Welcome to your Physics course at Ifield Community College. The step up from GCSE to A' levels is a big one – we would like you to complete this work to help you make that transition.

We are aiming to remind you of some of the important Physics concepts, to get your Maths up to scratch and to help you start thinking about how to make good quality notes at A' level. If you need help with any of this then please email MHa@ifieldcc.co.uk or CPi@ifieldcc.co.uk BEFORE you arrive in September.

Making Notes to Aid Understanding

You will be asked to read a lot more than you are used to for GCSE Science. Some of what you read will be 'background' –giving you an idea of context. Some of it will be essential knowledge – specific things you MUST know for the exams. It's good ensure you are able to tell the difference, and use your notes to help you understand those KEY IDEAS.
Try this exercise:

The statements below are taken from the **A-Level Physics Specification,** this tells you what you MUST know for the exam.

1) Pick out the KEY WORDS or PHRASES from these statements and put them in the box below:

Oscillation of the particles of the medium;

amplitude, frequency, wavelength, speed, phase, phase difference, $c = f\lambda$ $\quad f = \frac{1}{T}$

Phase difference may be measured as angles (radians and degrees) or as fractions of a cycle.

Stationary waves.

Nodes and antinodes on strings.

$f = \frac{1}{2l}\sqrt{\frac{T}{\mu}}$ for first harmonic.

The formation of stationary waves by two waves of the same frequency travelling in opposite directions.

A graphical explanation of formation of stationary waves will be expected.

Stationary waves formed on a string and those produced with microwaves and sound waves should be considered.

KEY WORDS/PHRASES to understand

Now use the website http://www.acoustics.salford.ac.uk/feschools/index.htm and use this to pick out things that will help you with these statements (if the web address does not work, do a google search for 'Sounds Amazing' – this should take you to the Salford university site – choose 'AS and A2 physics resources' – make NOTES on a separate **piece of paper** to help you- the purpose of these notes is:

i. To help you organize your thoughts and ensure you are clear about the content
ii. To show me that you can pick out key points
iii. To help you with revision when you need it later in the course

Notes could/should include:

iv. Definitions of key words or phrases
v. Clear labeled diagrams to illustrate points
vi. Examples of applications of the key points
vii. Worked examples of problems linked to the key points

Keep these notes to hand in with your work here – make sure you NAME them, it would also help to put the date on – this will help to keep you organised.

WHY PHYSICS?:

I'd like you to write a paragraph for me explaining why you are choosing to do Physics at A' Level. You might include:

- **What topics you found particularly interesting at GCSE**
- **What topics you want to learn more about**
- **What your future plans are**
- **What excites you about learning Physics**

WHY PHYSICS?

Try the Maths work below now.

Maths you need for Physics

Physics is the study of the real world which can be a pretty complicated place. Physicists use maths in order to find solutions to real world problems. So, a sound understanding of some basic mathematical concepts will be essential to your success in this subject. Here are some key mathematical skills that you will need, you will have encountered all of these at GCSE level and so none of this should be new to you:

Graph drawing

You will need to decide on which quantities to plot, on which axes.
Scales need to be chosen to show correctly the quantities you are analyzing
Lines of best fit (which may be curves) should be drawn correctly and you should know when to leave data out.

You will often be finding gradients to both straight lines and to curves. You will also need to know how to estimate the area under a line.

Proportion

When you analyse a graph, you will need to decide how to describe the relationship between two variables. The words proportion and inverse proportion have specific meanings and you need to know when to apply them in a description.

Algebraic relationships

You need to understand how equations work, to be able to change the subject of a formula and to be able to correctly substitute numbers into a formula.

Exponents and standard form

If you know about this already then that is good. You need to have a feel for what answer is plausible and what is not. Expressing data in standard form will help you to manipulate numbers in such a way that you do not become overly reliant on the number which comes out of a calculator (which is only correct if you input the correct data). Get used to converting numbers like 1000 into an exponent (1×10^4) for example.

Trigonometry

it is essential that you can use Pythagoras' theorem (square of hypotenuse = sum of squares on opposite & adjacent), and basic trig functions: sin, cos and tan

On the next few pages, there are mathematical examples from two of the Physics units covered at GCSE they deal with forces & motion and electricity. Use your GCSE notes/revision materials from Maths and Science to help you to answer the problems.

Please note, if you are asked to plot a graph, you must use proper graph paper and a pencil and ruler. Ask for paper before you leave at the end of term.
When answering these problems, a full answer is expected. Do not simply write the final number and do not forget units.
Note, if you see for example ms^{-1}, this means the same as m/s which you would have encountered at GCSE.

Rearranging formulae

Force = mass x acceleration
Rearrange to find mass

Momentum = velocity x mass
Rearrange to find mass

Speed = distance /time
Rearrange to find time

Acceleration = (final velocity – initial velocity)/time
Rearrange to find time

Rearrange to find initial velocity

Kinetic energy = ½ mass x velocity^2
Rearrange to find velocity

Forces & Motion questions

A car travels for 30s at a speed of $10ms^{-1}$.
Calculate the distance traveled by the car.

The car accelerates from $10ms^{-1}$ to $25ms^{-1}$ in a time of 5s.
Calculate the acceleration of the car.

The following data was collected for a car travelling along a dual carriageway.

Time (s)	Dist (m)
0	0
2	1
4	2
6	4
8	7
10	12
12	18
14	22
16	26
18	27
20	28
22	28
24	28
26	28

Plot a graph of this data with distance on the y-axis. You will plot a line (could be a curve) or best fit.

Describe the motion of the car from zero to 26 seconds.

Use the graph in order to determine the times between which the car was travelling at a constant speed.

By finding the gradient of the line in this time interval, calculate the speed of the car.

Current Electricity questions

These formulae may be useful

$$\textbf{current (A)} = \frac{\textbf{voltage (V)}}{\textbf{resistance }(\Omega)} \text{ or } I = \frac{V}{R}$$

Which is the same as:

$$\textbf{resistance }(\Omega) = \frac{\textbf{voltage (V)}}{\textbf{current (A)}} \text{ or } R = \frac{V}{I}$$

The symbol for ohm is Ω.

1 An electric kettle uses mains voltage (230 V). The current is 10 A. What is the resistance?

2 A light bulb with resistance 60 Ω is connected to a 12 V battery. What is the current?

3 A hairdryer uses mains voltage (230 V). It takes a current of 5A. Work out the resistance.

4 A toy tractor has a 4.5 V battery operated motor. The resistance of the motor is 15 Ω. What is the current?

5 A portable CD player takes a 6 V battery. The loudspeaker has a resistance of 4 Ω. What is the maximum current through the loudspeaker?

6 A torch takes a 3 V battery. The light bulb for the torch has ‘0.2 A’ stamped on the side, so 3 V gives a current of 0.2 A.

(a) What is the resistance of the bulb?

(b) A battery with voltage 1.5 V is used. How much current will flow through the torch bulb?

The current and potential difference (Pd) was measured in two different resistors.

Plot Pd (V) on the y-axis and current (A) on the x-axis.

Note that this is not usual since current is the dependant variable. We do it like this to make the maths easier.

Find the change in current (Δ I) and the change in Pd (Δ Pd) then find the gradient in the normal way.

Gradient = Δ Pd / Δ I (units are V/A)

Write down the values of these two resistors in kilo Ohms (kΩ)

Pd (V)	I 1 (A)	I 2 (A)
2	0.1	0.3
4	0.2	0.6
6	0.3	0.9
8	0.4	1.2
10	0.5	1.5
12	0.6	1.8
14	0.7	2.1

Exponents and standard form.

Number in standard form is expressed as a decimal from 0 -10. To do this it may be necessary to deal with the number of decimal places or zeros.

Eg. 4500 is expressed as 4.5×10^{3}

0.0045 is expressed as 4.5×10^{-3}

Express the following numbers in standard form:

3670000

0.00073

318.67

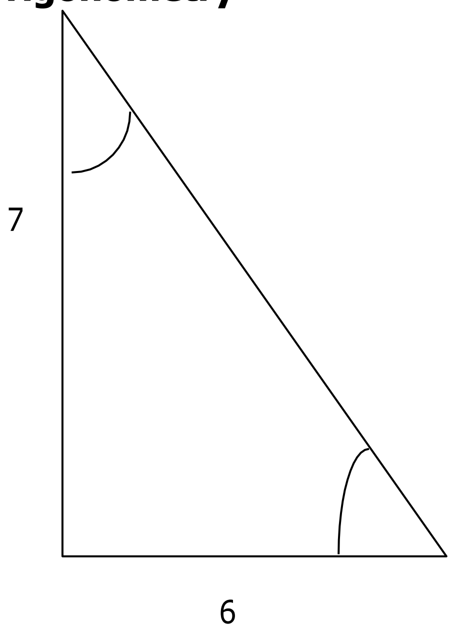
0.45067

46 000 000 000 300

907037

0.0000003706

Trigonometry



Calculate the length of the hypotenuse

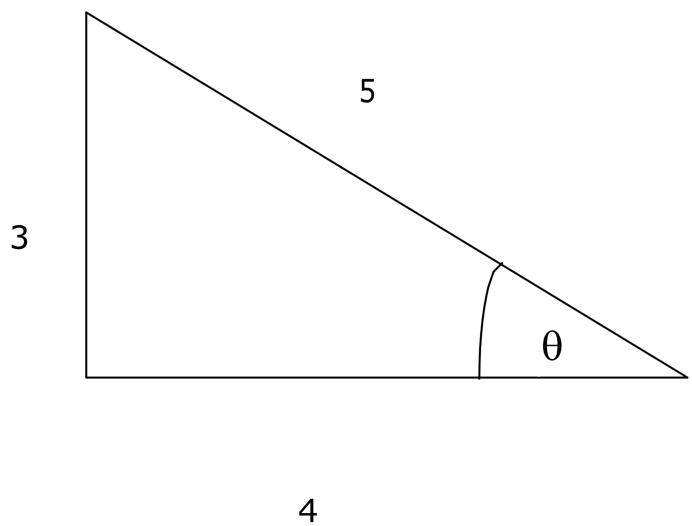
Calculate each of the non-right angles shown

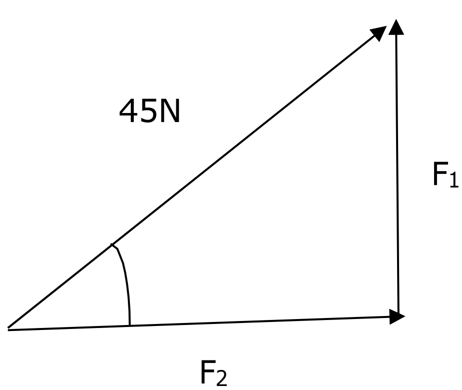
Write expressions for:

$\sin\theta$

$\cos\theta$

$\tan\theta$





The resultant force of 45N is made up from two component forces F_1 and F_2.

If the included angle is 30^o, calculate the values of the component forces.