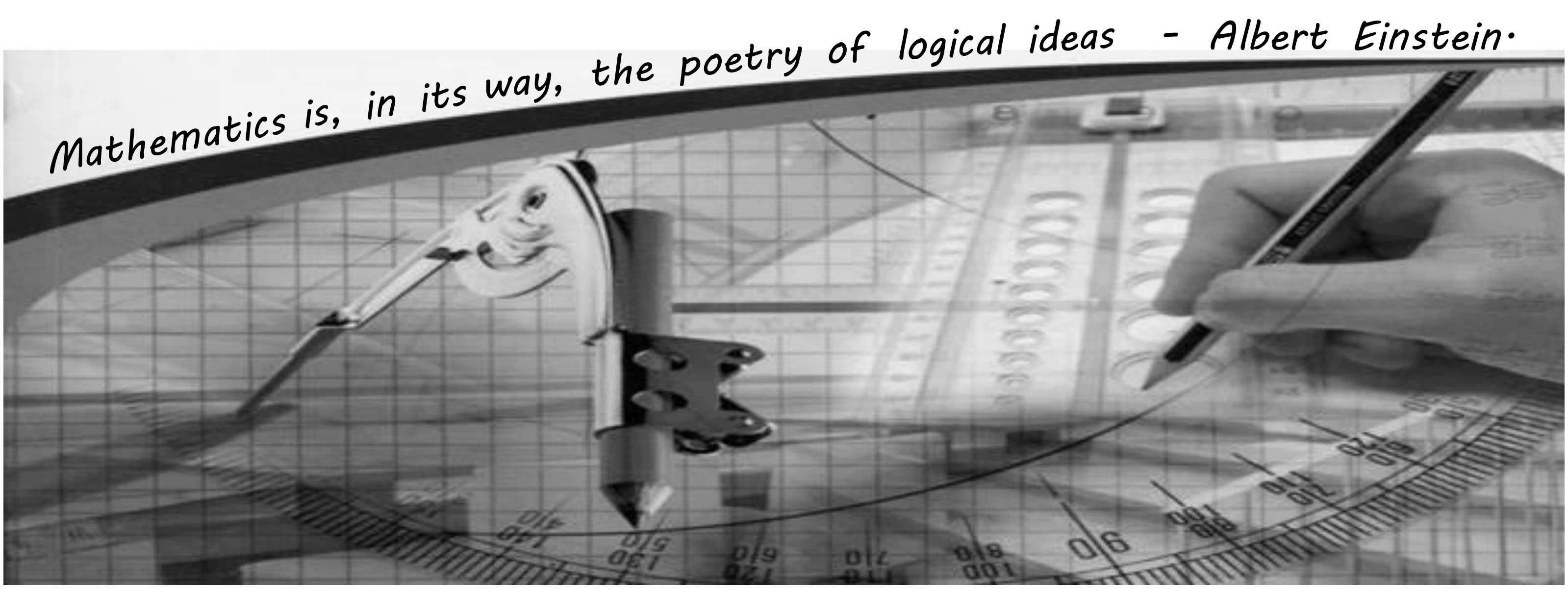
MATHEMATICS NOTES Form 2

Booklet 2

Ms. G. Bonnici

Name : ______________________________

Class: ______________



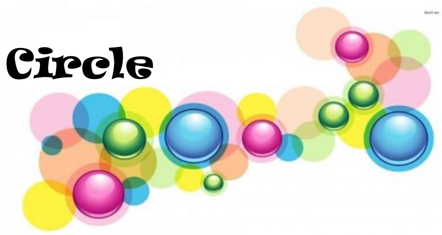
We are learning to:			
Understand the meaning of radius, diameter, circumference			
Find the Circumference of a Circle			
Find the Area of a Circle			
Solve problems involving the Circumference and Area of a Circle			
Work with compound shapes involving circles			
Find the volume of a Cylinder			

Chapter 9, Pg. 172: Circumference and Area of a Circle

The word "circle" derives from the Greek, kirkos coming from the verb 'to turn' or 'bend'. The circle has been known since before the beginning of recorded history. Natural circles would have been observed, such as the Moon, Sun, and a short plant stalk blowing in the wind on sand, which forms a circle shape in the sand. The circle is the basis for the wheel, which, with related inventions such as gears, makes much of modern civilisation possible. In mathematics, the study of the circle has helped inspire the development of geometry, astronomy, and calculus.

MTH_EN_709_081 Parts of a Circle
RLO 1 & 2 Identifying Parts of a Circle

Investigating the Circle



You will need: 4 circular objects
a long string
ruler
pens and calculator

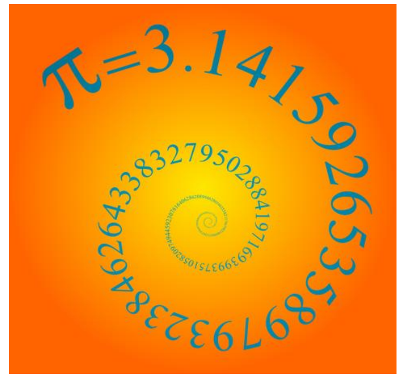
With your piece of string and a ruler, measure the Circumference and Diameter of each circular object you have got. Make sure you are as accurate as possible. Record your measurements in the table below.

Object	**Circumference / cm**	**Diameter / cm**	

Try to find a relationship between the Circumference and Diameter of each circular object.

Conclusion

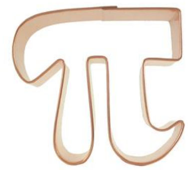
The Circumference of a Circle



The circumference of a circle is slightly more than three times as long as its diameter. The exact ratio is called **π**. The constant, sometimes written **pi**, is approximately equal to 3.14159 or $\frac{22}{7}$. Actually this number is unlike any other number that you have met so far. It cannot be written exactly as a fraction or as a decimal.

This number has been represented by the Greek letter "π" since the mid-18th century and now you can also find a π button on your calculator.

From your investigation we can conclude that that the Circumference of a Circle can be found by using one of these two formulae:



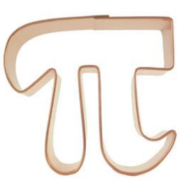
$$C = \pi d \quad \text{or} \quad C = 2\pi r$$

Use the π button on your calculator

Find the Circumference of a Circle with radius 8.5cm.

Find the Circumference of a Circle with Diameter 34.2cm.

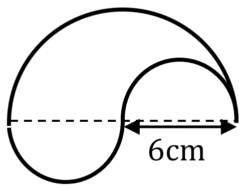
Find the radius of a circle with Circumference 29.5cm.



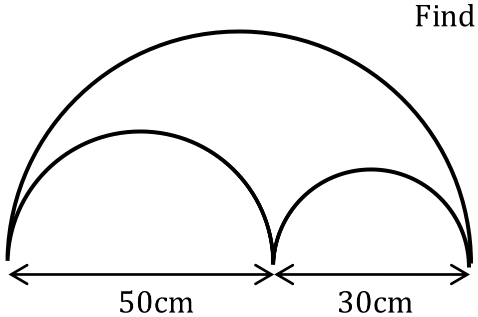
Pi Day is celebrated on March 14. The town of Princeton, New Jersey hosts numerous events in a combined celebration of Pi Day and Albert Einstein's birthday, which is also March 14.

Examples

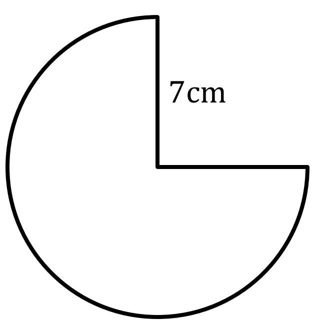
Find the Perimeter of this shape.

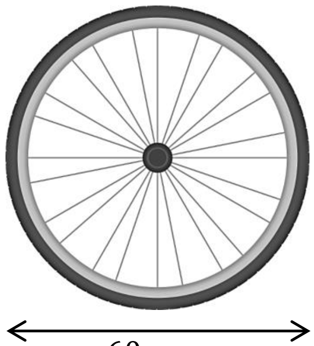


Find the Perimeter of this shape.



Find the Perimeter of this shape.



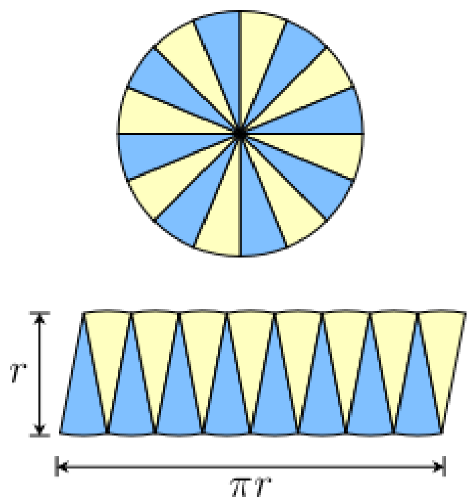


The diagram shows a bicycle wheel of diameter 60cm.

a) Calculate the length of the circumference correct to the nearest cm.
b) How many revolutions does the wheel have to turn to cover a distance of 825m? Give your answer correct to the nearest whole number.

The wheel of a wheelbarrow turns 80 times when it is pushed a distance of 70m. Work out the radius of the wheel. Give your answer in cm correct to the nearest cm.

The Area of a Circle



This circle was divided into 16 equal pieces which were arranged as shown to form a rectangular shape.

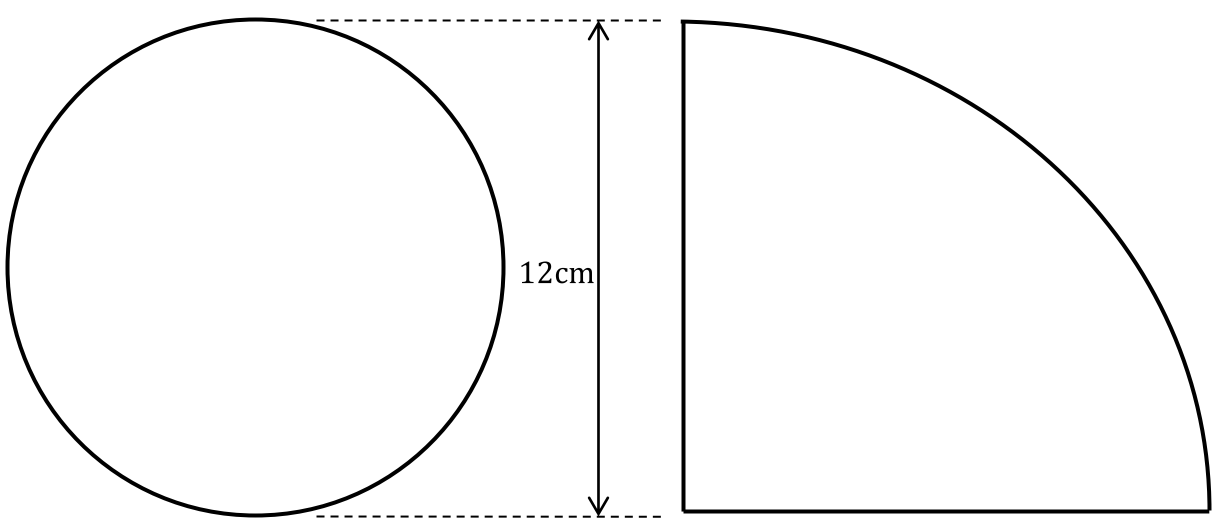
The edges of the shaded sectors make half the Circumference of the Circle so their total length is πr.

The height is equal to the radius of the circle (r).

The Area has remained unchanged.

From this we can obtain a formula for the Area of a Circle.

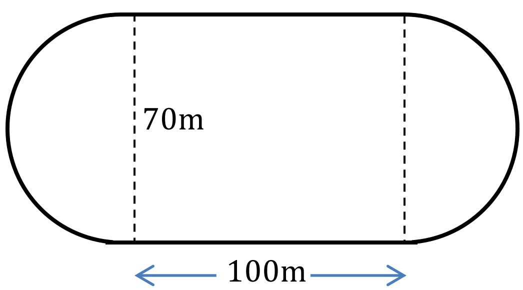
Find the Area of these Shapes



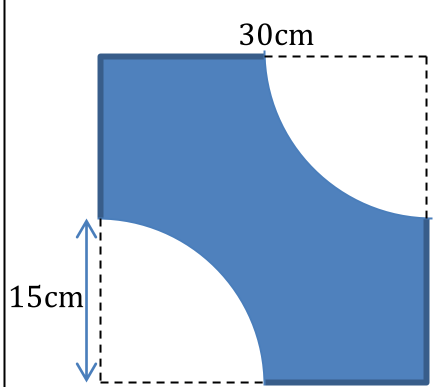
Examples

A rectangular card measures 30cm by 20cm. Two identical circles of radius 5cm are cut out of the card. Find the Area that is left, giving your answer correct to the nearest whole number.

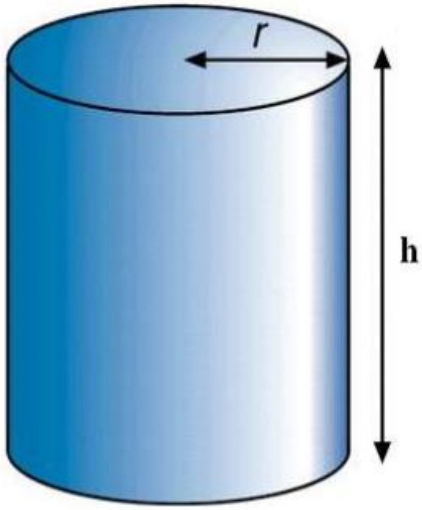
Find the Area of this sports field.



Find the Shaded Area



The Volume of a Cylinder

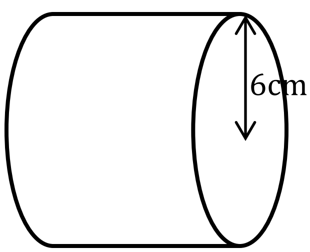


A cylinder is a prism with a circular cross-section.

From what you remember about Prisms, deduce the formula for the Volume of a Cylinder.

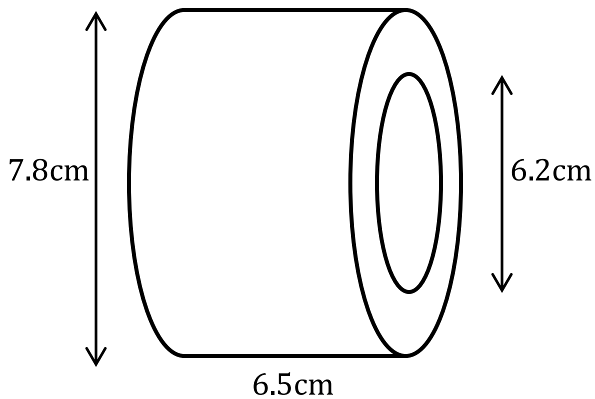
Examples

Find the Volume of this cylinder.

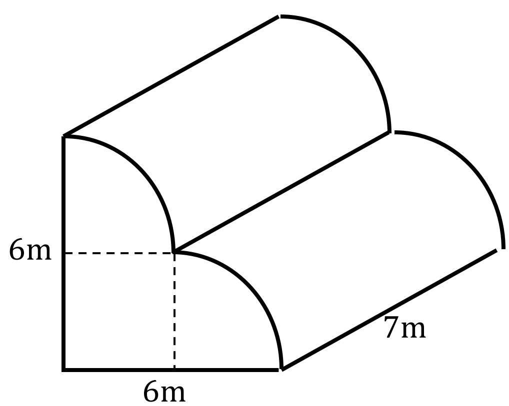


Tracy's Glass Shop has a semicircular cross-section of diameter 12m. The length of the shop is 15m. Find the Volume of the shop.

An annulus has an external diameter of 7.8cm, an internal diameter of 6.2cm and a length of 6.5cm. Work out the volume of the annulus. Give your answer correct to 1d.p.



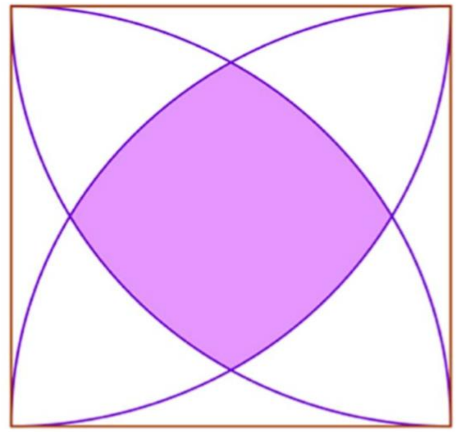
Find the Volume of this figure, giving your answer correct to 1d. p.



Curved Square

A square of side length 1 has a circle of radius 1 drawn from each of its corners, as in the diagram. The circles intersect inside the square at four points, to create the shaded region.

What is the exact area of the shaded region?



nrich.maths.org

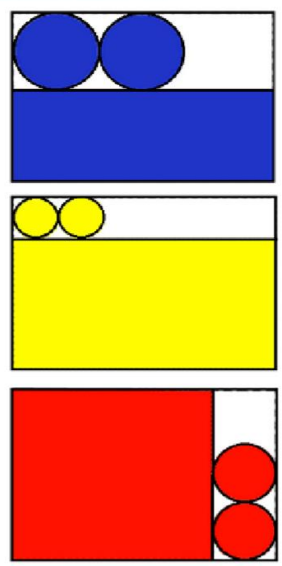
Efficient Cutting

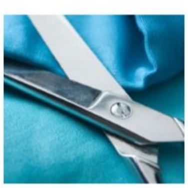
A cylindrical container can be made by using two circles for the ends and a rectangle which wraps round to form the body.

To make cylinders of varying sizes, the three pieces can be cut from a single rectangular sheet in several ways. Some examples are shown here.

Using a single sheet of A4 paper, make the cylinder with the largest volume. The cylinder must be closed off with a circle at each end.

What are its dimensions?





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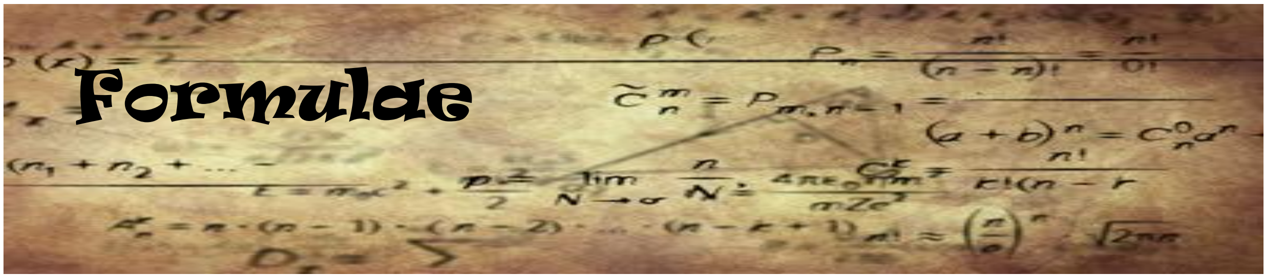


Formulae

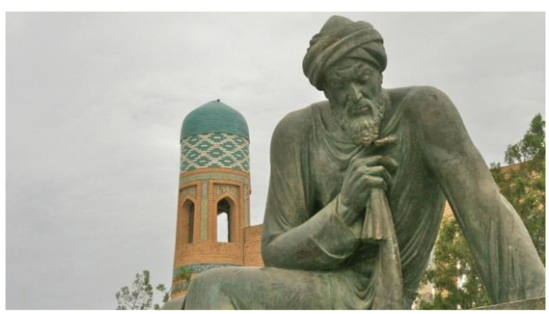
We are learning to:			
Construct a Formula			
Substitute Numbers into a Formula			
Make one letter the subject of the Formula			

Chapter 10, Pg. 190: Formulas

Mathematics is the only language which people in all countries understand. Everyone understands the numbers on this stamp even if they do not speak the language of the country.

Algebra is an important part of the language of mathematics. It comes from the Arabic ***al-jabr,*** *meaning 'The Collection'. It was first used in a book written in 820CE by a Persian Mathematician called al-Khwarizmi who is also pictured on this stamp.*

The use of symbols grew until the 17th Century when a French mathematics called Descartes developed them into the sort of algebra we use today.



Constructing a Formula

A formula is an equation which specifies how a number of variables are related to one another.

Reminder

This is an Expression

$5a + 3b$

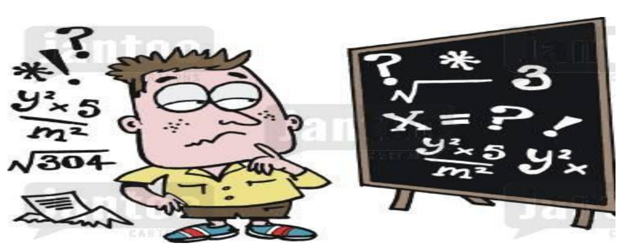
This is a Formula

$T = 5a + 3b$

MTH_EN_810_051 Formulae
RLO 1 & 2 Derive an expression/Derive and use a Formula

Write an Algebraic Expression for the following

2 more than ***x***		***6*** less than ***x***	
k more than ***x***		***x*** minus ***t***	
x added to ***3***		***d*** added to ***m***	
y taken away from ***b***		***p*** added to ***t*** added to ***w***	
8 multiplied by ***x***		***h*** multiplied by ***j***	
y divided by ***t***		***2*** divided by ***x***	
a multiplied by ***a***		***g*** multiplied by itself	



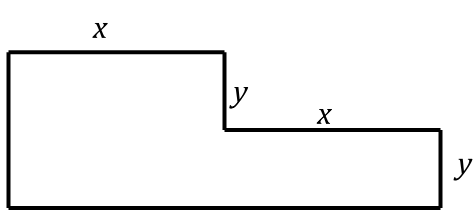
Duncan hires a car whilst on holiday in Spain. The cost of hiring a car is €90 plus €50 for each day that the car is hired for.

a) Write down a formula that could be used to find the total cost €C, to hire a car for ***d*** days.

b) Use your formula to work out the cost of hiring a car for 14 days.

David owns a hairdressing salon. On average, he spends 15 minutes on a male client and 35 minutes on a female client. In one week he had ***m*** male clients and ***f*** female clients. Write down a formula tor the total time **T** minutes that he spent on his clients during this week.

The diagram shows the plan of an L-shaped room. The dimensions are given in metres. Write down formulae in terms of ***x*** and ***y*** for ***P*** – the Perimeter of the room and ***A*** – the Area of the room.



Substituting Numbers into a Formula

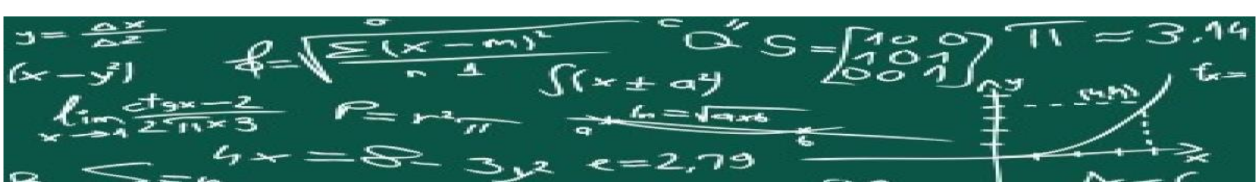
MTH_EN_810_041 Substitution
RLO 1 & 2 Substitution

A piece of fish costs €2 each and a portion of chips costs €1 at the local fast food shop. The change from €20 when buying some fish and chips is given by the formula:

$$\mathbf{C = 20 - \boldsymbol{p} - 2\boldsymbol{f}}$$

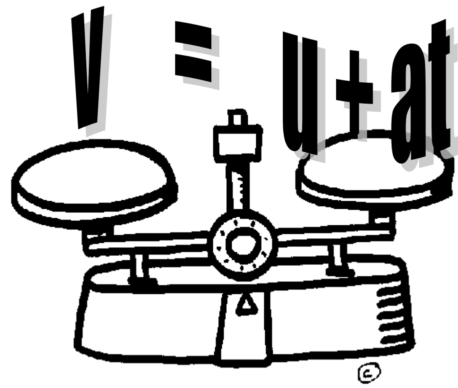
a) What do C, p and f stand for?
b) Jamie buys 3 portions of chips and 4 fish. How much change from €20 is he given?
c) Paul buys 5 portions of chips and some fish. He is given €3 change. How many fish portions does Paul buy?

Find the value of R in $\boldsymbol{R} = \dfrac{f+2g}{h^2}$ when $f = 17$, $g = 7.5$ and $h = -2$.



The Subject of the Formula

Physicists and engineers rearrange many complex formulae in order to find important measures.



Formulae are written so that a single variable, the subject of the formula is on the left hand side of the equation. Everything else goes on the right hand side of the equation.

In the formula ***v = u + at***, ***v*** is the subject of the formula.

Make ***a*** the subject of the formula. Remember it must be on its own on the first side of the Equation.

Make p the subject of the formula:

$$T = \frac{p+2}{7}$$

$$C = 2p^2 + 3$$

Exercise

In each case make the letter in brackets the subject of the formula:

1. $T = 3k$ (k)
2. $x = y - 1$ (y)
3. $Q = \frac{p}{3}$ (p)
4. $A = 4r + 9$ (r)
5. $W = 3n - 1$ (n)
6. $G = \frac{m}{v}$ (m)
7. $C = 2\pi r$ (r)
8. $P = 2l + 2w$ (l)
9. $m = p^2 + 2$ (p)
10. $A = \frac{1}{4}\pi d^2$ (d)
11. $W = 3n + t$ (n)
12. $x = 5y - 4$ (y)
13. $k = m + n^2$ (m)
14. $K = 5n^2 - w$ (n)
15. $a = \frac{b+2}{c}$ (c)
16. $3x^2 - 4y^2 = 11$ (x)

Matchless

There is a particular value of x, and a value of y to go with it, which make all five expressions equal in value, can you find that x, y pair ?

$2x + 3y - 20$

$5x - 2y + 38$

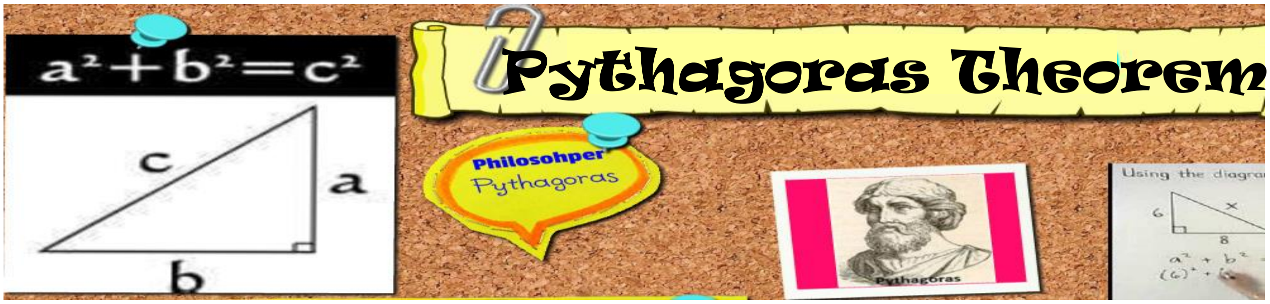
$4x + 5y - 72$

$x - 4y + 108$

$3x - y + 39$

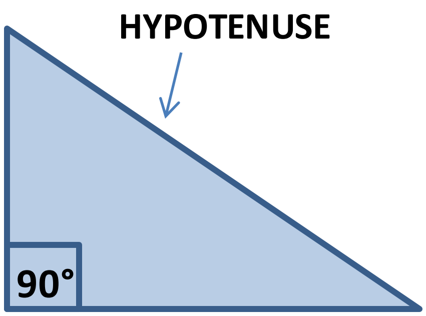
Did you have more information than you needed? Not enough information ?

Or exactly the amount required to solve the problem?



We are learning to:			
Identify the Hypotenuse in a Right Angled Triangle			
Understand the theorem of Pythagoras			
Use Pythagoras Theorem to find missing sides			
Apply Pythagoras Theorem to solve problems			

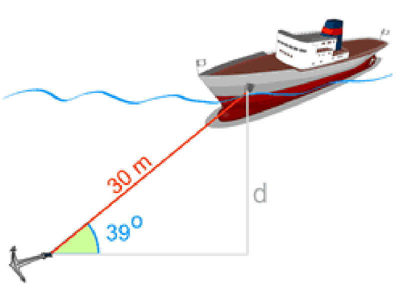
eBook Chapter 21, Pg. 413: Pythagoras' Theorem

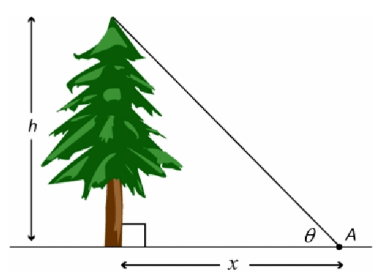


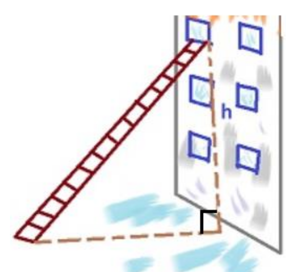
In this topic we are going to learn interesting facts about the right angled-triangle. One of the angles in this triangle is always 90°.

The side opposite the 90° angle is called the HYPOTENUSE.

We also encounter lots of right-angled triangles in everyday life so what we will be learning in this chapter would help.

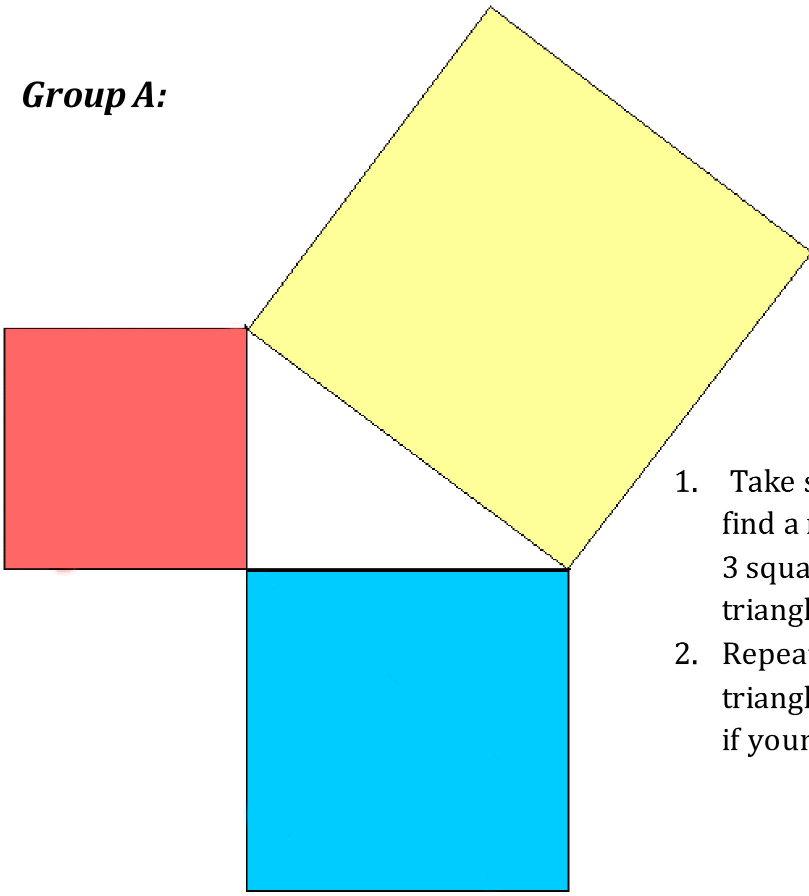






Investigating the Right-Angled Triangle

Group A:

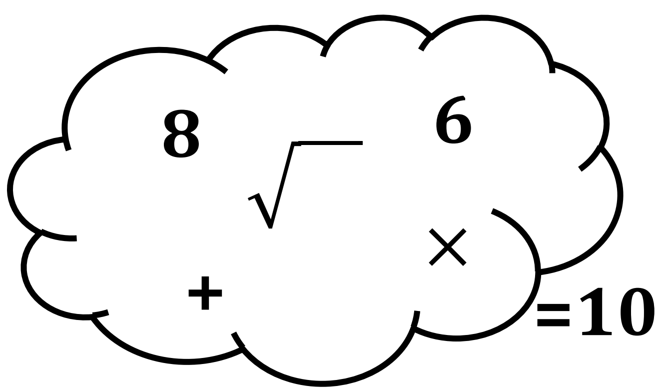


1. Take suitable measurements to find a relationship between the 3 squares on the sides of the triangle.
2. Repeat with any right-angled triangle of your own and check if your relationship still holds.

Group B:

Try to use the numbers and operations in brackets to get an answer of **10.**

You can use each number or operation more than once.

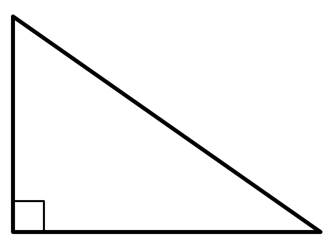


Results:

Group A	***Group B***

Our work here is related to the famous discovery attributed to the Greek Mathematics Pythagoras.

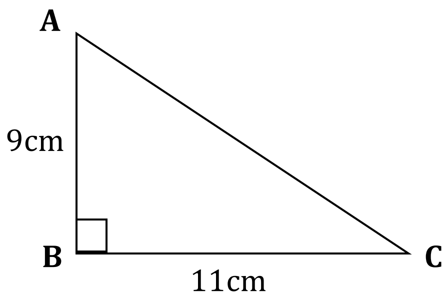
Pythagoras' Theorem

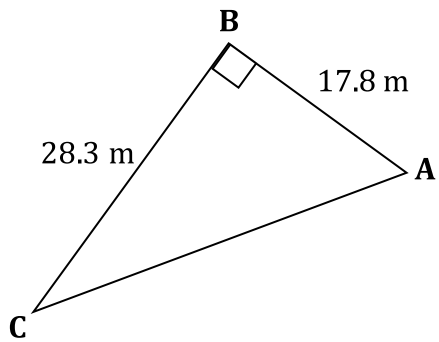


Pythagoras was a Greek philosopher and mathematician. He was born on the Greek island of Samos in 580BC. He later moved to Italy, where he established the Pythagorean Brotherhood which was a secret society devoted to politics, mathematics and astronomy. He might have travelled widely in his youth, visiting Egypt and other places seeking knowledge. He made influential contributions to philosophy and religious teaching in the late 6th Century B.C. He is best known for the Pythagorean Theorem which bears his name.

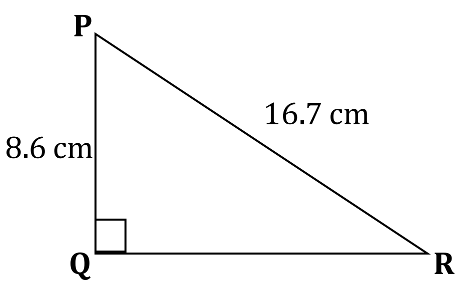
Examples

Find the length of the hypotenuse in each of the following triangles:





What is different about this example?

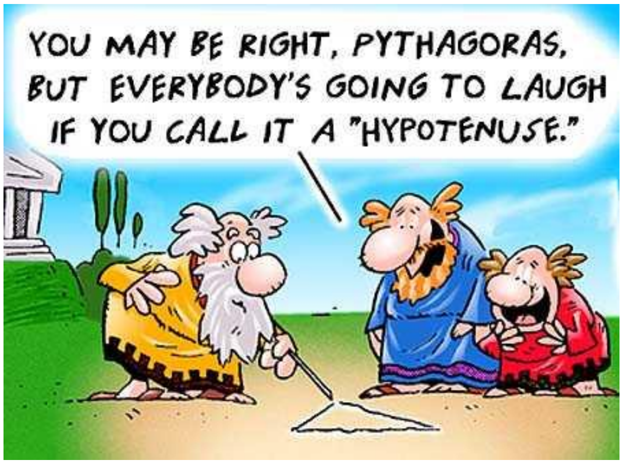


Rearrange the Pythagorean Formula and use it to find side QR.

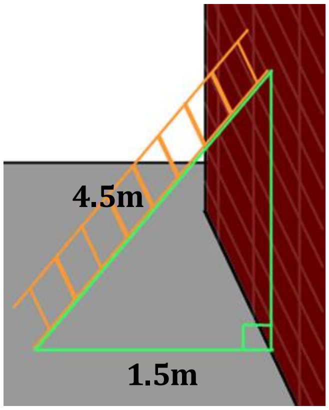
http://www.math-play.com/Pythagorean-Theorem-Jeopardy/Pythagorean-Theorem-Jeopardy.html

IMPORTANT:

- *Pythagoras Theorem is used in calculations involving sides of* ***Right-Angled triangles.***
- *We ____________________ when we need to find the hypotenuse and we________________________ when we need to find a smaller side.*



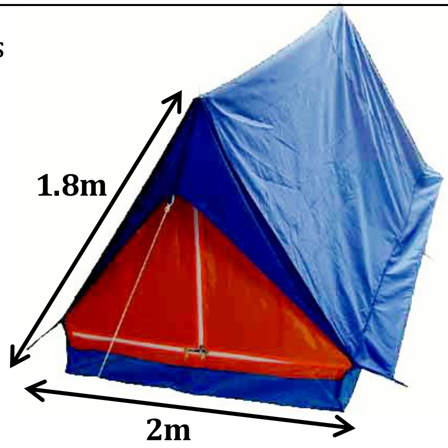
Pythagoras' Theorem in use



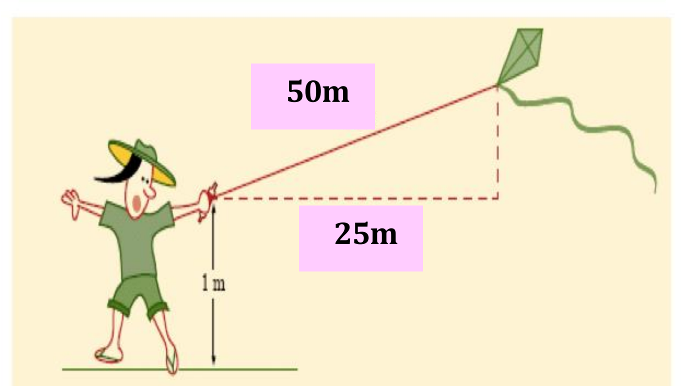
A 4.5m ladder leans against a vertical wall. The distance between the foot of the ladder and the wall is 1.5m. How far is the top of the ladder from the ground?

The picture shows a camping tent. The slant sides of the tent are 1.8m long and the base is 2m wide.

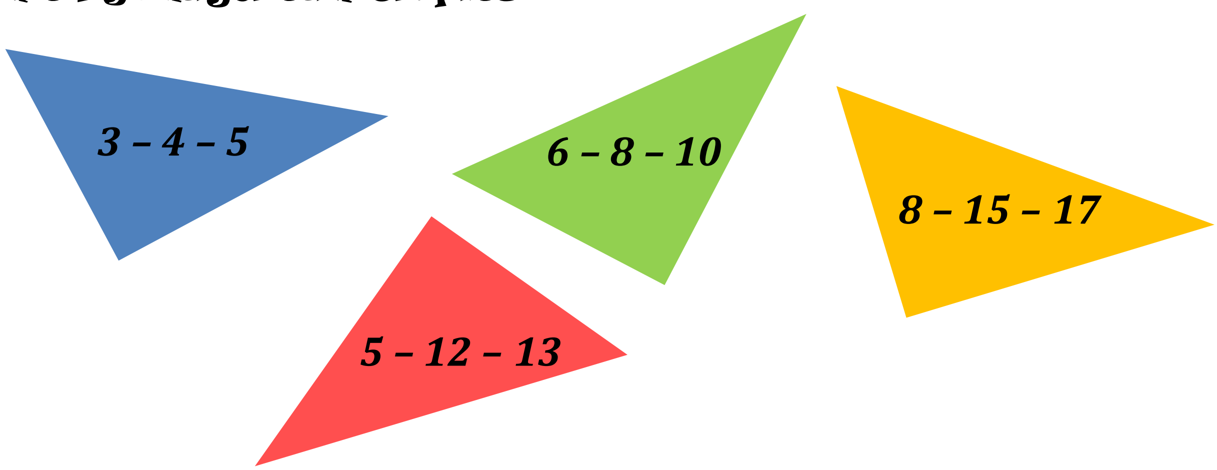
Find the height of the tent.



A boy is flying a kite using a string with length 50m and holding the string 1m above the ground. Find the height of the kite above the ground.

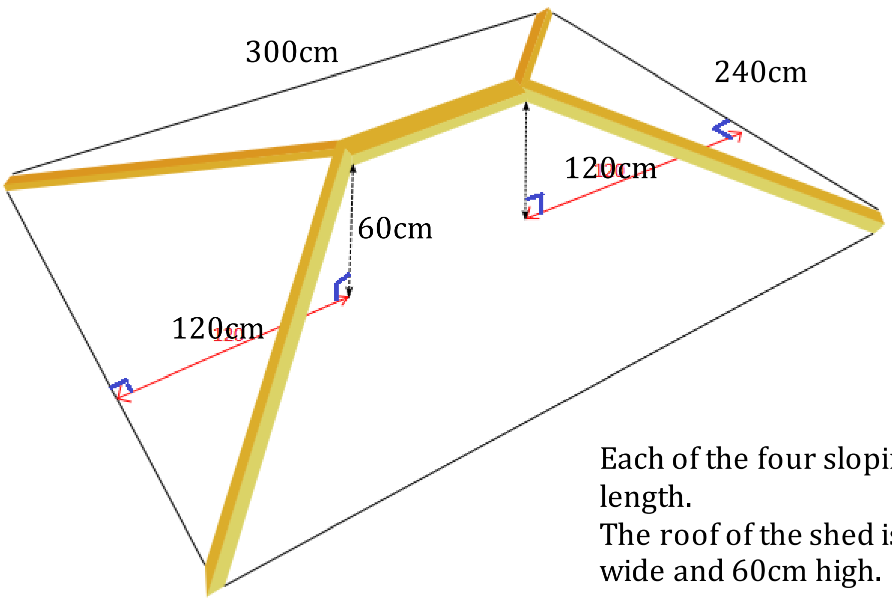


Some Pythagorean Triples



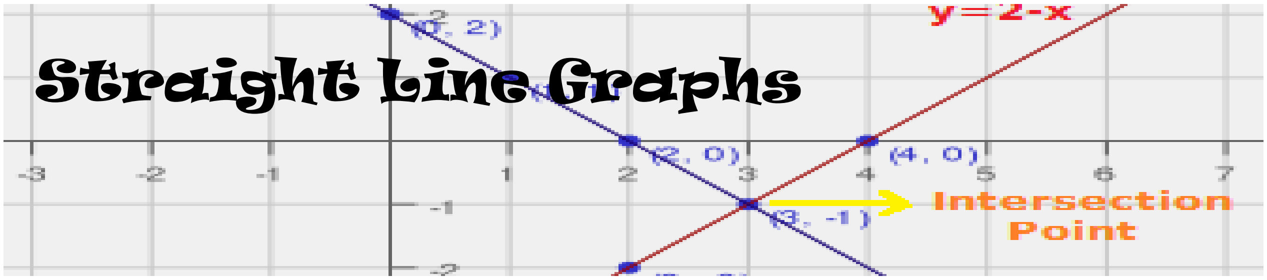
Garden Shed

Suppose we have a garden shed with a roof like the one below. The five main wooden beams are laid out like this.



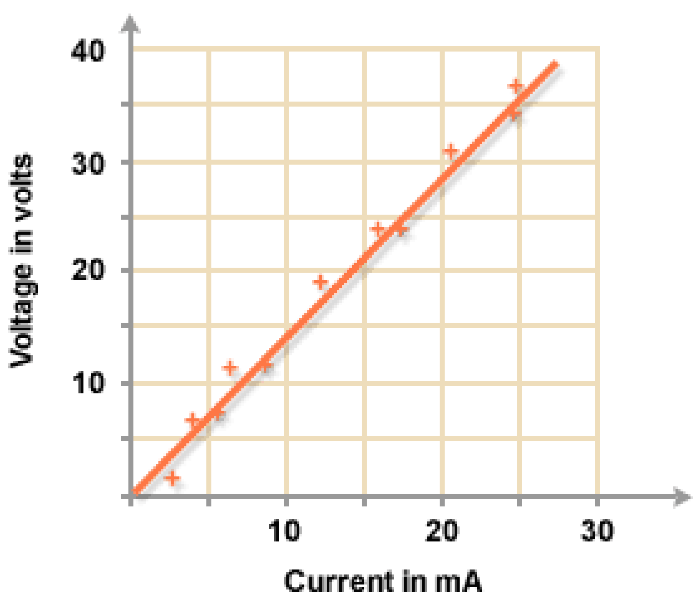
Each of the four sloping beams is the same length.
The roof of the shed is 300cm long, 240cm wide and 60cm high.

What is the total length of wood needed to make these five main beams for the roof?



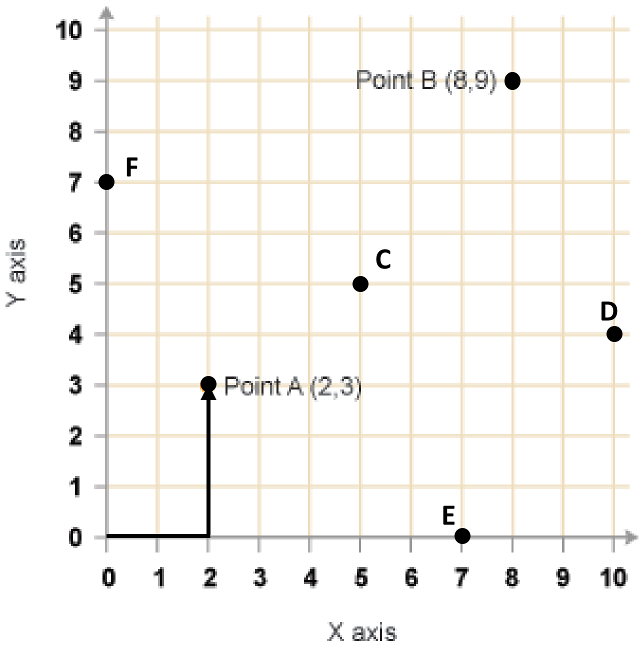
We are learning to:			
Plot Vertical and Horizontal Graphs			
Sketch straight line graphs			
Plot straight line graphs using $y = mx + c$			
Identify the gradient and intercept in the equation			
Find the gradient and intercept from the graph			
Conversion Graphs			

Chapter 13, Pg. 266: Straight Line Graphs



A graph gives us a good visual impression of the way two variables are related to each other. This graph shows the results of an experiment which measured the voltage in an electrical circuit when different currents were flowing. The points are approximately in a straight line. This tells us that there is a constant relationship between current and voltage. We can use the graph to find the voltage for any current we choose and also the other way round.

Reminder about Cartesian Coordinates



- The point (0,0) is called the **origin**.
- The horizontal axis is the **x-axis**.
- The vertical axis is the **y-axis**
- The x-axis is horizontal, and the y-axis is vertical.
- Coordinates are written as two numbers, separated by a comma within round brackets.
- The **first** number refers to the **x** coordinate.
- The **second** number refers to the **y** coordinate.

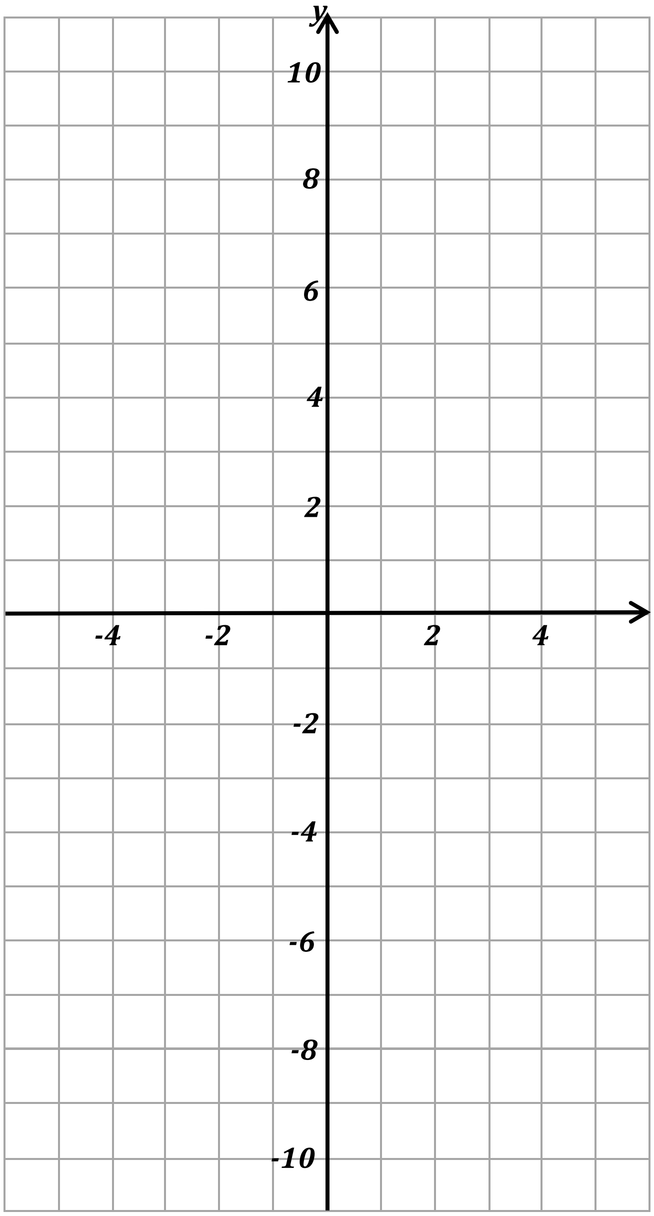
Write the Coordinates of the other points:

C (____ , _____) D (____ , _____) E (____ , _____) F (____ , _____)

This year we are going to relate coordinates to an algebraic equation. This connection was made for the first time by a French mathematician, Rene' Descartes in the 17th Century.

The coordinates in such graphs are called Cartesian Coordinates and the xy grid they appear on is called the Cartesian plane. The grid can be extended to include negative values as well. The graphs and equations shown on it are not always straight lines as we shall see in Form 3 and Form 4.

Plot the following coordinates on the given grid:



(-5, -10)	(-4,-8)	(-3,-6)
(-1,-2)	(0,0)	(2,4)
(4,8)	(5,10)	

What do these points form on the grid?

____

Can you find a relationship between each x and y coordinate?

____

____

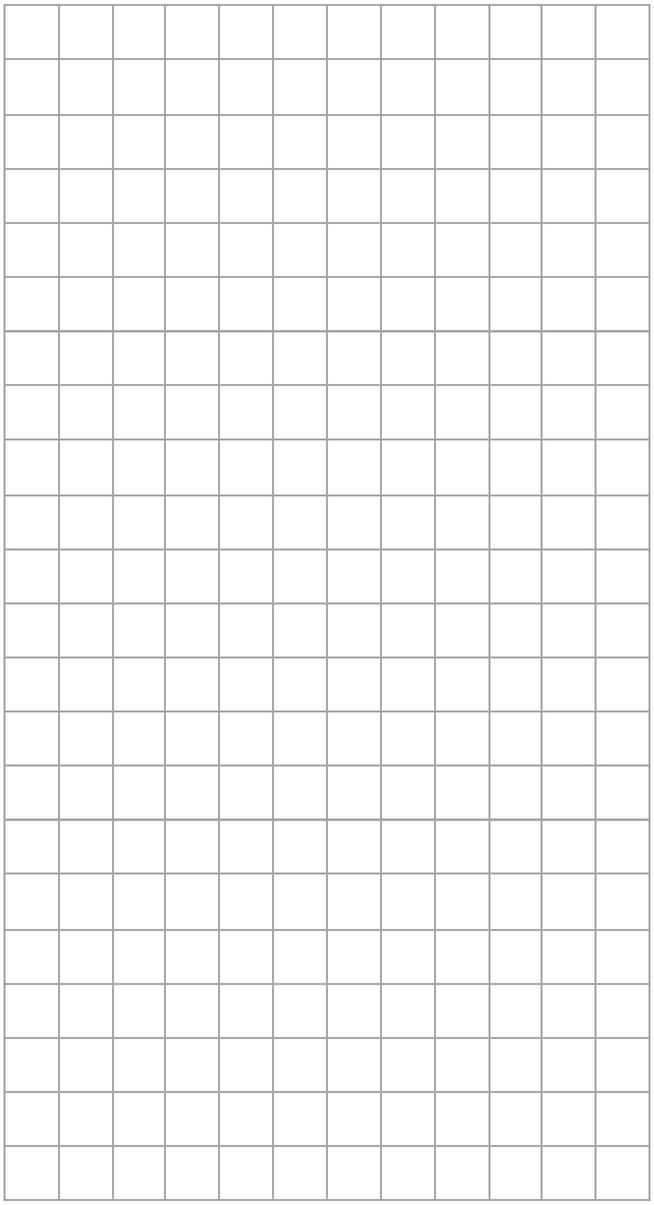
____

This year we will learn how to generate our own pairs of coordinates.

MTH_EN_815_011 Coordinates and Graphs
RLO 1 & 2 Finding the equation of a straight line graph

Let's generate our own points for an Equation:

Draw the graph $y = 3x$ for values of x from -3 to +3 at unit intervals.



x	-3	-1	0	1	3
y					

To get the y coordinates, we must multiply the x-coordinates by 3.

Choose an appropriate Scale and write it over here:

3 points would be enough to draw a straight line.

Graphs that do not pass through the origin

MTH_EN_815_021 Drawing Straight Line Graphs
RLO 1 & 2 Linear Relationship / Using tables

Draw the graph $y = 2x + 3$ for values of x from -3 to +3 at unit intervals. Use 1cm for 1 unit on both axes.

x	-3	-2	-1	0	1	2	3
$2x$							
$+3$							
y							

From your graph find:

The value of y when $x = 0.5$

____

The value of y when $x = -1.5$

____

What is the value of the y-coordinate where the line passes through the y-axis?

____

This is called the y-intercept and can also be found in the equation of the line.

$$y = 2x + \mathbf{3}$$

Draw the graph $y = -3x + 4$ for values of x from -2 to +3 at unit intervals. Use 1cm for 1 unit on both axes.

x	-2	-1	0	1	2	3
$-3x$						
$+4$						
y						

Be careful for the negative signs

From your graph find:

The value of y when $x = -1.5$

____

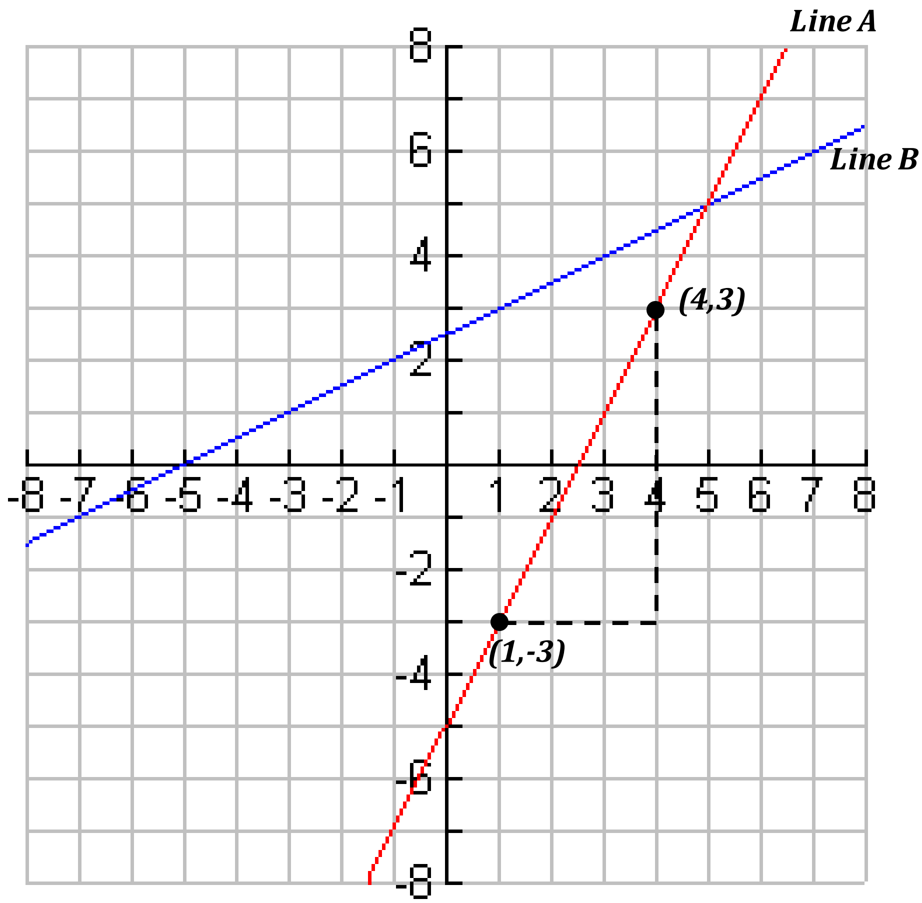
The value of y when $x = 2.5$

____

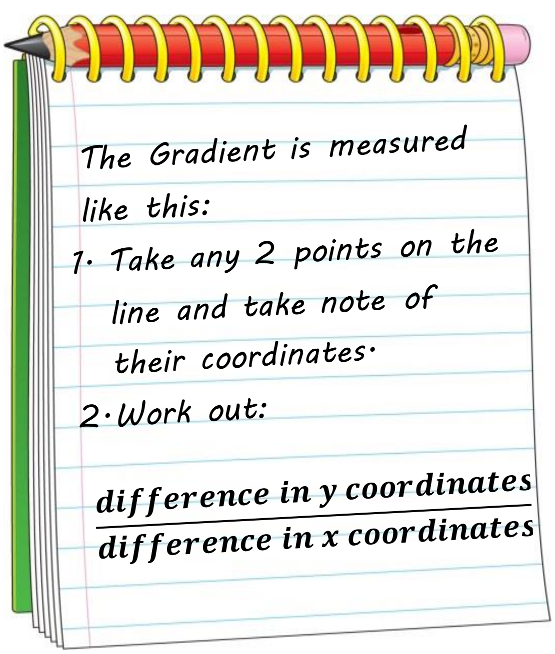
What is the intercept of this line?

____

The Gradient of a Line



In this graph, Line A is steeper than Line B.   The gradient measures the steepness of a line.



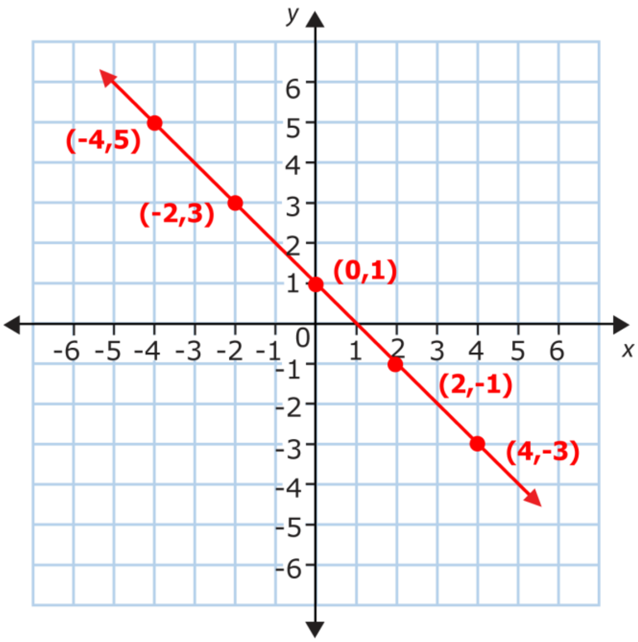
The Gradient of Line A = $\frac{\Delta y}{\Delta x}$

$$= \frac{3-(-3)}{4-1} = \frac{3+3}{3} = 2$$

Now work out the Gradient of Line B

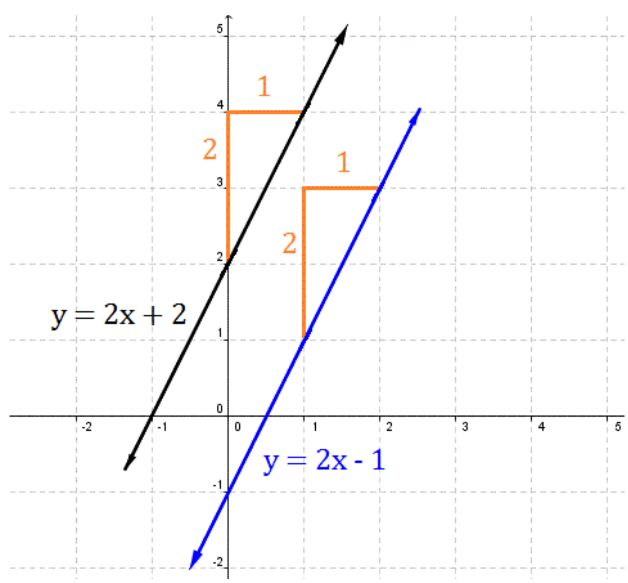
What did you notice from RLO 2?

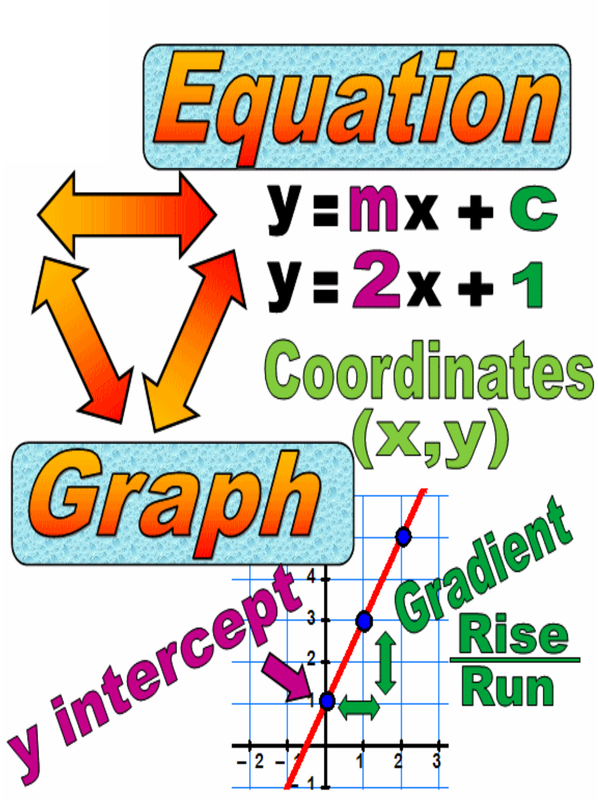
Check what is the gradient of this line:



What do you notice about the gradient?

What can you predict about gradients of parallel lines?





Important:

m is the gradient of the line. It tells us how steep the line is.

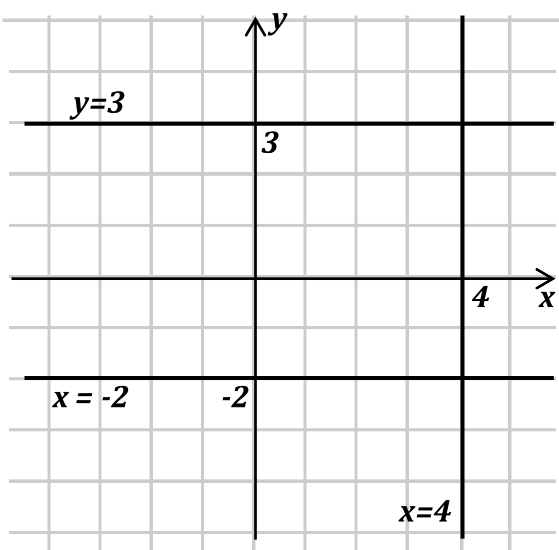
The steeper the line, the larger the gradient.

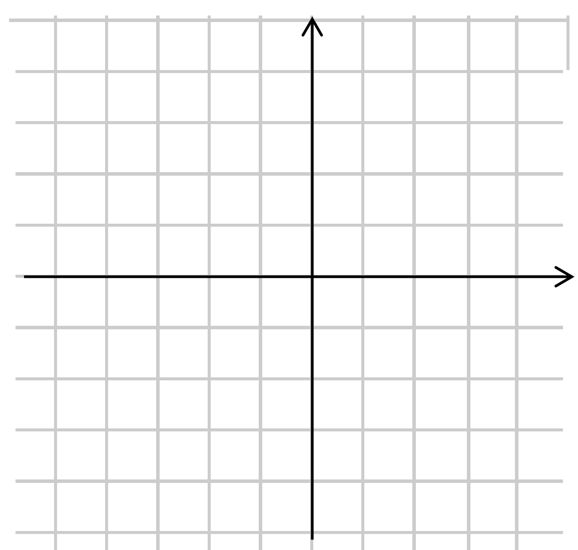
Parallel lines have the same gradient.

c is the *y*-intercept and it is the *y*-coordinate where the line cuts the *y*-axis.

A line going uphill has a positive gradient and a line going downhill has a negative gradient.

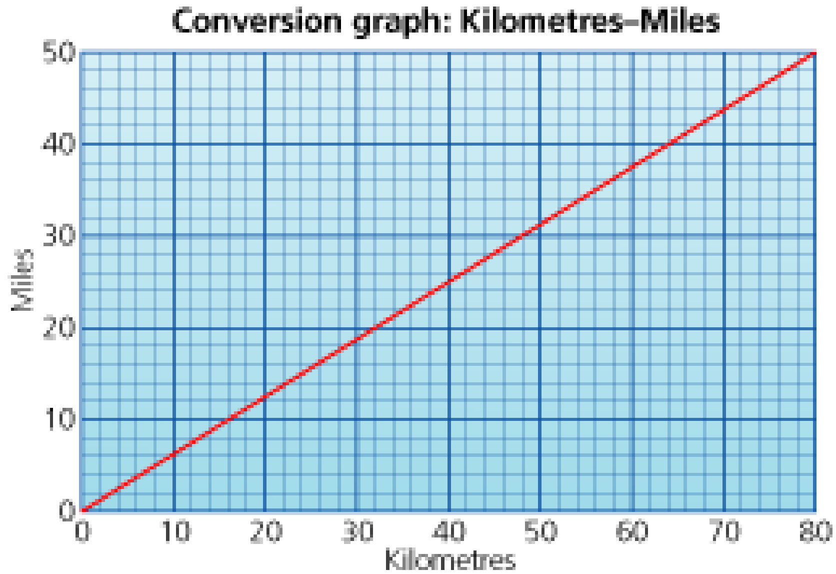
Other Special Graphs





Sketch the lines y= -3, x = -4 and x =2 here.

Conversion Graphs



This graph helps us to convert miles to kilometres and vice versa. For example, 12miles are equivalent to 20km.

MTH_EN_815_051 Conversion Graphs
RLO 1 & 2 Conversion Graphs/ Drawing a Conversion Graph

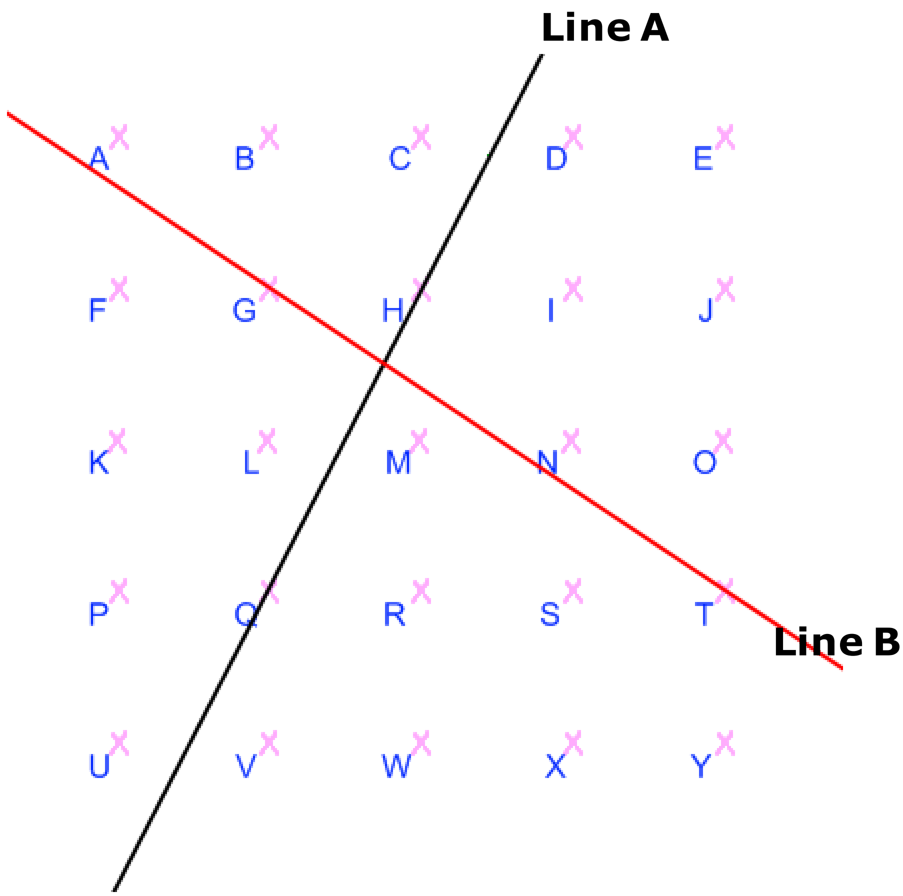
STP 8, Pg. 288: Investigations 1 and / or 2

How steep is the slope?

The gradient tells us how steep a line is.

On a grid like the one below we can draw lines with different gradients.

Check you agree that Line A is one of several that could be drawn with a gradient of 2 and Line B is one of several that could be drawn with a gradient of $-\frac{2}{3}$.



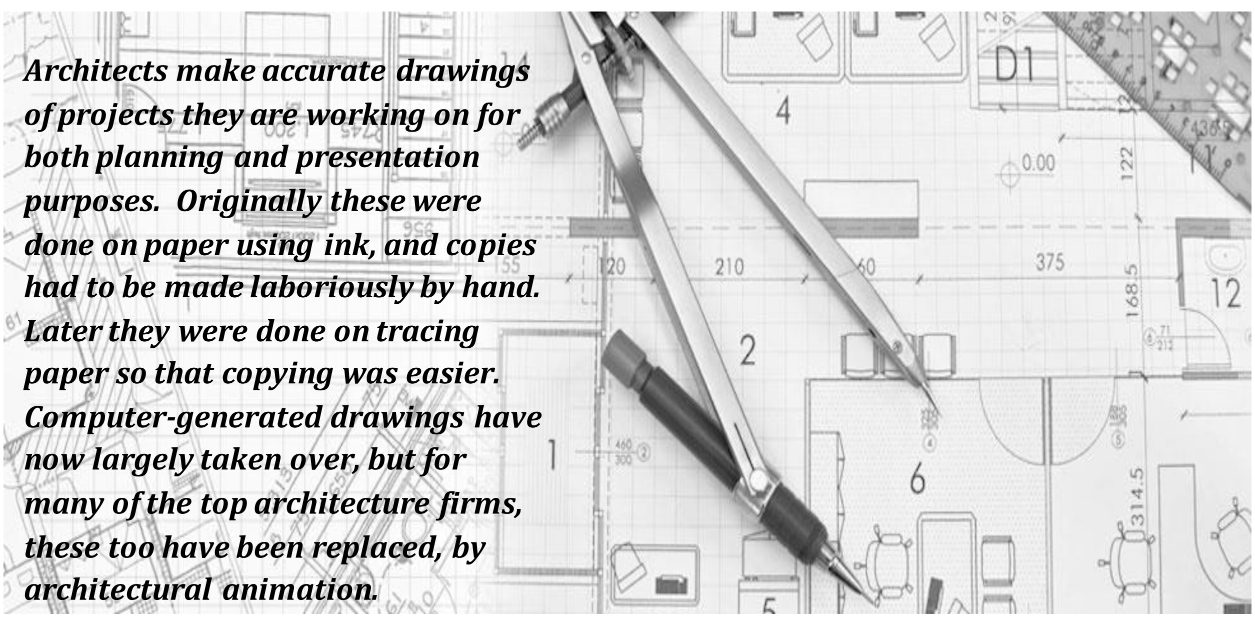
Picture some more lines with different gradients. You may want to use a dotted sheet to record your working.

How many different gradients can you find?

We are learning to:			
Remember special angle properties from last year			
Construct Triangles SSS, ASA, SAS			
Construct Quadrilaterals			
Construct Angles of 60°, 30°, 90° and 45°			
Bisect an Angle			
Bisect a Line (Perpendicular Bisector)			
Construct a Perpendicular from a Point to a Line			
Using mixed constructions together			

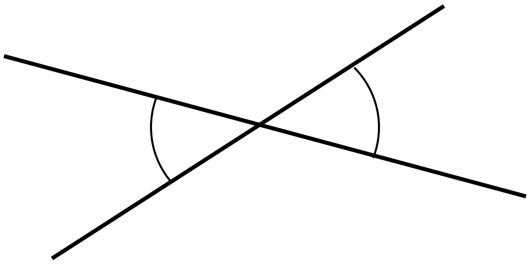
eBook

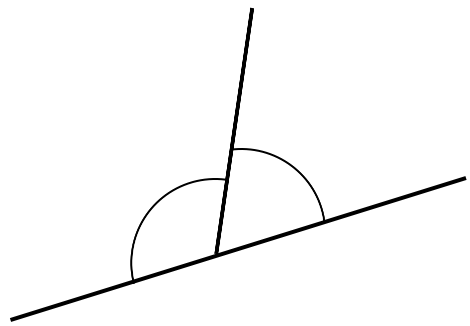
STP 7 Chapter 10, Pg. 166: Introducing Geometry
STP 7 Chapter 12, Pg. 200: Triangles and Quadrilaterals

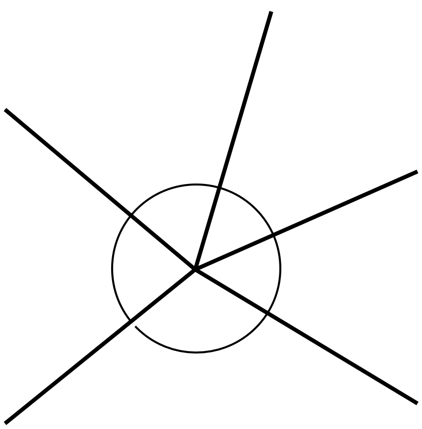


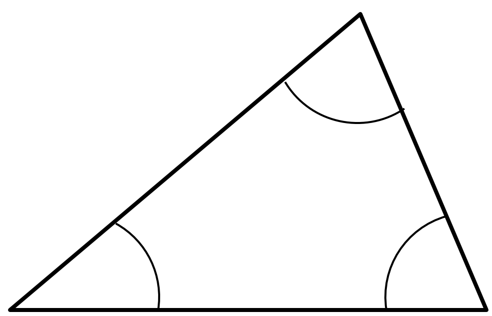
Angle Properties from Last Year

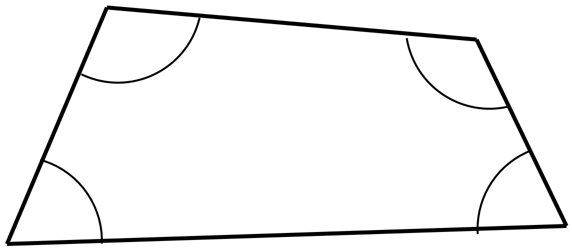
Write the name and special property next to each diagram.

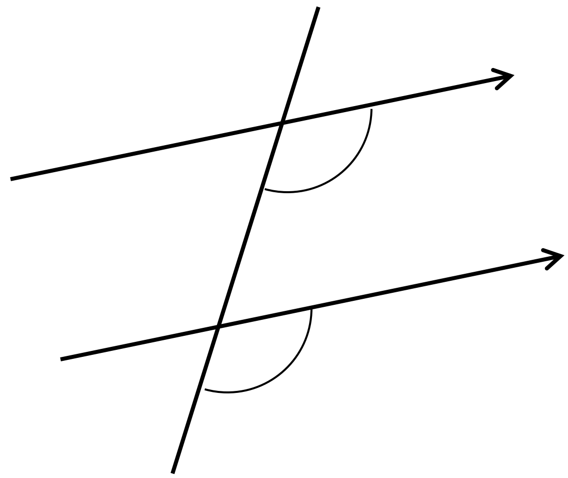


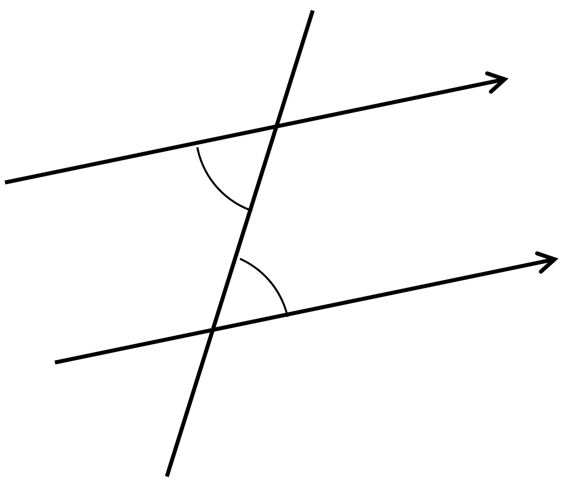


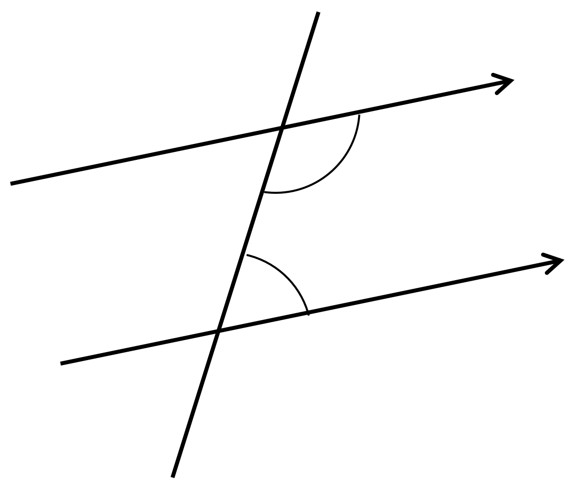










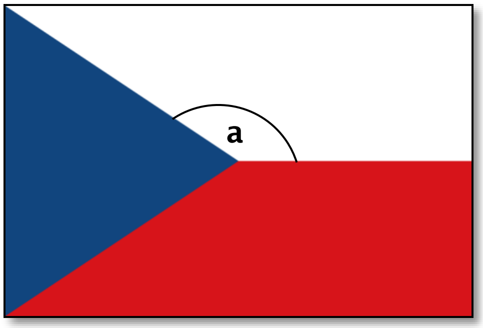


MTH_EN_802_081 Solving Problems Involving Parallel Lines
RLO 1 & 2 Monkey moves on Parallel Lines / Problems on Parallel Lines

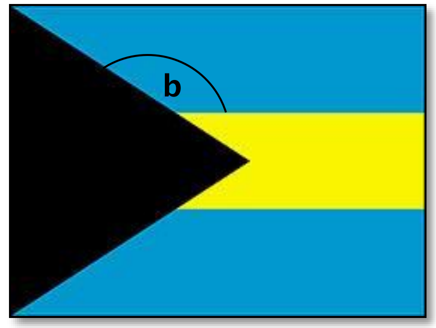
WHAT ABOUT FLAGS!

James Calleja

Look at these two flags.



Czech Republic



Bahamas

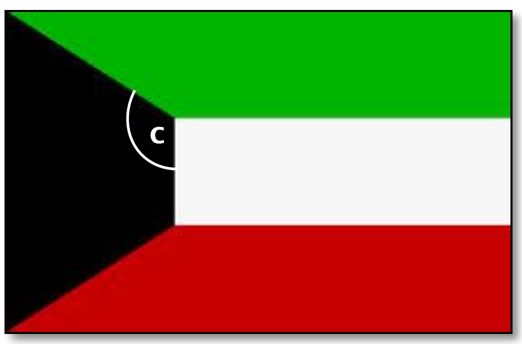
The triangle in each flag is **equilateral**.

For both flags, work out the marked angles **a** and **b**.

What can you infer from your results?

Write down your conclusion.

Now consider the flag of **Kuwait**.



Make reasoned assumptions to work out the size of angle **c**.

Write down reasons, working and assumptions that you have considered.

Finally design your own flag!!

Use your creativity to design a flag including triangles and quadrilaterals.

Make an accurate drawing of your flag on 1cm squared paper. **Colour** your flag.

Constructing Triangles

….. when given the 3 sides

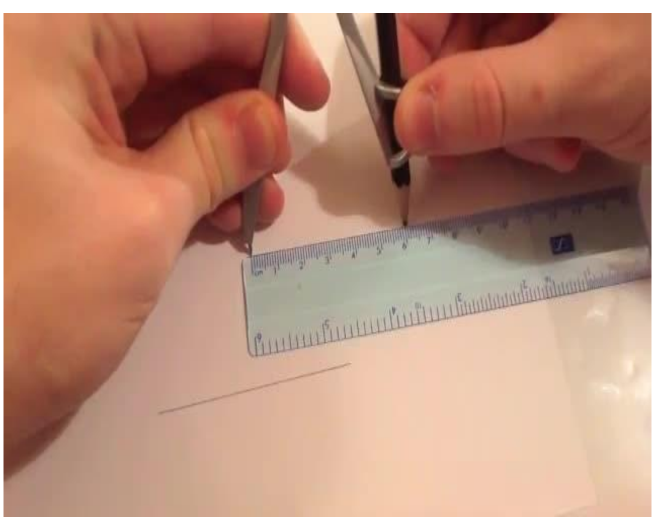
Construct ΔPQR with PQ = 5.3cm, PR = 6.8cm and QR = 7.2cm.

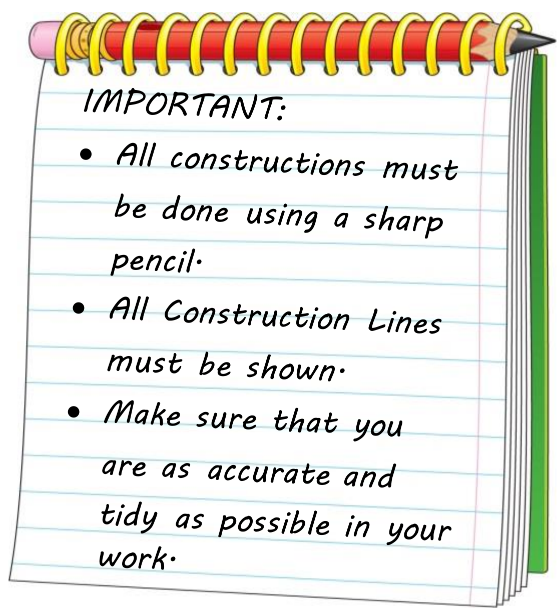
..... when given 1 side and 2 angles

Construct ΔABC with AB = 6.3cm, ∠A = 57° and ∠B = 43°.

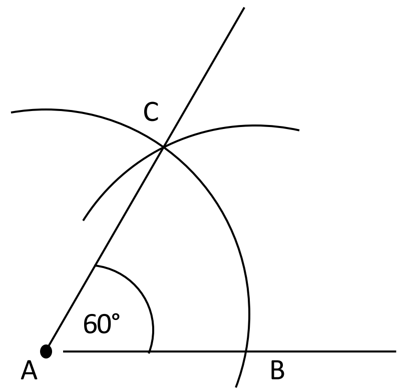
… when given 2 sides and the angle between them

Construct ΔXYZ with XY = 7cm, YZ = 7.8cm and ∠Y = 52°.





Constructing an Angle of 60°

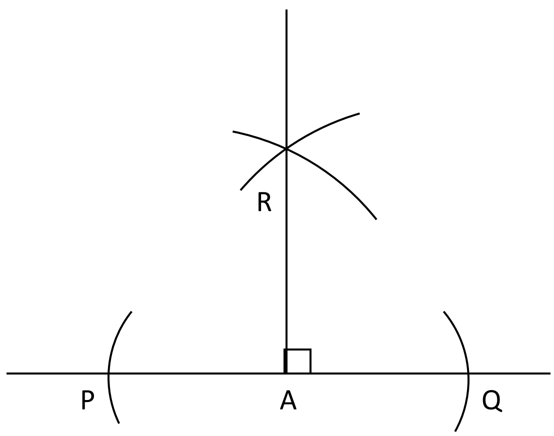


- Draw a straight line and mark point A on the line, near the left end.
- With the point of your compass on A and using any radius, draw an arc which cuts the line at B. Continue this arc well above the line.
- With the same radius, and the point of your compass on B, draw another arc which cuts the first arc at C.
- Join AC.
- ∠BAC is 60°.

Draw your own angle of 60° here:

MTH_EN_808_081 Using ruler and compasses only to draw angles of 60° and 90°.
RLO 1 & 2 Constructing angles of 60° and 90°

Constructing an Angle of 90°

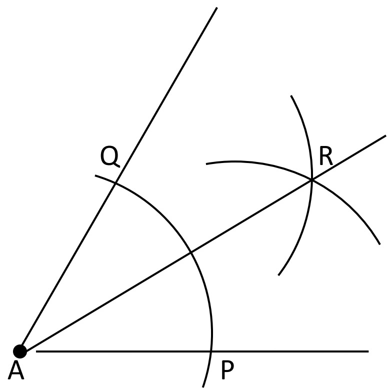


- Draw a straight line and mark point A somewhere in the middle of the line.
- With the point of your compass on A and using any radius, draw two arcs which cut the line on either side of A. Mark these points P and Q.
- Using a larger radius, and with the point of the compass on P draw an arc above point A.
- With the same radius, draw another arc from Q. The two arcs cut each other at R.
- Join RA.
- $\angle RAP$ and $\angle RAQ$ are both $90°$

Draw your own angle of 90° here:

Bisecting an Angle

eg. Bisecting an angle of 60° to get an angle of 30°

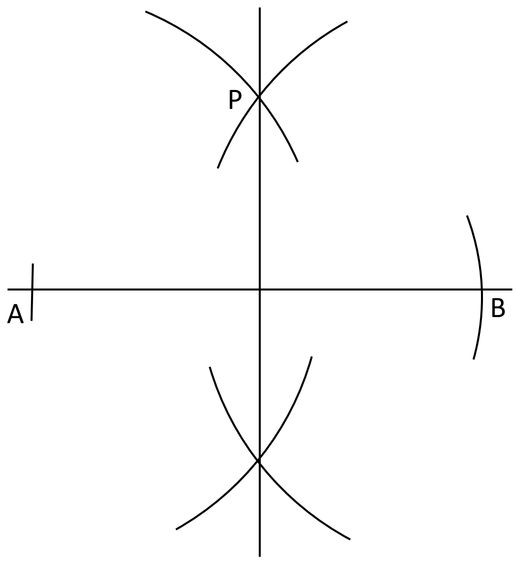


- Construct an angle of 60° as described earlier.
- With the point of the compass on A and using any radius, draw an arc which cuts both arms of the angle at P and Q.
- Using any radius, draw two other arcs from P and Q. These two arcs should cut each other at R.
- Join AR. Line AR bisects the angle of 60° into two angles of 30° each.

Now construct an angle of 90° and then bisect it to get an angle of 45°

MTH_EN_808_041 Bisecting an angle using Ruler and Compasses only
RLO 2 Bisecting an angle

Constructing the Perpendicular Bisector

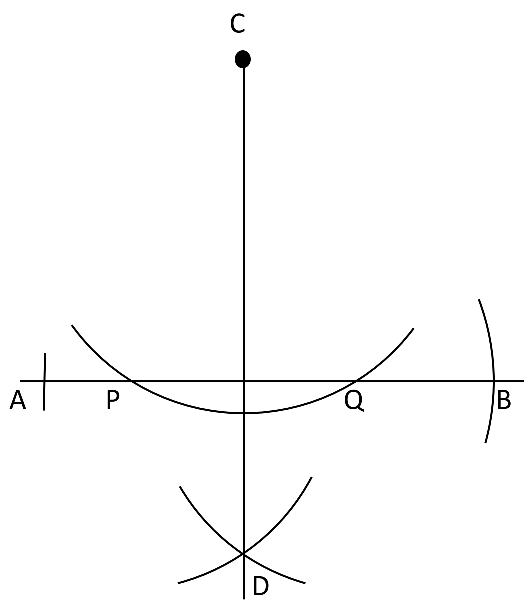


- Construct line AB
- With the radius of your compass a bit larger than half this line, draw two arcs from A, one above and one below line AB.
- With the same radius, draw two other arcs from point B.
- The two pairs of arcs cut each other at P above the line, and at Q below the line.
- Join PQ. PQ is the Perpendicular bisector, because it divides line AB from the middle at 90°.

Construct a line of 8 cm and then draw its perpendicular bisector.

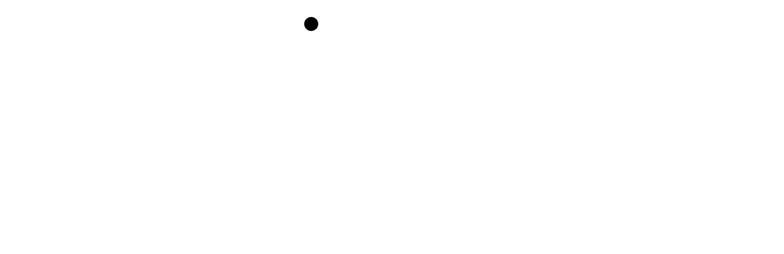
MTH_EN_808_031 Using ruler and compasses only to draw the perpendicular bisector
RLO 1 & 2 The Perpendicular Bisector

Constructing a Perpendicular from a Point to a Line



- With the point of your compass on C, draw an arc which cuts line AB at points P and Q.
- With the point of your compass on P, draw an arc below line AB.
- With the same radius, draw another arc from point Q, below line AB. This arc should cut the previous arc at D.
- Join CD. CD is a perpendicular to line AB.

Draw your own perpendicular from the given point to the given line.



MTH_EN_808_021 Using ruler and compasses only to draw a perpendicular to a line
RLO 1 & 2 Perpendicular from a Point to a Line

Exercise

1. Construct an equilateral triangle ABC of side 8cm.
    a) Draw the perpendicular bisectors of AB and AC.
    b) With the point of your compasses on the point where the two bisectors meet, draw a circle that passes through the points of triangle ABC.

2. Construct the triangle ABC is which AB = 10.4cm, BC = 9.2cm and AC = 7.3cm.
    a) Construct the bisector of $\angle ABC$
    b) Construct the bisector of $\angle ACB$

3. Construct triangle PQR with QR = 9.5cm, PQ = 7.7cm and $\angle PQR = 30°$. Drop a perpendicular from point P to side QR.

4. Construct triangle PQR with PQ = 7cm, QR = 9cm and $\angle PQR = 90°$. Bisect Angle PQR.

5. Construct a rectangle ABCD in which AB = 4cm and BC = 8cm.

6. Construct a square PQRS. Construct the diagonal at angle PQR.

STP 7 Pg. 225: Investigation1

We are learning to:			
Understand the concept of Probability			
Understand the probability of a certainty or impossibility			
Find the Probability of one or more events			
Find the Probability that an event does not happen			
Build a possibility space and use it to find probability			

STP 7 Chapter 13, Pg. 226: Probability
STP 8 Chapter 2, Pg. 41: Probability

In everyday life we use words like the following:

There's a good chance it will rain today.

It's quite likely that...

We will definitely...

It is unlikely that...

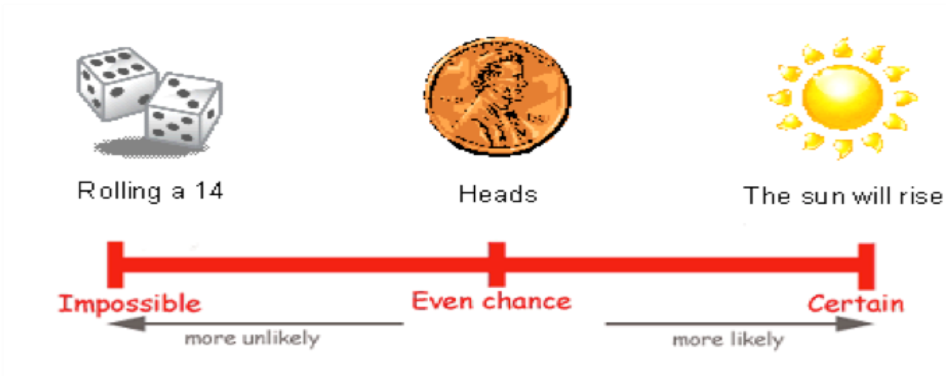
Most probably I will...

I doubt we'll get there on time if we set off at rush hour.

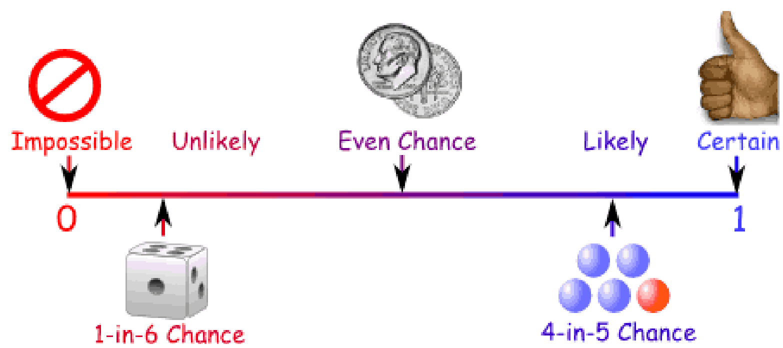
It is highly Improbable that...

Certainties and Impossibilities

Some things will certainly happen while others are impossible:



In probability we measure the chance that something happens when it is neither impossible or a certainty.



MTH_EN_710_091 Introducing Probability
RLO 1 & 2 Possible Events / Probability Scale

In order to measure Probability in a more accurate way we can use the following formula:

$$\textbf{\textit{Probability}} = \frac{\textbf{\textit{Number of Successful Outcomes}}}{\textbf{\textit{Total Number of PossibleOutcomes}}}$$

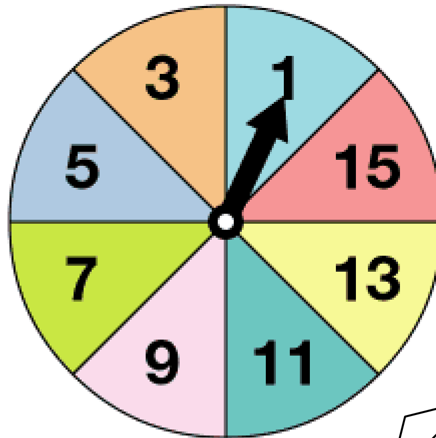
Examples

Total Number of Outcomes ______________

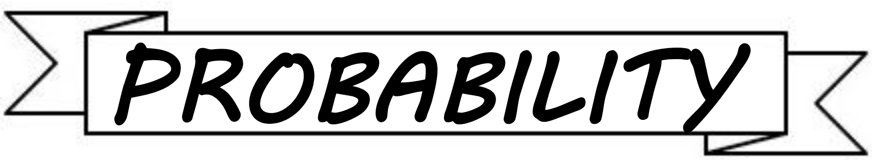
P(Odd Number) = ______________________
Certainty

P(Even Number) = ______________________
Impossibility

P(Multiple of 3) = ______________________



A letter is chosen at random from the word



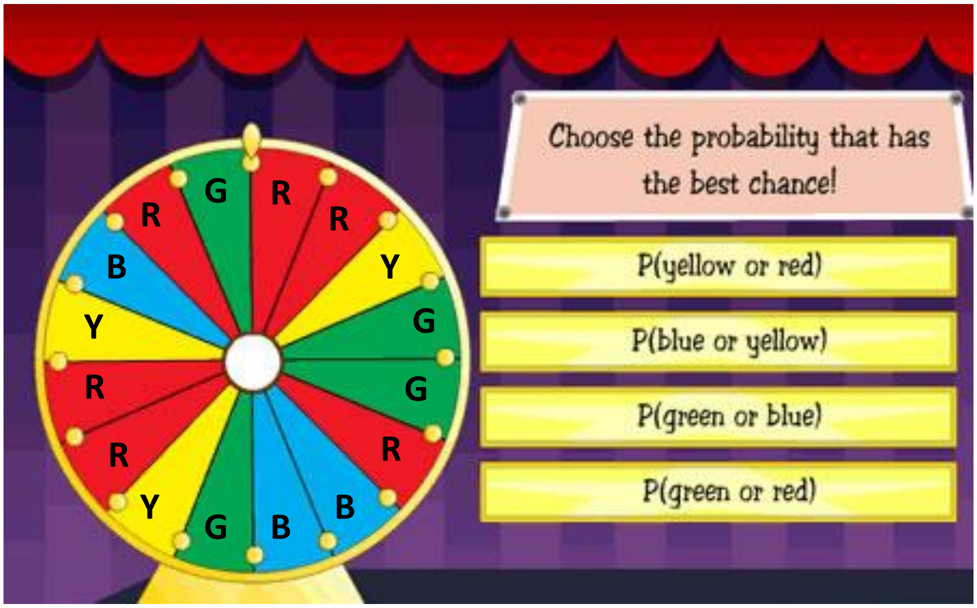
P(B) = ______________ P(Vowel) = ________________

P(D) = ______________

MTH_EN_710_101 The Probability of an Event
RLO 1 & 2 Calculating / Estimating Probabilities

When people first started to predict the weather scientifically over 150 years ago, they used probabilities to do it. Now in the 21st century, probability theory is used to control the flow of traffic through road systems, the running of telephone exchanges and to look at patterns of the spread of infection. Probability theory is also applied in everyday life in risk assessment and in trade on financial markets.

'OR' and 'NOT' Probabilities



= ________

= ________

= ________

= ________

P(Red) = ____________________ P(Not Red) = ________________________

P(Red) + P(Not Red) = ______________ + _____________ = ________________

Therefore **P(Not Red) =** ____

The Probability that an Event does not happen

Example

A number is drawn on a roulette wheel with numbers from 1 to 90.

P(a multiple of 10) =

P(Not an a Multiple of 10) =

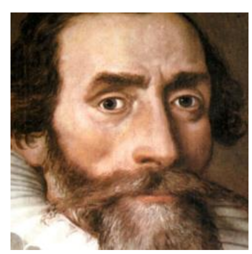
P(a multiple of 12 or 15) =

P(a Square Number) =

P(Not a Square Number) =

In the mid-seventeenth century, a simple question directed to Blaise Pascal by a nobleman sparked the birth of probability theory, as we know it today. This nobleman gambled frequently to increase his wealth. He bet on a roll of a die that at least one 6 would appear during a total of four rolls. From past experience, he knew that he was more successful than not with this game of chance. Tired of his approach, he decided to change the game but he soon realized that his old approach to the game resulted in more money. He asked his friend Blaise Pascal why his new approach was not as profitable. This problem proposed by the nobleman is said be the start of famous correspondence between Pascal and Pierre de Fermat. Historians think that the first letters written were associated with the above problem and other problems dealing with probability theory. Therefore, Pascal and Fermat are the mathematicians credited with the founding of this branch of mathematics.

Blaise Pascal



Pierre de Fermat

Probability for Two Events

When we throw 2 dice together, two events are taking place: The score on Dice A and the score on Dice B.

We can record these two events in a POSSIBILITY SPACE DIAGRAM.

- ✓ List the outcomes of each event along each axis of the diagram
- ✓ Fill in each pair of combination in the space diagram
- ✓ All combinations possible will be shown in the diagram which would help to find the Probability of two events occurring.

Dice B \ Dice A	1	2	3	4	5	6
1						1,6
2						
3						
4					4,5	
5						
6						

P(two similar numbers) =

P(a score that is even) =

P(a score greater than 8) =

P(a score of at least 10) =

Example

On a bookshelf in a library there are 3 German books, 2 Italian books and 1 French book.
On another shelf there are 2 German Books and 3 French books. Two books are chosen at random, one from each shelf.

Draw your own Possibility Space.

Shelf 1

Shelf 2

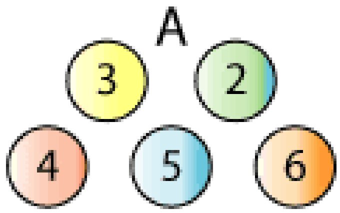
P(one German and one French book) =

P(two books in the same language) =

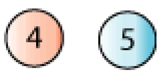
P(two books in a different language) =

Odds and Evens Made Fair

Here is a set of numbered balls used for a game.



To play the game, the balls are mixed up and **two** balls are randomly picked out **together**. The numbers on the balls are added together.

For example: 

The numbers on the balls are added together: $4+5=9$

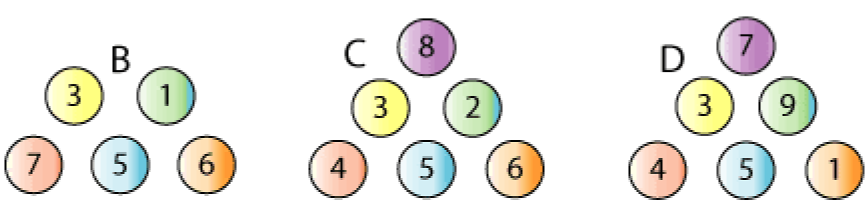
If the total is even, you win. If the total is odd, you lose.

1. **What are the probabilities that you get an odd or even total?**

2. **Can you find a set of balls where the chance of getting an even total is the same as the chance of getting an odd total?**

   What do you notice about the number of odd and even balls in your sets?

3. **Here are three more sets of balls:**



Which set would you choose to play with, to maximise your chances of winning?

Probability by Experiment

MTH_EN_710_111 Probability by Experiment
RLO 1 & 2 Heads or Tails / Rolling a Spinner