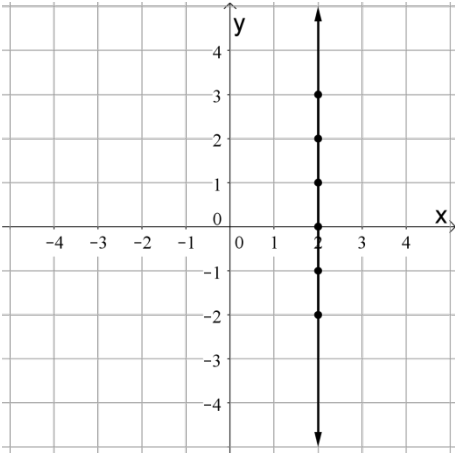
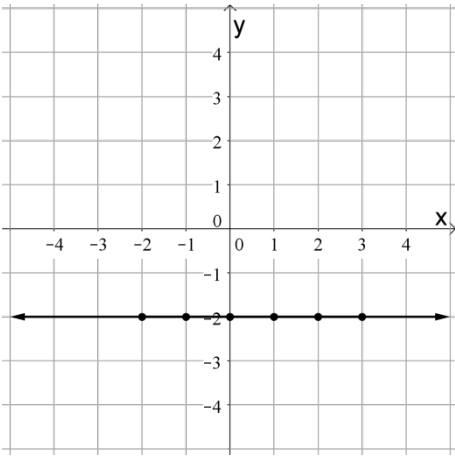


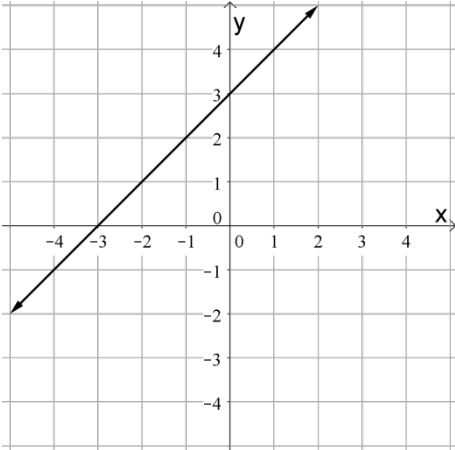
Mathematics Stage 5 Diagnostic Tasks Answers with Common Errors

Answers 5.1	Common Errors
5.1 Financial Mathematics	
QUESTION 1 a) \$540 b) \$13.05 (2 decimal places) c) \$847.60 d) i) \$2942.31 (2 decimal places) ii) \$6375 e) i) \$908.65 (2 decimal places) (using 52 weeks in a year) ii) \$6100.96 (2 decimal places)	d) Incorrect identifying the factor to divide by (i.e., 12 or 26 or 52) (ii) Students may multiply answer (i) by 2 thinking that there is 2 fortnights in a month rather than going back to the original salary. e) Not distinguishing the difference between holiday loading and holiday pay.
QUESTION 2 a) \$1250 b) \$61	Finding the value to calculate commission on (i.e. Determining commission calculated on \$30000).
QUESTION 3 a) \$25466.33 b) i) \$6672.50 ii) Refund. \$1077.50 iii) Taxable income = \$39867.50 Medicare levy = \$698.10 (2 decimal places)	a) Adding the deductions instead of subtracting b) ii) Not specifying the refund amount. iii) may work out the levy using the tax amount in questions part (ii)
QUESTION 4 a) \$1560 b) \$3805.50 c) \$65.63 (2 decimal places) d) i) \$3900 ii) \$998.40 iii) \$4898.40 iv) \$6398.40	b) Working out the interest and forgetting to add on the principal c) Incorrectly converting rate or time period. d) i) Not excluding the deposit. ii) Using the wrong Principal iii) Not adding the principal amount iv) Not adding the initial deposit to the total price paid

5.1 Financial Mathematics	Common Errors
<p>QUESTION 5</p> <p>a)</p> <p>i) \$3675.13 (2 decimal places) ii) \$675.13</p> <p>b) \$6486.25 (2 decimal places)</p> <p>c)</p> <p>i) \$5728.86 ii) \$5373.45</p> <p>Investment A $I = 5000 \times 0.03 \times 6$ $= \\$900$ $A = \\$5900$</p> <p>Investment B $A = 5000 \times 1.1941$ $= \\$5970.50$</p> <p>Therefore, Investment B is the better investment by \$70.50</p>	<p>a)and b) incorrectly distinguishing between interest earned and final value.</p> <p>c) Not recognising the table is only for \$1 and you need to multiply by the principal amount.</p>

5.1 Indices	Common Errors
<p>QUESTION 1</p> <p>a)</p> <p>i) a^4</p> <p>ii) 2^5</p> <p>b)</p> <p>i) 2^5</p> <p>ii) m^9</p> <p>iii) $6x^6$</p> <p>iv) $5p^4$</p> <p>v) $32x^3y^5$</p>	<p>a) Adding rather than multiplying especially with (i) and getting $4a$ as an answer</p> <p>b) Multiplying the indices instead of adding</p> <p>iii) Multiplying the base numbers to get 4^5 this is only a common error made when the bases and numerical.</p>
<p>QUESTION 2</p> <p>a) y^3</p> <p>b) $2x$</p> <p>c) $-6k$</p> <p>d) $4xy^2$</p>	<p>Divide the indices rather than subtract</p>
<p>QUESTION 3</p> <p>a) 5^6</p> <p>b) $2^3q^9 = 8q^9$</p> <p>c) $\left(\frac{7c}{d}\right)^2 = \frac{49c^2}{d^2}$</p>	<p>a) Squaring the 5 to get 25^6 this is only a common error made when the bases and numerical.</p> <p>b) and c) not raising everything inside the bracket to the power i.e. getting $2q^3$ and $\frac{7c^2}{d^2}$ or $\frac{7c^2}{d}$</p>
<p>QUESTION 4</p> <p>a) 1</p> <p>b) 2</p> <p>c) 1</p>	<p>b) Thinking that the entire expression is to the power of zero and giving the answer 1</p>
<p>QUESTION 5</p> <p>a)</p> <p>i) $\frac{1}{2^2}$</p> <p>ii) $\frac{1}{5^3}$</p> <p>b)</p> <p>i) 2^{-4}</p> <p>ii) -4^{-3}</p> <p>c)</p> <p>i) $\frac{1}{9}$</p> <p>ii) $-\frac{1}{5^3} = -\frac{1}{125}$</p> <p>iii) $-\frac{1}{16} + \frac{1}{4} = \frac{3}{16}$</p>	

5.1 Linear Relationships	Common Errors																												
<p>QUESTION 1</p> <p>a) positive b) (1.5, 1) c) $\frac{4}{5}$ d) $\sqrt{41} \approx 6.4$ (1 decimal place)</p>																													
<p>QUESTION 2</p> <p>a)</p> <table border="1" data-bbox="293 497 711 580"> <tr> <td>x</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>y</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> </table>  <p>b)</p> <table border="1" data-bbox="293 1111 711 1193"> <tr> <td>x</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>y</td> <td>-2</td> <td>-2</td> <td>-2</td> <td>-2</td> <td>-2</td> <td>-2</td> </tr> </table> 	x	2	2	2	2	2	2	y	-2	-1	0	1	2	3	x	-2	-1	0	1	2	3	y	-2	-2	-2	-2	-2	-2	<p>Getting the order of the coordinates mixed up, doing the y-ordinate across and the x-ordinate up/down</p> <p>Not extending the line beyond the plotted points.</p> <p>Not using arrows on both ends of the line.</p>
x	2	2	2	2	2	2																							
y	-2	-1	0	1	2	3																							
x	-2	-1	0	1	2	3																							
y	-2	-2	-2	-2	-2	-2																							

5.1 Linear Relationships	Common Errors
<p>QUESTION 3</p> <p>a) x-intercept:</p> $y = 0$ $x + 3 = 0$ $x = -3$ <p>y-intercept:</p> $x = 0$ $y = 0 + 3$ $y = 3$ <p>b)</p> 	<p>a) Incorrectly solving the equations when $x=0$ and $y=0$</p> <p>b) Not extending the line sufficiently to show the x- and y-intercepts.</p> <p>Not using arrows on both ends of the line.</p>
<p>QUESTION 4</p> $3 = 3(2) - 2$ $3 = 6 - 2$ $3 \neq 4$ <p>No, (2,3) does not lie on the line $y = 3x - 2$</p>	<p>Substituting the x and y values into the wrong variable.</p>
<p>QUESTION 5</p> $y = 3x \text{ and } y = 3x + 1$	<p>Including $y=-3x$ in the solution as it also has a 3</p>

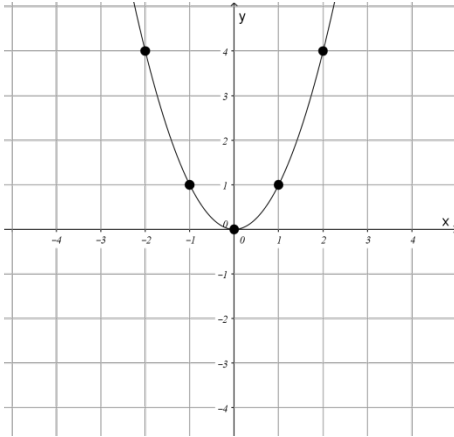
5.1 Non-Linear Relationships

Common Errors

QUESTION 1

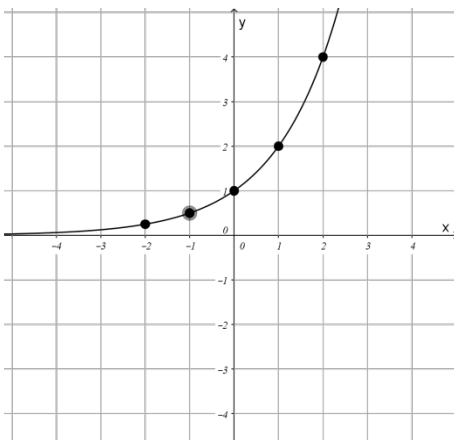
i)

x	-2	-1	0	1	2	3
y	4	1	0	1	4	9



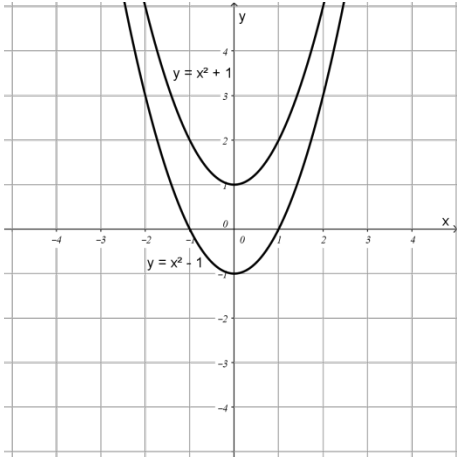
ii)

x	-2	-1	0	1	2	3
y	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8



i) Care must be taken by students when putting $(-2)^2$ and $(-1)^2$ into the calculator as if they don't use the brackets it will come out with a negative number

ii) points must be joined using a smooth curve not a straight line

5.1 Non-Linear Relationships	Common Errors																												
<p>QUESTION 2</p> <p>i) A ii) C iii) B</p>																													
<p>QUESTION 3</p> <p>i) $y = x^2 + 1$</p> <table border="1" data-bbox="263 416 743 526"> <tr> <td>x</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>y</td> <td>5</td> <td>2</td> <td>1</td> <td>2</td> <td>5</td> <td>10</td> </tr> </table> <p>$y = x^2 - 1$</p> <table border="1" data-bbox="263 613 743 723"> <tr> <td>x</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>y</td> <td>3</td> <td>0</td> <td>-1</td> <td>0</td> <td>3</td> <td>8</td> </tr> </table>  <p>$y = x^2 + 1$ crosses the y axis at $y = 1$ $y = x^2 - 1$ crosses the y axis at $y = -1$</p> <p>ii) The value of the constant is equal to where the graph crosses the y axis.</p>	x	-2	-1	0	1	2	3	y	5	2	1	2	5	10	x	-2	-1	0	1	2	3	y	3	0	-1	0	3	8	
x	-2	-1	0	1	2	3																							
y	5	2	1	2	5	10																							
x	-2	-1	0	1	2	3																							
y	3	0	-1	0	3	8																							

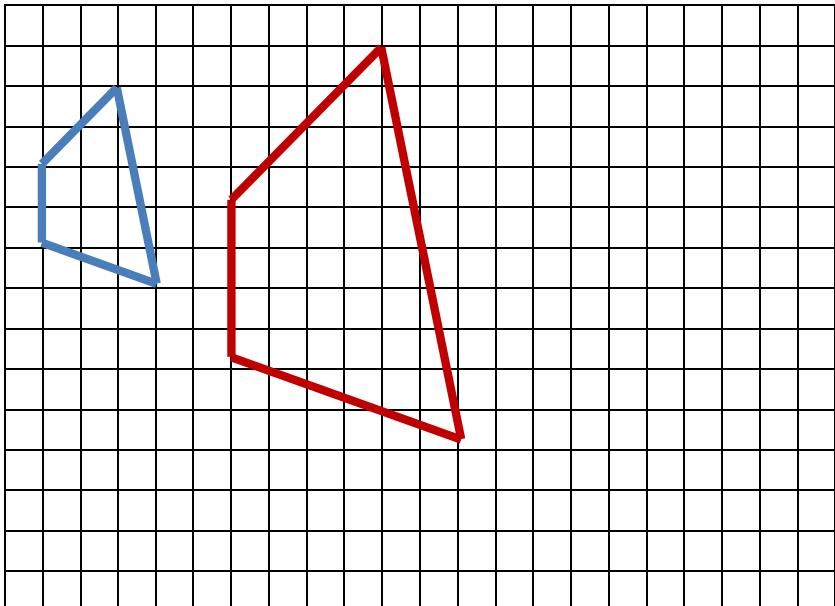
5.1 Area and Surface Area	Common Errors
<p>QUESTION 1</p> <p>a) $A = s^2 + \frac{1}{2}\pi r^2$ $= 8 \times 8 + \frac{1}{2} \times \pi \times 4^2$ $= 89.13 \text{ cm}^2$ (correct to 2 decimal places)</p> <p>b) $A = \frac{h}{2}(a + b)$ $= \frac{6.3}{2}(10 + 18.4)$ $= 89.46 \text{ cm}^2$</p> <p>c) $A = bh$ $= 12 \times 8$ $= 96 \text{ cm}^2$</p> <p>d) $A = \frac{130}{360}\pi r^2$ $= \frac{130}{360} \times \pi \times 10^2$ $= 113.45 \text{ cm}^2$ (correct to 2 decimal places)</p> <p>e) $A = \pi R^2 - \pi r^2$ $= \pi \times 9^2 - \pi \times 4^2$ $= 204.20 \text{ cm}^2$ (correct to 2 decimal places)</p> <p>f) $A = \frac{1}{2}bh - lw$ $= \frac{1}{2} \times 25 \times 14 - 4 \times 3$ $= 163 \text{ cm}^2$</p>	<p>Across all questions involving area and surface area</p> <ul style="list-style-type: none"> ➤ Mixing up area and perimeter ➤ Mixing up surface area and volume <p>a) Confusing the use of the circumference formula and the area of a circle formula or even a combination of both ($2\pi r^2$ is a common error for the area formula) or forgetting to halve the circle.</p> <p>e) using 18cm as the radius of the larger circle instead of 9cm.</p>
<p>QUESTION 2</p> <p>a) $Top = 22 \times 6.5$ $= 143 \text{ cm}^2$ $Front = 22 \times 10$ $= 220 \text{ cm}^2$ $Side = 6.5 \times 10$ $= 65 \text{ cm}^2$ $Surface Area = 2 \times (143 + 220 + 65)$ $= 856 \text{ cm}^2$</p> <p>b) Finding the perpendicular height of the triangle: $h^2 = 13^2 - 5^2$ $h = 12 \text{ cm}$ $Front = \frac{1}{2} \times 10 \times 12$ $= 60 \text{ cm}^2$ $Sloping side = 13 \times 18$ $= 234 \text{ cm}^2$ $Base = 10 \times 18$ $= 180 \text{ cm}^2$ $Surface Area = 2 \times 60 + 2 \times 234 + 180$ $= 768 \text{ cm}^2$</p>	<p>b) using 13 cm as the height of the triangle</p>

5.1 Area and Surface Area	Common Errors
<p>QUESTION 3</p> <p>a) 5</p> <p>b) $Front = 36 \times 42$ $= 1512 \text{ cm}^2$ $Side = 25 \times 42$ $= 1050 \text{ cm}^2$ $Base = 36 \times 25$ $= 900 \text{ cm}^2$ $Surface Area = 2 \times 1512 + 2 \times 1050 + 900$ $= 6024 \text{ cm}^2$</p>	<p>Not recognising that the box is open and has not top and including it in the calculation.</p>

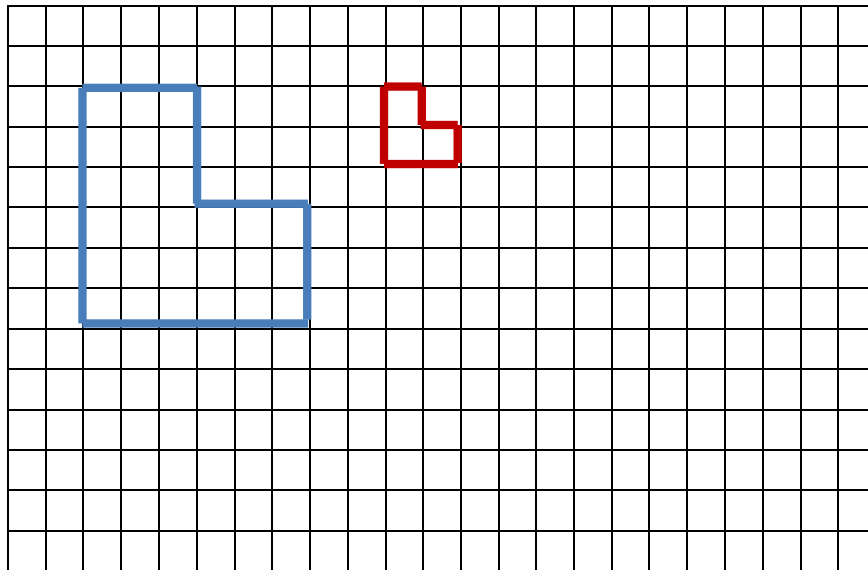
5.1 Numbers of Any Magnitude	Common Errors															
<p>QUESTION 1</p> <p>a) 2430 b) 0.238 c) 1.29</p>	<p>a) Getting 243, because they don't put the zero in to hold place value. b) Just cutting the decimal off at 3 decimal places and not rounding up i.e. getting 0.237. c) Rounding to 3 decimal places instead of 3 sig figs i.e. 1.288/1.287</p>															
<p>QUESTION 2</p> <p>a)</p> <p>i) 0.78 cm ii) 2.34 m iii) 1.86×10^{-6} m iv) 60 μm</p> <p>b)</p> <p>i) 7 850 L ii) 78.26 mL</p> <p>c)</p> <p>i) 7 MB = 7×1024 KB = 7168 KB ii) 5200 GB = $5200 \div 1024 = 5.078$ TB (correct to 3 decimal places) iii) 2.1 TB = $2.1 \times 1024 \times 1024 \times 1024 = 2\ 254\ 858\ 000$ KB (to the nearest thousand)</p> <p>d)</p> <p>i) $7.8 \times 60 \times 1000 = 468\ 000$ ms ii) $170\ 000 \mu$s = $170\ 000 \div 1\ 000\ 000$ s = $0.17 \div 60$ min = 0.0028 min (correct to 2 significant figures) iii) 1 fortnight = 1×14 days = 14×24 hours = 336×60 minutes = 20160×60 seconds = 1 209 600 s iv) $897 \div 10 = 89.7$ decades</p>	<p>a), b) and d) mixing up the multiplication and division by powers of 10 i.e. multiplying when it should be division and vice versa. Or using the wrong power of 10</p> <p>c) Note: $2^{10} = 1024$ using multiples of 10 for converting rather than the powers of 2 required for digital conversions.</p> <table border="1" data-bbox="869 891 1528 1444"> <thead> <tr> <th>Prefix</th> <th>Decimal/Analog value</th> <th>Binary/Digital value</th> </tr> </thead> <tbody> <tr> <td>k (kilo)</td> <td>10^3 (1000)</td> <td>2^{10} (1024)</td> </tr> <tr> <td>M (mega)</td> <td>10^6 (1 000 000)</td> <td>2^{20} (1 048 576)</td> </tr> <tr> <td>G (Giga)</td> <td>10^9 (1 000 000 000)</td> <td>2^{30} (1 073 741 824)</td> </tr> <tr> <td>T (Tera)</td> <td>10^{12} (1 000 000 000 000)</td> <td>2^{40} (1 099 511 627 776)</td> </tr> </tbody> </table>	Prefix	Decimal/Analog value	Binary/Digital value	k (kilo)	10^3 (1000)	2^{10} (1024)	M (mega)	10^6 (1 000 000)	2^{20} (1 048 576)	G (Giga)	10^9 (1 000 000 000)	2^{30} (1 073 741 824)	T (Tera)	10^{12} (1 000 000 000 000)	2^{40} (1 099 511 627 776)
Prefix	Decimal/Analog value	Binary/Digital value														
k (kilo)	10^3 (1000)	2^{10} (1024)														
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T (Tera)	10^{12} (1 000 000 000 000)	2^{40} (1 099 511 627 776)														
<p>QUESTION 3</p> <p>a)</p> <p>i) $2800 = 2.8 \times 10^3$ ii) $1\ 240\ 000 = 1.24 \times 10^6$ iii) $0.03456 = 3.456 \times 10^{-2}$ iv) $0.0000541 = 5.41 \times 10^{-5}$</p> <p>b)</p> <p>i) $2.6 \times 10^2 = 260$ ii) $4.56 \times 10^{-4} = 0.000456$</p>																

5.1 Numbers of Any Magnitude	Common Errors
<p>QUESTION 4</p> <p>a) 6.3×10^8, 1.2×10^9, 3.5×10^9</p> <p>b) 4.8×10^{-3}, 4.1×10^{-2}, 3.8×10^{-1}</p>	<p>Comparing only the decimal part of the number and not taking the power of 10 into consideration</p>
<p>QUESTION 5</p> <p>a) $t = \frac{d}{s} = \frac{1.52 \times 10^8}{3 \times 10^5} = 507 \text{ s}$ (correct to the nearest whole)</p> <p>b) $28\,000 \times 365 = 10\,220\,000$ words $= 1.022 \times 10^7$ words</p>	
<p>QUESTION 6</p> <p>a) ± 0.5 kg</p> <p>b) 15.5 kg to 16.5 kg</p>	
<p>QUESTION 7</p> <p>a) $25 + 15 = 40$</p> <p>b) $140 + 20 = 160$</p> <p>(Answers may vary slightly)</p>	

5.1 Trigonometry – Right Angled Triangles	Common Errors
<p>QUESTION 1</p> <p>a)</p> <p>i) AB ii) BC iii) AC</p> <p>b)</p> <p>i) $\frac{4}{5}$ ii) $\frac{3}{5}$ iii) $\frac{4}{3}$</p> <p>c)</p> <p>i) 0.29 ii) 0.21 iii) 1.17</p> <p>d)</p> <p>i) 82° ii) 57° iii) 37°</p>	<p>Across all questions involving trigonometry</p> <ul style="list-style-type: none"> ➤ Using the wrong ratios ➤ Getting confused when the unknown is in the denominator for example if: $\tan 30^\circ = \frac{12}{y}$ rearranging incorrectly to get $y = 12 \tan 30^\circ$ ➤ Not using the inverse function when calculating an unknown angle (i.e. on the calculator students need to press SHIFT before the trig ratio) ➤ Mixing up the opposite and adjacent sides is common <p>c) incorrect rounding</p>
<p>QUESTION 2</p> <p>a)</p> <p>i) $\tan 52 = \frac{y}{8}$ $y = 8 \times \tan 52$ $y = 10.2 \text{ cm (rounded to 1 decimal place)}$</p> <p>ii) $\cos 46 = \frac{7.5}{x}$ $x = 7.5 \div \cos 46$ $y = 10.8 \text{ cm (rounded to 1 decimal place)}$</p> <p>b)</p> <p>i) $\tan \theta = \frac{4}{3}$ $\theta = 53^\circ$</p> <p>ii) $\cos \theta = \frac{6}{10}$ $\theta = 53^\circ$</p> <p>c) $\tan 54 = \frac{h}{520}$ $h = 520 \times \tan 54$ $h = 716 \text{ m}$ the height of the cliff is 716 m.</p>	

5.1 Properties of Geometric Figures	Common Errors
<p>QUESTION 1</p> <p>Two shapes are similar if their shape is the same but their size is different.</p>	
<p>QUESTION 2</p> <p>A and C</p> <p>Matching angles are equal</p>	
<p>QUESTION 3</p> <p>a) AC-PR, CD-RS, DB-SQ, BA-QP</p> <p>b) $\angle A - \angle P$, $\angle C - \angle R$, $\angle D - \angle S$, $\angle B - \angle Q$</p>	
<p>QUESTION 4</p> <p>a)</p> <p>i) scale factor = $\frac{\text{image}}{\text{original}} = \frac{10}{4} = 2.5$</p> <p>ii) scale factor = $\frac{\text{image}}{\text{original}} = \frac{11}{44} = 0.25$</p> <p>b)</p> <p>i) scale factor = $\frac{\text{image}}{\text{original}} = \frac{3}{6} = 0.5$</p> <p>ii) $5 \times \frac{1}{2} = 2.5$ cm</p>	<p>Not recognising that the object is on the left hand side and the image is on the right hand side i.e. getting the scale factor backwards. Or always thinking that a scale factor has to be larger than 1 and having SF = 4 for (ii)</p>
<p>QUESTION 5</p> <p>i) scale = $\frac{34}{8} = 4.25$</p> <p>ii) $6.7 \times \text{scale} = 6.7 \times 4.25 = 28.5$ cm (correct to 1 decimal place)</p>	
<p>QUESTION 6</p> <p>a)</p> 	

b)



5.1 Single Variable Data Analysis	Common Errors																		
<p>QUESTION 1</p> <p>Positively skewed, negatively skewed, bi-modal, symmetric</p>																			
<p>QUESTION 2</p> <p>i)</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="border-right: 1px dotted black; border-bottom: 1px dotted black; padding: 5px;">GIRLS</th> <th style="border-right: 1px dotted black; border-bottom: 1px dotted black; padding: 5px;">LEAF</th> <th style="border-bottom: 1px dotted black; padding: 5px;">BOYS</th> </tr> </thead> <tbody> <tr> <td style="border-right: 1px dotted black; padding: 5px;">9</td> <td style="border-right: 1px dotted black; padding: 5px;">0</td> <td style="padding: 5px;">5 6</td> </tr> <tr> <td style="border-right: 1px dotted black; padding: 5px;"></td> <td style="border-right: 1px dotted black; padding: 5px;">1</td> <td style="padding: 5px;">2</td> </tr> <tr> <td style="border-right: 1px dotted black; padding: 5px;">5 4 2</td> <td style="border-right: 1px dotted black; padding: 5px;">2</td> <td style="padding: 5px;">5 6</td> </tr> <tr> <td style="border-right: 1px dotted black; padding: 5px;">7 6 3</td> <td style="border-right: 1px dotted black; padding: 5px;">3</td> <td style="padding: 5px;">3 4 5</td> </tr> <tr> <td style="border-right: 1px dotted black; padding: 5px;">0</td> <td style="border-right: 1px dotted black; padding: 5px;">4</td> <td style="padding: 5px;"></td> </tr> </tbody> </table> <p>ii) boys</p> <p>iii) Girls: mean = 28.25, median = 29, range = 31 Boys: mean = 22, median = 25.5, range = 30 The girls achieved the better results with a higher median and mean although their range is larger it is only by one mark and is negligible when other measures are taken into consideration.</p> <p>iv) Negatively skewed</p>	GIRLS	LEAF	BOYS	9	0	5 6		1	2	5 4 2	2	5 6	7 6 3	3	3 4 5	0	4		<p>Some students may not order the stem-and-leaf plot which will affect the answers to the questions that follow.</p>
GIRLS	LEAF	BOYS																	
9	0	5 6																	
	1	2																	
5 4 2	2	5 6																	
7 6 3	3	3 4 5																	
0	4																		
<p>QUESTION 3</p> <p>a)</p> <p>i) Date source and size of sample not mentioned.</p> <p>ii) From a census, this data is meaningful.</p>																			

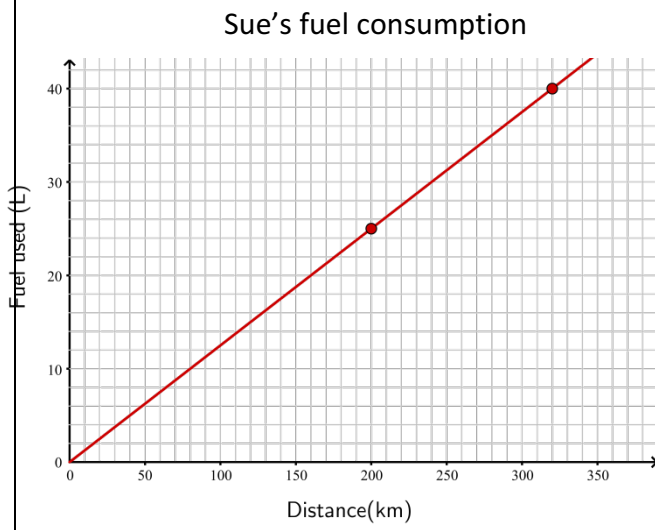
5.1 Probability	Common Errors
<p>QUESTION 1</p> <p>i) $\frac{4}{50}$</p> <p>ii) $\frac{20}{50} + \frac{5}{50} = \frac{25}{50} = \frac{1}{2}$</p>	<p>Mixing up relative frequency with frequency i.e. answering 4 for (i)</p>
<p>QUESTION 2</p> <p>$\frac{54}{150} \times 500 = 180$</p>	
<p>QUESTION 3</p> <p>a)</p> <p>i) 89</p> <p>ii) 5</p> <p>iii) $\frac{18}{89}$</p> <p>iv) $\frac{66}{89}$</p> <p>b)</p> <p>i) 54</p> <p>ii) $\frac{90}{840}$</p> <p>iii) $\frac{430}{840}$</p>	<p>a) Not seeing the 5 outside of the ellipses</p>

5.2 Answers	Common Errors
<p>5.2 Financial Mathematics</p> <p>QUESTION 1</p> <p>a)</p> <p>iii) = \$5624.32</p> <p>iv) A = 624.32</p> <p>b) Type A:</p> $A = 10000(1 + 0.05)^5$ $= 12762.815625$ $\approx \$12762.82$ <p>Type B:</p> $A = 10000 \left(1 + \frac{0.05}{12}\right)^{60}$ $= 12833.586785 \dots$ $\approx \$12833.59$ <p>Type B is the better investment.</p> <p>c) $\approx 18.6\%$</p> <p>d) $A = 7500(1 + 0.07)^n$</p> <p>Try $n = 5$, $A = 7500(1.07)^5$</p> $= \$10519.14$ <p>Try $n = 4$, $A = 7500(1.07)^4$</p> $= \$9830.97$ <p>Therefore, it will take 5 years.</p>	<p>a)</p> <p>v) Mixing up simple and compound interest and using the incorrect formula</p> <p>vi) Not subtracting the principal</p> <p>b) Incorrectly converting rate or time period</p> <p>c) Not converting the rate back to a percentage</p> <p>d) Trying to solve without using trial and error</p>
<p>QUESTION 2</p> <p>a) \$1412.49</p> <p>b)</p> <p>i) \$11339.90</p> <p>ii) $23000 - 11339.90$</p> $= \$11660.10$ <p>The car depreciated in value by \$11660.10</p>	

5.2 Rates and Ratio	Common Errors
<p>QUESTION 1</p> <p>a) $\frac{\\$5.50}{1 \text{ h}} = \frac{\\$5.50}{60 \text{ min}}$ $= \\$0.09/\text{min}$</p> <p>b) $\frac{250 \text{ L}}{1 \text{ h}} = \frac{250000 \text{ mL}}{1 \text{ h}}$ $= 250000 \text{ mL/h}$</p> <p>c) $\frac{65 \text{ km}}{1 \text{ h}} = \frac{65000 \text{ m}}{60 \text{ min}}$ $= \frac{65000 \text{ m}}{3600 \text{ s}}$ $= 18.1 \text{ m/s}$</p>	<p>Using incorrect conversion factor, especially when it comes to time</p>
<p>QUESTION 2</p> <p>a) speed = $\frac{250 \text{ km}}{5 \text{ h}}$ $= 50 \text{ km/h}$</p> <p>b) rate of leak = $\frac{2.5 \text{ L}}{6 \text{ h}}$ $= 0.417 \text{ L/h}$ $= 417 \text{ mL/h}$</p> <p>c) fuel consumption = $\frac{45 \text{ L}}{300 \text{ km}}$ $= \frac{15 \text{ L}}{100 \text{ km}}$ $= 15 \text{ L}/100\text{km}$</p>	<p>c) calculating per km rather than per 100km</p>
<p>QUESTION 3</p> <p>a) direct b) inverse c) direct</p>	
<p>QUESTION 4</p> <p>a) 70°F b) 35°C c) positive d) Yes, as one variable increases so does the other.</p>	<p>a) and b) reading from the wrong axis</p>
<p>QUESTION 5</p> <p>a) $F = k \times d$ b) $\frac{1}{8}$ or (0.125) c) 320 km</p>	<p>Students will need to either use the two pairs of information from part b) and c) or recognise that $F = \frac{1}{8}d$ as the equation of the line.</p>

5.2 Rates and Ratio**Common Errors**

d)

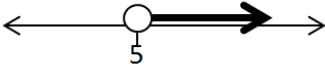
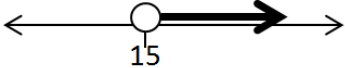
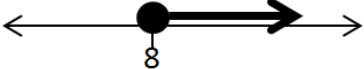
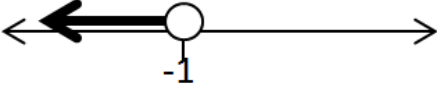
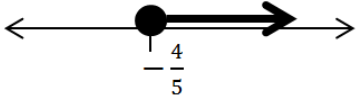


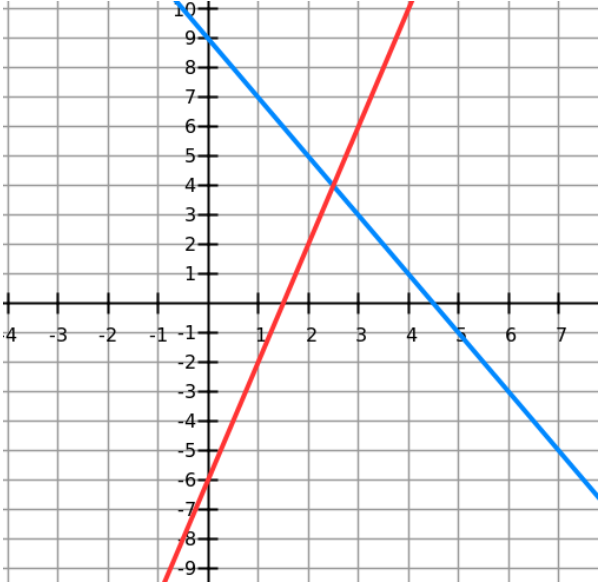
5.2 Algebraic Techniques	Common Errors
<p>QUESTION 1</p> <p>a)</p> <p>i) $\frac{5x}{6}$</p> <p>ii) $\frac{2y}{15}$</p> <p>iii) $\frac{a^2}{4}$</p> <p>iv) $3x$</p> <p>v) $\frac{11}{2n}$</p> <p>b)</p> <p>i) $2y^2 + 12$</p> <p>ii) $40a^2 - 32a + 4$</p> <p>iii) $x^2 + 6x + 8$</p> <p>iv) $2k^2 - k - 15$</p>	<p>i) and ii) Not creating a common denominator Add/subtracting denominators</p> <p>iii) and iv) not simplifying fully</p> <p>iv) dividing the numerators and denominators</p>
<p>QUESTION 2</p> <p>i) $4d^3 - 4d = 4d(d^2 - 1)$</p> <p>ii) $21xy - 3x + 9x^2 = 3x(7y - 1 + 3x)$</p> <p>iii) $h^2 + 8h + 12 = (h + 2)(h + 6)$</p>	

5.2 Indices	Common Errors
<p>QUESTION 1</p> <p>a)</p> <p>i) $\frac{1}{x^2} = x^{-2}$</p> <p>ii) $\frac{2}{m^3} = 2m^{-3}$</p> <p>iii) $\frac{1}{4a^2} = \frac{1}{4}a^{-2}$ $= \frac{a^{-2}}{4}$</p> <p>b)</p> <p>i) $x^{-3} = \frac{1}{x^3}$</p> <p>ii) $4m^{-5} = \frac{4}{m^5}$</p> <p>c) $1^{-3} = \frac{1}{1^3} = 1$ $-3 \times 1 = -3$ x^{-3} is not equivalent to $-3x$</p>	<p>a) iii) raising the 4 to the negative power to get $4a^{-2}$ or $(4a)^{-2}$</p> <p>b) ii) putting the 4 in the denominator, not recognising that only the m is to a negative power, i.e. getting $\frac{1}{4m^5}$</p>
<p>QUESTION 2</p> <p>a)</p> <p>i) $6m^{-10}$</p> <p>ii) x^{-10}</p> <p>iii) $3y^3$</p> <p>iv) $3k^{10}$</p> <p>v) $64m^{-6}$</p> <p>b)</p> <p>i) $4x^0 = 4, \therefore$ false</p> <p>ii) $a^6 \div a^8 = a^{-2}, \therefore$ false</p> <p>iii) $(6m)^0 = 1, \therefore$ true</p> <p>iv) $3x^6 \div 3x^6 = 1, \therefore$ false</p> <p>v) $4c^{-3} = \frac{4}{c^3}, \therefore$ false</p> <p>vi) $12m^{10} \times 2m^{-2} = 24m^8, \therefore$ true</p>	<p>a) i) and iii) multiplying the indices instead of adding</p> <p>iv) dividing the indices instead of subtracting</p> <p>v) not raising everything inside the brackets to the power of 3 i.e. getting $4m^{-6}$</p> <p>b) similar issues to part a)</p>
<p>QUESTION 3</p> <p>a) $-3m^2(5m^2 + 2m^4n)$ $= -15m^4 - 6m^6n$</p> <p>b) $\frac{16x^2}{4x} = 4x$</p> <p>c) $\frac{20a^3b^2}{15ab^3} = \frac{4a^2}{3b}$</p> <p>d) $\frac{3xy}{2} \times \frac{2x}{6} = \frac{x^2y}{2}$</p>	<p>b) not simplifying fully e.g. getting $\frac{16x}{4}$ or $\frac{4x^2}{x}$</p> <p>c) – f) not simplifying fully</p>

5.2 Indices	Common Errors
<p>e)</p> $\frac{b^2c^3}{4} \times \frac{12}{bc^2} = 3bc$ <p>f)</p> $\frac{4n^3}{3m^2} \div \frac{12n}{3m^5}$ $= \frac{4n^3}{3m^2} \times \frac{3m^5}{12n}$ $= \frac{m^3n^2}{3}$	<p>f) dividing the numerators and the denominators to get e.g. $\frac{3n^2}{m^3}$ or $\frac{3n^2}{m^{-3}}$</p>

5.2 Equations	Common Errors
<p>QUESTION 1</p> <p>a) $y = \frac{8}{5}$</p> <p>b) $y = -12$</p> <p>c) $k = \frac{15}{14}$</p>	<p>Across all questions involving equation</p> <ul style="list-style-type: none"> ➤ Errors in algebra ➤ Not performing the inverse operation to both sides ➤ Trying to solve equations before collection like terms after expansions ➤ When dividing both sides by the same number, subtracting rather than dividing e.g. $5y = 8$ $\frac{5y}{5} = \frac{8}{5}$ $y = 3$ ➤ When faced with a division question e.g. $\frac{x}{5} = 20$, students may solve as $\frac{x}{5} = 20$ $x = 20 \div 5$ $x = 4$
<p>QUESTION 2</p> <p>a) $y = \frac{11}{3}$</p> <p>b) $y = 10$</p> <p>c) $x = \frac{10}{3}$</p> <p>d) $m = 3$</p> <p>e) $y = \frac{8}{3}$</p>	<p>c) multiplying by 5 first will still give the same answer, but makes the equation more difficult to solve.</p>
<p>QUESTION 3</p> <p>a)</p> <p>i) $y = \pm 2$</p> <p>ii) $m = \pm 4$</p> <p>iii) $x = \pm\sqrt{8}$ $x = \pm 2.6$</p> <p>b)</p> <p>i) $k = \pm\sqrt{20}$</p> <p>ii) $k = \pm\sqrt{\frac{2}{3}}$</p>	<p>a) –b) not including the \pm in the answer</p> <p>b) square rooting before dividing by 6</p>

5.2 Equations	Common Errors
<p>QUESTION 4</p> <p>i) $x = -1$ ii) $y = 3$ or $y = 2$ iii) $z = 10$ or $z = -1$</p>	
<p>QUESTION 5</p> <p>a) i) $B = 7.5$ ii) $L = 16$</p> <p>b) $C = 27^{\circ}\text{C}$</p>	
<p>QUESTION 6</p> <p>a) 13, 14 and 15</p> <p>b) 9cm</p>	<p>a) students may only solve the equation and not give the answer to the question</p>
<p>QUESTION 7</p> <p>a) $x > 5$</p>  <p>b) $b > 15$</p>  <p>c) $b \geq 8$</p>  <p>d) $y < -1$</p>  <p>e) $m \geq -\frac{4}{5}$</p> 	<p>b) Leaving answer as $15 < b$ or incorrectly interpreting this as $b < 15$.</p> <p>e) not reversing the inequality sign with the division of -5</p>

5.2 Equations	Common Errors
<p>QUESTION 8</p> <p>a)</p>  <p>$(2\frac{1}{2}, 4)$</p> <p>b) $x = 3$ and $y = 7$</p> <p>c) $x = 4$ and $y = 1$</p>	<p>a) not accurately graphing and therefore the point of intersection cannot be accurately read off the graph</p> <p>b) and c) errors in solving equations</p>

5.2 Linear Relationships	Common Errors
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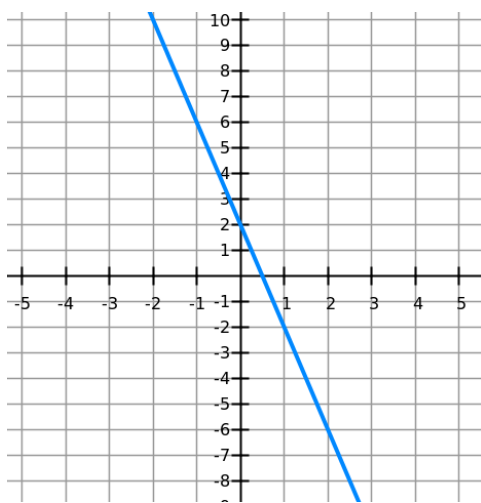
QUESTION 1

a)

	Gradient	Y- intercept
i)	3	-4
ii)	-4	-5
iii)	$\frac{1}{2}$	1
iv)	1	$\frac{3}{2}$

b) $y = -2x + 6$

c) $m = -4$ and $y\text{-int} = 2$



d)

i) 2

ii) -1

iii) $y = -x + 2$

ii) May mix up answers as the terms in the equation are written in a different order.

iii) and iv) students may struggle as the equations are not written in $y = mx + b$ form. Errors may be made in the rearranging of the equation.

d) ii) not recognising the gradient as negative

QUESTION 2

a) $y = -2x + 2$ and $y = \frac{1}{2}x + 4$

b)

i) $y = -4x - 2$

ii) $y = -\frac{3}{2}x - 2$

c) $y = -\frac{3}{2}x + 3$

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

$$m_1 \times m_2 = -\frac{3}{2} \times \frac{2}{3}$$

$$= -1$$

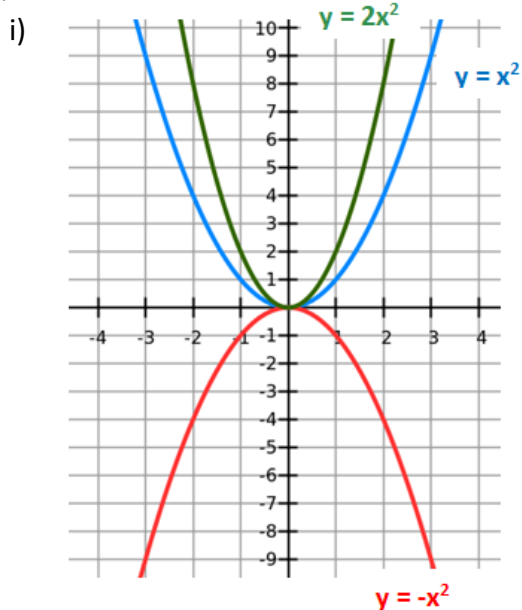
\therefore line 1 and line 2 are perpendicular

5.2 Non-Linear Relationships

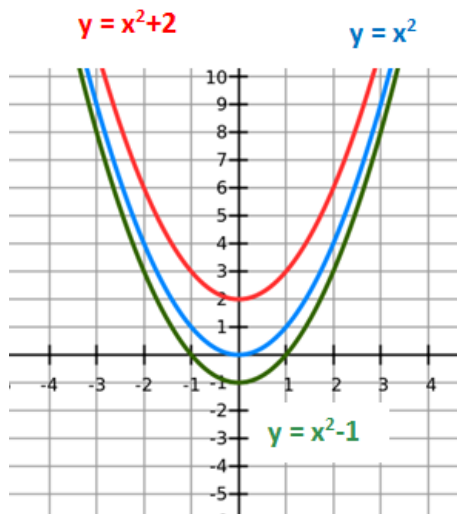
Common Errors

QUESTION 1

a)



ii)



iii) The co-efficient of the x^2 affects the concavity and the width of the parabola. The constant term shifts the parabola up and down the y axis (i.e. changing the y-intercept)

b) $y = ax^2 - 1$ (any value of 'a' is acceptable e.g.
 $y = 2x^2 - 1$)

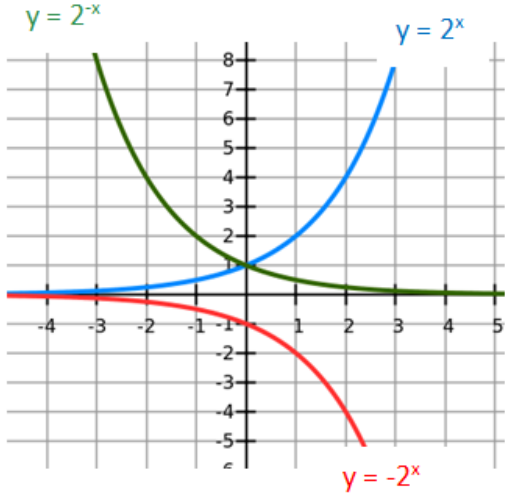
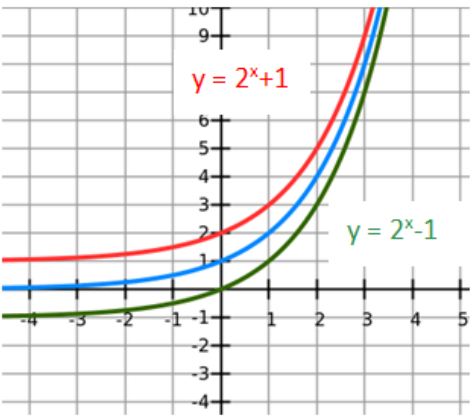
c) $x = \pm\sqrt{6}$ ($x = \pm 2.4$)

d) $y = -x^2 + 1$

Across all questions involving graphing non-linear relationships

- No smooth curve
- Coefficient in front of the basic function widens the curve as its value increases
- Mixing up the direction that the constant shifts the curve

c) incorrect solving of equations and forgetting the \pm

5.2 Non-Linear Relationships	Common Errors
<p>QUESTION 2</p> <p>a)</p>  <p>$y = -2^x$ is a reflection of $y = 2^x$ in the x-axis. $y = 2^{-x}$ is a reflection of $y = 2^x$ in the y-axis</p> <p>b)</p>  <p>The constant shifts the exponential function up/down the y axis which also changes where the asymptote is.</p>	<p>Common Errors</p> <p>Across all questions involving graphing non-linear relationships</p> <ul style="list-style-type: none"> ➤ No smooth curve ➤ Coefficient in front of the basic function widens the curve as its value increases ➤ Mixing up the direction that the constant shifts the curve <p>a) incorrect reflection, mixing up $y = -2^x$ and $y = 2^{-x}$</p> <p>b) no shifting the asymptote with the change in the y-intercept</p>
<p>QUESTION 3</p> <p>a) Centre (0,0) Radius 3 units</p> <p>b) $x^2 + y^2 = 4$</p>	

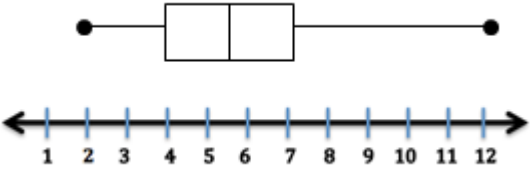
5.2 Non-Linear Relationships	Common Errors
<p>QUESTION 4</p> <p>a) i) B ii) C iii) E iv) A v) D vi) F</p>	

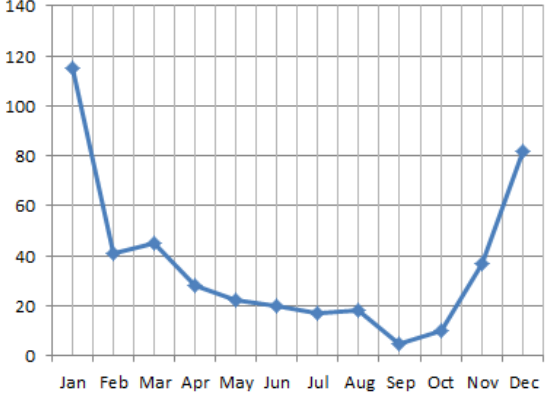
5.2 Area and Surface Area	Common Errors
<p>QUESTION 1</p> <p>a) 915.4 cm^2 b) 932.6 cm^2 c) 143.1 cm^2</p>	<p>Across all questions involving area and surface area</p> <ul style="list-style-type: none"> ➤ Mixing up area and perimeter ➤ Mixing up surface area and volume <p>a) using the incorrect formula for the area of a circle ($A = 2\pi r^2$ is a common error students use for the area of a circle)</p> <p>b) not halving the areas for the cylinder or forgetting to add the rectangle on the bottom</p>
<p>QUESTION 2</p> <p>a)</p> <ul style="list-style-type: none"> i) 691.2 cm^2 ii) 789.2 cm^2 <p>b) $S/A = 1078.8\text{m}^2$ Cost = \$48546</p> <p>c)</p> <ul style="list-style-type: none"> i) 75.4m^2 ii) 96m 	<p>a) ii) not recognising that it is a tin to put stationary in and therefor has no top (i.e. only one circular face)</p> <p>b) difficulty with the trapezium face, or including the top in the calculation (i.e. tiling the top of the pool)</p> <p>c) i) calculating the surface area of the entire greenhouse rather than just the roof</p>

5.2 Volume	Common Errors
<p>QUESTION 1</p> <p>a) 1680 m^3 b) 900 cm^3 c) 424.1 cm^3 d) 220 cm^3</p>	<p>Across all questions involving volume</p> <ul style="list-style-type: none"> ➤ Mixing up volume and surface area <p>c) not converting all measurements to the same units</p>
<p>QUESTION 2</p> <p>384 KL</p>	
<p>QUESTION 3</p> <p>a) 249505.29 mm^3 b) 317680 mm^3 c) 21.5%</p>	<p>a) not converting all measurements to the same units</p> <p>c) calculating the percentage of space that the crackers takes up instead of the empty space (i.e. 78.5%)</p>

5.2 RIGHT-ANGLED TRIANGLES (TRIGONOMETRY)	Common Errors
<p>QUESTION 1</p> <p>a) 13.67 cm b) 32.04 cm</p>	<p>Across all questions involving trigonometry</p> <ul style="list-style-type: none"> ➤ Using the wrong ratios ➤ Getting confused when the unknown is in the denominator for example if: $\tan 30^\circ = \frac{12}{y}$ rearranging incorrectly to get $y = 12 \tan 30^\circ$ ➤ Not using the inverse function when calculating an unknown angle (i.e. on the calculator students need to press SHIFT before the trig ratio)
<p>QUESTION 2</p> <p>a) $47^\circ 1'$ b) $33^\circ 24'$</p>	
<p>QUESTION 3</p> <p>a) 13.2m b) 200 m c) 234° d) i)</p> <p>ii) 419 m iii) $326^\circ 41'$</p>	<p>a) incorrectly placing the 15m as the height it reaches up the wall rather than the length of the ladder</p> <p>d) iii) stopping at calculating the angle and not recognising that this is not the bearing.</p>

5.2 Properties of Geometric Figures	Common Errors
<p>QUESTION 1</p> <p>a) SSS, SAS, AAS, RHS b) i) Yes (SSS) ii) YES (RHS) c) i) RHS ii) corresponding angles in congruent triangles</p>	<p>a) mixing up the congruent triangle test with the test for similar triangles, especially the equiangular test for similarity</p> <p>c) not giving reasons or stating reasons that are not on the diagram</p>
<p>QUESTION 2</p> <p>i) AAS ii) need to prove opposite angles are equal</p>	<p>No reasons stated or not stating the parallel lines that form the alternate angles</p>
<p>QUESTION 3</p> <p>1. Equiangular 2. Three sides of one triangle are proportional to the three sides of the other triangle 3. An angle of one triangle is congruent to an angle of a second triangle and the lengths of the sides including these angles are proportional 4. The length of the hypotenuse and a second side of a right angled triangle are proportional to hypotenuse and a second side of the other triangle</p>	<p>mixing up the test for similar triangles with congruent triangle test with</p>
<p>QUESTION 4</p> <p>a) Equiangular b) Three sides of one triangle are proportional to the three sides of the other triangle</p>	
<p>QUESTION 5</p> <p>$y = 4$ $x = 15$</p>	<p>Errors in solving equations Incorrectly setting up equality statement e.g. $\frac{y}{10} = \frac{5}{2}$</p>
<p>QUESTION 6</p> <p>i) 3240° ii) 162° iii) 18°</p>	<p>i) using $20 \times 180^{\circ}$ to get 3600° instead of $18 \times 180^{\circ}$</p>

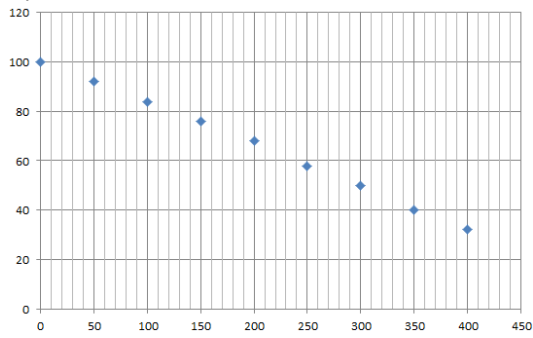
5.2 Single Variable Data Analysis	Common Errors
<p>QUESTION 1</p> <p>a) Lower = 2, Upper = 12, Median = 5.5 $Q_1 = 4, Q_3 = 7$</p> <p>b) 3 c) 50% d)</p>  <p>e) 25%</p>	<p>a) stating the median as 5 and 6 rather than finding the mean of 5 and 6</p> <p>d) not including a scale</p>
<p>QUESTION 2</p> <p>a) ii) b) i)</p>	
<p>QUESTION 3</p> <p>a) Year 9 = 7 Year 12 = 8 b) Year 9 = 2 Year 12 = 3 c) Year 9 = 3 Year 12 = 7 d) Year 12 spent the longest, they have a higher median and 75% of students spent more than 6 hours compared with Year 9 who had only 25% of students spend more than 4 hours. e) 50%</p>	<p>Incorrectly reading the scale</p>

5.2 Bivariate Data Analysis	Common Errors
<p>QUESTION 1</p> <p>a) Dependent: Rainfall Independent: month</p> <p>b) Dependent: hand span Independent: height</p>	
<p>QUESTION 2</p> <p>Line graph, as you can track small changes over time more accurately</p>	
<p>QUESTION 3</p> <p>a)</p>  <p>b) September</p> <p>c) January</p> <p>d) The rainfall is the highest in January and then slowly falls throughout the year till September and then slowly increases again through to December</p>	
<p>QUESTION 4</p> <p>Strong positive, no correlation, weak positive, strong negative</p>	
<p>QUESTION 5</p> <p>a) Linear and a positive correlation</p> <p>b) Approx. 52</p> <p>c) As the results in the topic tests increase, so does the result in the final exam.</p>	<p>b) trying to estimate the result without constructing a line of best fit.</p>

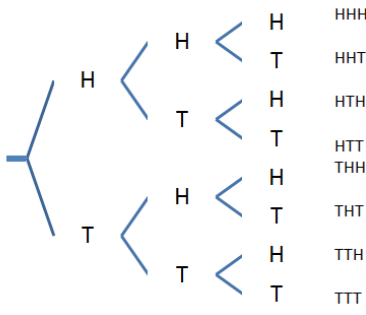
5.2 Bivariate Data Analysis	Common Errors
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QUESTION 6

a)



b) The relationship is linear and indirect, the further you travel the less fuel you have in the tank

5.2 Probability	Common Errors
<p>QUESTION 1</p> <p>a) {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6}</p> <p>b) $\frac{1}{12}$</p>	<p>b) calculating the probability of a head or a 6 and getting $\frac{7}{12}$</p>
<p>QUESTION 2</p> <p>a) $\frac{4}{7}$</p> <p>b) $\frac{16}{49}$</p> <p>c) $\frac{12}{49}$</p>	
<p>QUESTION 3</p> <p>a)</p>  <p>b) $\frac{1}{8}$</p> <p>c) $\frac{7}{8}$</p>	
<p>QUESTION 4</p> <p>a) $\frac{2}{9}$</p> <p>b) $\frac{3}{8}$</p> <p>c) $\frac{4}{7}$</p>	<p>b) and c) not decreasing the sample space for each successive event. (when you eat the jelly bean it is no longer in the bag)</p>
<p>QUESTION 5</p> <p>a) Independent</p> <p>b) Independent</p> <p>c) Dependent</p>	

5.2 Probability	Common Errors
<p>QUESTION 6</p> <p>a) {3, 4, 5, 6}</p> <p>b) $\frac{1}{4}$</p> <p>c) 0</p>	<p>a) listing the sample space of the die as {1, 2, 3, 4, 5, 6}</p> <p>b) and c) using the incorrect sample space</p>
<p>QUESTION 7</p> <p>a) The second toss is independent of the first toss therefor every time you roll a die there is a $\frac{1}{6}$ chance of obtaining a one</p> <p>b) Each too is an independent event, every time you toss a coin there is an even chance of obtaining a head.</p>	