Mini-Prelim Revision Booklet

S5/6 National 5

FORMULAE LIST

The roots of $ax^2+bx+c=0$ are $x=\dfrac{-b\pm\sqrt{(b^2-4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A}=\dfrac{b}{\sin B}=\dfrac{c}{\sin C}$

Cosine rule: $a^2=b^2+c^2-2bc\cos A$ or $\cos A=\dfrac{b^2+c^2-a^2}{2bc}$

Area of a triangle: $A=\frac{1}{2}ab\sin C$

Volume of a sphere: $V=\frac{4}{3}\pi r^3$

Volume of a cone: $V=\frac{1}{3}\pi r^2 h$

Volume of a pyramid: $V=\frac{1}{3}Ah$

Standard deviation: $s=\sqrt{\dfrac{\Sigma(x-\bar{x})^2}{n-1}}$

or $s=\sqrt{\dfrac{\Sigma x^2-\dfrac{(\Sigma x)^2}{n}}{n-1}}$, where n is the sample size.

Topic	Leckie & Leckie Nat 5
Surds	Pg 5 Q2, Pg 7 Q4, Pg 9 Q7
Indices	Pg 17 Q1, Pg 18 Q2, Pg 22 Q4
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Volume of 3D solids	Pg 77 Q2, Pg 78 Q5, Pg 81 Q1, Pg 82 Q3&4
Percentage change	Pg 331 Q6,9,10
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Equations and Inequalities	Pg 116 Q1, Pg 117 Q2a+d
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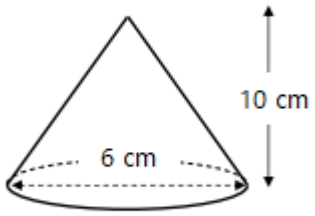
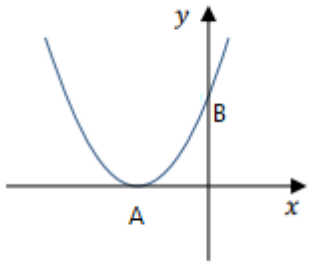
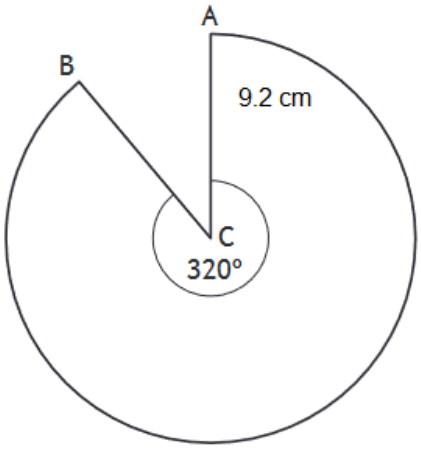
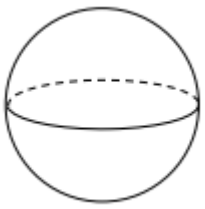
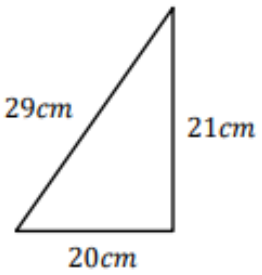
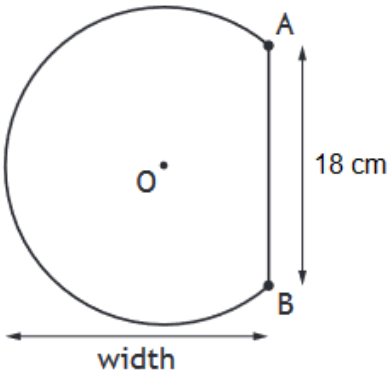
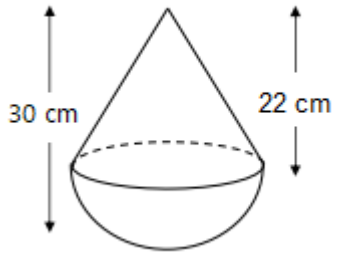
Pythagoras	Pg 206 Q1, P208 Q1a-c, Pg 211 Q1,

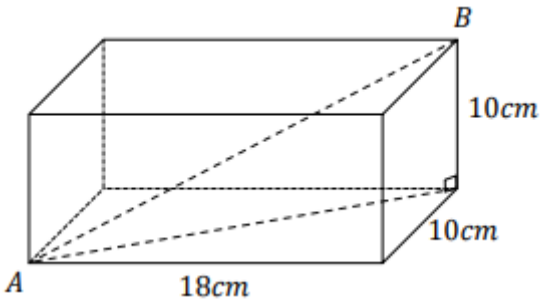
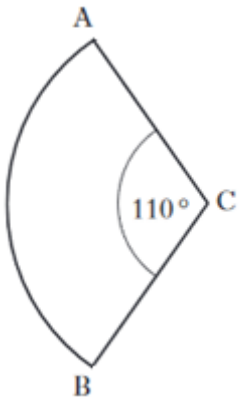
A1	Non-Calculator Paper	
1	Evaluate $2\frac{1}{3}+\frac{5}{6}$ Give your answer in the simplest form.	**2**
2	Expand and simplify $(x-4)(x^2-5x+3)$	**3**
3	Given that $f(x)=x^2-5$, evaluate $f(-2)$	**2**
4	Express $x^2-10x+32$ in the form $(x+p)^2+q$	**2**
5	Solve, algebraically, the system of equations $4x+5y=19$ $3x-2y=-3$	**3**
6	(a) Express r^{-3} with a positive power. (b) Hence or otherwise express $\frac{1}{r^{-3}}$ with a positive power.	**1** **1**
7	The diagram shows a cone with a diameter of 6 centimetres and a height of 10 centimetres. Calculate the volume of the cone. Take $\boldsymbol{\pi = 3.14}$ 	**2**
8	Simplify $\sqrt{20}+\sqrt{125}-\sqrt{5}$	**3**
9	The diagram shows part of a parabola with an equation in the form $y=(x+5)^2$. Find the coordinates of: (i) A, the x-intercept. (ii) B, the y-intercept. 	**2** **1**
	22 marks	

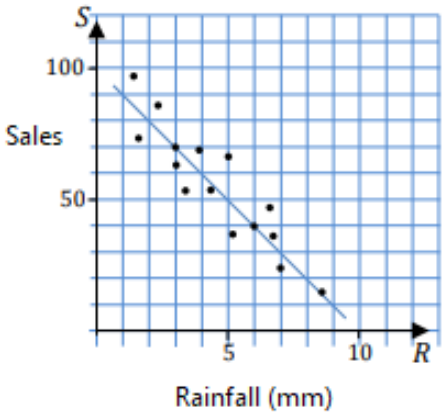
A2	Calculator Paper	
1	The population of a city is steadily increasing by 4.9% per year. In 2021 the population was approximately 3 million. What will the population be in 2024. Give your answer rounded to **2 significant figures.**	**4**
2	The diagram shows a sector of a circle with centre C. The radius of the circle is 9.2 centimetres and the centre angle BCA is $320°$. Calculate the length of the arc AB. 	**3**
3	Factorise $5x^2 - 7x - 6$	**2**
4	Find the equation of the line passing through the points $(2, -1)$ and $(12,4)$. Give your equation in its simplest form.	**3**
5	Solve algebraically, the inequality $3(5 - x) > 21$	**2**
6	An energy company charged a late payment fee of 3.5% on an electricity bill. The total bill came to £269.10. How much would have been due if the bill was paid on time?	**3**
7	Solve the quadratic equation $5x^2 + 6x - 1 = 0$ Give your answers **correct to 1 decimal place**.	**3**
8	This sphere has a volume of $250\ cm^3$. Calculate the length of the radius. 	**3**

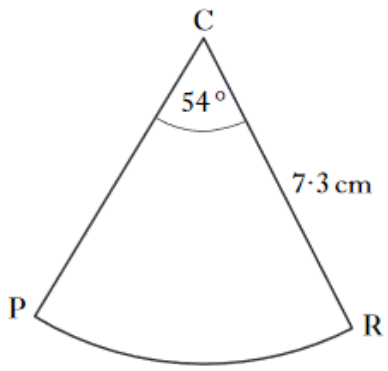
9	Determine whether the triangle in the diagram is a right-angled triangle. **Justify your answer.** 	**3**
10	Express $\frac{2}{n} - \frac{1}{n-2}$, $n \neq 0$, $n \neq 2$ As a single fraction in its simplest form.	**3**
11	This shape is part of a circle with a centre O. The circle has a radius of 15 centimetres. The line AB is a chord of the circle and is 18 centimetres. Calculate the width of the shape. 	**4**
	33 marks	

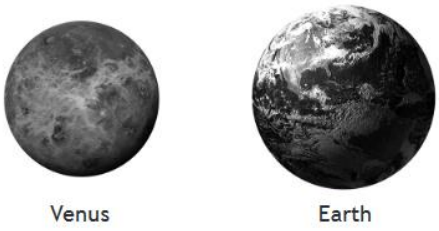
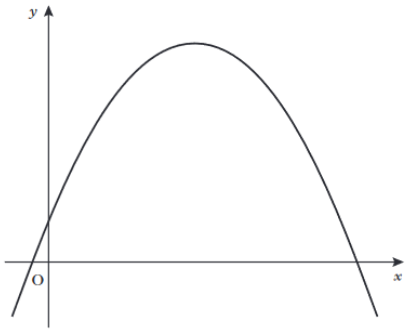
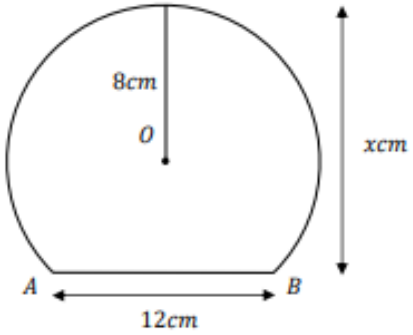
B1	Non-Calculator Paper	
1	Evaluate $1\frac{4}{5} \div \frac{3}{10}$ Give your answer in the simplest form.	**2**
2	Factorise (i) $x^2 - y^2$ (ii) $x^2 - 2x - 48$	**1** **2**
3	Expand and simplify $(2x + 1)(x - 5) + 2(x^2 + 1)$	**3**
4	Find the equation of the line passing through the points $(-3,1)$ and $(-5,9)$. Give your equation in its simplest form.	**3**
5	Express $\sqrt{2} \times \sqrt{6}$ as a simplified surd.	**2**
6	Jan buys a school backpack from a sport website. He has a loyalty card that gives him a 20% discount. He pays £22.80 for the backpack. Calculate the cost of the backpack without the discount.	**3**
7	Remove the brackets and simplify $(3p^4)^2$	**2**
8	(a) Express $y = x^2 - 4x + 3$ in the form $y = (x + a)^2 + b$ (b) Hence or otherwise state the coordinates of the turning point of the graph $y = x^2 - 4x + 3$	**2** **2**
	22 marks	

B2	Calculator Paper	
1	An industrial machine costs £176500. Its value depreciates by 4.25% each year. How much is it worth after 3 years?	**3**
2	A function is defined as $f(x) = 5 + 3x$ Given that $f(b) = -22$, calculate b.	**2**
3	At a farmer's market Esther buys six potatoes and four turnips. The total cost is £2.68. (a) Write down an equation to illustrate this information. At the same farmer's market Magnus buys five potatoes and three turnips. The total cost for these is £2.15 (b) Write down an equation to illustrate this information. (c) Calculate, algebraically, the cost of one potato and one turnip.	**1** **1** **4**
4	Solve the quadratic equation $3x^2 - 4x - 9 = 0$ Give your answers **correct to two significant figures**	**3**
5	Solve, algebraically, the equation $\frac{4}{3}(1 - x) = 2$ Give your answer as a simplified fraction.	**3**
6	The diagram shows a solid constructed from a cone and a hemisphere.  The cone has a height of 22 centimetres. The solid has a height of 30 centimetres. Calculate the volume of the solid. Give your answer correctly rounded to **2 significant figures.**	**5**

7	Sketch the graph of $y = x(x - 6)$. On your sketch clearly show the points of intersection with the x-axis and the y-axis, and the coordinates of the turning point.	**3**
8	For the cuboid shown in the diagram, calculate the length of the diagonal AB.  	**3**
9	The diagram shows a sector of a circle with a centre C. The central angle ACB is $110°$ Arc AB is 17.9 centimetres. Calculate the length of the radius  	**3**
10	Determine the nature of the roots of the function $f(x) = 3x^2 + 7x + 5$	**2**
	33 marks	

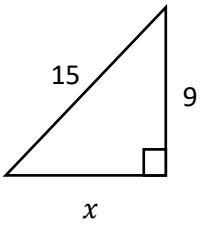
C1	Non-Calculator Paper	
1	Evaluate $6\frac{1}{5} - \frac{3}{4}$ Give your answer in the simplest form.	**2**
2	Expand and simplify $(x-3)^2 + 15$	**2**
3	Solve, algebraically, the system of equations $$4x + 5y = 22$$ $$6x + y = 7$$	**3**
4	 Sales from an ice cream van were recorded through the summer. The graph shows the number of ice creams sold S, compared to the amount of rainfall R mm. 70 ice creams were sold on a day with 3 mm of rainfall. 40 ice creams were sold on a day with rainfall of 6 mm. (a) Find the equation of the line of best fit in terms of S and R. Give your equation in its simplest form. (b) Use the answer from part (a) to estimate the number of ice creams sold on a day with 7 mm of rainfall.	**3** **1**
5	Solve, algebraically, the inequation $$5 - (x-3) \leq x + 10$$	**3**
6	(a) Factorise $x^2 - 10x + 24$ (b) Hence simplify $\frac{x^2-10+24}{x^2-36}$	**2** **2**
7	Evaluate $\sqrt{400} - \sqrt{100}$	**2**
8	Determine the nature of the roots of the function $f(x) = 4x^2 - 4x + 1$	**2**
	22 marks	

C2	Calculator Paper	
1	Aliyah normally runs a total distance of 50 miles per week. Over the next 6 weeks she intends to increase her distance by 10% per week. How many miles will Aliyah run in her sixth week.	**3**
2	Express $x^2 + 8x + 11$ in the form $(x + a)^2 + b$	**2**
3	 The diagram shows a sector of a circle with a centre C. The radius of the circle is 7.3 centimetres and angle PCR is 54 ° Calculate the area of the sector PCR.	**3**
4	Solve $x^2 - 8x - 20 = 0$	**2**
5	A tennis ball has a diameter of 6.5 centimetres. Three balls are packaged into a cylindrical tube so that they touch each other and each end of the tube. (a) Calculate the volume of one tennis ball. (b) Calculate the volume of empty space in the tube when there are three balls inside. 	**2** **4**
6	Solve the quadratic equation $x^2 - 2x - 5 = 0$ Give your answers **correct to 1 decimal place**.	**3**

7	Venus and Earth are two planets within our solar system.  Venus Earth The volume of Earth is approximately 1.1×10^{12} cubic centimetres. This is 15% more than the volume of Venus. Calculate the volume of Venus. Given your answer in scientific notation correctly rounded to two significant figures.	**4**
8	The diagram shows part of the graph of $y = 10 - (x - 5)^2$.  (a) State the coordinates of the maximum turning point. (b) State the equation of the axis of symmetry.	**2** **1**
9	This shape is part of a circle with a centre O. The circle has a radius of 8 centimetres. The line AB is a chord of the circle and is 12 centimetres. Calculate x, the height of the shape. 	**4**
10	A straight line has the equation $5y = 3x - 10$ (a) Find the gradient of the straight line. (b) Find the **coordinates** of the point where the straight line crosses the y-axis	**2** **1**
	33 marks	

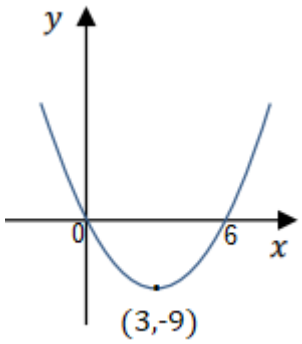
A1	Answers to the Non-Calculator Paper	
1	Mark 1 common denominator $2\frac{1}{3}+\frac{5}{6}=2\frac{2}{6}+\frac{5}{6}$ Mark 2 answer $\boldsymbol{3\frac{1}{6}\ or\ \frac{19}{6}}$	
2	Mark 1 evidence of any 3 correct terms $x^3-5x^2+3x\ or -4x^2+20x-12$ Mark 2 all 6 terms correct $x^3-5x^2+3x-4x^2+20x-12$ Mark 3 collect like terms $\boldsymbol{x^3-9x^2+23x-12}$	
3	Mark 1 substitute into the function $(-2)^2-5$ Mark 2 answer $4-5=\boldsymbol{-1}$	
4	Mark 1 correct bracket with square $(x-5)^2$ Mark 2 completed square $\boldsymbol{(x-5)^2+7}$	
5	Mark 1 show scaling for the simultaneous equations $12x+15y=57$ or $8x+10y=38$ $12x-8y=-12$ $15x-10y=-15$ Mark 2 follow a valid strategy to find values for y and for x $23y=69,\quad y=3$ $or\ 23x=23,\quad x=1,$ Mark 3 Both values correct for this simultaneous equation $\boldsymbol{x=1, y=3}$	
6	Mark 1 use laws of indices $r^{-3}=\frac{1}{r^3}$ Mark 2 answer $\frac{1}{r^{-3}}=r^3$	
7	Mark 1 correct substitution into formula for a cone $V=\frac{1}{3}\times 3.14\times 3^2\times 10$ Mark 2 answer $\boldsymbol{94.2(cm^3)}$ $\boldsymbol{\frac{1}{3}\times 90\times 3.14\ \rightarrow\ 30\times 3.14\ \rightarrow\ 3\times 31.4=94.2}$	
8	Mark 1 simplify $\sqrt{20}$ $\sqrt{20}=\sqrt{4}\sqrt{5}=2\sqrt{5}$ Mark 2 simplify $\sqrt{125}$ $\sqrt{125}=\sqrt{25}\sqrt{5}=5\sqrt{5}$ Mark 3 collect like terms $2\sqrt{5}+5\sqrt{5}-\sqrt{5}=\boldsymbol{6\sqrt{5}}$	
9	Mark 1 &2 state correct coordinate $A\ (-5,0)$ Mark 3 state correct coordinate $\boldsymbol{B\ (0,25)}$ One mark can be given in part (i) for $A\ (0,-5)\ or\ A\ (5,0)$	

A2	Answers to the Calculator Paper	
1	Mark 1 know how to find a percentage increase $100 + 4.9 = 104.9\%\ or\ 1.049$ Mark 2 use this answer to find value over three years $3 \times 1.049^3\ \ or\ 3 \times \left(\frac{104.9}{100}\right)^3$ Mark 3 give the unrounded answer $3.462961 \ldots . million$ Mark 4 round answer to 2 significant figures $\boldsymbol{3.5\ million\ \ or\ 3500\,000}$ 2 marks will be given for a percentage decrease $3 \times 0.951^3 = 2.6\ million$ or a percentage increase over 2 or 4 years.	
2	Mark 1 Correct fraction of the circle $\frac{320}{360}$ Mark 2 substitute into the formula for arc length $Arc = \frac{320}{360} \times \pi \times 18.4$ Mark 3 calculate arc length $\boldsymbol{Arc = 51.382.. = 51.4}$ Two marks will be given for the correct calculation of sector area $\rightarrow 236.4\ cm^2$	
3	Mark 1 once factor correct $(5x + 3)\ or\ (x - 2)$ Mark 2 complete factorisation $\boldsymbol{(5x + 3)(x - 2)}$	
4	Mark 1 find the gradient between two points $m = \frac{5}{10}\ or \frac{1}{2}$ Mark 2 substitute gradient and one point into the equation of the straight line. $4 = \frac{1}{2} \times 12 + c\ \ or\ \ y - 4 = \frac{1}{2}(x - 12)$ etc Mark 3 find c and state the equation in the simplest form $c = -2,\quad \boldsymbol{y = \frac{1}{2}x - 2}$	
5	Mark 1 expand the bracket $15 - 3x > 21$ Mark 2 solve the inequality $15 - 21 > 3x,\quad -6 > 3x$ $\boldsymbol{-2 > x\ \ or\ x\ < -2}$	
6	Mark 1 know that the new bill is $103.5\% = 269.10$ Mark 2 use a valid strategy to find 10% or 20% etc $1\% = 26.10 \div 103.5\ etc$ Mark 3 calculate answer correctly $\boldsymbol{£260}$	
7	Mark 1 correct substitution into the quadratic formula $x = \frac{-6 \pm \sqrt{(6)^2 - 4 \times 5 \times (-1)}}{2 \times 5}$ Mark 2 evaluate discriminant $b^2 - 4ac = 56$ Mark 3 calculate both roots correct to **one decimal place** $x = 0.148331 \ldots\ and\ x = -1.348331 \ldots .\ so\ \boldsymbol{x = 0.1\ and - 1.3}$	
8	Mark 1 substitute into the correct formula $250 = \frac{4}{3} \times \pi \times r^3$ Mark 2 rearrange the formula $\frac{250 \times 3}{4 \times \pi} = \boldsymbol{r^3},\ \boldsymbol{r^3 = 59.683} \ldots$ Mark 3 calculate a value for the radius $r = \sqrt[3]{answer} = \boldsymbol{3.9\ cm}$	
9	Mark 1 Find the square of the long side $29^2 = 841$ Mark 2 Find the sum of the squares of the two short sides $21^2 + 20^2 = 841$ Mark 3 state a conclusion **As $\boldsymbol{29^2 = 21^2 + 20^2}$ then by the converse of Pythagoras this triangle is right-angled.**	

10	Mark 1 correct denominator $\frac{}{n(n-2)}$ Mark 2 correct numerators $\frac{2(n-2)}{n(n-2)} - \frac{n}{n(n-2)}$ Mark 3 simplify numerator $\frac{\boldsymbol{n-4}}{\boldsymbol{n(n-2)}}$	
11	Mark 1 Recognise right angled triangle  Mark 2 consistent statement of Pythagoras $x^2 = 15^2 - 9^2$ Mark 3 calculate a value for the missing side $x = 12$ Mark 4 calculate the width $15 + 12 = \mathbf{27\ cm}$ 2 marks can be given for $x^2 = 15^2 + 9^2, x = 17.5$ so width is $32.5\ cm$ 2 marks can be given for $x^2 = 18^2 - 15^2, x = 9.9$ so width is $24.9\ cm$	

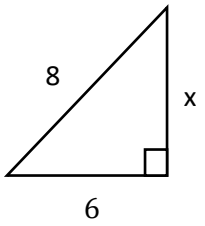
B1	Answers to the Non-Calculator Paper	
1	Mark 1 change the mixed fraction and change the divide to multiply $\frac{9}{5} \times \frac{10}{3} = \frac{90}{15}$ Mark 2 consistent answer in the simplest form $\mathbf{6}$	
2	Mark 1 factorise the difference of two squares $(x+y)(x-y)$ Mark 2&3 factorise the trinomial $(x-8)(x+6)$	
3	Mark 1 start to expand (evidence of any 3 correct terms) Mark 2 all terms correct $2x^2 - 10x + x - 5 + 2x^2 + 2$ Mark 2 collect like terms $\mathbf{4x^2 - 9x - 3}$	
4	Mark 1 find the gradient between two points $m = \frac{8}{-2}$ or -4 Mark 2 substitute gradient and one point into the equation of the straight line. $9 = -4 \times -5 + c$ or $y - 9 = -4(x+5)$ etc Mark 3 find c and state the equation in the simplest form $c = -11$, $\mathbf{y = -4x - 11}$	
5	Mark 1 multiply the surds and start to simplify $\sqrt{2} \times \sqrt{6} = \sqrt{12}$ Mark 2 simplify $\sqrt{12} = \sqrt{4}\sqrt{3} = \mathbf{2\sqrt{3}}$	
6	Mark 1 know that the new price is $80\% = 22.80$ Mark 2 use a valid strategy to find 10% or 20% etc $20\% = 22.80 \div 4$ $20\% = 5.70$ $\boldsymbol{or}$ $10\% = 22.80 \div 8$, $10\% = 2.85$ Mark 3 calculate answer correctly £$\mathbf{28.50}$	
7	Mark 1 one term correct $3^2 = 9$ or $(p^4)^2 = p^8$ Mark 2 both terms present and correct $\mathbf{9p^8}$	
8	Mark 1 correct bracket with square $(x-2)^2$ Mark 2 completed square $\mathbf{(x-2)^2 - 1}$ Mark 3&4 coordinates of the turning point are $\mathbf{(2, -1)}$ If you wish you can factorise $y = x^2 - 4x + 3$ to give $y = (x-3)(x-1)$. When this is set equal to zero it gives the roots $x = 3$ and $x = 1$. The x-coordinate of the turning point is $x = 2$ which can be substituted back into the equation to give $(2, -1)$	

B2	Answers to the Calculator Paper	
1	Mark 1 know how to find a percentage decrease $100 - 4.25 = 95.75\% = 0.9575$ Mark 2 use this answer to find value over three years 176500×0.9675^3 *or* $\left(\frac{95.75}{100}\right)^3$ Mark 3 calculate the answer $\mathbf{£154939.11}$ 2 marks will be given for a percentage increase $176500 \times 1.0425^3 = £199973.81$	
2	Mark 1 form an equation $-22 = 5 + 3b$ Mark 2 solve for b (or x) $= -27 = 3b \quad \boldsymbol{b = -9}$	
3	Mark 1 form an equation $6p + 4t = 2.68$ Mark 2 form a second equation $5p + 3t = 2.15$ Mark 3 show scaling for the simultaneous equations $30p + 20t = 13.40$ or $18p + 12t = 8.04$ $30p + 18t = 12.90$ $20p + 12t = 8.60$ Mark 4 and 5 follow a valid strategy to find values for p and for t $p = 0.28\,, t = 0.25$ Mark 6 communicate answer **One potato costs £0.28 and one turnip is £0.25**	
4	Mark 1 correct substitution into the quadratic formula $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 3 \times (-9)}}{2 \times 3}$ Mark 2 evaluate discriminant $b^2 - 4ac = 124$ Mark 3 calculate both roots correct to **one decimal place** $x = 2.522588\ldots$ *and* $x = -1.189254\ldots.$ *so* $\boldsymbol{x = 2.5}$ ***and*** $\boldsymbol{-1.2}$	
5	Mark 1 multiply by 3 to remove the fraction $4(1 - x) = 6$ Mark 2 expand bracket $4 - 4x = 6$ Mark 3 solve the equation $-4x = 2, \ \boldsymbol{x = -\frac{1}{2}}$	4
6	Radius of the hemisphere and the cone is $30 - 22 = 8\ cm$ Mark 1 substitute into the formula for a hemisphere $V_{hs} = \frac{1}{2} \times \frac{4}{3} \times \pi \times 8^3$ or Mark 2 substitute into the formula for a cone $V_{cone} = \frac{1}{3} \times \pi \times (8)^2 \times 22$ Mark 3 know to add the resulting volumes $V_{cone} + V_{hs}$ Mark all calculations correct $V_{cone} + V_{hs} = 1474.454.. + 1072.330.. = 2546.784$ Mark 5 answer with correct units and rounding $\boldsymbol{V_{cone} = 2500\ cm^3}$ Last mark is only available for correct rounding **and** units.	

7	Mark 1 is for the x and y intercepts $(0,0)$ and $(6,0)$ Mark 2 is for the turning point $(3,-9)$ Mark 3 is for all of this information on a correctly annotated u-shaped parabola. 	
8	Mark 1 use of Pythagoras $18^2 + 10^2 + 10^2$ or $18^2 + 10^2$ or $10^2 + 10^2$ Mark 2 use of Pythagoras in 3 dimensions $18^2 + 10^2 + 10^2 = 524$ ***or*** $18^2 + 10^2 = 424,\ so\ \ 424 + 10^2 = 524$ Mark 3 find the length of the diagonal $\sqrt{524} = \mathbf{22.89\ cm}$	
9	Mark 1 substitute into the formula for arc length $17.9 = \frac{110}{360} \times \pi \times D$ Mark 2 Rearrange the equation to find the diameter $D = \frac{17.9 \times 360}{110 \times \pi} = 18.647$ Mark 3 find the length of the radius $\boldsymbol{radius\ is\ 9.3\ cm}$	
10	Mark 1 calculate the discriminant $b^2 - 4ac = 7^2 - 4 \times 3 \times 5 = -11$ Mark 2 state the nature of the roots there are no real roots (roots are non-real).	

C1	Answers to the Non-Calculator Paper	
1	Mark 1 correct denominator $6\frac{1}{5}-\frac{3}{4}=6\frac{4}{20}-\frac{15}{20}$ Mark 2 consistent answer in the simplest form $6\left(-\frac{11}{20}\right)=5\frac{\mathbf{9}}{\mathbf{20}}$ *or* $\frac{\mathbf{109}}{\mathbf{20}}$	
2	Mark 1 start to expand $(x-3)^2$ $(x-3)(x-3)+15=x^2-6x+9+15$ Mark 2 collect terms $\boldsymbol{x^2-6x+24}$	
3	Mark 1 show scaling for the simultaneous equations $12x+15y=66$ or $4x+5y=22$ $12x+2y=14$ $30x+5y=35$ Mark 2 follow a valid strategy to find values for y and for x $13y=52\ so\quad y=4$ or $26x=13\ so\ \ x=\frac{1}{2}$, Mark 3 Both values correct for this simultaneous equation $\boldsymbol{x=\frac{1}{2},\ y=4}$	
4	Use two points on the line $(3,70)$ and $(6,40)$ Mark 1 find the gradient between two points $m=\frac{70-40}{3-6}=\frac{30}{-3}=-10$ Mark 2 substitute gradient and one point into the equation of the straight line. $70=-10\times3+c\ \ or\ \ y-70=-10(x-3)$ etc Mark 3 find $c=100$ and state the equation in the correct form $\boldsymbol{S=-10R+100}$ A final answer in the form $y=-10x+100$ will lose mark 3.	
5	Mark 1 expand the brackets $5-x+3\leq x+10$ Mark 2 collect like terms $-2\leq 2x\ \ or\ \ -2x\leq 2$ Mark 3 solve the inequality $-1\leq x\ \ or\ \ x\geq -1$	
6	Mark 1 factorise the trinomial $(x-6)(x-4)$ Mark 2&3 use answer from part (a) and factorise the difference of 2 squares $\frac{x^2-10+24}{x^2-36}=\frac{(x-6)(x-4)}{(x+6)(x-6)}$ Mark 4 simplify the fraction $\boldsymbol{\frac{x-4}{x+6}}$	
7	Mark 1 simplify the surds $\sqrt{400}=20\ \ and\ \sqrt{100}=10$ Mark 2 answer $20-10=\mathbf{10}$	
8	Mark 1 calculate the discriminant $b^2-4ac=(-4)^2-4\times4\times1=0$ Mark 2 state the nature of the roots there are two real and equal roots. The second mark can be given for "real and equal roots" but not for "two real roots" or "two equal roots"	

C2	Answers to the Calculator Paper	
1	Mark 1 know how to find a percentage increase $100 + 10 = 110\% = 1.1$ Mark 2 use this answer to find value over four years 50×1.1^6 Mark 3 calculate the answer $88.6\ miles$ 2 marks will be given for a percentage decrease $50 \times 0.9^6 = 26.6\ miles$	
2	Mark 1 correct bracket with square $(x+4)^2$ Mark 2 completed square $\boldsymbol{(x+4)^2 - 5}$	
3	Mark 1 correct fraction for the sector $\frac{54}{360}$ Mark 2 substitute into the formula for sector area $Area = \frac{54}{360} \times \pi \times 7.3^2$ Mark 3 answer $\boldsymbol{Area = 25.11\ (cm^2)}$ If you find the arc length using the correct fraction and radius then you get 2 marks	
4	Mark 1 factorise $(x-10)(x+2) = 0$ Mark 2 solve for two answers $\boldsymbol{x = 10,\ x = -2}$	
5	Radius of the sphere and the cylinder is 3.25 cm. Height of the cylinder is $3 \times 6.5 = 19.5$ Mark 1 substitute into the formula for a sphere $V_{sphere} = \frac{4}{3} \times \pi \times 3.25^3$ Mark 2 calculate volume of 3 spheres $V = 3 \times 143.7933.. = 431.3799\ldots$ Mark 3 substitution into the formula for a cylinder $V_{cylinder} = \pi \times 3.25^2 \times \boldsymbol{(6.5 \times 3)}$ Mark 4 calculate volume $V_{cylinder} = 647.0699\ldots$ Mark 5 know to subtract to find the empty space $V = V_{cylinder} - 3 \times V_{sphere},\ V = 647.0699 - 431.3799 = 215.6899\ldots$ Mark 6 answer with units $\boldsymbol{Volume\ is\ 215.7\ cm^3}$ Full marks will be given for a correct answer of $216\ cm^3$ if all working is shown.	
6	Mark 1 correct substitution into the quadratic formula $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \times 1 \times (-5)}}{2 \times 1}$ Mark 2 evaluate discriminant $b^2 - 4ac = 24$ Mark 3 calculate both roots correct to **one decimal place** $x = 3.449488\ldots\ and\ x = -1.44948\ldots.\ so\ \boldsymbol{x = 3.4\ and\ -1.4}$	
7	Mark 1 Know that the volume of the Earth is equal to 115% $115\% = 1.1 \times 10^{12}$ Mark 2 Find one percent (or similar) $1\% = 1.1 \times 10^{12} \div 115$ Mark 3 Find the volume of Venus $100\% = 9.5652\ldots \times 10^{11}$ Mark 4 give answer rounded to 2 sig figs Volume is $\boldsymbol{9.6 \times 10^{11}} (cm^3)$	
8	Mark 1&2 coordinates of the turning point $\boldsymbol{(5, 10)}$ Mark 3 equation of the axis of symmetry $\boldsymbol{x = 5}$	

9	Mark 1 Recognise right angled triangle  Mark 2 consistent statement of Pythagoras $x^2 = 8^2 - 6^2$ Mark 3 calculate a value for the missing side $x = 5.3$ Mark 4 calculate the height $8 + 5.3 = \mathbf{13.3\ cm}$ 2 marks can be given for $x^2 = 8^2 + 6^2, x = 10$ so height is $18\ cm$ 2 marks can be given for $x^2 = 12^2 - 8^2, x = 8.9$ so width is $16.9\ cm$	
10	Mark 1 rearrange equation of straight line to $y = mx + c$ $y = \frac{3}{5}x - 2$ Mark 2 identify the gradient of the straight line $\boldsymbol{m = \frac{3}{5}}$ Mark 3 know that $x = 0$ so $5y = -10,\ y = -2$ $(\mathbf{0}, \mathbf{-2})$	