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# **Applied Science**

# **Bridging Project**

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3. Ratios
4. Means and Anomalous results
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## **Standard Form**

1. Convert these numbers into normal form.

a)  $5.239 \times 10^3$       b)  $4.543 \times 10^4$       c)  $9.382 \times 10^2$       d)  $6.665 \times 10^6$

e)  $1.951 \times 10^2$       f)  $1.905 \times 10^5$       g)  $6.005 \times 10^3$

2. Convert these numbers into standard form.

a) 65345      b) 28748      c) 548454      d) 486856

e) 70241      f) 65865758      g) 765

3. Convert these numbers into normal form.

a)  $8.34 \times 10^{-3}$       b)  $2.541 \times 10^{-8}$       c)  $1.01 \times 10^{-5}$

d)  $8.88 \times 10^{-1}$       e)  $9 \times 10^{-2}$       f)  $5.05 \times 10^{-9}$

4. Convert these numbers to standard form.

a) 0.000567      b) 0.987      c) 0.0052

d) 0.0000605      e) 0.008      f) 0.0040302

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## Algebraic Manipulation

4. In the following examples, the equation is given to you. Rearrange the equation for each of the other quantities. The first line shows an example of this.

Equation	First Rearrangement	Second Rearrangement
(Power of lens) $P = \frac{1}{f}$	$1 = Pf$	$f = \frac{1}{P}$
(Magnification of lens) $m = \frac{v}{u}$	$v =$	$u =$
(refractive index) $n = \frac{c}{v}$	$c =$	$v =$
(current) $I = \frac{\Delta Q}{\Delta t}$		
(electric potential) $V = \frac{\Delta E}{\Delta Q}$		
(power) $P = \frac{\Delta E}{\Delta t}$		
(power) $P = VI$		
(power) $P = I^2R$		
(power) $P = \frac{V^2}{R}$		
(stress) $\sigma = \frac{F}{A}$	$F =$	$A =$

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(strain) $\varepsilon = \frac{x}{l}$	$x =$	$l =$	
(conductance) $G = \frac{\sigma A}{L}$			
(resistance) $R = \frac{\rho L}{A}$			
(phase angle) $\theta = 2\pi ft$	$f =$	$t =$	
(displacement) $y = a \sin \theta$	$a =$	$\theta =$	
(Young's interference) $x = \frac{\lambda L}{d}$			
(electron wavelength) $\lambda = \frac{h}{mv}$			

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## Ratios

Simplify the following ratios (Example  $6:4 = 3:2$ ):

1.  $120:50$

2.  $64:24$

3.  $13:52$

4.  $100:10\ 000$

5.  $24:72$

6.  $18:90$

7.  $56:88$

8.  $36:144$

9. A toy is made from red bricks and yellow bricks.  
Number of red bricks: Number of yellow bricks =  $5:2$ .  
There are 210 more red bricks than yellow bricks.

How many red bricks are in the toy?

10. There are 100 balls in a bag. The balls are red, blue, green or white. The ratio of blue to red is  $5:1$ . There are twice as many blue as green.  $\frac{1}{4}$  of the balls are green.

How many white balls are in the bag?

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## Means and Anomalous Results

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

<b>1</b>	<b>2</b>	<b>3</b>	<b>Mean</b>
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	

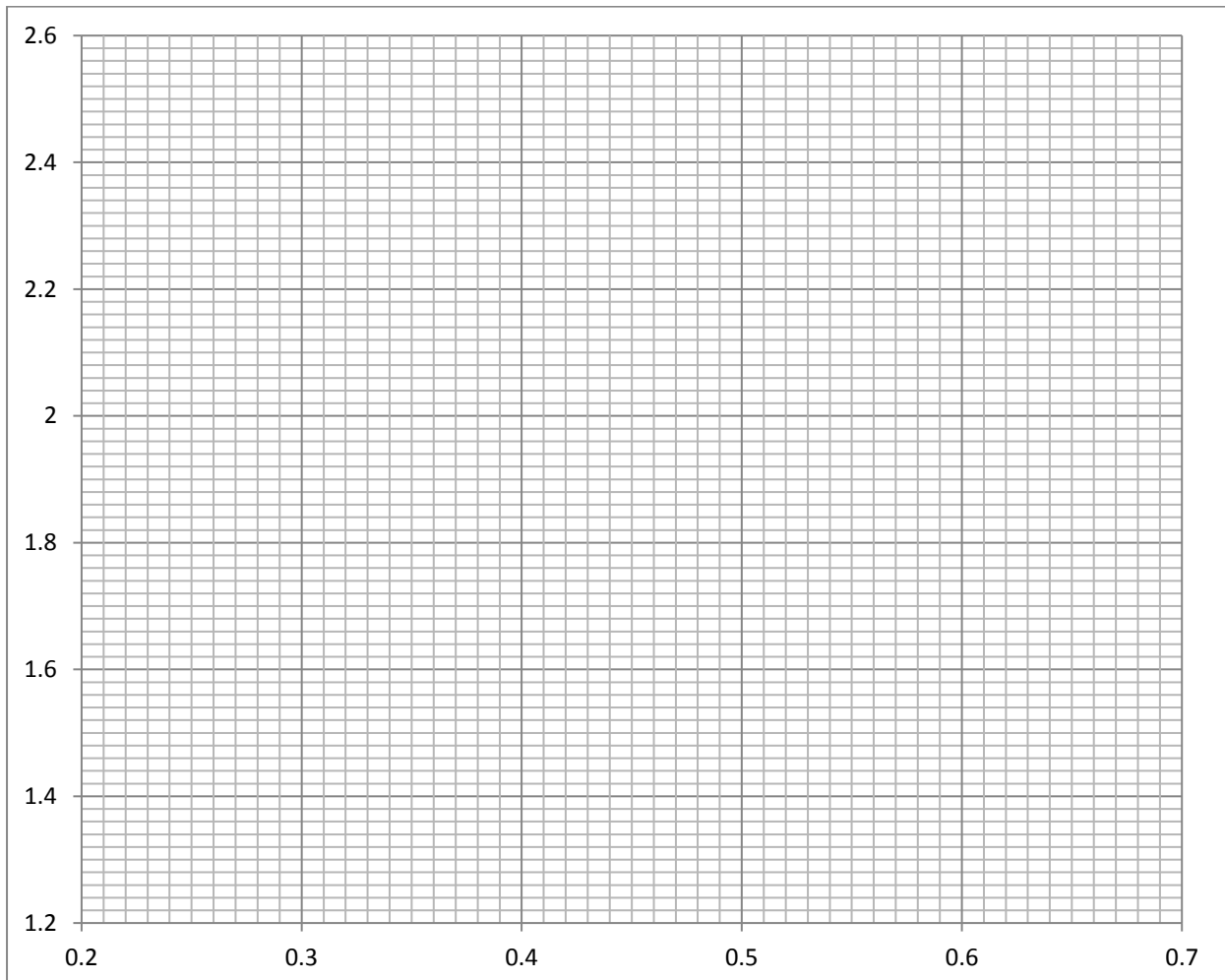
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>Mean</b>
63.10	62.97	62.53	62.99	
465.98	463.40	466.96	155.56	
3.61	7.39	3.55	3.64	
73.71	70.98	74.19	72.38	
2.058	1.566	2.078	1.787	
416	402	189	986	
700653	739762	742471	726161	
2670887	2670901	2669942	2670733	
110.4	260.1	1044.2	488.8	

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## Points Plotting

*You are going to practice plotting points on a graph.*

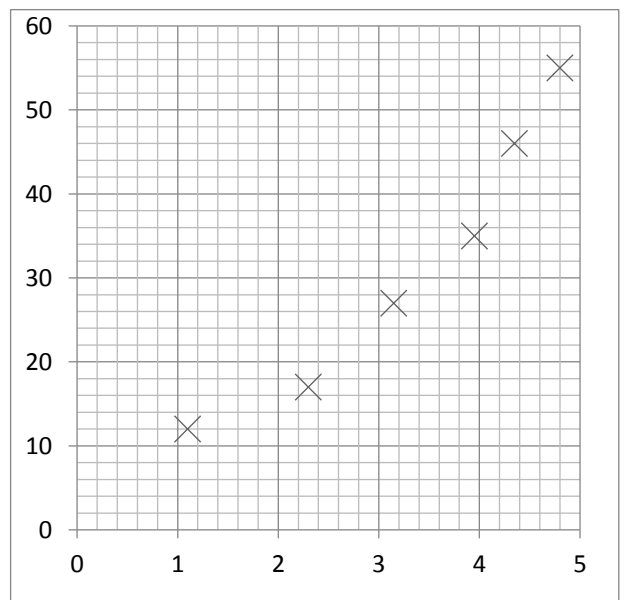
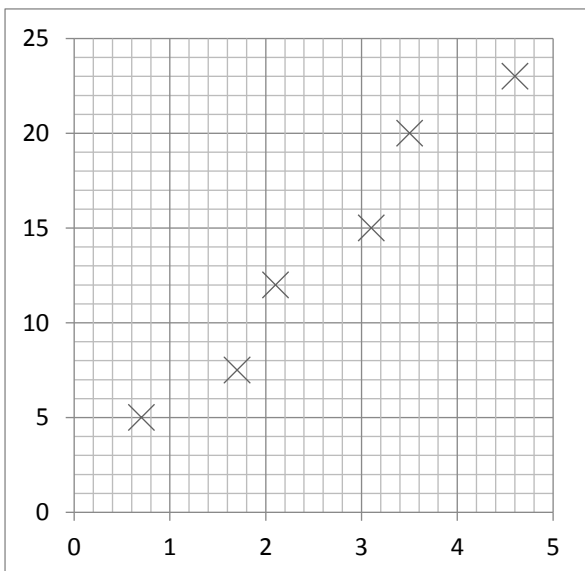
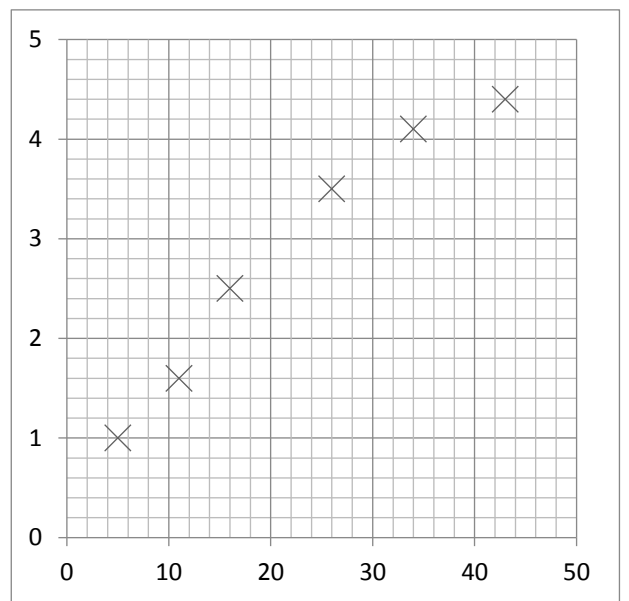
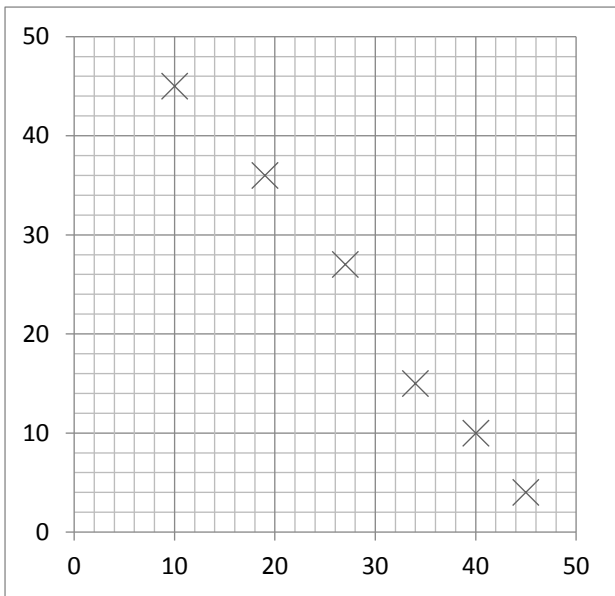
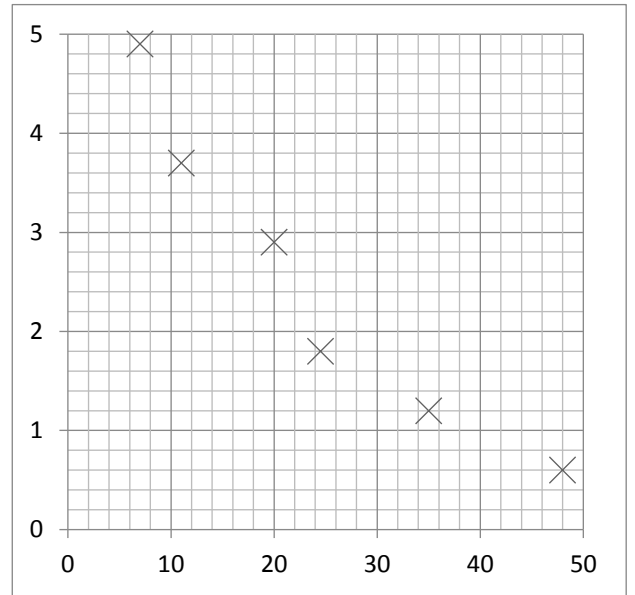
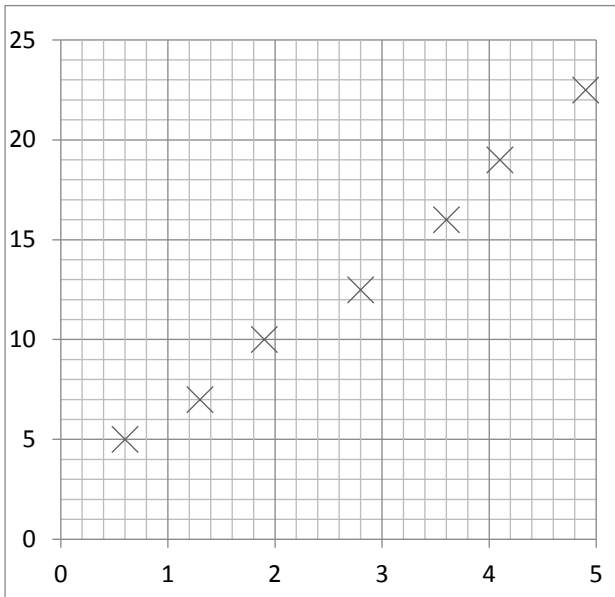
x axis	y axis	x axis	y axis	x axis	y axis
0.44	2.44	0.34	1.75	0.67	2.12
0.27	1.39	0.49	1.99	0.58	1.64
0.39	2.13	0.26	2.22	0.65	2.52
0.62	1.23	0.31	2.49	0.29	1.92
0.37	1.52	0.52	2.36	0.45	1.47
0.22	2.56	0.61	2.23	0.53	1.27
0.42	1.84	0.64	1.83	0.24	1.71
0.48	1.70	0.55	2.15	0.67	1.45



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## Lines of Best Fit

Draw a line of best fit for each graph

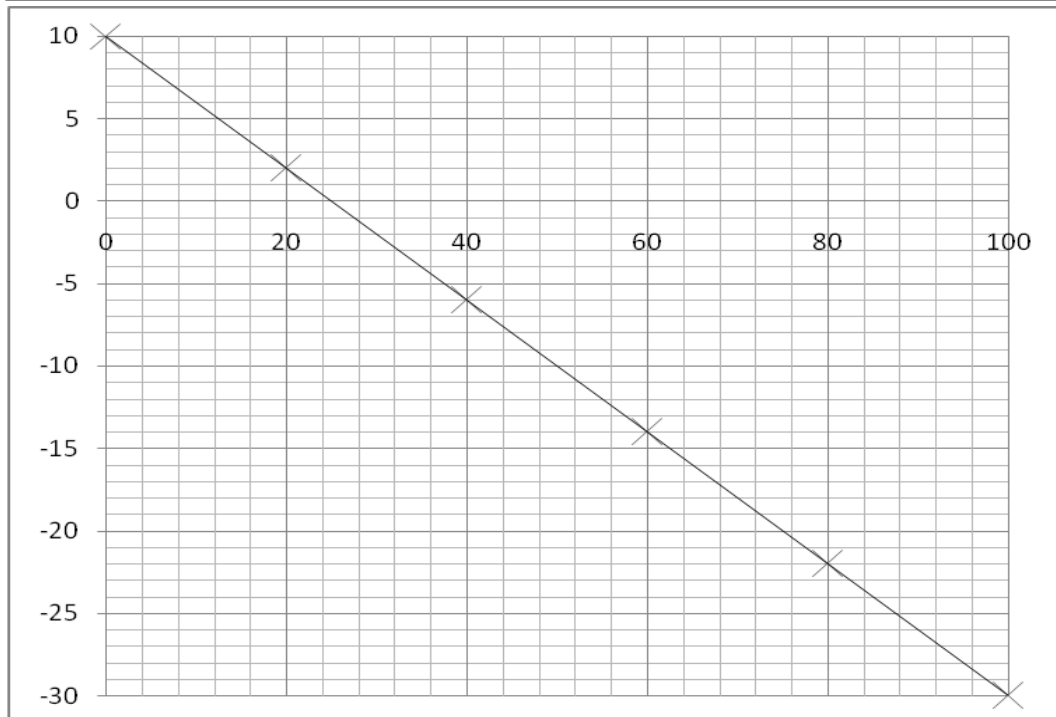
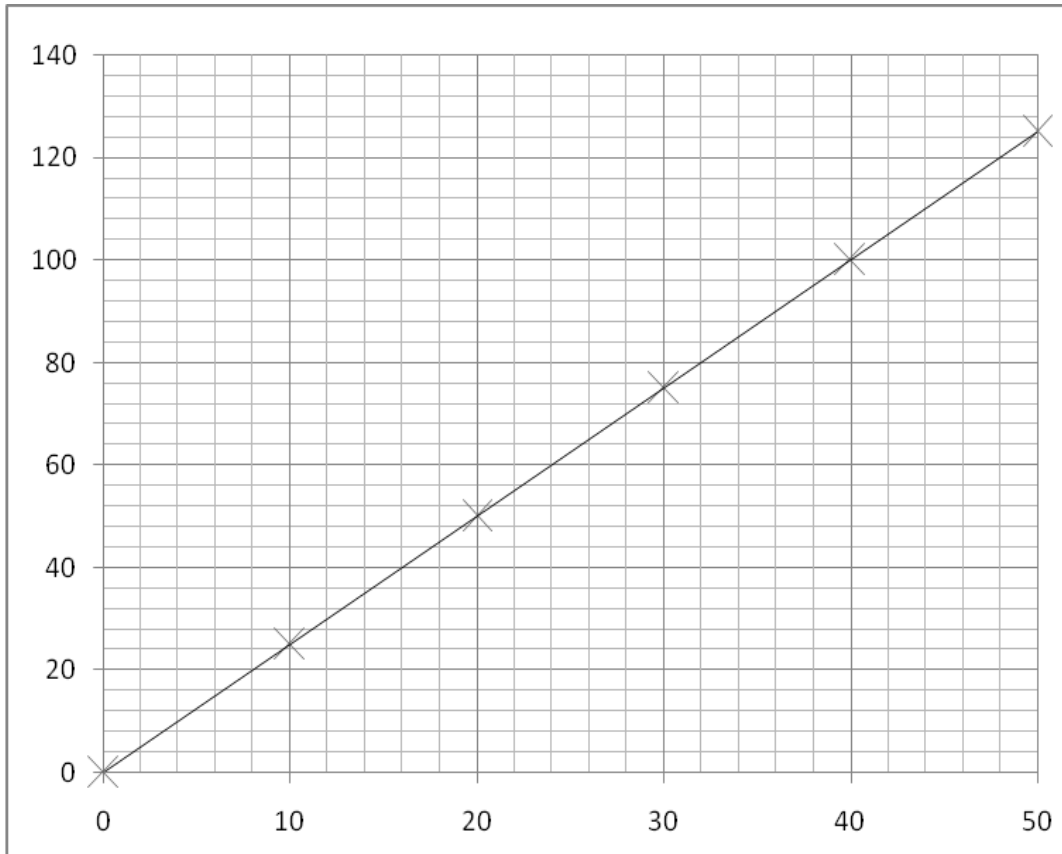




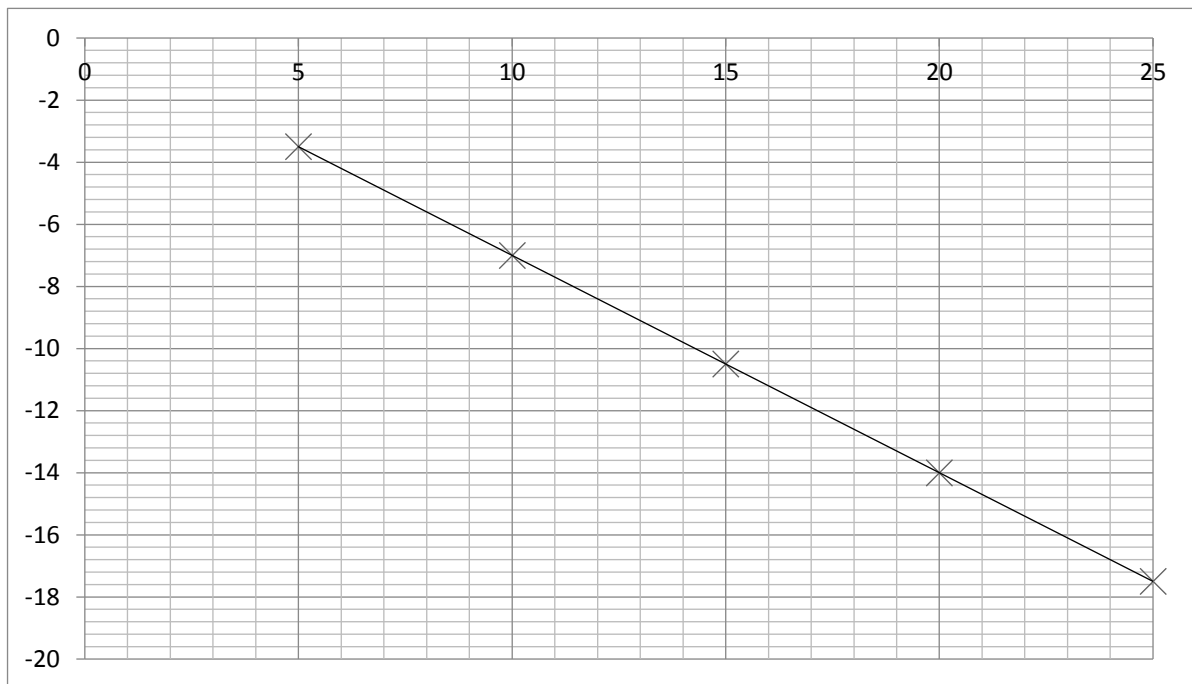
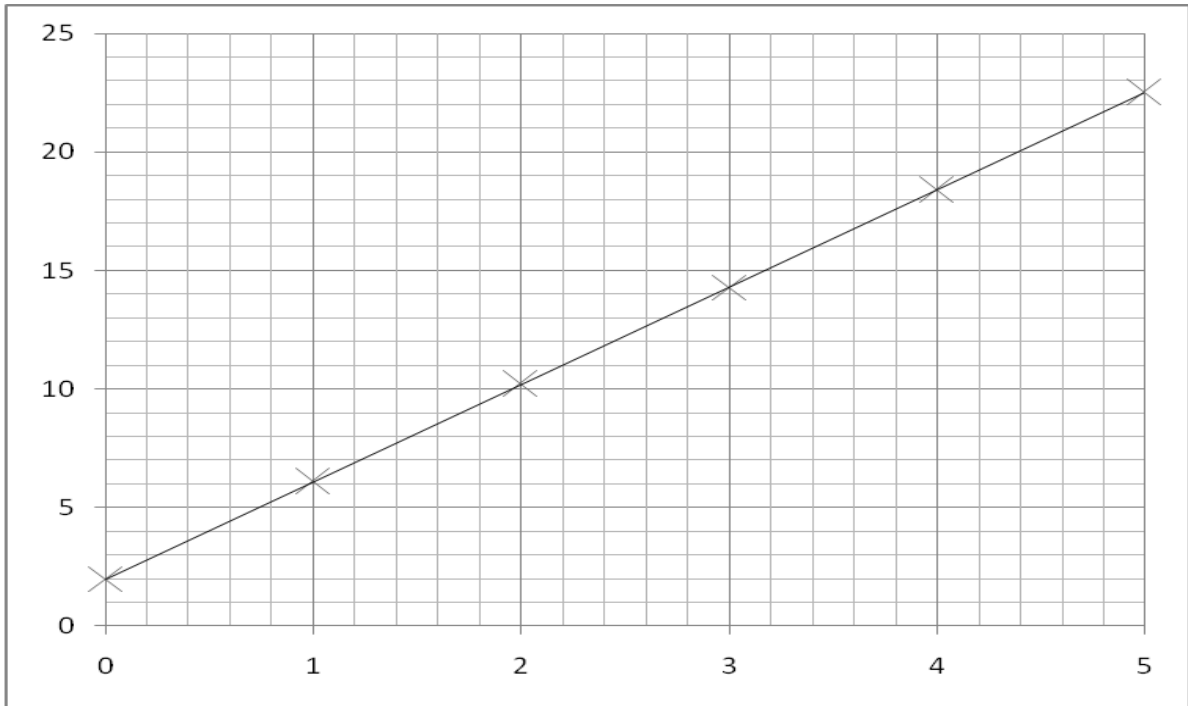
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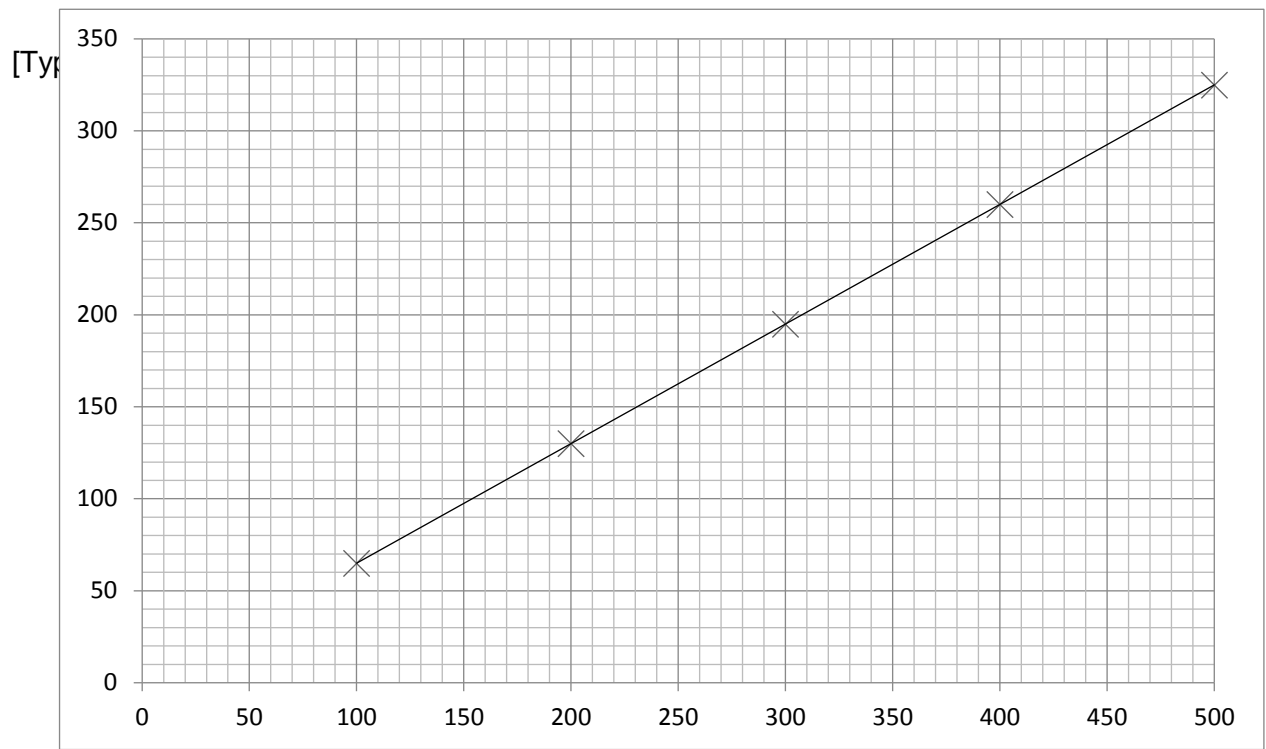
## Calculating Gradients

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



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## **Using scientific equipment**

- a) Find pictures of the following equipment and describe how you would use it. State the accuracy of each piece of equipment.
1. Top pan balance (describe how to calibrate this)
  2. Burette
  3. Pipette (describe how to calibrate this)
  4. Thermometer
  5. Vernier caliper
  6. Micrometer
  7. pH probe (describe how to calibrate this)
  8. Calorimeter
  9. Colorimeter
- b) Explain how to make a standard solution sodium hydroxide
- c) Explain how you would check the molarity of hydrochloric acid and sodium hydroxide
- d) Explain how to complete the following statistical tests:
1. Chi-squared
  2. Standard deviation
  3. Degrees of freedom
  4. T – test
- e) Explain what a null hypothesis is and give examples.