# Mark Scheme (Results)
# January 2009

GCE

## GCE Mathematics (6664/01)

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# 6664 Core Mathematics C2
# Mark Scheme

| Question Number | Scheme | Marks |
|---|---|---|
| **1** | $(3-2x)^5 = 243$, $\quad \ldots\ldots + 5\times(3)^4(-2x) = -810x \quad \ldots\ldots$<br><br>$+\frac{5\times 4}{2}(3)^3(-2x)^2 = \qquad +1080x^2$ | B1, B1<br><br>M1 A1 (4)<br><br>**[4]** |
| Notes | First term must be 243 for **B1**, writing just $3^5$ is B0 (Mark their final answers except in second line of special cases below).<br>Term must be simplified to –810*x* for **B1**<br>The *x* is required for this mark**.**<br>The **method** mark **(M1) is generous** and is awarded for an attempt at Binomial to get the third term.<br>There must be an $x^2$ (or no *x*- i.e. not wrong power) and attempt at Binomial Coefficient and at dealing with powers of 3 and 2. The power of 3 should not be one, but the power of 2 may be one (regarded as bracketing slip).<br>So allow $\binom{5}{2}$ or $\binom{5}{3}$ or ${}^5C_2$ or ${}^5C_3$ or even $\left(\frac{5}{2}\right)$ or $\left(\frac{5}{3}\right)$ or use of '10' (maybe from Pascal's triangle)<br>May see ${}^5C_2(3)^3(-2x)^2$ or ${}^5C_2(3)^3(-2x^2)$ or ${}^5C_2(3)^5(-\frac{2}{3}x^2)$ or $10(3)^3(2x)^2$ which would each score the **M1**<br>**A1**is c.a.o and needs $1080x^2$ (if $1080x^2$ is written with no working this is awarded both marks i.e. **M1 A1.)** | |
| Special cases | $243+810x+1080x^2$ is **B1B0M1A1** (condone no negative signs)<br>Follows correct answer with $27-90x+120x^2$ can isw here (sp case)– full marks for correct answer<br>Misreads *ascending* and gives $-32x^5+240x^4-720x^3$ is marked as **B1B0M1A0** special case and must be completely correct. *(If any slips could get B0B0M1A0)*<br>Ignores 3 and expands $(1\pm 2x)^5$ is **0/4**<br>243, -810*x*, 1080$x^2$ is full marks but 243, -810, 1080 is **B1,B0,M1,A0**<br>NB Alternative method $3^5(1-\frac{2}{3}x)^5 = 3^5 - 5\times 3^5\times\left(\frac{2}{3}x\right)+\binom{5}{3}3^5\left(-\frac{2}{3}x\right)^2+..$ is **B0B0M1A0**<br>– answers must be simplified to 243 –810*x* +1080$x^2$ for full marks (awarded as before)<br>Special case $3(1-\frac{2}{3}x)^5 = 3-5\times 3\times\left(\frac{2}{3}x\right)+\binom{5}{3}3\left(-\frac{2}{3}x\right)^2+..$ is **B0, B0, M1, A0**<br>Or $3(1-2x)^5$ is **B0B0M0A0** | |

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| **2** | $y=(1+x)(4-x)=4+3x-x^2$ M: Expand, giving 3 (or 4) terms<br>$\int(4+3x-x^2)\mathrm{d}x=4x+\frac{3x^2}{2}-\frac{x^3}{3}$ M: Attempt to integrate<br>$=[..............]_{-1}^{4}=\left(16+24-\frac{64}{3}\right)-\left(-4+\frac{3}{2}+\frac{1}{3}\right)=\frac{125}{6}$ $\left(=20\frac{5}{6}\right)$ | M1<br>M1 A1<br>M1 A1 (5)<br>**[5]** |
| Notes | **M1** needs expansion, there may be a slip involving a sign or simple arithmetical error e.g. $1\times4=5$, but there needs to be a 'constant' an '$x$ term' and an '$x^2$ term'. The $x$ terms do not need to be collected. (Need not be seen if next line correct)<br>Attempt to integrate means that $x^n \to x^{n+1}$ for at least one of the terms, then **M1** is awarded ( even 4 becoming 4$x$ is sufficient) – one correct power sufficient.<br>**A1** is for correct answer only, not follow through. But allow $2x^2-\frac{1}{2}x^2$ or any correct equivalent. Allow **+ *c***, and even allow an evaluated extra constant term.<br>**M1**: Substitute limit 4 and limit –1 into a changed function (must be –1) and indicate subtraction (either way round).<br>**A1** must be exact, not 20.83 or similar. If recurring indicated can have the mark. Negative area, even if subsequently positive loses the A mark. | |
| Special cases | (i) Uses calculator method: **M1** for expansion (if seen) **M1** for limits if answer correct, so 0 , 1 or 2 marks out of 5 is possible (Most likely **M0 M0 A0 M1 A0** )<br>(ii) Uses trapezium rule : not exact, no calculus – 0/5 unless expansion mark **M1** gained.<br>(iii) Using original method, but then change all signs after expansion is likely to lead to: **M1 M1 A0, M1 A0 i.e. 3/5** | |

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| **3** (a) | 3.84, 4.14, 4.58 (Any one correct B1 B0. All correct B1 B1) | B1 B1 (2) |
| (b) | $\frac{1}{2}\times 0.4,\ \{(3+4.58)+2(3.47+3.84+4.14+4.39)\}$ | B1, M1 A1ft |
| | = 7.852 (awrt 7.9) | A1 (4) **[6]** |
| Notes (a) | **B1** for one answer correct Second **B1** for all three correct<br>Accept awrt ones given or exact answers so $\sqrt{21}$, $\sqrt{\left(\frac{369}{25}\right)}$ or $\frac{3\sqrt{41}}{5}$, and $\sqrt{\left(\frac{429}{25}\right)}$ or $\frac{\sqrt{429}}{5}$, score the marks. | |
| (b) | **B1** is for using 0.2 or $\frac{0.4}{2}$ as $\frac{1}{2}h$.<br>**M1** requires first bracket to contain first plus last values and second bracket to include no additional values from those in the table.<br>If the only mistake is to omit one value from 2nd bracket this may be regarded as a slip an can be allowed ( An extra repeated term forfeits the **M** mark however)<br>*x* values: **M0** if values used in brackets are *x* values instead of *y* values.<br>Separate trapezia may be used : **B1** for 0.2, **M1** for $\frac{1}{2}h(a+b)$ used 4 or 5 times ( and **A1**ft all<br>e.g.. $0.2(3+3.47)+0.2(3.47+3.84)+0.2(3.84+4.14)+0.2(4.14+4.58)$ is **M1 A0** equivalent to missing one term in { } in main scheme<br>**A1ft** follows their answers to part (a) and is for {correct expression}<br>Final **A1** must be correct. (No follow through) | |
| Special cases | Bracketing mistake: i.e. $\frac{1}{2}\times 0.4(3+4.58)+2(3.47+3.84+4.14+4.39)$<br>scores **B1 M1 A0 A0** <u>unless</u> the final answer implies that the calculation has been done correctly (then full marks can be given).<br>**Need to see trapezium rule – answer only (with no working) is 0/4.** | |

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|---|---|---|
| **4** | $2\log_5 x = \log_5\left(x^2\right)$, $\log_5(4-x) - \log_5(x^2) = \log_5 \frac{4-x}{x^2}$ <br> $\log\left(\frac{4-x}{x^2}\right) = \log 5$ $5x^2 + x - 4 = 0$ **or** $5x^2 + x = 4$ **o.e.** <br> $(5x-4)(x+1) = 0$ $x = \frac{4}{5}$ $(x = -1)$ | B1, M1 <br> M1 A1 <br> dM1 A1 <br> (6) <br> **[6]** |
| Notes | **B1** is awarded for $2\log x = \log x^2$ anywhere. <br> **M1** for correct use of log $A$ – log $B$ = log $\frac{A}{B}$ <br> **M1** for replacing 1 by $\log_k k$ . **A1** for correct quadratic <br> ($\log(4-x) - \log x^2 = \log 5 \Rightarrow 4 - x - x^2 = 5$ is **B1M0M1A0 M0A0**) <br> **dM1** for attempt to solve quadratic with usual conventions. (Only award if previous two **M** marks have been awarded) <br> **A1** for 4/5 or 0.8 or equivalent (Ignore extra answer). | |
| Alternative 1 | $\log_5(4-x) - 1 = 2\log_5 x$ so $\log_5(4-x) - \log_5 5 = 2\log_5 x$ <br> $\log_5 \frac{4-x}{5} = 2\log_5 x$ <br> then could complete solution with $2\log_5 x = \log_5\left(x^2\right)$ <br> $\left(\frac{4-x}{5}\right) = x^2$ $5x^2 + x - 4 = 0$ <br> Then as in first method $(5x-4)(x+1) = 0$ $x = \frac{4}{5}$ $(x = -1)$ | M1 <br> M1 <br> B1 <br> A1 <br> dM1 A1 <br> (6) <br> **[6]** |
| Special cases | Complete trial and error yielding 0.8 is **M3** and **B1** for 0.8 <br> **A1, A1** awarded for each of two tries evaluated. i.e. 6/6 <br> Incomplete trial and error with wrong or no solution is 0/6 <br> Just answer 0.8 with no working is **B1** | |
| | If log base 10 or base e used throughout - can score **B1M1M1A0M1A0** | |

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| --- | --- | --- |
| **5** (a) | $PQ: \quad m_1 = \frac{10-2}{9-(-3)} \quad (=\frac{2}{3})$ **and** $QR: \quad m_2 = \frac{10-4}{9-a}$ | M1 |
| (b) | $m_1 m_2 = -1: \quad \frac{8}{12} \times \frac{6}{9-a} = -1 \qquad a = 13 \qquad (*)$ | M1 A1 (3) |
| Alt for (a) | (a) Alternative method (Pythagoras) Finds **all three** of the following | |
| | $(9-(-3))^2 + (10-2)^2$, $(i.e. 208)$, $(9-a)^2 + (10-4)^2$, $(a-(-3))^2 + (4-2)^2$ | M1 |
| | Using Pythagoras (correct way around) e.g. $a^2 + 6a + 9 = 240 + a^2 - 18a + 81$ to form equation | M1 |
| | Solve (or verify) for $a$, $a = 13$ (*) | A1 (3) |
| | (b) Centre is at (5, 3) | B1 |
| | $(r^2 =)\ (10-3)^2 + (9-5)^2$ or equiv., or $(d^2 =)\ (13-(-3))^2 + (4-2)^2$ | M1 A1 |
| | $(x-5)^2 + (y-3)^2 = 65$ or $x^2 + y^2 - 10x - 6y - 31 = 0$ | M1 A1 (5) |
| Alt for (b) | Uses $(x-a)^2 + (y-b)^2 = r^2$ or $x^2 + y^2 + 2gx + 2fy + c = 0$ and substitutes (-3, 2), (9, 10) and (13, 4) then eliminates one unknown | M1 |
| | Eliminates second unknown | M1 |
| | Obtains $g = -5, f = -3, c = -31$ or $a = 5, b = 3, \quad r^2 = 65$ | A1, A1, B1cao (5) **[8]** |
| Notes (a) | **M1**-considers gradients of *PQ* and *QR* -must be *y* difference / *x* difference<br>(or considers three lengths as in alternative method)<br>**M1** Substitutes gradients into product = -1 (or lengths into Pythagoras' Theorem the correct way round )<br>**A1** Obtains $a$ = 13 with no errors by solution or verification. Verification can score 3/3. | |
| (b) | Geometrical method: **B1** for coordinates of centre – can be implied by use in part (b)<br>**M1** for attempt to find $r^2, d^2, r$ or $d$ ( allow one slip in a bracket).<br>**A1** cao. These two marks may be gained implicitly from circle equation<br>**M1** for $(x \pm 5)^2 + (y \pm 3)^2 = k^2$ or $(x \pm 3)^2 + (y \pm 5)^2 = k^2$ ft their (5,3) Allow $k^2$ non numerical.<br>**A1** cao for whole equation and rhs must be 65 or $(\sqrt{65})^2$, (similarly B1 must be 65 or $(\sqrt{65})^2$, in alternative method for (b)) | |

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| Further alternatives | (i) A number of methods find gradient of PQ = 2/3 then give perpendicular gradient is –3/2 This is **M1**<br>They then proceed using equations of lines through point $Q$ or by using gradient $QR$ to obtain equation such as $\frac{4-10}{a-9}=-\frac{3}{2}$ **M1** (may still have $x$ in this equation rather than $a$ and there may be a small slip)<br><br>They then complete to give ($a$ )= 13 **A1**<br><br>(ii) A long involved method has been seen finding the coordinates of the centre of the circle first.<br>This can be done by a variety of methods<br>Giving centre as (c, 3) and using an equation such as<br>$(c-9)^2+7^2=(c+3)^2+1^2$ (equal radii)<br>or $\frac{3-6}{c-3}=-\frac{3}{2}$ **M1** (perpendicular from centre to chord bisects chord)<br><br>Then using $c$ ( = 5) to find $a$ is **M1**<br><br>Finally $a$ = 13 **A1**<br><br>(iii) Vector Method:<br>States **PQ. QR** = 0, with vectors stated 12i +8j and (9 – $a$)**i + 6**j is **M1**<br>Evaluates scalar product so 108 – 12 $a$ + 48 = 0 (**M1**)<br>solves to give $a$ = 13 (**A1**) | M1<br>M1<br><br><br>A1<br><br>M1<br><br><br><br><br><br>M1<br><br>A1<br><br>M1<br>M1<br>A1 |

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| **6** (a) | $f(2)=16+40+2a+b$ **or** $f(-1)=1-5-a+b$ | M1 A1 |
| | Finds 2nd remainder and equates to 1st $\Rightarrow$ $16+40+2a+b=1-5-a+b$ | M1 A1 |
| | $a=-20$ | A1cso (5) |
| (b) | $f(-3)=(-3)^4+5(-3)^3-3a+b=0$ | M1 A1ft |
| | 81 – 135 + 60 + $b$ = 0 gives $b$ = -6 | A1 cso<br>(3)<br>**[8]** |
| Alternative for (a) | (a) Uses long division, to get remainders as $b$ + 2$a$ + 56 or $b$ – $a$ - 4 or correct equivalent | M1 A1 |
| | Uses second long division as far as remainder term, to get<br>$b$ + 2$a$ + 56 = $b$ – $a$ - 4 or correct equivalent | M1 A1 |
| | $a=-20$ | A1cso (5) |
| Alternative for (b) | (b) Uses long division of $x^4+5x^3-20x+b$ by ($x$ + 3) to obtain<br>$x^3+2x^2-6x+a+18$ ( with their value for $a$ ) | M1 A1ft |
| | Giving remainder $b$ + 6 = 0 and so $b$ = -6 | A1 cso<br>(3)<br>**[8]** |
| Notes (a) | **M1** : Attempts f( $\pm2$ ) or f( $\pm1$)<br>**A1** is for the answer shown (or simplified with terms collected ) for one remainder<br>**M1:** Attempts other remainder and puts one equal to the other<br>**A1:** for correct equation in $a$ (and $b$) then **A1 for** $a=-20$ **cso** | |
| (b) | **M1** : Puts $f(\pm3)=0$<br>**A1** is for f( -3) = 0, (where f is original function), with no sign or substitution errors (follow through on '$a$' and could still be in terms of $a$ )<br>**A1:** $b$ = -6 is cso. | |
| Alternatives | (a) **M1**: Uses long division of $x^4+5x^3+ax+b$ by ($x$ $\pm2$ ) **or** by ($x$ $\pm1$) as far as three term quotient<br>**A1**: Obtains at least one correct remainder<br>**M1:** Obtains second remainder and puts two remainders (no $x$ terms) equal<br>**A1:** correct equation **A1**: correct answer $a$ = -20 following correct work.<br>(b) **M1**: complete long division as far as constant (ignore remainder)<br><br>**A1ft:** needs correct answer for their $a$<br>**A1:** correct answer | |

**Beware:** It is possible to get **correct answers with wrong working**. If remainders are equated to 0 in part (a) both correct answers are obtained fortuitously. This could score M1A1M0A0A0M1A1A0

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| **7** (a) | $\frac{1}{2}r^2\theta = \frac{1}{2}\times 6^2 \times 2.2 = 39.6 \quad (\text{cm}^2)$ | M1 A1 (2) |
| (b) | $\left(\frac{2\pi - 2.2}{2} =\right) \pi - 1.1 = 2.04 \quad (\text{rad})$ | M1 A1 (2) |
| | (c) $\Delta DAC = \frac{1}{2}\times 6\times 4\sin 2.04 \qquad (\approx 10.7)$ | M1 A1ft |
| | Total area = sector + 2 triangles = 61 $(\text{cm}^2)$ | M1 A1 (4) **[8]** |
| (a) | **M1:** Needs $\theta$ in radians for this formula. Could convert to degrees and use degrees formula.<br>**A1:** Does not need units. Answer should be 39.6 exactly.<br>Answer with no working is **M1 A1**.<br>This **M1A1** can only be awarded in part (a). | |
| (b) | **M1:** Needs full method to give angle in radians<br>**A1:** Allow answers which round to 2.04 (Just writes 2.04 – no working is 2/2) | |
| (c) | **M1:** Use $\frac{1}{2}\times 6\times 4\sin A$ (if any other triangle formula e.g. $\frac{1}{2}b\times h$ is used the method must be complete for this mark) (No value needed for *A*, but should not be using 2.2)<br>**A1:** ft the value obtained in part (b) – need not be evaluated- could be in degrees<br>**M1:** Uses Total area = sector + 2 triangles or other complete method<br>**A1:** Allow answers which round to 61. (Do not need units)<br>Special case degrees: Could get M0A0, M0A0, M1A1M1A0<br>Special case: Use $\Delta\, BDC - \Delta\, BAC$ Both areas needed for first **M1**<br>Total area = sector + area found is second **M1**<br>**NB** Just finding lengths BD, DC, and angle BDC then assuming area BDC is a sector to find area BDC is 0/4 | |

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|---|---|---|
| **8** | | |
| (a) | $4(1-\cos^2 x)+9\cos x-6=0$ $\quad$ $4\cos^2 x-9\cos x+2=0$ (*) | M1 A1 (2) |
| (b) | $(4\cos x-1)(\cos x-2)=0$ $\quad$ $\cos x = ...,$ $\frac{1}{4}$ | M1 A1 |
| | $x = 75.5$ $\quad$ $(\alpha)$ | B1 |
| | $360-\alpha,$ $\quad$ $360+\alpha$ or $720 - \alpha$ | M1, M1 |
| | 284.5, 435.5, 644.5 | A1 (6) **[8]** |
| (a) | **M1:** Uses $\sin^2 x = 1-\cos^2 x$ (may omit bracket) **not** $\sin^2 x = \cos^2 x - 1$<br>**A1:** Obtains the printed answer without error – **must have = 0** | |
| (b) | **M1:** Solves the quadratic with usual conventions<br>**A1:** Obtains ¼ accurately- ignore extra answer 2 but penalise e.g. -2.<br>**B1:** allow answers which round to 75.5<br>**M1:** $360-\alpha$ ft their value, **M1:** $360+\alpha$ ft their value or 720 - $\alpha$ ft<br>**A1:** Three **and only three** correct exact answers in the range achieves the mark | |
| Special cases | In part (b) Error in solving quadratic (4cosx-1)(cosx+2)<br>Could yield, **M1A0B1M1M1A1** losing one mark for the error<br><br>Works in radians:<br>Complete work in radians :Obtains 1.3 **B0**. Then allow **M1 M1** for $2\pi-\alpha$ , $2\pi+\alpha$ or $4\pi-\alpha$ Then gets 5.0, 7.6, 11.3 **A0 so 2/4**<br>Mixed answer 1.3, 360 – 1.3, 360 + 1.3, 720 – 1.3 still gets **B0M1M1A0** | |

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|---|---|---|
| **9** (a) | Initial step: Two of: $a = k+4,\ ar = k,\ ar^2 = 2k-15$<br>Or one of: $r = \frac{k}{k+4},\quad r = \frac{2k-15}{k},\quad r^2 = \frac{2k-15}{k+4}$ ,<br>Or $k = \sqrt{(k+4)(2k-15)}$ or even $k^3 = (k+4)k(2k-15)$ | M1 |
| | $k^2 = (k+4)(2k-15)$, so $k^2 = 2k^2 + 8k - 15k - 60$ | M1, A1 |
| | Proceed to $k^2 - 7k - 60 = 0$ (*) | A1 (4) |
| (b) | $(k-12)(k+5) = 0 \qquad k = 12$ (*) | M1 A1 (2) |
| (c) | Common ratio: $\frac{k}{k+4}$ or $\frac{2k\text{-}15}{k} = \frac{12}{16}$ $\left(= \frac{3}{4} \text{ or } 0.75\right)$ | M1 A1 (2) |
| (d) | $\frac{a}{1-r} = \frac{16}{\left(1/4\right)} = 64$ | M1 A1 (2) **[10]** |
| (a) | **M1:** The 'initial step', scoring the first M mark, may be implied by next line of proof<br>**M1**: Eliminates *a* and *r* to give valid equation in *k* only. Can be awarded for equation involving fractions.<br>**A1 :** need some correct expansion and working and answer equivalent to required quadratic but with uncollected terms. Equations involving fractions do not get this mark. (No fractions, no brackets – could be a cubic equation)<br>**A1:** as answer is printed this mark is for cso (Needs = 0)<br>**All four marks must be scored in part (a)** | |
| (b) | **M1:** Attempt to solve quadratic<br>**A1:** This is for correct factorisation or solution and *k* = 12. Ignore the extra solution (*k* = –5 or even *k* = 5), if seen.<br>Substitute and verify is **M1 A0**<br>**Marks must be scored in part (b)** | |
| (c) | **M1:** Complete method to find *r* Could have answer in terms of *k*<br>**A1:** 0.75 or any correct equivalent<br>**Both Marks must be scored in (c)** | |
| (d) | **M1:** Tries to use $\frac{a}{1-r}$, (even with $r>1$). Could have an answer still in terms of *k*.<br>**A1:** This answer is 64 cao. | |

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| **10** (a) | $2\pi rh + 2\pi r^2 = 800$ | B1 |
| | $h = \dfrac{400 - \pi r^2}{\pi r}$, $\quad V = \pi r^2\left(\dfrac{400 - \pi r^2}{\pi r}\right) = 400r - \pi r^3$ (*) | M1, M1 A1 (4) |
| (b) | $\dfrac{dV}{dr} = 400 - 3\pi r^2$ | M1 A1 |
| | $400 - 3\pi \quad r^2 = 0 \qquad r^2 = ..., \qquad r = \sqrt{\dfrac{400}{3\pi}}$ ( = 6.5 (2 s.f.) ) | M1 A1 |
| | $V = 400r - \pi r^3 = 1737 = \dfrac{800}{3}\sqrt{\dfrac{400}{3\pi}}\ (\text{cm}^3)$<br>(accept awrt 1737 or exact answer) | M1 A1 (6) |
| (c) | $\dfrac{d^2V}{dr^2} = -6\pi r$, Negative, $\therefore$ maximum<br>(Parts (b) and (c) should be considered together when marking) | M1 A1 (2) **[12]** |
| Other methods for part (c): | Either: M: Find value of $\dfrac{dV}{dr}$ on each side of "$r = \sqrt{\dfrac{400}{3\pi}}$" and consider sign.<br>A: Indicate sign change of positive to negative for $\dfrac{dV}{dr}$, and conclude max.<br>Or: M: Find value of $V$ on each side of "$r = \sqrt{\dfrac{400}{3\pi}}$" and compare with "1737".<br>A: Indicate that both values are less than 1737 or 1737.25, and conclude max. | |
| Notes (a) | **B1:** For any correct form of this equation (may be unsimplified, may be implied by 1st M1)<br>**M1 :** Making $h$ the subject of their three or four term formula<br>**M1:** Substituting expression for $h$ into $\pi r^2 h$ (independent mark) Must now be expression in $r$ only.<br>**A1:** cso | |
| (b) | **M1:** At least one power of $r$ decreased by 1 **A1:** cao<br>**M1:** Setting $\dfrac{dV}{dr}$ =0 and finding a value for correct power of $r$ for candidate<br>**A1 :** This mark may be credited if the value of $V$ is correct. Otherwise answers should round to 6.5 (allow $\pm 6.5$ )or be exact answer<br>**M1:** Substitute a positive value of $r$ to give $V$ **A1:** 1737 or 1737.25….. or exact answer | |

| | |
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| (c) | **M1:** needs complete method **e.g.**attempts differentiation (power reduced) of their first derivative and considers its sign<br>**A1(first method)** should be $-6\pi r$ (do not need to substitute *r* and can condone wrong *r* if found in (b))<br>Need to conclude maximum or indicate by a tick that it is maximum.<br>Throughout allow confused notation such as d*y*/d*x* for d*V*/d*r* |
| Alternative for (a) | $A = 2\pi r^2 + 2\pi rh$, $\frac{A}{2} \times r = \pi r^3 + \pi r^2 h$ is **M1** Equate to 400*r* **B1**<br>Then $V = 400r - \pi r^3$ is **M1 A1** |