his grandfather's age.

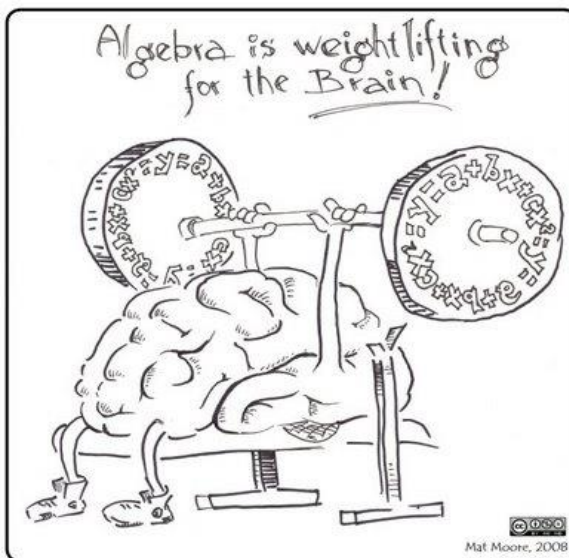


These equations are more complicated as you need to add an extra step:

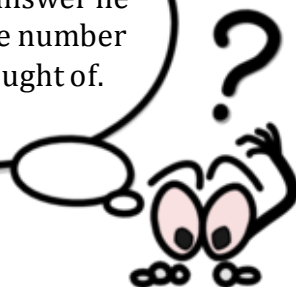
$$\frac{x}{8} - 5 = 2$$

$$\frac{3x}{4} + 7 = 1$$

$$\frac{7x}{9} + 3 = -4$$



Gareth thinks of a number, divides it by 6 and then adds 4. The answer he gets is 10. Find the number Gareth first thought of.



$$\frac{x + 3}{2} = 5$$

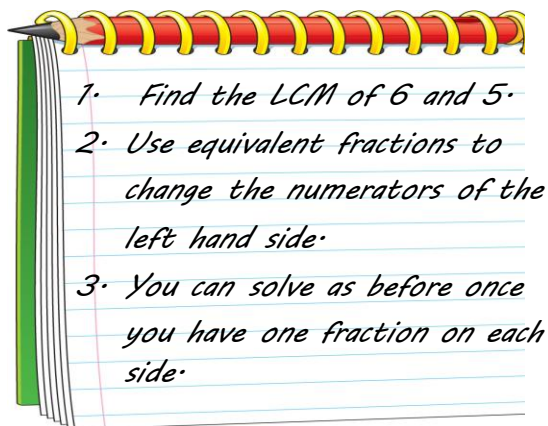
$$\frac{2x - 3}{5} = 4$$

$$\frac{x - 1}{4} = \frac{x}{7}$$

$$\frac{3x - 2}{4} = \frac{x + 5}{7}$$

This equation has two fractions on one side. You need to use what you learnt in fractions to add them together first and get one fraction on each side.

$$\frac{x}{6} + \frac{3}{5} = \frac{1}{10}$$



Harder Examples

$$\frac{2x}{5} - \frac{3}{10} = \frac{1}{15}$$

$$\frac{4x+1}{6} - \frac{3x-2}{3} = \frac{x}{2}$$

Daphne spends $\frac{1}{3}$ of a sum of money on clothes and $\frac{1}{6}$ of the sum on food. If she spends a total of €225, write down an equation and solve it to find the original sum of money.



With computer games you play by running, jumping or finding secret things. Well, with Algebra you play with letters, numbers and symbols, and you also get to find secret things!

And once you learn some of the "tricks", it becomes a fun challenge to work out how to use your skills in solving each "puzzle".



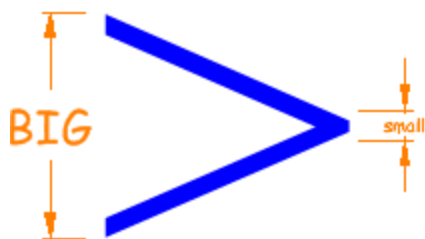
Inequalities

Mathematics is not always about "equals"! Sometimes you only know that something is bigger or smaller.

The two most common inequalities are:

Symbol	Words	Example Use
$>$	greater than	$5 > 2$
$<$	less than	$7 < 9$

They are easy to remember: the "small" end always points to the smaller number, like this:



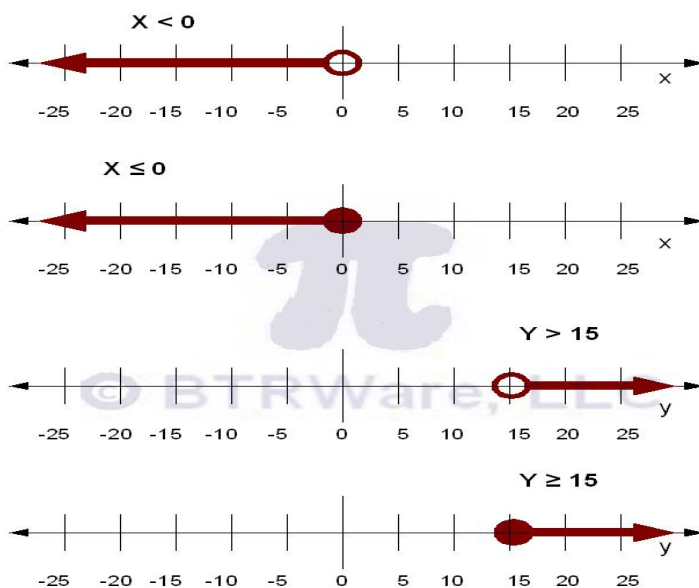
You can also have inequalities that include "equals", like:

Symbol	Words	Example Use
\geq	greater than or equal to	$x \geq 1$
\leq	less than or equal to	$y \leq 3$

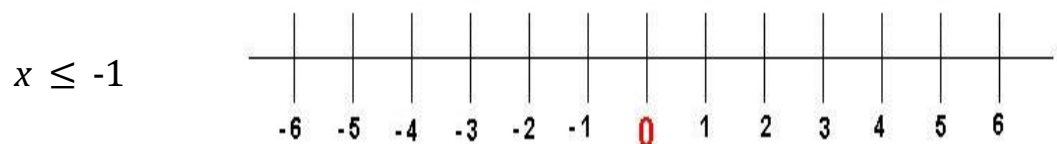
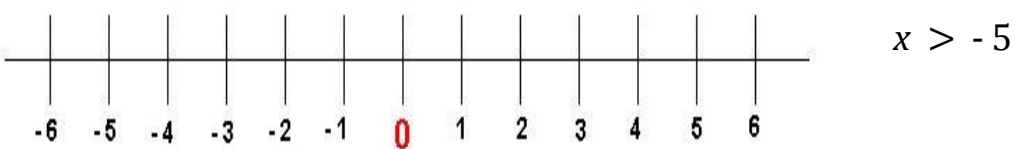
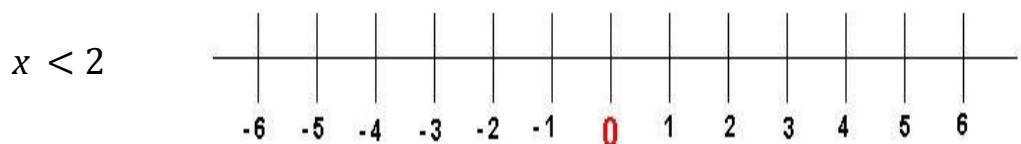
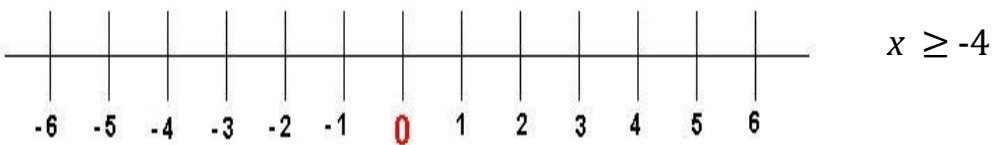
Inequalities can be represented on a number line in this way:

A solid circle indicates \leq or \geq (greater/smaller or equal)

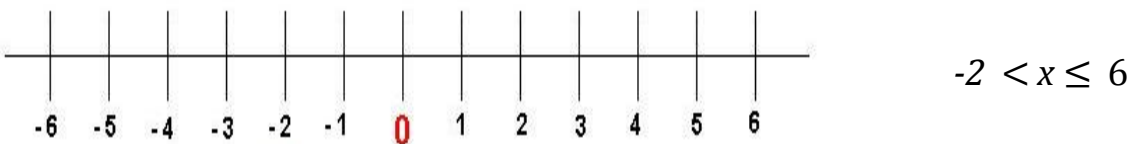
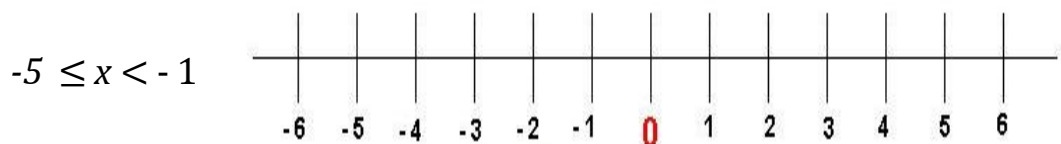
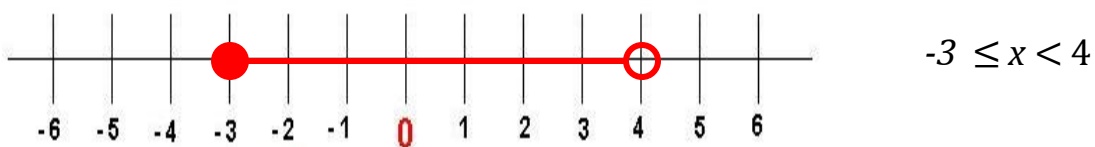
An empty circle indicates $<$ or $>$ (greater/smaller but NOT equal)



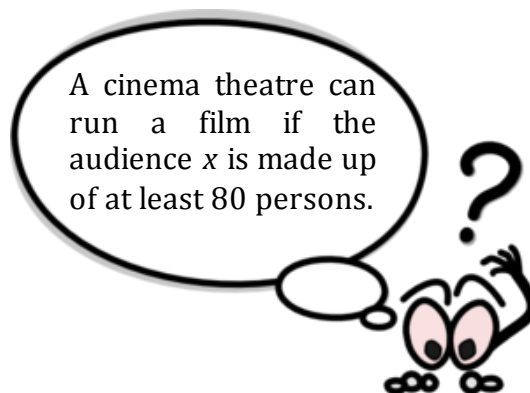
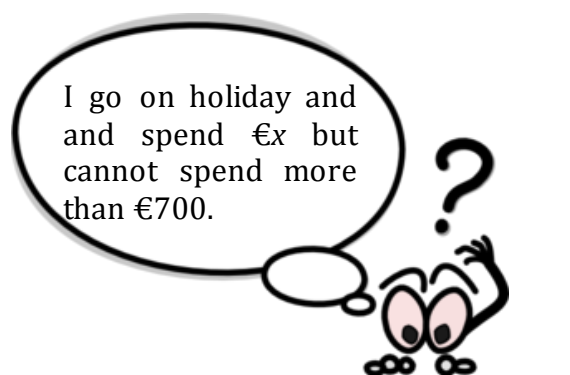
Represent these Inequalities on the given Number Line:



Sometimes Inequalities are also used to represent a Range of numbers:



Write down an Inequality for these Statements:



As in an equation, an inequality remains true when the same number is added to or subtracted from both sides.

$$x + 3 < 10$$

Subtract 3 from both sides


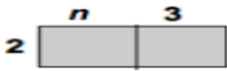
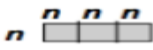
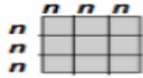
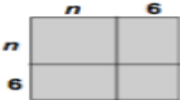


An inequality also remains true when multiplying or dividing by the same **positive** number.

Solve the following Inequalities

$6 < 8 - x$

$2x + 1 \leq 7 - 4x$

Interpreting Algebraic Notation

$\frac{n+6}{2}$	$3n^2$	Square n , then multiply by three	
$2n+12$	$2n+6$	Add six to n , then multiply by two.	
$2(n+3)$	$\frac{n}{2}+6$	Add six to n , then divide by two	
$(3n)^2$	$(n+6)^2$	Divide n by two, then add three	
$n^2+12n+36$	$\frac{n}{2}+3$	Add six to n , then square the answer	
n^2+6	Add three to n then multiply by two.	Square n , then multiply by nine	
n^2+6^2	Multiply n by two then add twelve	Multiply n by two, then add six.	

Think of Two Numbers






Think of two whole numbers under 10
 Take one of them and add 1
 Multiply by 5
 Add 1 again
 Double your answer
 Subtract 1
 Add your second number
 Add 2
 Double again
 Subtract 8
 Halve this number and tell me your answer

From your answer I can work out both your numbers very quickly. How?

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Statistics

We are learning to:			
Understand and find the Mean, Mode and Median			
Identify the Range of given data			
Build tally charts and frequency tables			
Build and Interpret Bar Charts			
Build and interpret Pie Charts			



STP 7: Chapter 3, Pg. 34: Collecting and Displaying Data
 STP 7: Chapter 19, Pg. 345: Summarising and Comparing Data
 STP7: Chapter 22, Pg. 395: Grouping Data



There is a story about Rtuparna who was born in India about 5000BC. He wanted to estimate the amount of fruit on a tree.

- *He counted the fruit on one branch, then he estimated the number of branches on the tree.*
- *He multiplied the estimated number of branches by the counted fruit on one branch.*

He was amazed that the total was very close to the actual counted number of fruit when it was picked.

Rtuparna was one of the first to use arithmetic Mean. The branch he chose was an average one representing all the branches.

Mean, Median, Mode and Range

Mean, Median, Mode, and Range

First, arrange the numbers in order by size.
Example: 3, 5, 5, 6, 8, 10, 12

Mean	Median	Mode	Range
the average of the numbers	the middle number of a sequence	the number that occurs most often	the difference between the lowest and highest values
1. Add the numbers together. 2. Divide by how many numbers were added. $3+5+5+6+8+10+12=49$ $49 \div 7 = 7$	The median is the middle number when numbers are arranged in order by size. For an even number of numbers, the median is the average of the two numbers in the middle. The middle number is 6.	Find the number(s) that occurs most often in the sequence (there may be more than one). There are two 5s and one of each of the other numbers.	Subtract the smallest number from the largest number. $12 - 3 = 9$
The mean is 7.	The median is 6.	The mode is 5.	The range is 9.



MTH_EN_811_051 The Mean of a set of ungrouped data
RLO 1 The Mean



MTH_EN_811_061 The Median of a set of ungrouped data
RLO 1 & 2 The Median of an odd/even number of data



MTH_EN_811_071 The Mode of a set of ungrouped data
RLO 1 & 2 The Mode of a set of ungrouped data



MTH_EN_811_081 The Range
RLO 1 The Range

Examples

The following data set represents the heights in cm of 10 important persons:

163 165 158 167 175
185 173 178 158 177

Mean: Total divided by the number of heights

Median: The Middle Number
Put the Numbers in Ascending Order First.

When the data is an even number, take the middle two numbers, add them up and divide by 2.

Barack Obama	Gordon Brown	Dmitry Medvedev	Nicolas Sarkozy
6' 1"	5' 11"	5' 4"	5' 5"
1.85m	1.80m	1.63m	1.65m



Mode: The most frequent number.

You can have more than one mode.

Range: Largest - Smallest

**Hey diddle diddle,
the median's the middle;
YOU ADD AND DIVIDE FOR THE MEAN.
The mode is the one that appears the most,
and the range is the difference between.**

Making a Frequency Table

When a lot of information has been gathered, it is often convenient to put it together in a **frequency table**.



MTH_EN_811_041 Frequency Tables
RLO 1 & 2 Frequency Tables for Ungrouped and Grouped Data

In a survey 30 persons were asked how many cups of coffee they drink per day and the raw data is represented below.

0	3	4	7	2	5
1	2	4	6	3	4
0	1	3	5	4	2
2	4	2	7	6	6
5	3	3	1	5	3

Fill in this frequency table:

No. of Cups	Tally	Frequency
0		
1		
2		
3		
4		
5		
6		
7		
Total		



Can you say what is the Mode from this Frequency Table?

What about the Mean and Median?

Grouped Data and Bar Charts

The same 30 people were asked for their weight in kg. Since there are too many different data, the weights will be grouped in a class interval – **Grouped Data**.

Weight in Kg					
60	57	56	53	61	56
45	58	66	49	41	67
68	43	51	63	55	53
58	52	59	47	73	48
72	66	54	62	55	62

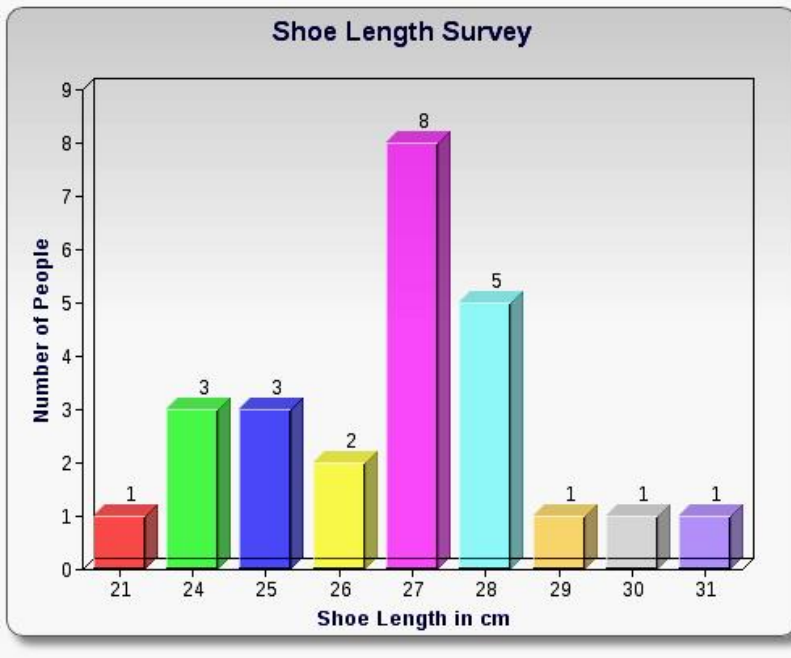
Sort this data in a Frequency Table

Weight in kg	Tally	Frequency
40-44		
45-49		
50-54		
55-59		
60-64		
65-69		
70-74		
Total		



This data can also be represented on a Bar Chart. Which you can draw on the grid underneath.

It is easy to read information from ready-made bar charts. The following bar-chart shows us the shoe sizes of a group of people.



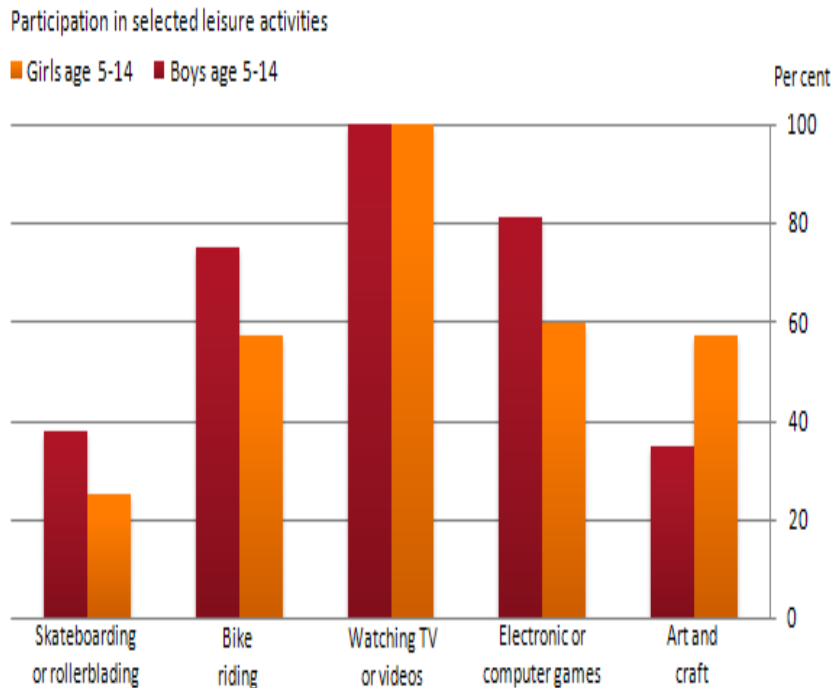
Which is the most popular shoe size?

Which sizes are the least popular?

Name two sizes which are used by the same number of people.

How many more people wear size 27 than size 25?

This bar chart compares how boys and girls spend their free time.



Which activity is the most popular by both genders?

Which activities are more popular with boys?

Which activity is more popular with girls?

Give a rough estimate of how many more boys prefer electronic and computer games than girls.

Pie Charts

Information can also be represented on a Pie Chart. Here you have to share the 360° of a circle proportionally to the given data in the Frequency Table.

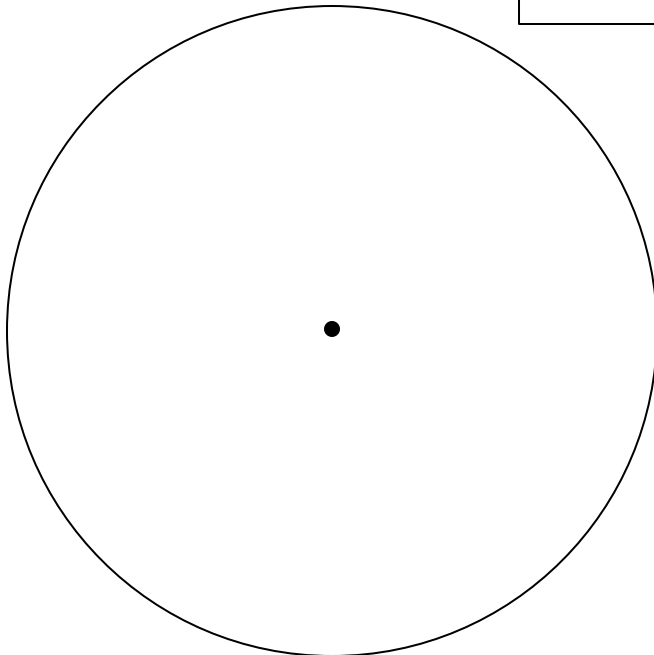
This frequency table shows the results of a survey regarding the type of transport used by 120 people on their last holiday.

Type of Transport	Train	Bus	Car	Ship	Plane
Frequency	24	12	59	11	14
Degrees on Pie Chart					



What fraction of the total number of people participating in the survey used the train?

The total number of people would be represented by 360° on the pie chart. How many degrees would represent the people using trains during their holiday?

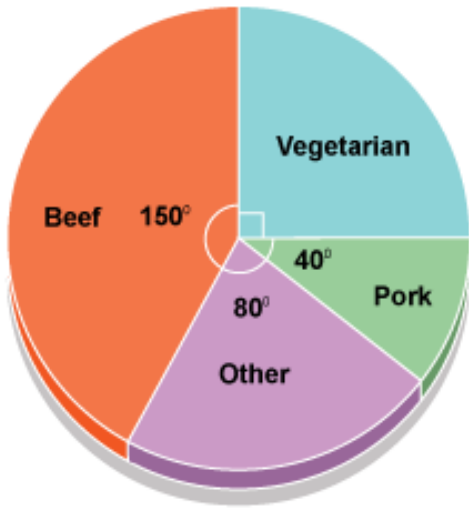


Find the degree allotted for the other means of transport and represent this data in the circle below.

Do not forget to label your pie-chart.

You can also read information from a ready made pie-chart.

This pie-chart represents the type of dishes ordered by 144 persons that visited a restaurant one evening.



How many people chose a vegetarian dish?

How many more people chose a beef dish than a pork dish?



You can also use the computer to draw bar-charts and pie-charts.



MTH_EN_811_091 Use a spreadsheet to construct a bar chart and pie chart
RLO 1 & 2 Bar Charts and Pie Charts



Group Investigation

Each group needs to investigate whether one of these Hypotheses is true or not.

Most children do not have breakfast before they go to school.

The most popular sport among boys is football.

Boys are spending too much time playing computer games these days!

The most popular shoe size among Form 2 boys is Size 38.

Form 2 boys spend about 2 hours daily studying and doing their homework.

Cartoons are the favourite TV programmes among Form 2 boys.

Your report should include:

- The question/s that you are going to ask the members of your class
- The observation sheet / tally that you collect replies on
- Bar charts and / or Pie Charts illustrating the results
- A conclusion
- A report of any difficulties encountered and suggestions how these could be overcome.



M, M and M



I have five numbers.

Their mean is 4.

Their median is 3.

Their mode is 3.

Can you find *all* the different sets of five positive whole numbers that satisfy these conditions?

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Investigation

Find the front page of a newspaper. Find the Area of the front page used for each of the categories:

- Headlines
- Pictures
- Text
- Adverts
- Anything else



Illustrate your results with a bar chart or a pie chart and give a reason for your choice.