1. a) SIGHT OF x^2-4x+7 M1

$a=2 \quad b=-2 \quad c=6$ B3

b I) $(4,6)$ A1 A1

II) $(1,2)$ A1 A1

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2. a) $a+11d=760$ M1

$a+24d=240$ M1

GOOD ATTEMPT AT SIMULTANEOUS EQUATIONS M1

$\Rightarrow a=1200$ A1

$\Rightarrow d=-40$ A1

b) $\frac{25}{2}\left[2\times\text{"}1200\text{"}+24(\text{"}-40\text{"})\right]$ OR $\frac{25}{2}\left[\text{"}1200\text{"}+240\right]$

B1 $\frac{25}{2}$

M1 STRUCTURE

M1 ALL CORRECT

18000 c.a.o A1

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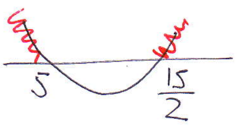
3 $25-2x$ B1

$x(25-2x)<75$ M1

$2x^2-25x+75>0$ A1

$(2x-15)(x-5)>0$ M1



A1 SIGHT OF $\frac{15}{2}, 5$

M1 DIAGRAM OR EQUIVALENT

$x<5$ OR $x>\frac{15}{2}$ A1 BOTH

DO NOT ACCEPT $5>x>\frac{15}{2}$
ACCEPT AND INSTEAD OF OR

$3<x<5$ OR $\frac{15}{2}<x<9$ A1 A1

c.a.o c.a.o

ACCEPT $\leq$ SO LONG AS IT IS CONSISTENT THROUGHOUT

4. a) $f'(16) = \dfrac{16-6}{\sqrt{16}} = \dfrac{5}{2}$ B1

$y + 5 = \frac{5}{2}(x - 16)$ A1

O.E e.g. $2y = 5x - 90$

b) SIGHT OF $x^{\frac{1}{2}} - 6x^{-\frac{1}{2}}$ O.E B1

SIGHT OF $\int "x^{\frac{1}{2}} - 6x^{-\frac{1}{2}}" \, dx$ B1

$(f(x) =) \frac{2}{3}x^{\frac{3}{2}} - 12x^{\frac{1}{2}} + C$ A2 −1 eeoo

$-5 = \frac{2}{3} \times 16^{\frac{3}{2}} - 12 \times 16^{\frac{1}{2}} + C$ M1

64 4 M1 (both)

$C = \frac{1}{3}$ OR $(f(x) =) \frac{2}{3}x^{\frac{3}{2}} - 12x^{\frac{1}{2}} + \frac{1}{3}$ A1

c) $\dfrac{x-6}{\sqrt{x}} = -1$ B1

$x + \sqrt{x} - 6 = 0$ M1 — OR $(x-6)^2 = (-\sqrt{x})^2$

$(\sqrt{x} + 3)(\sqrt{x} - 2) = 0$ M1 — OR $x^2 - 13x + 36 = 0$

$\sqrt{x} = 2$ OR $\sqrt{x} = \langle^{2}_{\cancel{-3}}$ A1 — OR $(x-4)(-9) = 0$

$x = 4$ ONLY A1

$y = -\frac{55}{3}$ A1

5. $(x + 3x\sqrt{3})^2 = 56 + 12\sqrt{3}$ M1

$x^2(1+3\sqrt{3})^2$ OR $x^2 + 6\sqrt{3}x^2 + 27x^2$ M1

SIGHT OF $28 + 6\sqrt{3}$ B1

$\dfrac{56 + 12\sqrt{3}}{28 + 6\sqrt{3}} = 2$ A1

$x = \pm\sqrt{2}$ A1

$y = \pm 3\sqrt{2}$ A1

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6. a) $21 = \dfrac{u_3 + 1}{2}$ OR $u_n = 2u_{n+1} - 1$ M1

$u_3 = 41$ A1

b) $u_2 = 81$ A1

$u_1 = 161$ OR $k = 161$ A1

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7. $kx - 9 = 3(x+1)^2$ B1

$3x^2 + (6-k)x + 12 = 0$ A1

"REPEATED ROOTS" OR $b^2 - 4ac = 0$ OR $(6-k)^2 - 4\times3\times12$ B1

$(6-k)^2 = 144$ OR $k^2 - 12k - 108 = 0$ O.E M1

$6 - k = \pm 12$ OR $k - 6 = \pm 12$ OR $(k+6)(k-18)$ M1

$k = -6, 18$ (BOTH) A1

$3x^2 + 12x + 12 = 0$ OR $3x^2 - 12x + 12 = 0$ O.E M1

$x = -2$, $y = 3$ OR $(-2, 3)$ A1 A1

$x = 2$, $y = 27$ OR $(2, 27)$ A1 A1

8. a) $\dfrac{-2-(-4)}{3-0}$ o.e M1

$\frac{2}{3}$ A1

$y = \frac{2}{3}x - 4$ OR $2x - 3y - 12 = 0$ A1

b) $\left(x, \frac{2}{3}x - 4\right)$ MUST BE AS CO-ORDINATES B1

$\sqrt{\left[-4-\left(\frac{2}{3}x-4\right)\right]^2 + (0-x)^2} \left(= 3\sqrt{13}\right)$ M1 USE OF FORMULA
M1 ALL CORRECT

$\sqrt{\frac{4}{9}x^2 + x^2} \left(= 3\sqrt{13}\right)$ A1

$\sqrt{\frac{13}{9}x^2} \left(= 3\sqrt{13}\right)$ A1

$\frac{13}{9}x^2 = 117$ OR $\frac{13}{9}x^2 = 9 \times 13$ M1

$x^2 = 81$ M1

$x = \pm 9$ A1

$(9, 2)$ $(-9, -10)$ A1 A1

WITH EVIDENCE
OF SUBSTITUTION