

A Level Bridging Work

Physics

The tasks below are designed to support you as you start A Level Physics. Complete each of the tasks below and bring your work to your first lesson.

Task 1

Study and complete the booklet on prefixes, significant figures and standard form (provided at the end of this document). There will be a test during your first week of post 16 study.

Task 2

Bring revision material to your first lesson from the following GCSE Physics Specification.

Use the information below to guide your revision around key topics from GCSE to ensure your knowledge and skills are secure for you to be successful as you start at A Level Physics.

You will need to prepare a 5 minute presentation on each of the topics in your first lesson. You will only have your summaries and a whiteboard to present your presentation (no PowerPoint).

Revision topics AQA GCSE Physics- Specification On the AQA website	Topics that were not covered in trilogy Physics (combined) but you need to be aware of.
4.1 Energy	
4.1 Electricity	
4.3 Particle model of matter	4.3.3.2 Pressure in gases 4.3.3.3 Increasing the pressure of a gas
4.4 Atomic structure	4.4.3 Hazards and uses of radioactive emissions and of background radiation 4.4.4 Nuclear fission and fusion
4.5 Forces	4.5.4 Moments, levers and gears 4.5.5 Pressure and pressure differences in fluids
4.6 Waves	4.6.1.3 Reflection of waves 4.6.1.4 Sound waves 4.6.1.5 Waves for detection and exploration 4.6.2.5 Lenses 4.6.2.6 Visible light 4.6.3 Black body radiation

Task 3

Research a method to determine the Young's modulus of copper. You must provide a method, equipment list, diagram of the experimental set up, and the results table that you would use.

Challenge – can you also describe how you would analyse the results?

Task 4 – Challenge / extension

Create a 600 word obituary for Robert Hooke, describing his major contributions to science. This should be written in a style suitable for inclusion in a Sunday broadsheet newspaper.

A Level Physics

Skills, Practicals and Analysis

Define the following words:

Independent variable

Calibration

Dependent variable

Random error

Control variable

Systematic error

Continuous variable

Zero error

Discrete variable

Mean value

Ordered variable

Anomalous results

Categoric variable

Line of best fit

Accuracy

Gradient

Precision

Y-Intercept

Reliability

How do you improve the precision of a reading?

How do could you improve the reliability of your results?

If a weighing scale read 20g when nothing was placed on it how would you describe it?

If you used this to find the masses of different samples of metal what type of error would it produce?

How could you calculate the true value for each of the masses?

How do you calculate a mean value of 4 readings?

If all your readings are to 2 significant figures how many sig fig can your mean value be? Why?

Which type of variable would the following be classed as:

Height in cm?

Temperature in Fahrenheit?

Gender?

Favourite chocolate bar?

Distance in m?

Current in Amps?

Brightness?

pH?

Volume of CO₂ produced in m³?

Pressure in Pa?

T-Shirt size?

Prefixes

In Physics we have to deal with quantities from the very large to the very small. A prefix is something that goes in front of a unit and acts as a multiplier. This sheet will give you practice at converting figures between prefixes.

Symbol	Name	What it means		How to convert	
P	peta	10^{15}	1000000000000000		↓ x1000
T	tera	10^{12}	1000000000000	↑ ÷ 1000	↓ x1000
G	giga	10^9	1000000000	↑ ÷ 1000	↓ x1000
M	mega	10^6	1000000	↑ ÷ 1000	↓ x1000
k	kilo	10^3	1000	↑ ÷ 1000	↓ x1000
			1	↑ ÷ 1000	↓ x1000
m	milli	10^{-3}	0.001	↑ ÷ 1000	↓ x1000
μ	micro	10^{-6}	0.000001	↑ ÷ 1000	↓ x1000
n	nano	10^{-9}	0.000000001	↑ ÷ 1000	↓ x1000
p	pico	10^{-12}	0.000000000001	↑ ÷ 1000	↓ x1000
f	femto	10^{-15}	0.000000000000001	↑ ÷ 1000	

Convert the figures into the prefixes required.

s	ms	μs	ns	ps
134.6				
96.21				
0.773				

m	km	mm	Mm	Gm
12873				
0.295				
57.23				

kg	Mg	mg	g	Gg
94.76				
0.000765				
823.46				

A	mA	μA	nA	kA
0.000000678				
3.56				
0.00092				

Skills

Means and Anomalous Results

For each set of values calculate the mean and then calculate the mean ignoring any anomalous results.

1	2	3	Mean	
4152	2996	4018		
935.5	925.8	926.7		
16.2	19.1	17.4		
80.1316	80.1324	80.1466		
2229	2011	1610		
127.664	127.416	127.489		
55.88	11.97	37.59		
3.767	3.763	3.751		
375.5	511.5	463.4		
1048	888	1655		
0.507	0.415	0.230		
27145	25157	26017		
1450	1014	2238		
9104.32	10529.45	9160.97		

1	2	3	4	Mean	
63.10	62.97	62.53	62.99		
465.98	463.40	466.96	155.56		
3.61	7.39	3.55	3.64		
73.71	70.98	74.19	72.38		
2.058	1.566	2.078	1.787		
416	402	189	986		
700653	739762	742471	726161		
2670887	2670901	2669942	2670733		
110.4	260.1	1044.2	488.8		

1	2	3	4	5	Mean	
140	220	90	180	140		
56300	41200	58600	48300	53800		
0.186	0.341	0.276	0.216	0.314		
1.427	0.235	0.488	1.922	1.620		
34	62	46	12	39		
326.19	360.22	314.20	352.22	400.18		
1.4	5.3	2.7	3.9	2.6		

Skills	<h1 style="margin: 0;">Significant Figures</h1>
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For each value state how many significant figures it is stated to.

Value	Sig Figs	Value	Sig Figs	Value	Sig Figs	Value	Sig Figs
2		1066		1800.45		0.07	
2.0		82.42		2.483×10^4		69324.8	
2.00		750000		2.483		0.0063	
0.136		310		5906.4291		9.81×10^4	
0.34		3.10×10^2		200000		6717	
54.1		3.1×10^2		12.711		0.91	

Add the values below then write the answer to the appropriate number of significant figures

Value 1	Value 2	Value 3	Total Value	Total to correct sig figs
51.4	1.67	3.23		
7146	-32.54	12.8		
20.8	18.72	0.851		
1.4693	10.18	-1.062		
9.07	0.56	3.14		
739762	26017	2.058		
8.15	0.002	106		
132.303	4.123	53800		
152	0.8	0.55		
0.1142	4922388	132000		

Multiply the values below then write the answer to the appropriate number of significant figures

Value 1	Value 2	Total Value	Total to correct sig figs
0.91	1.23		
8.764	7.63		
2.6	31.7		
937	40.01		
0.722	634.23		

Divide value1 by value 2 then write the answer to the appropriate number of significant figures

Value 1	Value 2	Total Value	Total to correct sig figs
5.3	748		
3781	6.434		
91×10^2	180		
5.56	22×10^{-3}		
3.142	8.314		

Skills	Significant Figures 2
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For each value state how many significant figures it is stated to.

Value	Sig Figs	Value	Sig Figs	Value	Sig Figs	Value	Sig Figs
2.863		689671.49		100000		6.4981×10^7	
100		356865		8.5×10^{-3}		7.85	
24.92		13		6400		17.99	
5.18×10^{27}		182.15		875.4		3.189×10^6	
2.8		4.267		94		0.053	
2.9970		0.02		94.0		0.422	

Calculate the mean of the values below then write the answer to the appropriate number of significant figures

Value 1	Value 2	Value 3	Mean Value	Mean to correct sig figs
1	1	2		
435	299	4130		
500	600	900		
3.038	4.925	3.6		
720	498	168		
1655	2996	140		
0.230	925.8	56300		
26017	19.1	0.186		
2238	80.1324	1.427		
9160.97	2011	34		
62.99	127.416	326.19		
155.56	11.97	1.4		
3.64	3.763	700653		
72.38	511.5	2670887		
1.787	888	110.4		
986	0.415	62.97		
726161	25157	463.40		
2670733	1014	7.39		
488.8	10529.45	70.98		
0.186	140	1.566		
1.427	53800	402		
34	0.314	739762		
326.19	1.620	2670901		

Skills	<h1 style="margin: 0;">Calculating Errors</h1>
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Complete the table.

Variable	Reading 1	Reading 2	Reading 3	Mean Value	Uncertainty	% Uncertainty
A	121	118	119			
B	599	623	593			
C	3.3	3.6	3.2			

What would be the percentage error in the following quantities?

A^2		CB	
AB		ABC	
$\frac{C}{B}$		$\frac{A^2 C}{B}$	

Complete the table.

Variable	Reading 1	Reading 2	Reading 3	Mean Value	Uncertainty	% Uncertainty
D	17	17	17			
E	42.5	42.8	42.1			
F	3.60	3.28	3.73			
G	757	714	739			

What would be the percentage error in the following quantities?

$D^3 F$		EFG^3	
$GE^2 F$		EGD^2	
$\frac{G^2}{DE}$		$\frac{DG}{FE}$	
AFD		$F^2 B^2 G$	

Complete the table.

Variable	Reading 1	Reading 2	Reading 3	Mean Value	Uncertainty	% Uncertainty
H	58205	58309	58193			
I	82.3	81.4	82.8			
J	1985	1988	1980			
K	43	19	27			

What would be the percentage error in the following quantities?

$\frac{H^2 K^4}{AEI}$		$J^3 \frac{HI}{K}$	
KFC		JFK	
$K^4 I$		$I^2 JK$	
$\frac{ABCDEF}{GHIJK}$		$ADH \frac{BEI}{CFJ^2}$	

Skills	Calculating Errors 2
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Complete the table.

Variable	1	2	3	4	Mean Value	Uncertainty	% Uncertainty
<i>L</i>	11.49	11.56	11.63	10.53			
<i>M</i>	385	322	408	328			
<i>N</i>	2736	2729	2743	2643			
<i>O</i>	5101	5108	5003	5098			
<i>P</i>	125	137	167	142			
<i>Q</i>	6124	6118	6510	6123			
<i>R</i>	3.29	3.29	3.29	3.29			
<i>S</i>	4589	4606	4644	4596			
<i>T</i>	417	488	460	456			
<i>U</i>	1.506	3.061	3.085	1.513			
<i>V</i>	274	333	338	277			
<i>W</i>	33.46	33.45	33.96	33.65			

What would be the percentage error in the following quantities?

MO		MO^2N	
$OMLM$		N^3O	
$\frac{L}{M}$		$\frac{NO^2}{L}$	
NML		$LMON$	
P^2R		QPR	
SNO^2P		PMT	
$\frac{SR}{PM}$		$\frac{R^2S}{N^2}$	
$(QR)^2S$		$TROL^2$	
$QP \frac{VR}{ST}$		$\frac{PO^2}{RUT}$	
$SWOT$		$OWLS$	
$N^4 \frac{O^4P^2}{W^2} S^2$		$\frac{TUW^2PN}{MS^2R}$	
$RUST$		WO^2L	

Skills	<h1 style="margin: 0;">Identifying Errors</h1>
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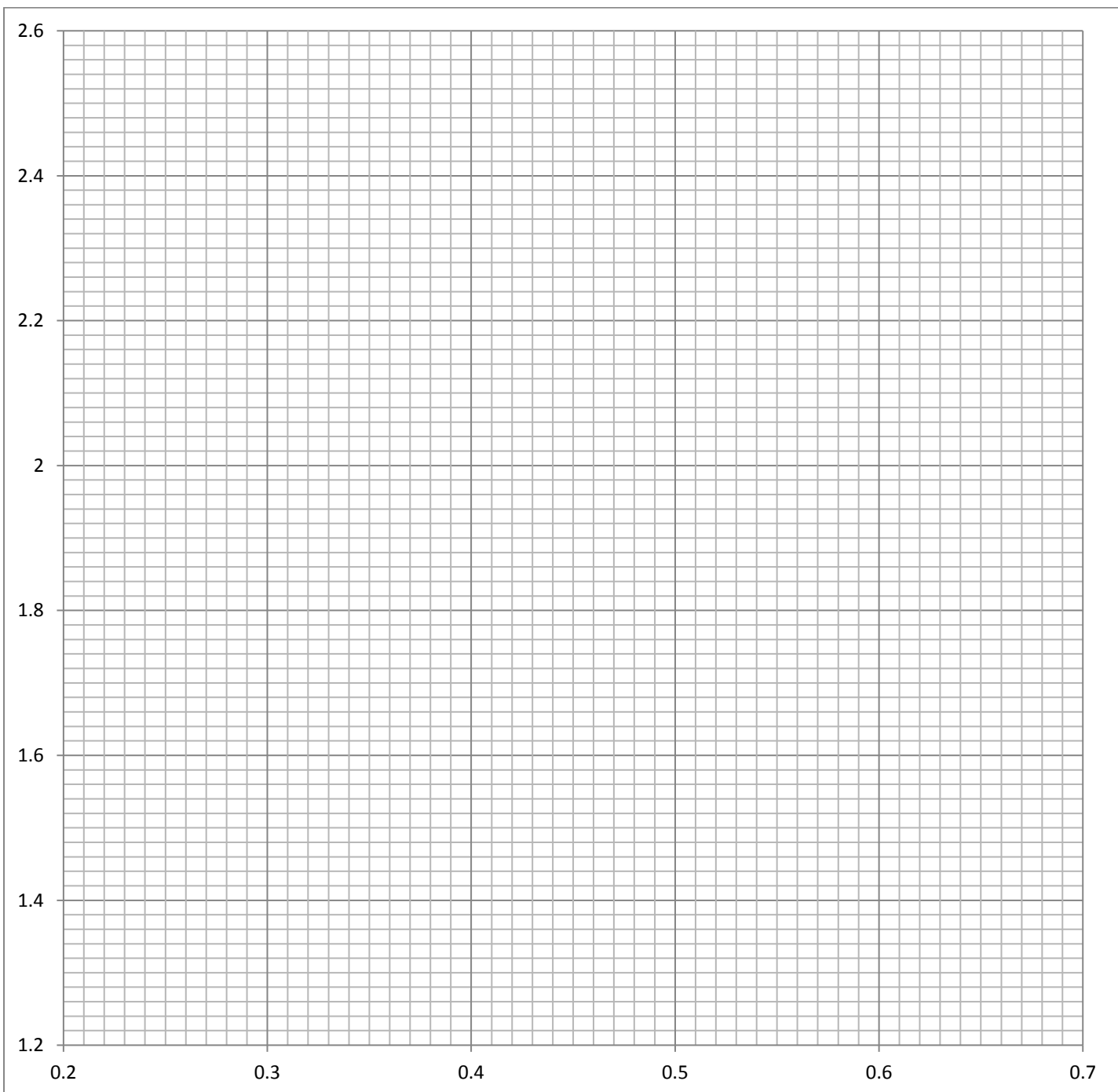
For each of the measurements listed below identify the most likely source of error what type of error this is and one method of reducing it.

Measurement	Source	Type
A range of values are obtained for the length of a copper wire		
The reading for the current through a wire is 0.74A higher for one group in the class		
A beaker of hot water left on the desk appears to have gained temperature		
A mass of a beaker shows different values on different balances		
A range of values are obtained for the bounce back height of a dropped ball		
A few groups obtain different graphs of resistance vs light intensity for an LDR		
The time period (time of one oscillation) of a pendulum		
A range of values are obtained for the time a parachute takes to reach the ground from 0.5m		

Skills	<h1 style="margin: 0;">Points Plotting</h1>
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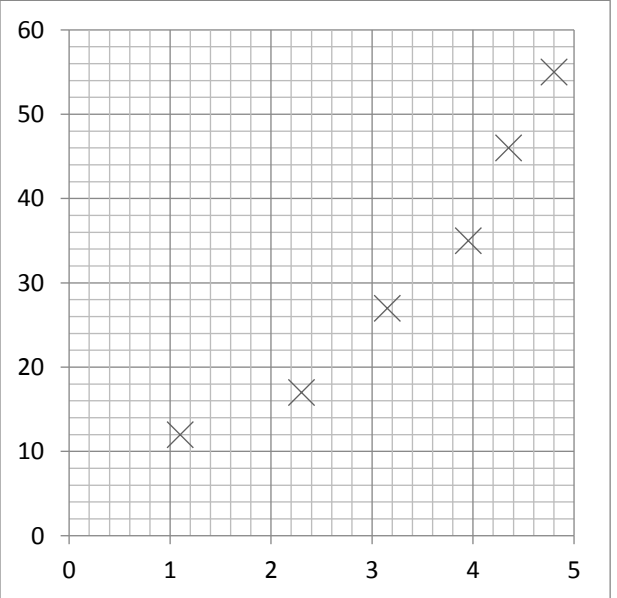
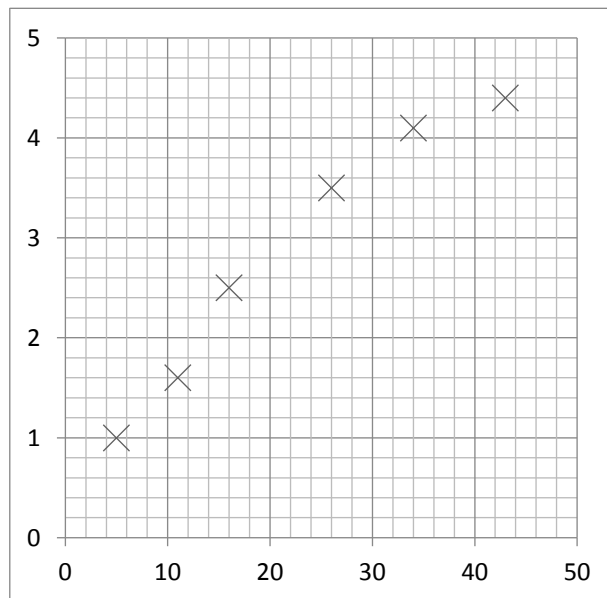
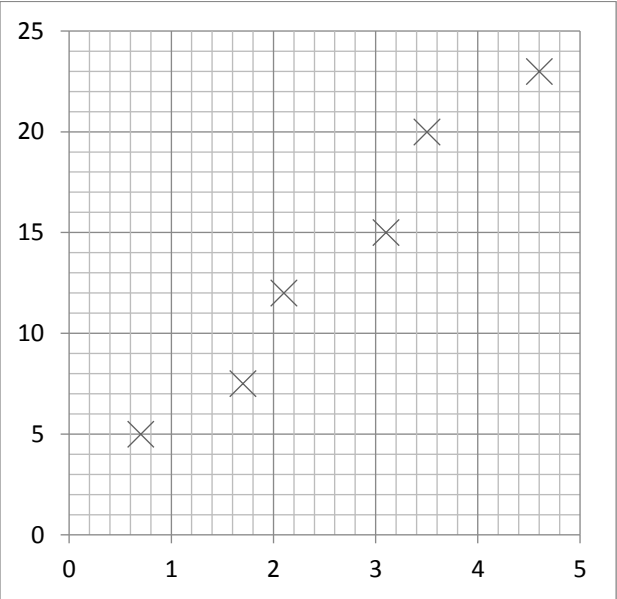
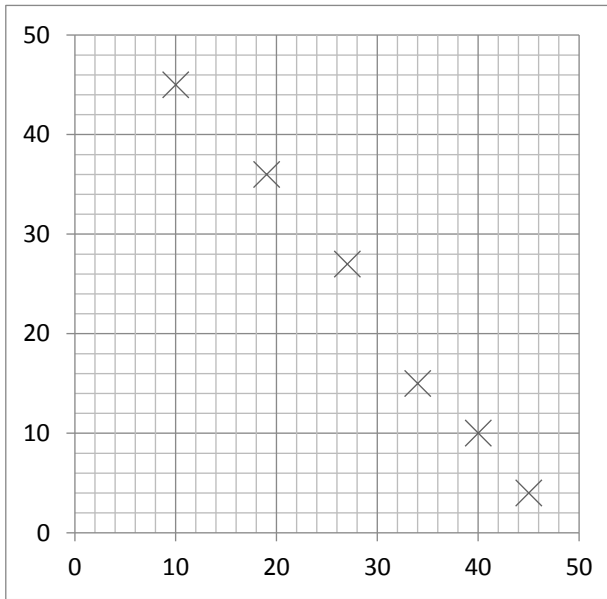
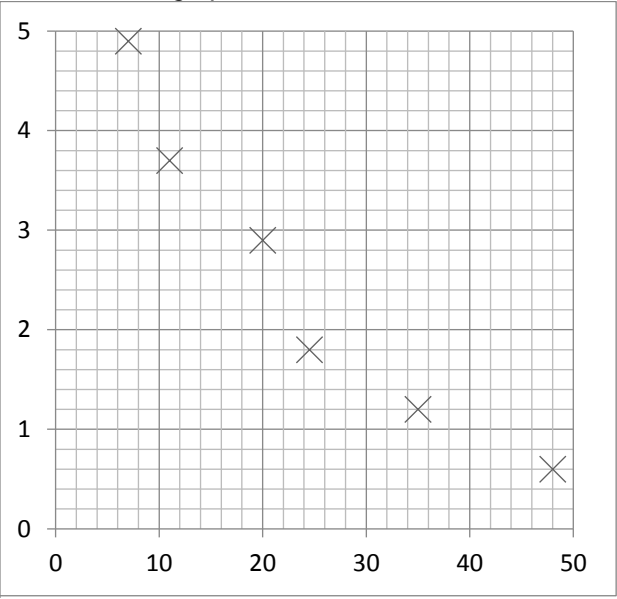
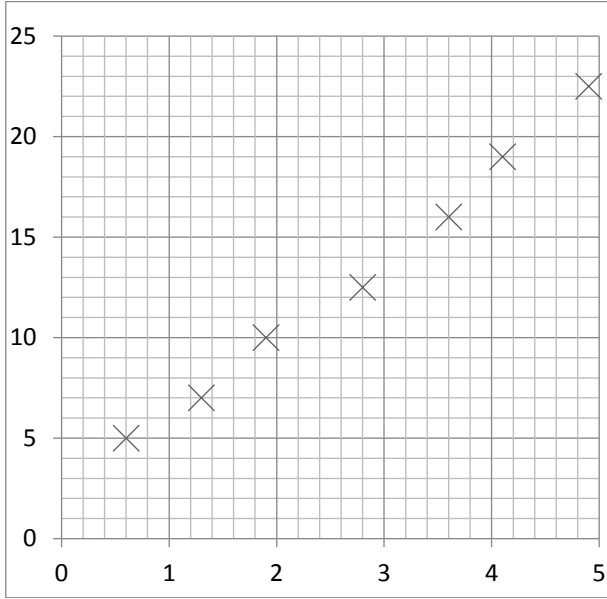
You are going to practice plotting points on a graph. This skill carries up to 3 marks in the ISA.

x axis	y axis	x axis	y axis	x axis	y axis
0.44	2.44	0.34	1.75	0.67	2.12
0.27	1.39	0.49	1.99	0.58	1.64
0.39	2.13	0.26	2.22	0.65	2.52
0.62	1.23	0.31	2.49	0.29	1.92
0.37	1.52	0.52	2.36	0.45	1.47
0.22	2.56	0.61	2.23	0.53	1.27
0.42	1.84	0.64	1.83	0.24	1.71
0.48	1.70	0.55	2.15	0.67	1.45



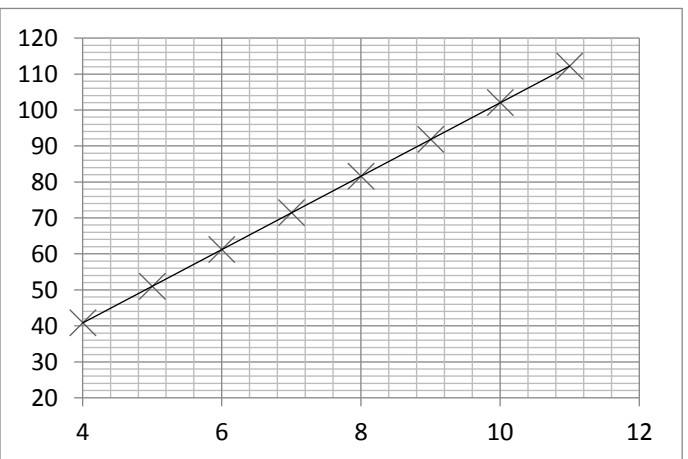
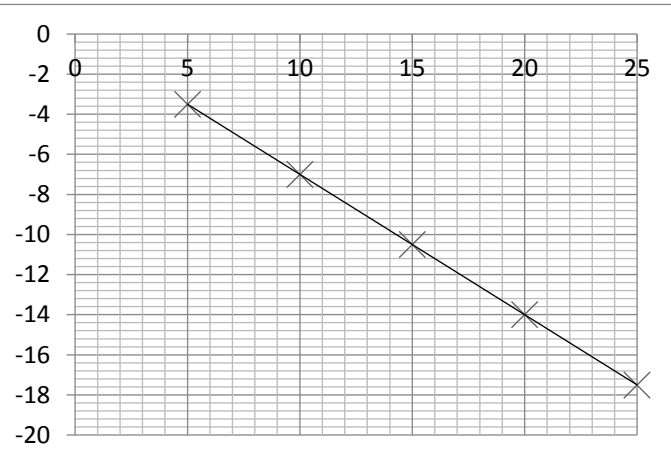
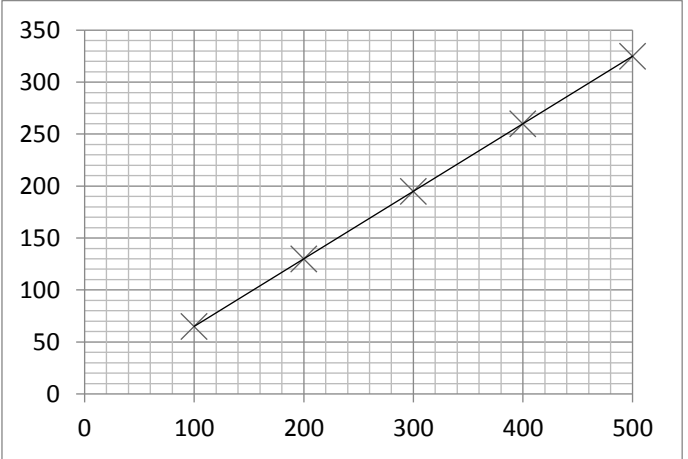
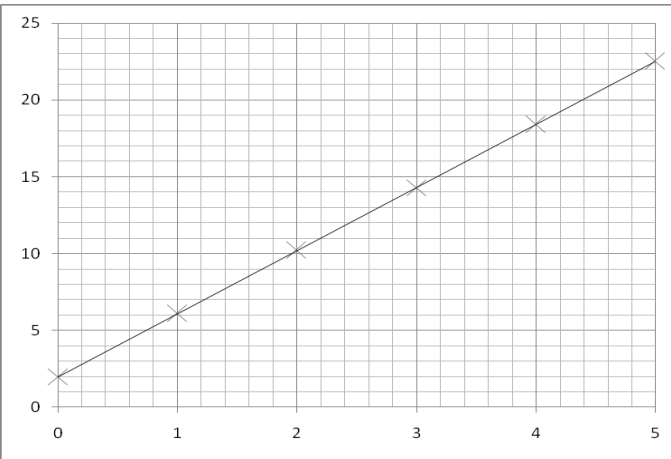
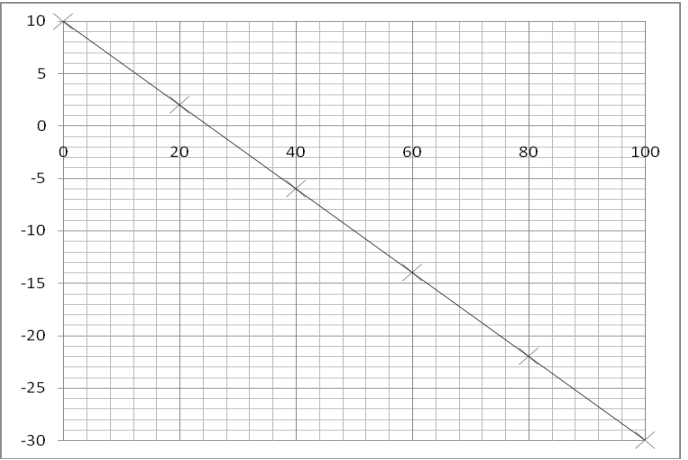
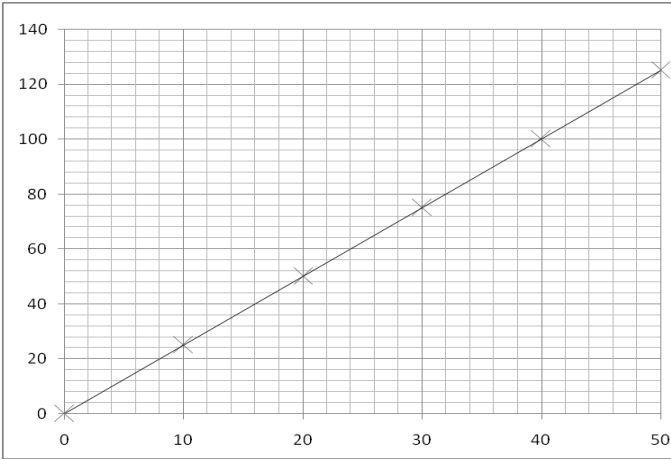
Lines of Best Fit

Draw a line of best fit for each of the graphs.



Gradients

Calculate the gradients of the graphs below. Work out the equation for the line.



Skills	Gradient Equations
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Complete the table below about graphs and gradients

Equation	Graph	Rearrange Equation	Gradient	Intercept
$y = mx + c$	y plotted on the y axis	$y = mx + c$	m	c
	x plotted on the x axis			
$V = IR$	y axis = V	$V = RI$	R	0
	x axis = I			
$I = \frac{Q}{t}$	y axis = t			
	x axis = Q			
$\rho = \frac{RA}{l}$	y axis = l			
	x axis = R			
$\varepsilon = V + Ir$	y axis = V			
	x axis = I			
$E = VIt$	y axis = E/t			
	x axis = V			
$hf = \phi + E_k$	y axis = E_k			
	x axis = f			
$\lambda = \frac{h}{mv}$	y axis = $1/v$			
	x axis = m			
$E_p = mgh$	y axis = mg			
	x axis = E_p			
$E = \frac{1}{2} Fe$	y axis = e			
	x axis = $1/F$			
$c = f\lambda$	y axis = $1/\lambda$			
	x axis = f			
$v = u + at$	y axis = a			
	x axis = $1/t$			
$v^2 = u^2 + 2as$	y axis = v^2			
	x axis = s			
$s = \frac{(u + v)}{2} t$	y axis = v			
	x axis = s			
$w = \frac{\lambda D}{s}$	y axis = λ			
	x axis = w			

Skills	<h1 style="margin: 0;">Gradient Equations 2</h1>
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Complete the table below about graphs and gradients

Equation	Graph	Rearrange Equation	Gradient	Intercept
$y = mx + c$	y plotted on the y axis	$y = mx + c$	m	c
	x plotted on the x axis			
$V = IR$	y axis = V	$V = RI$	R	0
	x axis = I			
$F = \frac{\Delta(mv)}{\Delta t}$	y axis = v			
	x axis = F/m			
$F = m\omega^2 r$	y axis = r			
	x axis = F/m			
$T = 2\pi\sqrt{\frac{l}{g}}$	y axis = l			
	x axis = g			
$T = 2\pi\sqrt{\frac{m}{k}}$	y axis = T^2			
	x axis = m			
$g = -\frac{GM}{r^2}$	y axis = M			
	x axis = g			
$F = \frac{Qq}{4\pi\epsilon_0 r^2}$	y axis = F			
	x axis = q/r^2			
$C = \frac{Q}{V}$	y axis = V			
	x axis = Q			
$Q = Q_0 e^{-t/RC}$	y axis = $\ln(Q/Q_0)$			
	x axis = t			
$\epsilon = N \frac{\Delta\phi}{\Delta t}$	y axis = ϵ			
	x axis = $N\phi$			
$\frac{N_s}{N_p} = \frac{V_s}{V_p}$	y axis = N_p			
	x axis = N_s			
$R = r_0 A^{1/3}$	y axis = R^3			
	x axis = A			
$pV = nRT$	y axis = T			
	x axis = V			
$Q = mc\Delta T$	y axis = T			
	x axis = Q			