1. a) I) $\frac{6}{\frac{1}{2^2}}$ or 6×2^2 M1

24 c.a.o A1

II) $\sqrt{\frac{16}{9}}$ or $\frac{4}{3}$ M1

$\frac{64}{27}$ c.a.o A1

b) $(\sqrt{z})^3 = 27$ or $27^{\frac{2}{3}}$ M1

$z = 9$ c.a.o A1

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2 a) $\frac{36(5+\sqrt{7})}{(5-\sqrt{7})(5+\sqrt{7})}$ B1

$\frac{\ldots\ldots}{18}$ M1

$10 + 2\sqrt{7}$ O.E e.g $2(5+\sqrt{7})$ A1

b) $\frac{2\sqrt{2}}{3}$ ← FOR FIRST TERM M1

$\sqrt{\frac{2}{3}}$ OR $\frac{\sqrt{2}}{\sqrt{3}}$ ← FOR SECOND TERM M1

$\frac{3\sqrt{2}}{\sqrt{3}}$ ← SUM OF TWO TERMS M1

$\sqrt{6}$ c.a.o A1

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3. SPLITS INTO TRAPEZIUMS OR "BOXES" INC 4 SQUARE M1

9, 18, 44 ANY TWO OF THESE OR 5, 6, 12, 40 ANY 3 OF THESE M1

17 c.a.o A1

4. $y = mx - 1$ B1

ATTEMPTS SIMULTANEOUS EQUATION BY $y = mx + c,\ c \neq 0$ and $y = x^2 + 2x$ B1

SIMPLIFIES 4 3 TERM QUADRATIC, WITH "m" PRESENT
e.g. $x^2 + (2-m)x + 1 = 0$ M1

STATE OF $b^2 - 4ac < 0$ OR $(2-m)^2 - 4 \times 1 \times 1 < 0$ M1

$m^2 - 4m < 0$ A1

STATE OF 0 & 4 (MAY BE IN DIAGRAM) A1

~~DIAGRAM~~ OR EQUIVALENT METHOD M1 dep

$0 < m < 4$ c.a.o A1 c.a.o

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5. ATTEMPTS SENSIBLE SOLUTION OF SIMULTANEOUS EQUATIONS
e.g. $x = \frac{3}{2}y + 6$ $y = \frac{2}{3}x - 4$ B1

SUBS INTO THE OTHER M1

SIMPLIFIES FRACTIONS & DIVIDES DOWN M1

$y^2 + 8y - 20$ OR $x^2 = 81$ A1

$y = \begin{cases} 2 \\ -10 \end{cases}$ (BOTH) OR $x = \begin{cases} 9 \\ -9 \end{cases}$ (BOTH) A2 (1 MARK FOR BOTH x & y)

$(9, 2)$ OR $(-9, -10)$ A1 (MUST BE IN CO-ORDINATE FORM

6. $y = \int 2x - 6 \, dx$ B1

$y = x^2 - 6x + C$ A2 −1 eeoo

$b = a^2 - 6a + C$ M1

$2b = 4a^2 - 12a + C$ M1

ELIMINATES b, e.g. $2(a^2 - 6a + C) = 4a^2 - 12a + C$ M1

$C = 2a^2$ A1

$y = x^2 - 6x + 2a^2$ A1 c.a.o

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7. a)(I) $0 = \frac{x^2}{2} - \frac{4}{x}$ M1

$x^3 = 8$ MA1

$(2, 0)$ c.a.o A1

(II) $\left(\frac{dy}{dx} =\right) x + 4x^{-2}$ o.e M1 M1

"TANGENT GRADIENT" $= 3$ MA1

$y = -\frac{1}{3}(x - "2")$ M1 STRUCTURE ft
A1 ALL CORRECT

b) ATTEMPTS TO SOLVE THE EQUATIONS SIMULTANEOUSLY B1

MULTIPLIES THROUGH BY 2 & x e.g. $3x^3 + 2x^2 - 4x + 24$ M1

$(x - 2)(ax^2 + bx + C)$ M1

$(x - 2)(3x^2 + 8x + 12)$ A1

ATTEMPTS $b^2 - 4ac$ OBTAINS NEGATIVE ft OR (-80) AND STATES A1
OR
ATTEMPT TO COMPLETE THE SQUARE
OR
C^2 = NEGATIVE

M1

NEGATIVE
OR NO SOLUTIONS
OR SIMILAR

8. a) $L - a = (n-1)d$ OR $u_n - a = (n-1)d$ M1

$\frac{L-a}{d} = n-1$ OR $\frac{u_n - a}{d} = n-1$ M1

$n = \frac{L-a}{d} + 1$ OR $\frac{u_n - a}{d} + 1 = n$ M1

WRITES $\left(S_n =\right) \frac{1}{2} n[a + L]$ & IMPLIES SUBSTITUTION TO THE ANSWER GIVEN A1

b) $\frac{1}{2}[550 + 1100]\left[\frac{1100 - 550}{11} + 1\right]$ o.e M1

42075 c.a.o A1

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9. a) $-2 = \frac{\frac{1}{2}A + 2}{4 + \frac{1}{2}B}$ B1

$-\frac{1}{3} = \frac{-2A + 2}{4 - 2B}$ B1

$-16 - 2B = A + 4$
$4 - 2B = 6A - 6$ } EITHER

ATTEMPTS SENSIBLE SOLUTION M1 ft

$A = 6$ A1

$B = -13$ A1

b) ATTEMPTS u_4 M1 ft

$u_4 = 0$ A1

$u_5 = \frac{1}{2}$ MA1

$9\left(\frac{1}{2} - 2 - \frac{1}{3} + 0\right) + \frac{1}{2}$ M1

(CONVINCINGLY & CORRECTLY) SHOWS -16 A1

10. IMPLIES THAT MINIMUM LIES ON MIDPOINT OF $x=a$ & $x=1$ M A2

OR $(a,0)$ & $(1,0)$

(STATING $x=\frac{a+1}{2}$ ON ITS OWN DOES NOT SUFFICE BUT IT CAN BE USED FURTHER ON)

SUBS $x=\frac{a+1}{2}$ INTO THE QUADRATIC B1

SIMPLIFIES DENOMINATORS M1

SIMPLIFIES CORRECTLY & CONVINCINGLY TO $-\frac{(a-1)^2}{4}$ M A1

(ALLOW AN EQUIVALENT APPROACH, BY COMPLETING THE SQUARE)