

# MATHEMATICS NOTES Form 2

## Booklet 1

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Ms. G. Bonnici

Name : \_\_\_\_\_




Class: \_\_\_\_\_

*Mathematics is the alphabet in which God has written the Universe.*  
Galileo Galilei



# Working with Numbers



At the end of this topic I will be able 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?

$5 \times 5 \times 5 \times 5 \rightarrow$  \_\_\_\_\_       $7 \times 7 \times 7 \rightarrow$  \_\_\_\_\_

$2 \times 2 \times 2 \times 11 \times 11 \times 11 \times 11 \rightarrow$  \_\_\_\_\_

Is  $3^4$  equal to  $3 \times 4$ ?



<http://www.math-play.com/Exponents-Jeopardy/Exponents-Jeopardy.html>

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

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

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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:**

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

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

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

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

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

$$\frac{x^9}{x^5} \rightarrow \underline{\hspace{2cm}}$$

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?

**3<sup>rd</sup> Index Law**





## Examples:

Find the value of the following:

$10^{-3} \rightarrow$

$5^{-2} \rightarrow$

$25^{-1} \rightarrow$

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

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



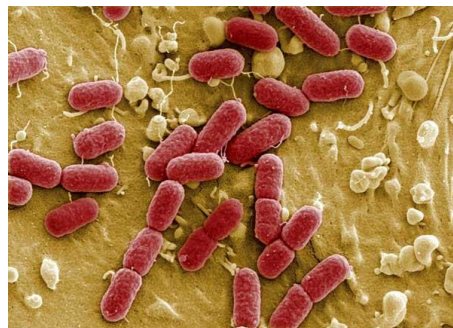
<http://www.math-play.com/exponent-game.html>

## Standard Form



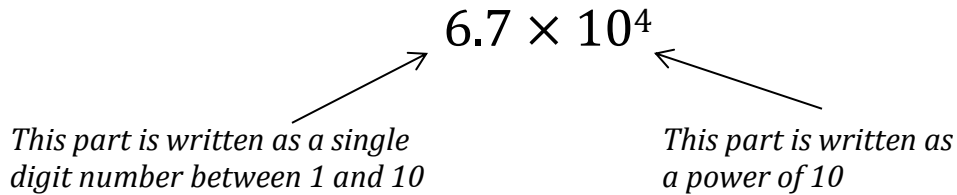
*Saturn is the largest planet in the solar system. It is about 120,000km across and 1,400,000,000km away from the Sun.*

*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.*



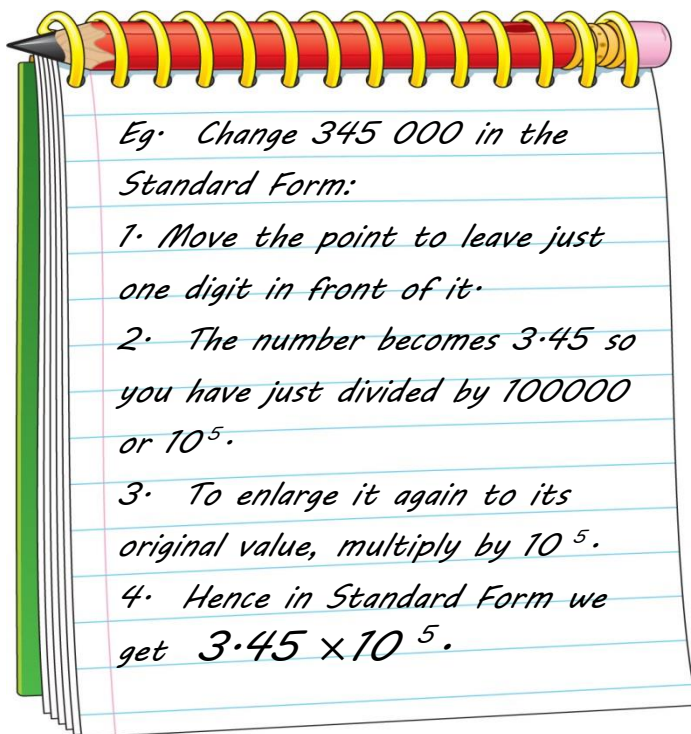
Standard Form allows us to write both very large and very small numbers in a more useful form.

If we change 67000 in the Standard Form it would look like this:



To change a normal number in the standard form:

Try these out yourself:



8 710 000
634
29 000 000
98 000

0.0076 is a very small number which can be written in the Standard Form.

Move the point so that the digit before it is a number between 0 and 10. \_\_\_\_\_

The number has been enlarged as you multiplied it by \_\_\_\_\_ or  $10^{\square}$ .

To get the original value you have to divide by this number again. Hence  $\frac{7.6}{\square}$

This can also be written as \_\_\_\_\_.

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:**

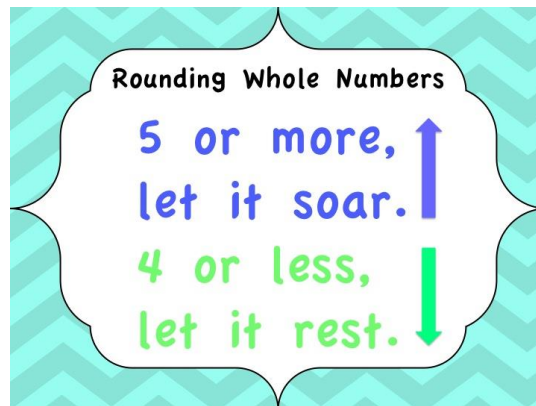
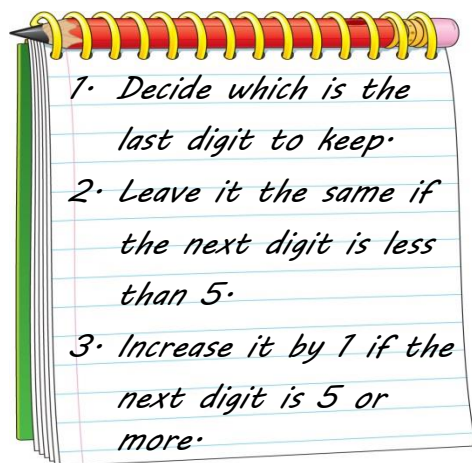
Ordinary Number	Index Number
0.00056	
0.0000073	
	$1.6 \times 10^5$
	$2.7 \times 10^{-4}$
123 000 000	
0.05	
	$4.763 \times 10^{-2}$



On your calculator you can write a number in the Standard Form using the **10<sup>x</sup>** or **EXP** button.

### **Revision: Rounding up Numbers**

How to round numbers:





**6735**

Nearest 1000  
or 1sf:  
7000

Nearest 100  
or 2sf:  
6700

Nearest 10  
or 3sf:  
6740

**27.83652**

2 sig. fig.  
28

3sf or 1dp:  
27.8

4sf or 2dp:  
27.84

**0.0507**

1sf or 2dp:  
0.05

2sf or 3dp:  
0.051

### Reminder

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.

1st significant figure    3rd significant figure

0.0345

2nd significant figure

This is the 2nd decimal number

↓

0.1284

↑

This is the 3rd decimal number



MTH\_EN\_801\_021 Rounding Numbers

RLO 2 At the Greengrocer

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_801\\_021/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_801_021/index.html#M02)



MTH\_EN\_804\_051 Rounding Numbers to a given number of Decimal Places

RLO 2

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_804\\_051/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_804_051/index.html#M02)

## 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.



### Example:



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

# Area and Volume



At the end of this topic I will be able 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			

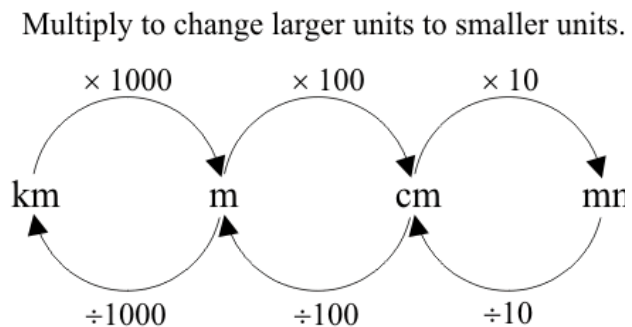


Chapter 7, Pg. 138: Area of triangles and parallelograms  
Chapter 18, Pg. 348: Volumes

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		
		54.34	
			568

**Reminders:**

**Area of a Square / Rectangle = Length  $\times$  Breadth**

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

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

**Parallelogram / Rhombus**

**Area = Base  $\times$  Height**

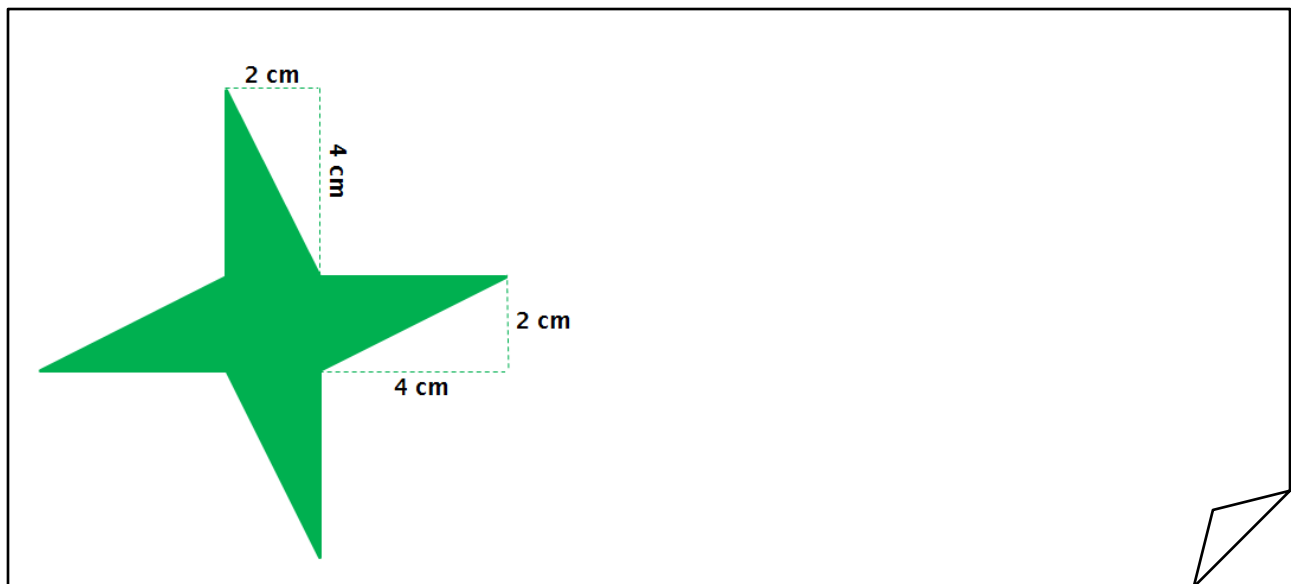
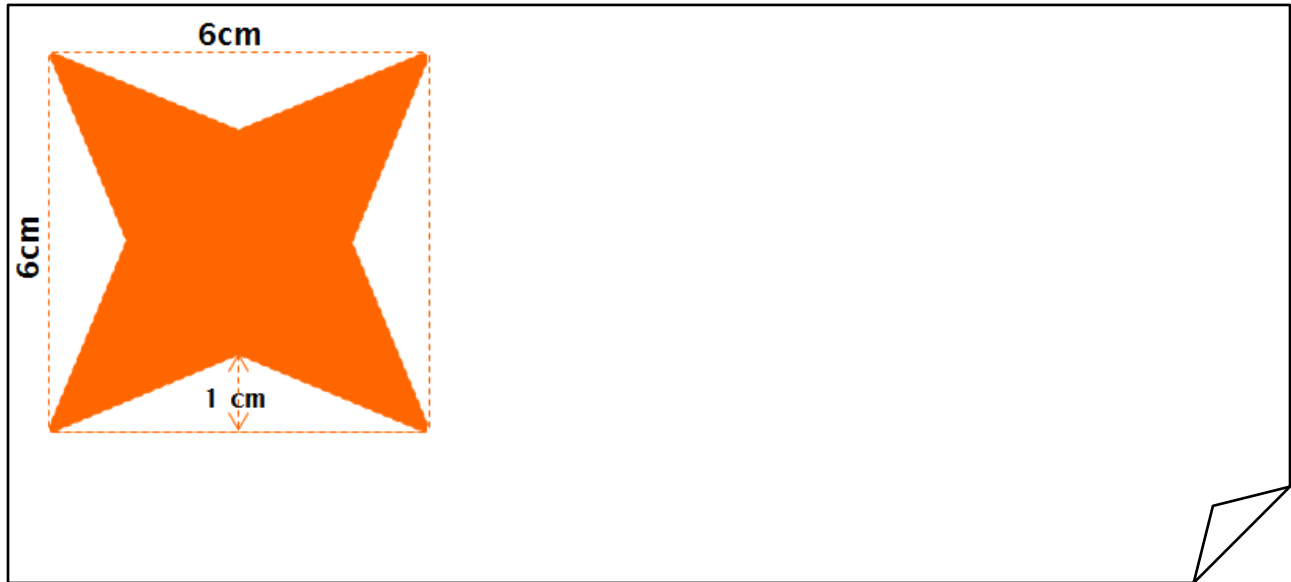


MTH\_EN\_806\_031 Area of Compound Shapes

RLOs 1: Area of Compound Shapes

[https://ftp.siveco.ro/aemalta/repository/MTH\\_EN\\_806\\_031/index.html#M01](https://ftp.siveco.ro/aemalta/repository/MTH_EN_806_031/index.html#M01)

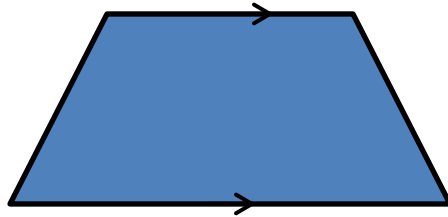
**Examples: Find the Area of these Shapes**



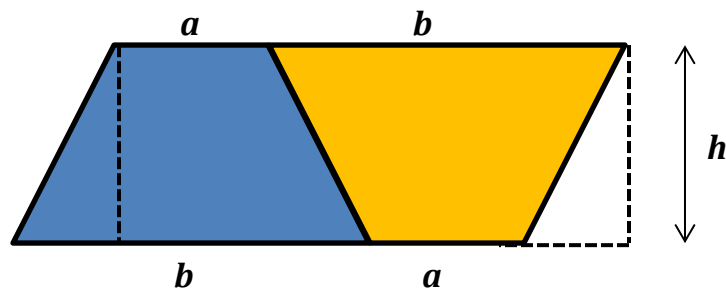
*People have always needed to measure areas and volume. From earliest times, farmers wanted to know the area of their fields to see how many crops they could grow or animals they could support. When land is bought and sold, the cost depends on the area. In everyday life for instance, you need to find 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 from each colour.
2. Label the parallel sides  $a$  and  $b$  and the height  $h$ .
3. Join them to each other, one of them put upside down 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 \_\_\_\_\_

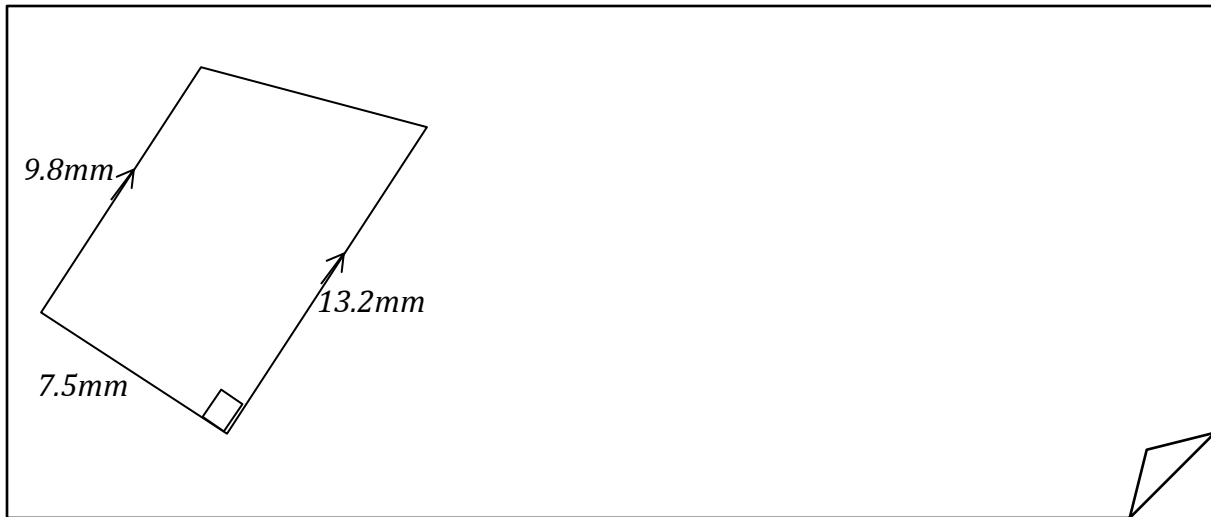
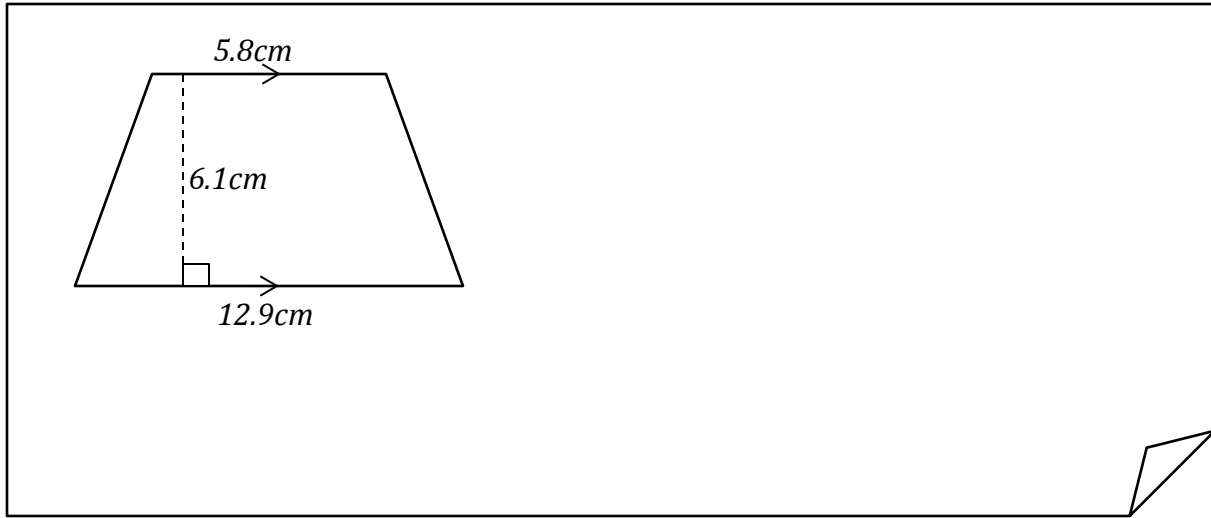
Breadth \_\_\_\_\_

Area \_\_\_\_\_

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

**Area of Trapezium**

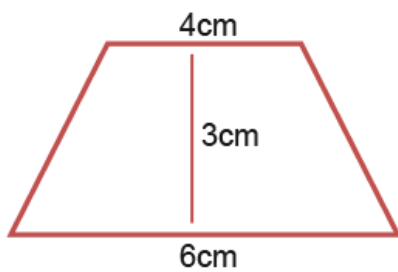
## Examples: Find the Area of the Trapezia



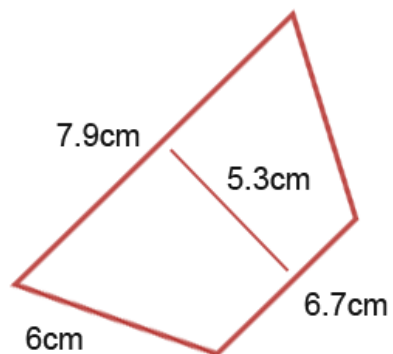
## Exercise

Find the Area of these trapezia:

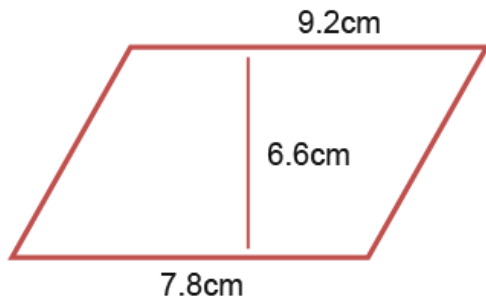
1.



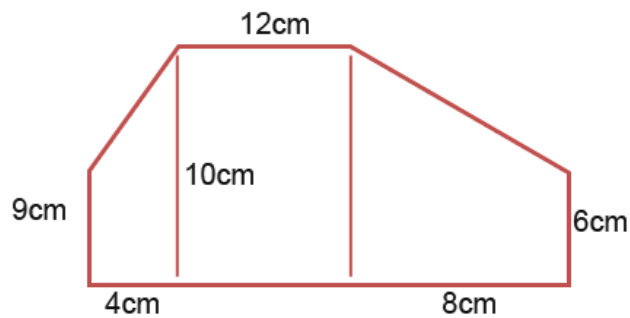
2.



3.



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

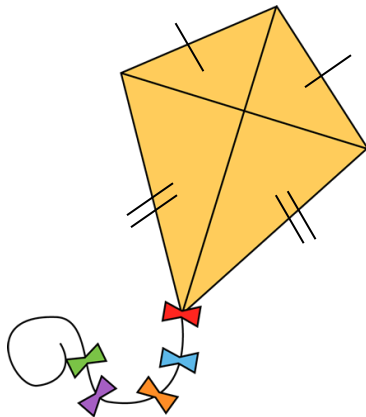


5. Find the area of a trapezium whose parallel sides are 38.7 cm and 22.3 cm, and the distance between them is 16 cm.

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

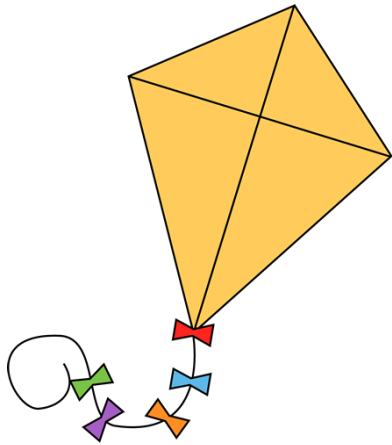
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### **The Area of a Kite and other Compound Shapes**

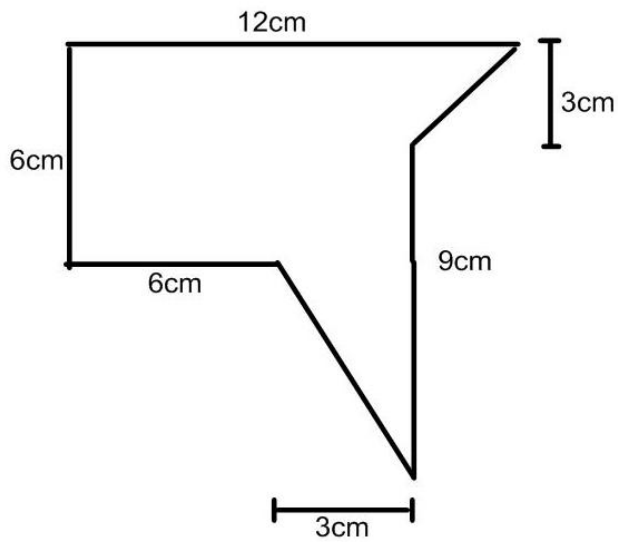


A kite has two pairs of equal sides with the diagonals crossing at right-angles. Opposite angles are equal and it has one line of symmetry.





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.

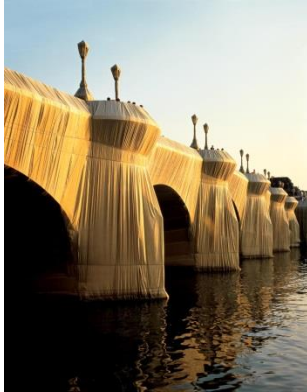
15cm

24cm

7cm 26cm 7cm

Find the Area of this Pentagon.

## The Surface Area of Solid Shapes



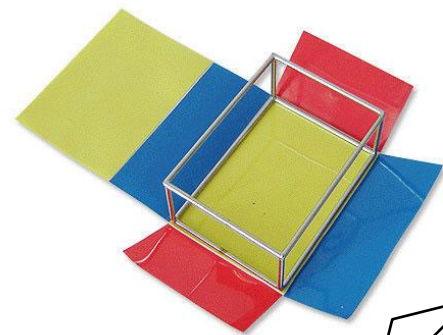
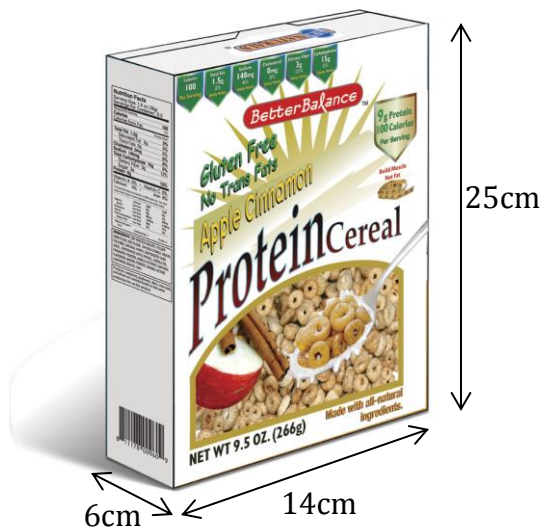
The photo shows a work of art by the artists Christo and Jeanne-Claude in which they wrapped the Pont Neuf Bridge in Paris in  $40,876\text{m}^2$  of silky golden fabric. To wrap this structure, they needed to work out the surface area and calculate the amount of fabric required.



MTH\_EN\_806\_041 Surface Area of a Cube and Cuboid  
RLO 2: Surface Area of a Cuboid

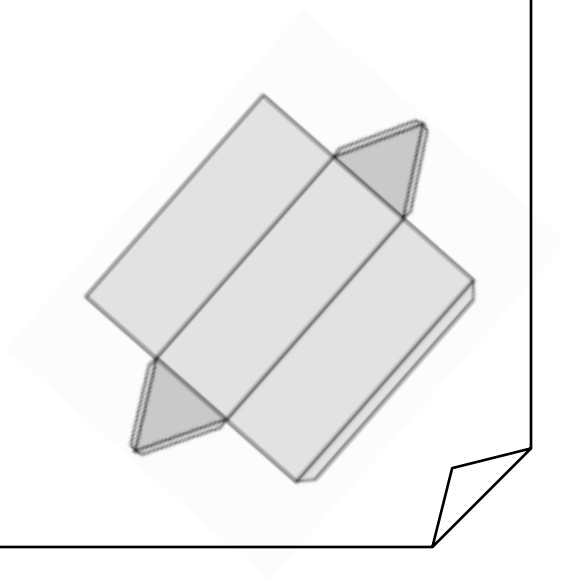
[https://ftp.siveco.ro/aemalta/repository/MTH\\_EN\\_806\\_041/index.html#M02](https://ftp.siveco.ro/aemalta/repository/MTH_EN_806_041/index.html#M02)

Find the Surface Area of this Cereal Packet.



A net like this one might help.

Find the Surface Area of this Toblerone Chocolate Bar.



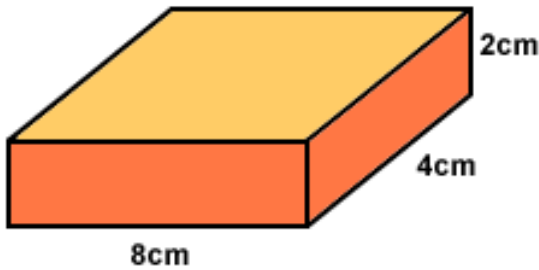
# Volume

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.



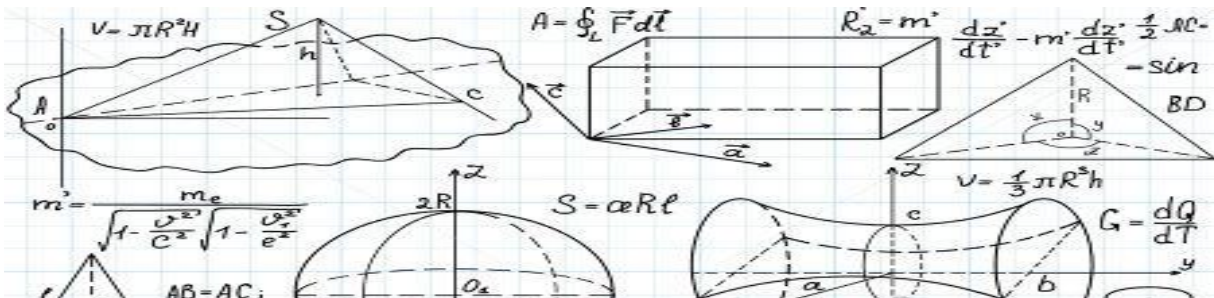
Volumes of containers for liquids also need to be measured. Think, for example of a car fuel tank, the water tank in a building or an aquarium. It is important to be able to calculate the capacity of all these things.

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

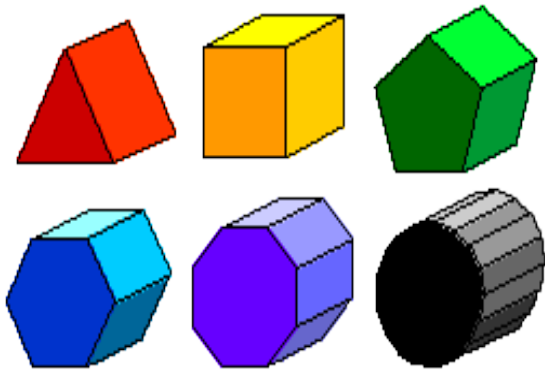


Now you will learn other formulae that can be used to calculate volumes of different shapes, based on a few measurements. Many of these formulae were first worked out thousands of years ago. They are still in use today because they are important in everyday life.

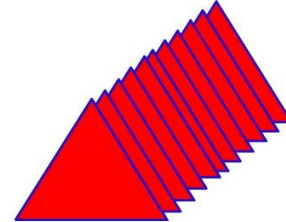
The process of calculating areas and volume using formulae is called Mensuration.



## 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.

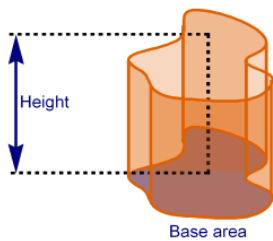


MTH\_EN\_806\_061 Volume of a Prism

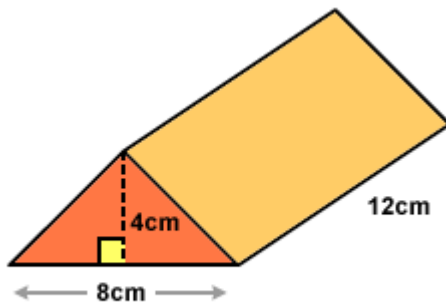
RLO 1 & 2: Identifying a Prism / The Volume of a Prism

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_806\\_061/index.html#M01](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_806_061/index.html#M01)

**The Volume of a Prism =**

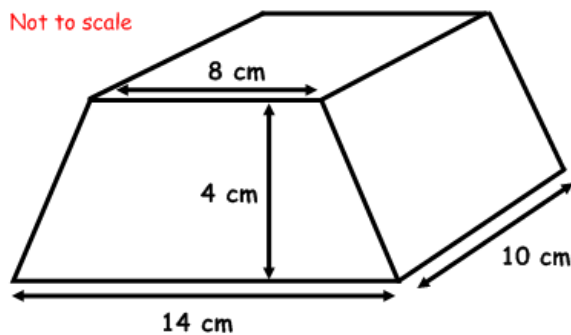


Find the volume of this prism:

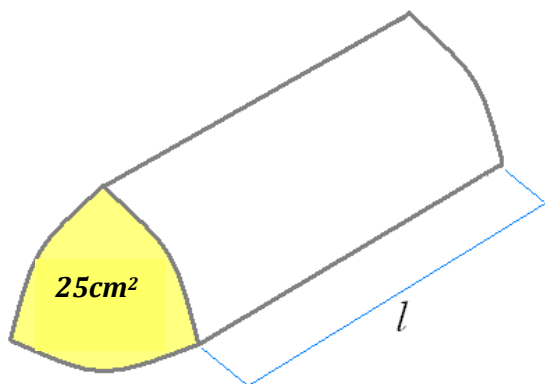


Find the volume of this prism:

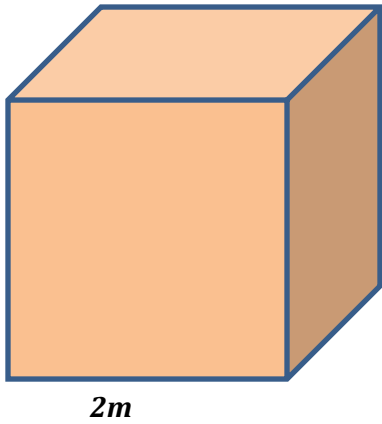
Not to scale



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



## Unit Conversions in Area and Volume



This cube has side 2m.

Its Volume is \_\_\_\_\_m<sup>3</sup>.

2m = \_\_\_\_\_ cm = \_\_\_\_\_ mm

The volume in cm<sup>3</sup> is \_\_\_\_\_cm<sup>3</sup>.

The volume in mm<sup>3</sup> is \_\_\_\_\_mm<sup>3</sup>.

Therefore: 1m<sup>3</sup> = \_\_\_\_\_cm<sup>3</sup> = \_\_\_\_\_mm<sup>3</sup>

Now repeat with the Area of one square face:

Therefore: \_\_\_\_\_ m<sup>2</sup> = \_\_\_\_\_cm<sup>2</sup> = \_\_\_\_\_mm<sup>2</sup>

Convert the following Area Measurements:

m <sup>2</sup>	cm <sup>2</sup>	mm <sup>2</sup>
1.25		
	13.6	
		241.8



... and the following Volume Measurements:

$m^3$	$cm^3$	$mm^3$
17.34		
	346.8	
		367.92

## 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.

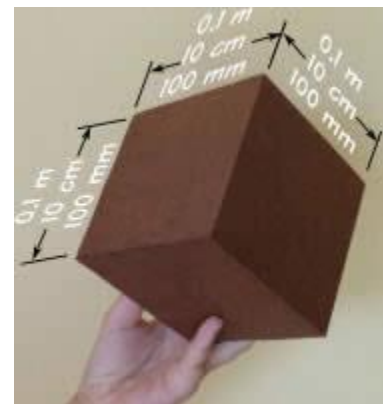


A litre is made up of 1000 millilitres and would fill in a jar like this one. Milk and soft drinks are often sold in litres.

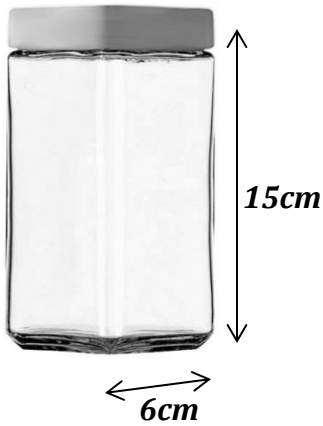
A cube with sides 10cm can contain 1l of liquid.

Therefore:

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



## 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



# Fractions and Percentages

At the end of this topic I will be able 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 %.



## Revision of Fractions



MTH\_EN\_803\_061 Adding and Subtracting two Mixed Numbers  
RLO 2: *Adding and Subtracting Mixed Numbers - Harder Examples*  
[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_803\\_061/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_803_061/index.html#M02)



MTH\_EN\_803\_101 Dividing one fraction by another fraction  
RLO 2: *Dividing Fractions*  
[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_803\\_101/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_803_101/index.html#M02)

### Examples

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

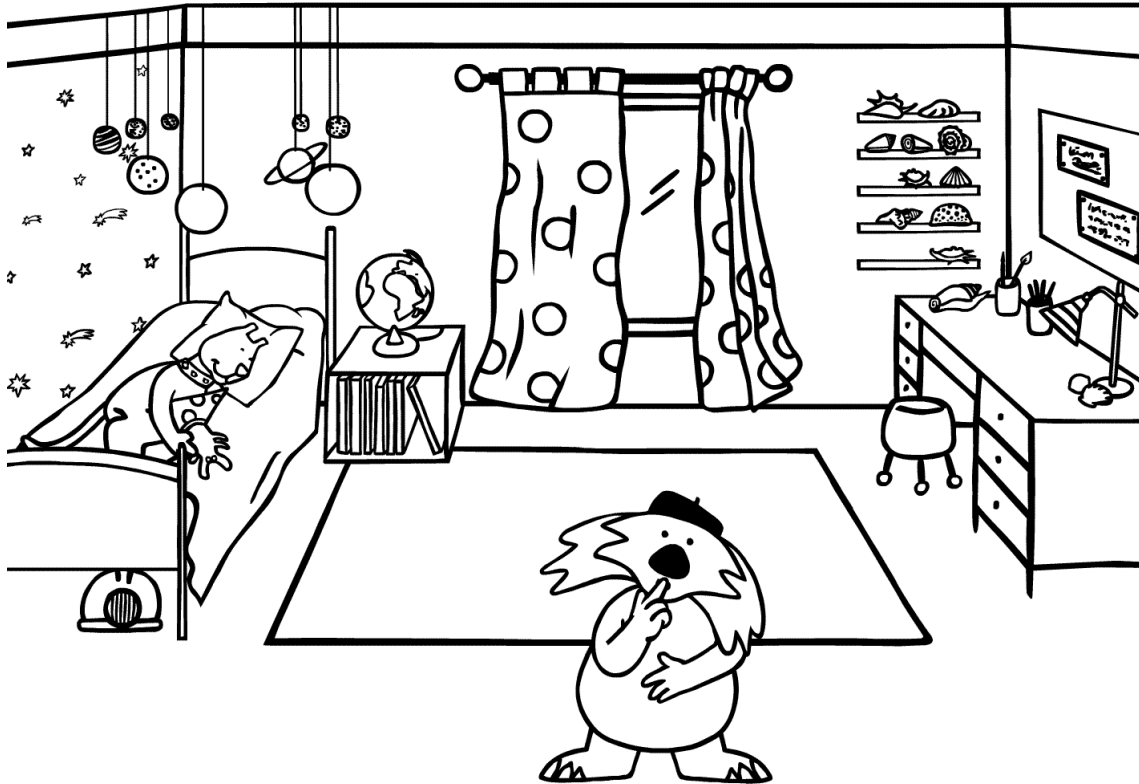
$$\frac{2}{5} \times \frac{11}{14} \div \frac{4}{7}$$

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



# BEDROOM PAINTING

James Calleja



Amanda decides to paint her bedroom.

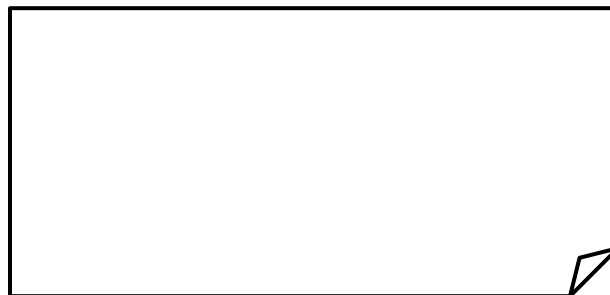
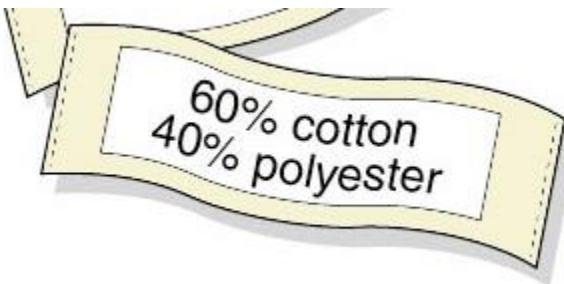
She asks her elder brothers Paul and Mark to help her out.

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?



**Seven reasons to say YES**

Every YES BANK Savings Account comes with seven magnificent offerings that'll lighten up your bank. So much so, your nearest YES BANK Branch, now!

- 1. Higher interest rate of 7% p.a.\*
- 2. Superior Branch Network
- 3. Free unlimited ATM access
- 4. International Debit Card
- 5. MONEY MONITOR
- 6. Secure NetBanking
- 7. True Anywhere Banking

**YES BANK**

\*As per RBI. The actual interest rate may vary. For more information, visit [www.yesbank.in](http://www.yesbank.in). © 2014 YES BANK. All rights reserved.

## 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:  $28\% = \frac{28}{100} = 0.28$

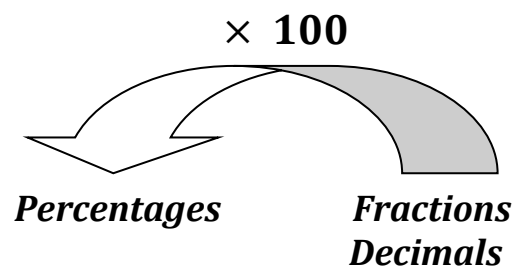
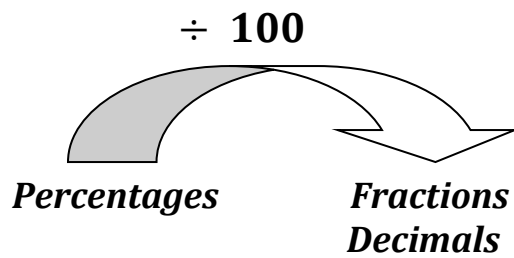


MTH\_EN\_805\_011 Change percentages to fractions and decimals and vice-versa  
RLOs 1 & 2: *Converting and grouping fractions, decimals and percentages*  
[https://ftp.siveco.ro/aemalta/repository/MTH\\_EN\\_805\\_011/index.html#M01](https://ftp.siveco.ro/aemalta/repository/MTH_EN_805_011/index.html#M01)

**Example: Complete this table**

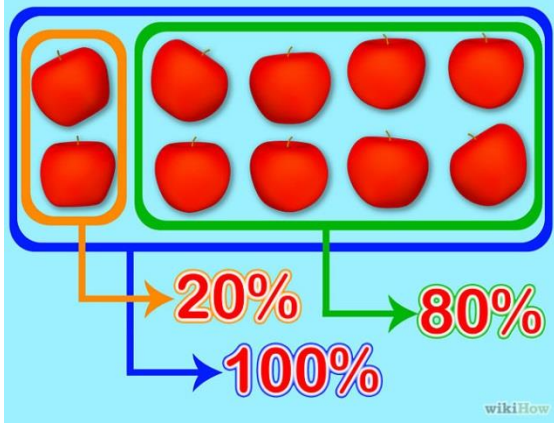
Fraction	Decimal	Percentage
$\frac{1}{2}$		
	0.25	
		75%
$\frac{1}{3}$		
	0.6	
	0.1	
		20%

**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

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_705\\_101/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_705_101/index.html#M02)

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*

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_805\\_021/index.html#M01](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_805_021/index.html#M01)

## 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.



At the end of this topic I will be able to:			
Understand the meaning of an equation and an expression			
Form and solve equations			
Use multiplication and division in Expressions			
Solve equations involving fractions			
Understand the concept of inequalities			
Represent inequalities on a Number Line			
Solve inequalities			



Chapter 12, Pg. 242: Linear Equations

Give an example of:

**An Equation**

**An Expression**

You can only **Simplify** an **Expression** but you can **Solve** an **Equation**.

Simplify the following Expressions:

$14g - 7h - 3g - h$	$2(3x - 4) - 5(6x - 7)$
---------------------	-------------------------

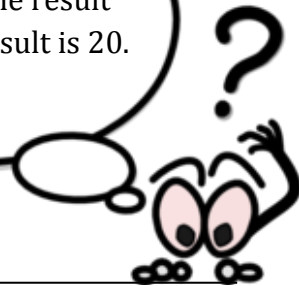
Solve the following Equations:

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

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.





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.

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





## 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:

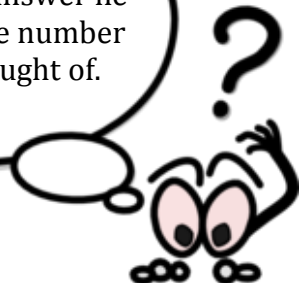
$$\frac{x}{8} - 5 = 2$$

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

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



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.



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

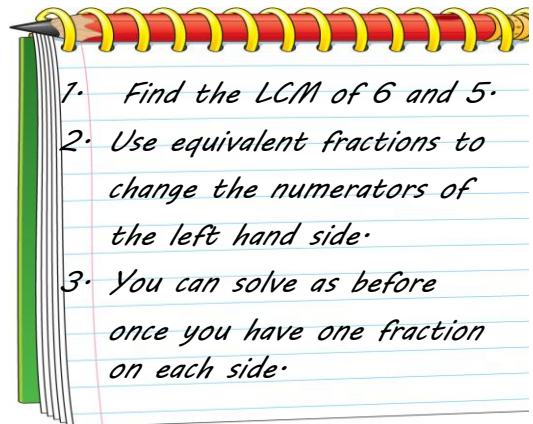
$$\frac{2x - 3}{5} = 4$$

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

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

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.

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



## Examples

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

$$\frac{4x}{5} - \frac{3}{10} = \frac{x}{5}$$

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".*



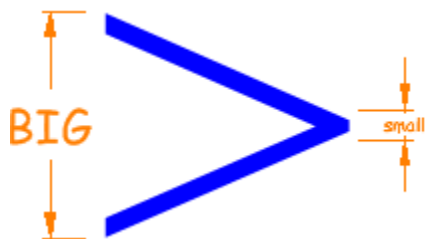
# Inequalities

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:



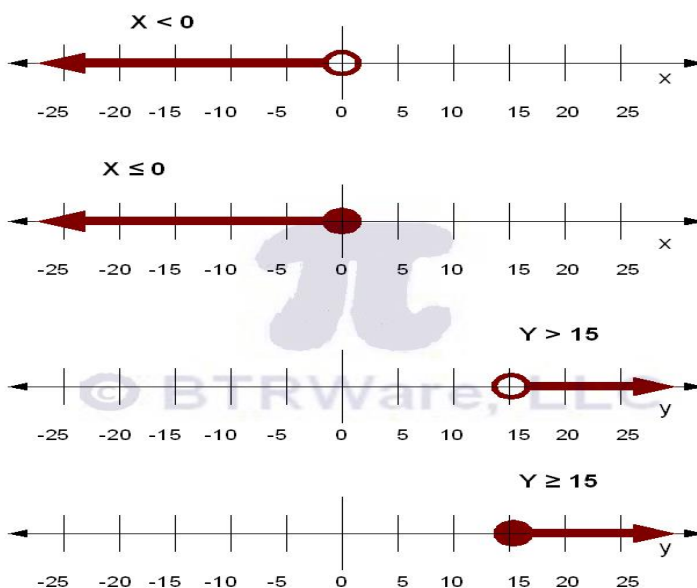
You can also have inequalities that include "equals", like:

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

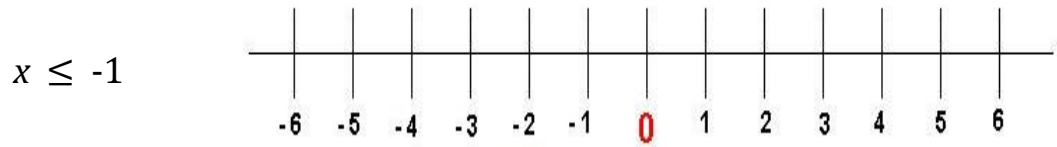
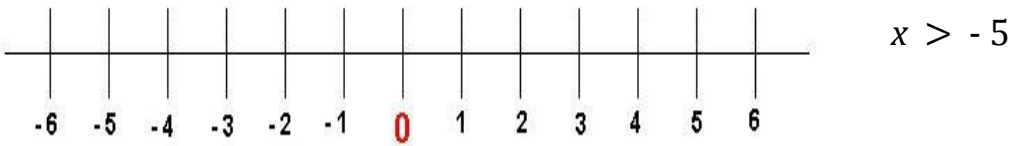
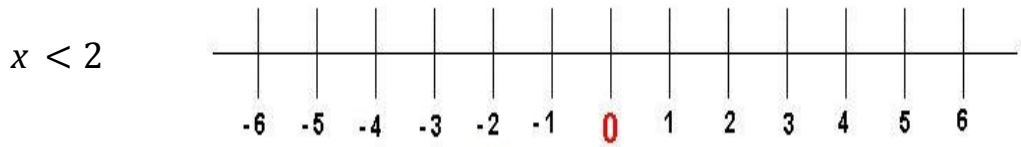
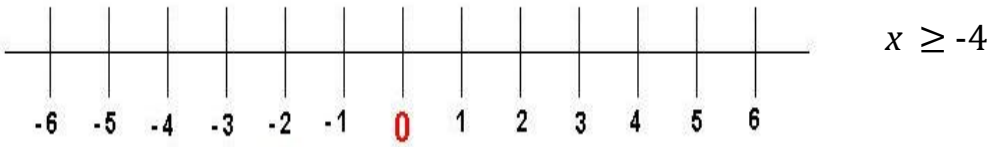
Inequalities can be represented on a number line in this way:

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

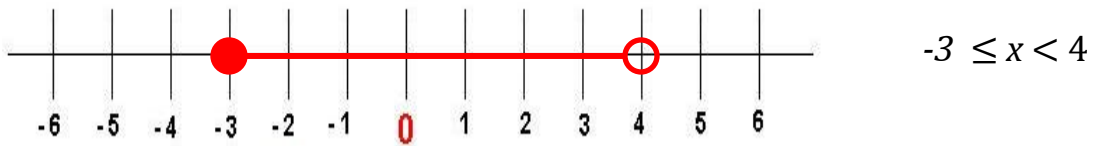
**An empty circle indicates  $<$  or  $>$  (greater/smaller but NOT equal)**



Represent these Inequalities on the given Number Line:



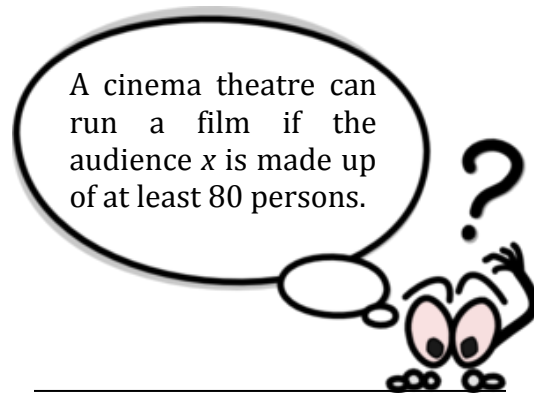
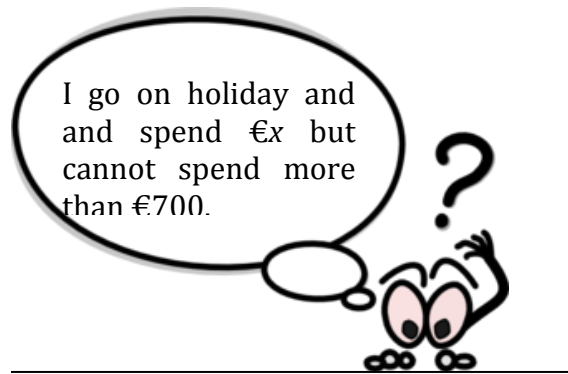
Sometimes Inequalities are also used to represent a Range of numbers:



*MTH\_EN\_804\_021 Inequalities on the Number Line*  
*RLO 2 Simple Case Inequalities*

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_804\\_021/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_804_021/index.html#M02)

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

$6 < 8 - x$

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



# Statistics

At the end of this topic I will be able 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.*



## Reminder from Last Year

# 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
<b>the average of the numbers</b>	<b>the middle number of a sequence</b>	<b>the number that occurs most often</b>	<b>the difference between the lowest and highest values</b>
1. Add the numbers together. 2. Divide by how many numbers were added. <b><math>3+5+5+6+8+10+12=49</math></b> <b><math>49 \div 7 = 7</math></b>	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.  <b>The middle number is 6.</b>	Find the number(s) that occurs most often in the sequence (there may be more than one).  <b>There are two 5s and one of each of the other numbers.</b>	Subtract the smallest number from the largest number.  <b><math>12 - 3 = 9</math></b>
<b>The mean is 7.</b>	<b>The median is 6.</b>	<b>The mode is 5.</b>	<b>The range is 9.</b>



MTH\_EN\_811\_051 The Mean of a set of ungrouped data

RLO 1 The Mean

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_811\\_051/index.html](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_811_051/index.html)



MTH\_EN\_811\_061 The Median of a set of ungrouped data

RLO 1 & 2 The Median of and odd/even number of data

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_811\\_061/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_811_061/index.html#M02)



MTH\_EN\_811\_071 The Mode of a set of ungrouped data

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

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_811\\_071/index.html](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_811_071/index.html)



MTH\_EN\_811\_081 The Range

RLO 1 The Range

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_811\\_081/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_811_081/index.html#M02)

## 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

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_811\\_041/index.html#M01](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_811_041/index.html#M01)

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		
<b>Total</b>		



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

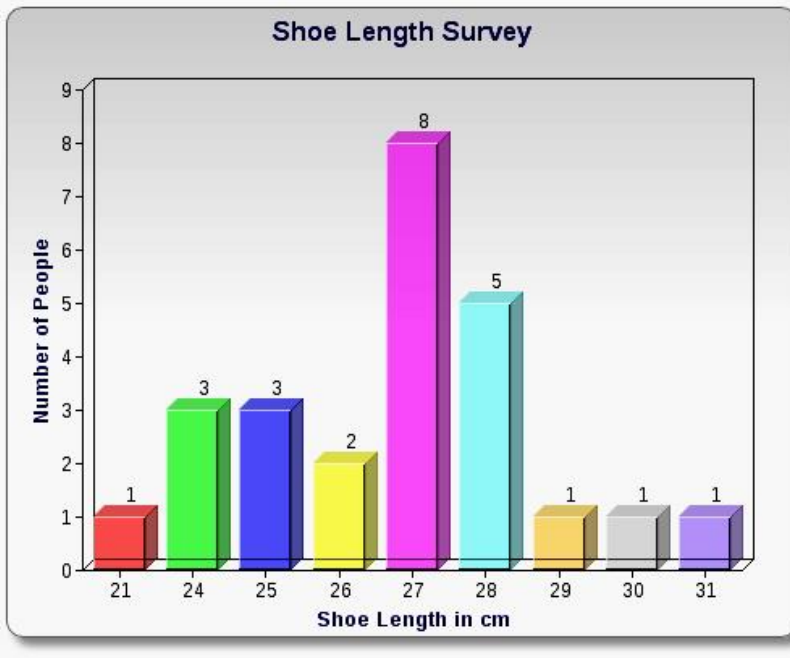
Sort this data in a Frequency Table

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



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?

\_\_\_\_\_

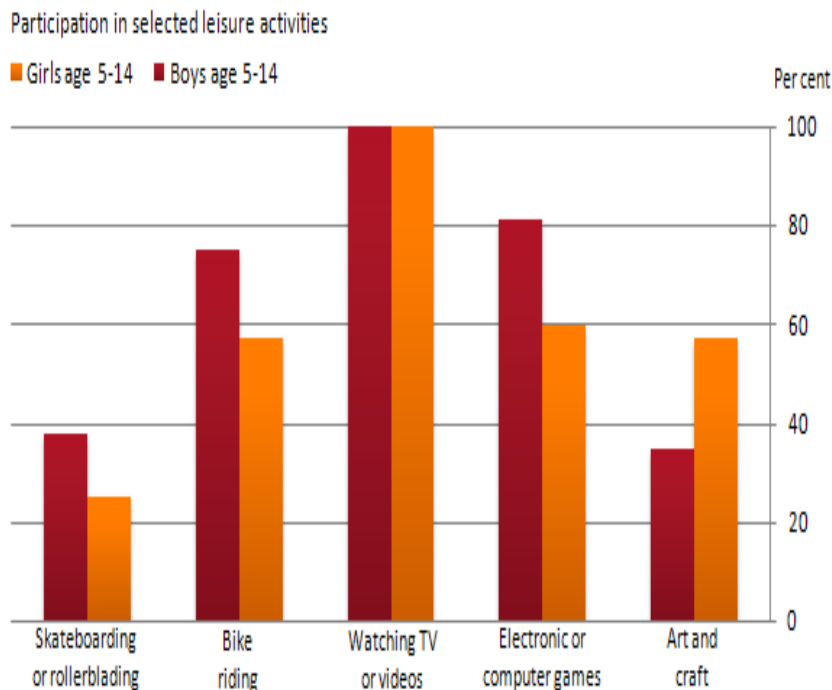
Name two sizes which are used by the same number of people.

\_\_\_\_\_

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  $360^\circ$  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.

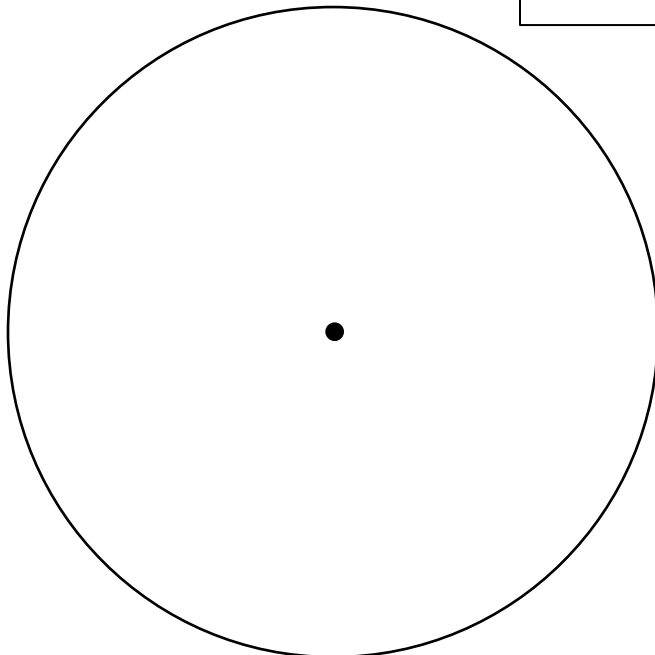
Type of Transport	Train	Bus	Car	Ship	Plane
Frequency	24	12	59	11	14
Degrees on Pie Chart					



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

\_\_\_\_\_

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

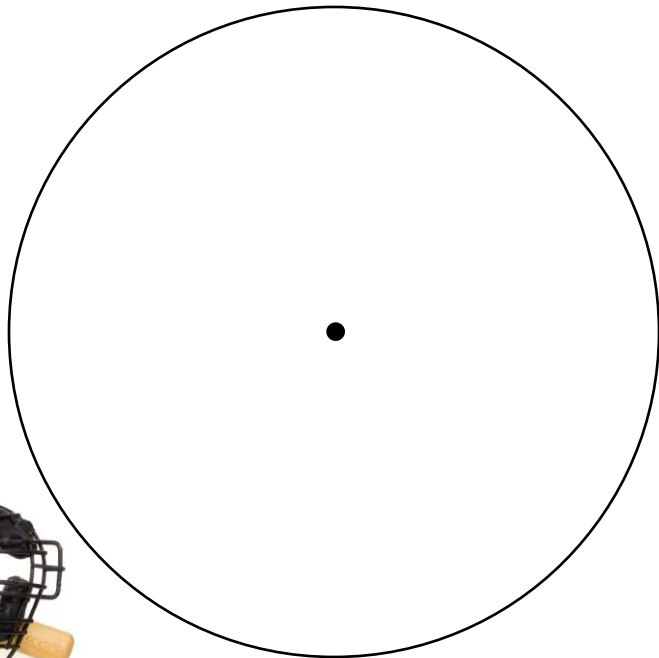


Find the degree allotted for the other means of transport and represent this data in the circle below.

Do not forget to label your pie-chart.

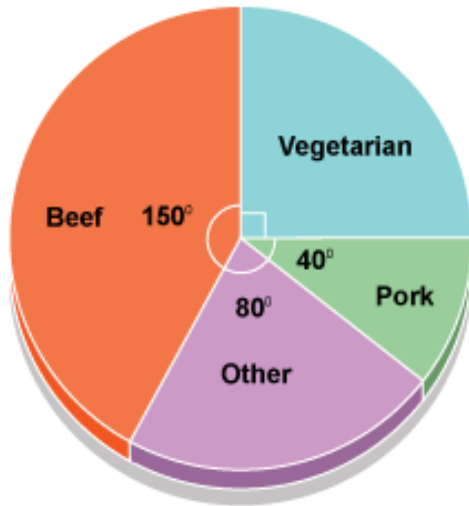
Sean asked 24 of his friends which sport they preferred to play. The data is shown in the frequency table. Use this information to draw a Bar-Chart and a Pie-Chart.

Sport	Rugby	Football	Tennis	Baseball	Basketball	Volleyball
Frequency	4	9	3	1	5	2
Degrees for 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

[https://ftp.siveco.ro/aelmalta/repository/MTH\\_EN\\_811\\_091/index.html#M02](https://ftp.siveco.ro/aelmalta/repository/MTH_EN_811_091/index.html#M02)



## 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:

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







## 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.