Unit 12 Foundation Right-Angled Triangles 1

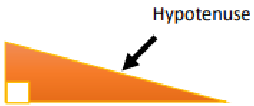
Trigonometry Video 329, 330, 331

Pythagoras Theorem

$a^2 + b^2 = c^2$

Pythagoras is used to find missing sides in ***Right-angled triangles***

Key Facts

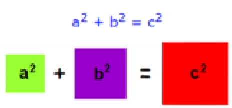


HYPOTENUSE
This is the longest side in a right-angled triangle and is **ALWAYS** opposite the right angle

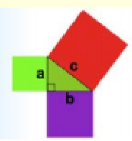
Method to find the hypotenuse

Pythagoras video 257

Square side a
Square side b
Add together
Square root



Method to find a shorter side

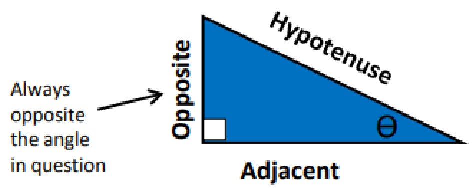


Square side c
Square side a/b (whichever is known)
Subtract a/b from c
Square root

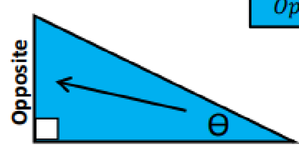
Trigonometry

Used to find missing sides and angles in right-angled triangles

You must label your sides correctly



Using the Tangent Ratio:



$Opp = \tan\theta \times Adj$

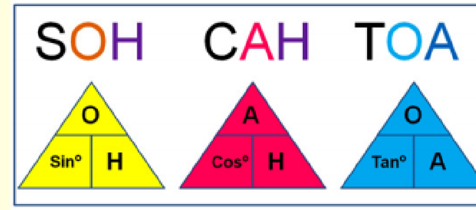
$Adj = \dfrac{Opp}{\tan\theta}$

$\tan^{-1}\theta = \dfrac{Opp}{Adj}$

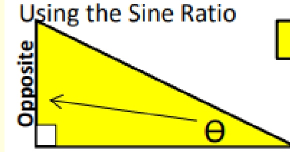
Press shift and then tan on your calculator

SOH – CAH – TOA Pyramids

Cover the letter which is the unknown value, and then Multiply for horizontal relationships and Divide for vertical relationships



Using the Sine Ratio



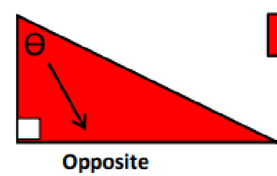
$Opp = \sin\theta \times Hyp$

$Hyp = \dfrac{Opp}{\sin\theta}$

$\sin^{-1}\theta = \dfrac{Opp}{Hyp}$

Press shift and then sin on your calculator

Using the Cosine Ratio:



$Adj = \cos\theta \times Hyp$

$Hyp = \dfrac{Adj}{Cos\,\theta}$

$\cos^{-1}\theta = \dfrac{Adj}{Hyp}$

Press shift and then cos on your calculator

Unit 13 Foundation

The ***probability*** of something (let's call it outcome **A**) happening is written as **P(A)**, and must be between 0 and 1.
If **P(A) = 0**, it is impossible.
If **P(A) = 1**, it is certain to happen.

The probability of A not happening is written as **P(A')**. Since A will either happen or not happen,
P(A) + P(A') = 1

Video 250: Events not happening

We call the two outcomes above "mutually exclusive" – this means they cannot happen at the same time. The probabilities of all possible outcomes for an event always add up to 1, because one of them is certain to happen.

Example:
Event: rolling **3** on a fair six-sided dice.

P(3) = 1/6
P(3') = 5/6

These two outcomes are mutually exclusive and cover every possibility, so their probabilities **add up to 1**

Video 249: Independent Events

If the outcome of one event doesn't affect the outcome of another, we call those events independent. For example, **flipping a coin** and **rolling a dice** are independent of each other.

Experimental probability is about estimating probability based on **previous outcomes**, (unlike **theoretical** probability, which was used above and is based on **what should happen**). Experimental probability would be written as

Video 248: Relative Frequency

$$\frac{\textit{frequency of desired outcomes}}{\textit{total number of trials}}$$

"**Trials**" refers to what you actually do for your experiment (flipping a coin; counting cars as they drive past). Each time you do it counts as **one trial**.

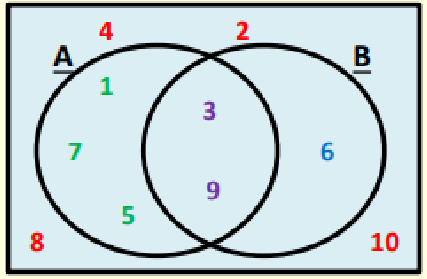
Example:
Experiment: spinning a fair four-numbered spinner 100 times (i.e. 100 **trials**)

Score	1	2	3	4
Frequency	23	26	30	21

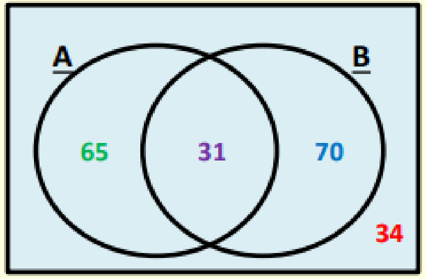
Based on these results, the **P(1)** = **23/100**, or **0.23**. To estimate **relative frequency**, multiply the number of intended trials by the experimental probability, e.g. for **200** trials, we would predict **46** results will be 1 because **200 x 0.23 = 46**, and **60** results will be 3 because **200 x 0.30 = 60**.

Venn diagrams show how two or more **sets** (groups) can overlap, and we can use them to calculate the probability of a given **element** (item in a set) being chosen. They can have each element individually written in them (Example 1), or just the quantity of each section (Example 2). The **universal set** (ξ) contains **everything** being considered.

Example 1
ξ: Integers up to 10
A: Odd numbers
B: Multiples of 3



Example 2
ξ: Year 10 students (200 in total)
A: Students who walk to school
B: Students who like football



A∩B: **only** elements in both **A and B**
A∪B: **all** elements in **A or B or both**

A∩B': elements in **A and not in B**
A'∩B: elements in **B and not in A**

Video 380: Venn Diagrams

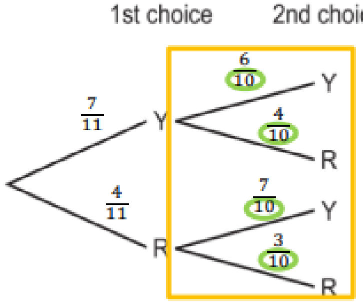
If picking a number at random,
P(A∩B') = 3/10 P(A'∩B) = 1/10
P(A∩B) = 2/10 P(A'∩B') = 4/10

If picking a student at random,
P(A∩B') = 65/200 P(A'∩B) = 70/200
P(A∩B) = 31/200 P(A'∩B') = 34/200

Probability "tree" diagrams show the possible outcomes of multiple events one after the other. The "branches" are for each outcome and every set of branches adds to 1.

There are 11 balls in the bag, so the first choice is out of 11. The second choice is out of 10, since a ball has been taken out, so the denominators change

The second choice has two sets of branches because there are two possible scenarios for it (either after a yellow or after a red).



Y then Y: $P(YY) = \frac{7}{11} \times \frac{6}{10} = \frac{42}{110}$

Y then R: $P(YR) = \frac{7}{11} \times \frac{4}{10} = \frac{28}{110}$

R then Y: $P(RY) = \frac{4}{11} \times \frac{7}{10} = \frac{28}{110}$

R then R: $P(RR) = \frac{4}{11} \times \frac{3}{10} = \frac{12}{110}$

To find the final probability, multiply along the branches as shown.

(For example, the probability of picking red both times is **12/110**).

Video 252: Tree Diagrams

Unit 14 Foundation Multiplicative Reasoning

$0.1 = \frac{1}{10} = 10\%$ $0.01 = \frac{1}{100} = 1\%$

The original amount of something is always 100%, if it is increased then the final amount is more than 100%. If it is decreased then it is less than 100%.

To find out a percentage of something, convert the % to a decimal and multiply

e.g. Find 80% of 45
$0.8 \times 45 = 36$ V233

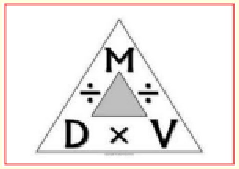
To calculate percentage change: $Percentage\ change = \frac{actual\ change}{original\ amount} \times 100$

Compound vs simple interest: in compound interest, you are paid interest on the amount. The second time interest is paid, it is paid on the *original* amount *and* the interest added before

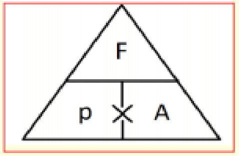
Calculating compound interest: $Final\ amount = initial\ amount \times interest\ rate^{time}$

V236

Density: is a measure of the mass of a sub stance contained in a certain volume
Usually measured in g/cm^3



V384



Pressure: is the force applied per unit area

Pressure is usually measured in N/m^2

V385

Kinematics Formulae: these are also called equations of motion, but you don't need to learn them in Maths.
v = final speed, u = initial speed, a = acceleration, t = time, s = distance

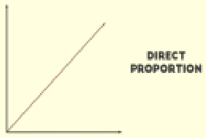
$$v = u + at$$
$$s = ut + \frac{1}{2}at^2$$
$$v^2 = u^2 + 2as$$

Velocity vs speed: velocity is speed in a certain dir ection (often measured in m/s)

Acceleration: is the rate of change of velocity (often measured in m/s^2)

Direct Proportion: if two quantities are in direct proportion, as one increases, the other increases by the same percentage

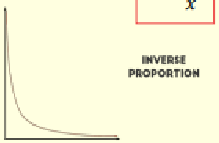
$$y \propto x$$
$$y = kx, where\ k\ is\ a\ constant\ value$$



V254

Indirect Proportion: is when one value increases as the other value decreases.

$$y \propto \frac{1}{x}$$
$$y = \frac{k}{x}$$



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