1. a) ATTEMPT TO EXPAND, AT LEAST ONE UNSIMPLIFIED COEFFICIENT SEEN M1

$1 + 24x + 252x^2 + 1512x^3$ A3

b) 20412 B1

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2. a) "$r = 2a$" SEEN B1

$1 = \frac{a}{1-r}$ M1

$1 = \frac{a}{1-2a}$ OR $1 - 2a = a$ M1

$a = \frac{1}{3}$ A1

b) $\frac{1}{3} \times \left(\frac{2}{3}\right)^4$ M1 M1 -1 eeoo

$\frac{16}{243}$ c.a.o A1

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3. a) SUBS $x=1$ OR $x=-1$ INTO $f(x)$ M1

$p + q = -7$ OR SIMILAR A1

$p - q = 3$ OR SIMILAR A1

ATTEMPTS SOLUTION OF "THEIR" SIMULTANEOUS EQUATION M1

$p = -2$ A1

$q = -5$ A1

b) $(x-1)(x^2+bx+c)$ M1

$(x-1)(x^2-x-6)$ A1

$(x-1)(x+2)(x-3)$ M1

$x = 1, -2, 3$ A1 (ALL 3)

4.

$\frac{5}{2}\left[0+0+2(2.12+2.94+3.03+2.77+1.91)\right]$ M3

≈ 63.85 or 63.9 or 64 A1

SC2 53.775 IF THEY TREATED 2.12 & 1.91 AS FIRST & LAST

5

DIVIDES EQUATION BY $\cos\theta$ M1

$2\tan\theta = 5$ OR $\tan\theta = \frac{5}{2}$ A1

68.2 A1

248.2 A1

6.

$\log_a[x(x-3)]$ OR $\log[x^2-3x]$ M1

$x^2-3x=10$ O.E A1

$(x-5)(x+2)$ M1

$x = 5, -2$ BOTH OR 5 ONLY A1

INDICATES 5 IS THE ONLY SOLUTION A1

7. a)

$\frac{5-6}{12-1}$ M1

$-\frac{1}{11}$ A1

b)

SIGHT OF MIDPOINT $\left(\frac{13}{2}, \frac{11}{2}\right)$ B1

GRAD OF PERPENDICULAR BISECTOR IS 11 M1 ft

$y - \text{"}\frac{11}{2}\text{"} = \text{"}11\text{"}\left(x - \text{"}\frac{13}{2}\text{"}\right)$ M1 ft

SUBS $y=0$ INTO "THEIR EQUATION" M1 ft

$11x = 66$ & SHOWS CONCLUSION A1

c)

"ATTEMPTS" TO FIND |PR| OR |QR| M1

$(x-6)^2 + y^2 = 61$ ft A1 A1

8.

$7^2 = x^2 + 9x^2 - 2x(3x)\cos 60$ M1

(ALLOW 1 "SILLY" ERROR")

$7x^2 = 49$ A1

$x = \sqrt{7}$ A1

$\frac{\sin\theta}{\text{"}\sqrt{7}\text{"}} = \frac{\sin 60}{7}$ M1

$7\sin\theta = \text{"}\sqrt{7}\text{"} \times \text{"}\sin 60\text{"}$

OR ELIMINATES ALL FRACTIONS M1

SHOWS CONVINCINGLY $\frac{\sqrt{21}}{14}$ A1

9\. SIGHT OF 11 OR 4 [AS THE y CO-ORDS OF A & B] B1

$\frac{"11+4"}{2} \times 3$ OR $\frac{45}{2}$ SEEN B1

$\int_1^4 8\sqrt{x} + \frac{16}{x^2} - 13 \, dx$ O.E — ONE FOR LIMITS M1, ONE FOR INTEGRAL M1

$\frac{16}{3}x^{\frac{3}{2}} - \frac{16}{x} - 13x$ O.E (ALLOW 1 ERROR) M1

$\left(\frac{128}{3} - 4 - 52\right) - \left(\frac{16}{3} - 16 - 13\right)$

OR

$-\frac{40}{3} - \left(-\frac{71}{3}\right)$ M1

$\frac{31}{3}$ AS THE AREA UNDER CURVE A1

$"\frac{45}{2}" - "\frac{31}{3}"$ OR $\frac{73}{6}$ A1

10\. a) $(x+x+x) + (x+x+x\theta) = 60$ M1

$5x + x\theta = 60$ & THEN SHOWS THE ANSWER A1

b) $\frac{1}{2}x^2 \sin 60 + \frac{1}{2}x^2\theta$ M1

$\frac{1}{4}\sqrt{3}x^2 + \frac{1}{2}x(60-5x)$ OR SIMILAR M1

CONVINCINGLY WITHOUT "FUDGES" SHOWS THE ANSWER A1

c) $\frac{1}{2}(\sqrt{3}-10)x + 30$ M1

"THEN $\frac{dy}{dx} = 0$" M1

ATTEMPTS SOLUTION M1

SHOWS A.W.R.T 7.26 A1

d) $\frac{1}{2}(\sqrt{3}-10)$ SEEN

STATES < 0 (REGARDLESS OF x) SO MAXIMUM

STATES A.W.R.T 109

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11. INDICATES GAP OF 60 OR $\frac{\pi}{3}$ OR PERIOD 120 OR $\frac{2\pi}{3}$ M1

$n = 3$ A1 ↗ dep

SOME EVIDENCE OF CORRECT METHOD
e.g. $\frac{\phi}{3} = \frac{\pi}{9}$ } M1

$\phi = \frac{\pi}{3}$ A1 ↗ dep

OR

$n\left(\frac{\pi}{9}\right) - \phi = 0$

$n\left(\frac{4\pi}{9}\right) - \phi = \pi$

$n\left(\frac{7\pi}{9}\right) - \phi = 2\pi$

} M1 any out of these

ELIMINATES BETWEEN ANY TWO M1

$n = 3$ A1 dep on first M1

$\phi = \frac{\pi}{3}$ A1 dep on first M1