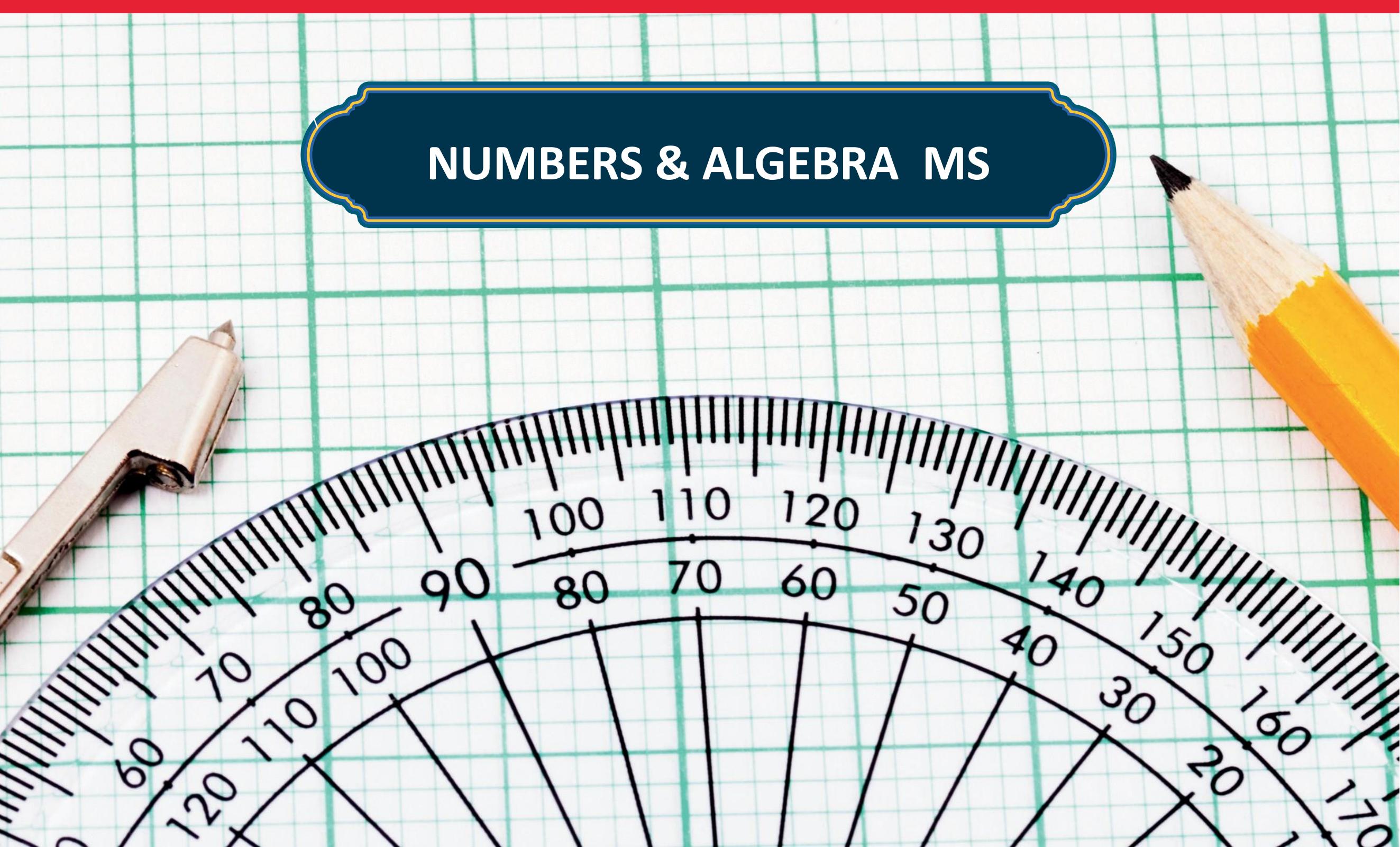


ELEVATE

MATH TOPICAL WORKSHEETS

NUMBERS & ALGEBRA MS



Numbers

1(a)	12500	2	M1 for $P\left(1 + \frac{60}{100}\right) = 20000\text{oe}$
(b)	$20000 \times \left(1 + \frac{60}{100}\right)^4 \text{ oe}$ [= 131072]	1	
(c)	2065 nfiw	4	<p>B3 for 9 or 8.32 or 8.323 ... or for 45 or 41 to 42</p> <p>OR</p> <p>M3 for $n \log\left(1 + \frac{60}{100}\right) = \log\left(\frac{1000000}{20000}\right)$</p> <p>or</p> <p>or good sketch indicating value between 8 and 9</p> <p>or correct trials as far as 8 and 9</p> <p>or M2 for $\left(1 + \frac{60}{100}\right)^n = \frac{1000000}{20000}$ or</p> <p>or sketch that could lead to solution</p> <p>e.g. $y = 1.6^x$ and $y = \frac{1000000}{20000}$</p> <p>or at least 3 correct trials</p> <p>or M1 for</p> <p>$20000 \times \left(1 + \frac{60}{100}\right)^n = 1000000$ soi</p> <p>or at least 2 correct trials</p>

2.(a)	84.9 or 84.85 to 84.86	1	
(b)	7.08 or 7.079 to 7.08	2	M1 for distance divided by time. or B1 for 113
(c)	9.58 or 9.579 to 9.580	3	M1 for distance divided by speed M1 for $\div 1000$ and $\times 60 \times 60$

3(a)	21:19 cao	2	B1 for answer 84:76 or M1 for $\frac{1}{2}(160) + 4$ or $\frac{1}{2}(160) - 4$ If o scored, SC1 for final answer of 19:21
(b)	5.6[0] or 5.599 to 5.600	3	M2 for $\sqrt[6]{\frac{1.664}{1.2}}$ oe or M1 for $1.2 \times [\dots]^6 = 1.664$
(c)(i)	1.35×10^{122} cao	2	B1 for 13.5×10^{121} oe seen
(c)(ii)	2.02×10^n cao	2	B1 for figs 202

4.

$14 + 6\sqrt{3}$ oe	2	B1 for $14 + k\sqrt{3}$ or $k + 6\sqrt{3}$ or M1 for $20 + 10\sqrt{3} - 4\sqrt{3} - 2\sqrt{3}\sqrt{3}$
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5	6	1
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6(a)	$\frac{11}{20}$ oe	2	M1 for common denominator with one Numerator correct.
(b)	$7\frac{1}{3}$ cao	3	M2 for $\frac{11}{4} \times \frac{8}{3}$ oe or M1 for one correct improper fraction

7(a)	1.880 cao	1
(b)	25	1
(c)	-1,0,1	1
(d)	6	1

8.	F $= x + 0.65y$	2	B1 for $x + 0.65y$ or $F = x + ky, k \neq 0$ or $F = c + 0.65y, c \neq 0$
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POINTS EDULAB

9	$\frac{5+\sqrt{5}}{4}$ or $\frac{\sqrt{5}(\sqrt{5}+1)}{4}$	2	M1 for $\times \frac{\sqrt{5}+1}{\sqrt{5}+1}$
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10	4000	1
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11(a)	0.030	0.5
(b)	0.03015	0.5

12	105	2	B1 for $\frac{360}{12}$ or 30 [for 1 hour] or 15 [for half an hour] or 255 seen
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13			B2 for 3[h] and 2[h] soi by 5[h]] or B1 for 60/30 or 60/20 or 3[h] If B0 or B1 scored, then M1 for 120 ÷ their total time (their total time MUST be greater than 2)
	24	2	

14.

29	31	41	59	2	B1 for at least two correct
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15

121 or 144	1
Any correct fraction	1
Any correct irrational number	1

16.

1(a)(i)	$\frac{2}{2+3} \times 200$	1	
(a)(ii)	24.64cao	2	M1 for $\frac{30.8}{100} \times 80$ oe
(a)(iii)	126.96cao	3	M for $120 + \frac{120 \times 1.16 \times 5}{100}$ oe
(b)(i)	5000cao		or M1 for $\frac{120 \times 1.16 \times 5}{100}$
(b)(ii)	5520.4[0]nfww	2	M1 for $X \times \left(1 + \frac{2}{100}\right)^3 = 5306.04$ oe

			B3 for 29.9 or 29.16 ... OR or M3 for $n \log\left(1 + \frac{1.4}{100}\right) = \log\left(\frac{150}{100}\right)$ oe or good sketch indicating value between 29 and 30 (c) 30nfww 4 or correct trials reaching 20 and 21 or M2 for $\left(1 + \frac{1.4}{100}\right)^n = \frac{150}{100}$ oe or suitable graph with $n > 1$ or at least 3 correct trials or M1 for [...] $\times \left(1 + \frac{1.4}{100}\right) n = \frac{150}{100} \times [...]$ oe soi by at least 2 trials with $n > 1$
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17.

4	1
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18.

	420.2[0]		B3 for one correct answer
a	756.36	4	or M2 for $1000 + 1800 + 1200$ oe
	504.24		or B1 for 1000 or 1800 seen
b	250nfww	3	M for $x \times \left(1 + \frac{2}{100}\right) = 255$ oe

19.

(a)	1.05 $\times 10^{-1}$ cao	2	M1 for equivalent non-standard form answer e.g. 10.5×10^{-2}
(b)	7.28 $\times 10^{-2}$ cao	2	M1 for figs 728 seen

20.

$\frac{3}{6}$ oe	2	M1 for correct working with common denominator or better
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ALGEBRA

1

Question	Answer	Marks	AO Element	Notes	Guidance
(a)	$\frac{48}{x}$ final answer	1		Accept $48 \div x$	
(b)	<p>M1 for <i>their (a)</i> $-\frac{60}{x+2} = 4$ oe</p> <p>M2 for $48(x+2) - 60x = 4x(x+2)$ oe</p> <p>A1 for $48x + 96 - 60x = 4x^2 + 8x$ oe leading to $x^2 + 5x - 24 = 0$</p>	4		<p>FT <i>their (a)</i> provided expression in x</p> <p>FT <i>their 3 term eqn with algebraic denominators, x and $x+2$, for M2 or M1</i></p> <p>M1 for common denominator $x(x+2)$ oe seen or any two terms in a 3 term equation from $\pm 48(x+2)$, $\pm 60x$, $\pm 4x(x+2)$ oe seen</p> <p>With brackets expanded and no errors or omissions seen</p>	
(c)	<p>B2 for $(x-3)(x+8)$</p> <p>B1 for 3 and -8</p>	3		<p>B1 for $x(x+8) - 3(x+8)$ or $x(x-3) + 8(x-3)$ or $(x+a)(x+b) [= 0]$ where $ab = -24$ or $a+b = 5$ [a, b integers]</p>	
(d)	12	1			

2

(a)	$\frac{12}{x} + \frac{26}{x+10} = 2.8$ oe isw	3		<p>B2 for $\frac{12}{x} + \frac{26}{x+10}$ oe isw</p> <p>OR</p> <p>B1 for $\frac{26}{x+10}$ seen</p> <p>B1 for time = 2.8 or $\frac{168}{60}$ or $2\frac{48}{60}$ oe</p>	
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(b)	<p>M2 for $12(x + 10) + 26x = 2.8x(x + 10)$ or better</p> <p>M1 for $12x + 120 + 26x = 2.8x^2 + 28x$ A1 for $2.8x^2 - 10x - 120 = 0$ oe or $30x + 300 + 65x = 7x^2 + 70x$ or better leading to $7x^2 - 25x - 300 = 0$</p>	4		<p>FT <i>their</i> time, provided 2 algebraic fractions one in x and other in $\pm x \pm 10$</p> <p>M1 for $12(x + 10) + 26x$ seen or better</p> <p>FT <i>their</i> equation dep on M2</p> <p>with no errors or omissions</p>	
(c)	<p>B2 for $\frac{[-]25 \pm \sqrt{([-]25)^2 - 4(7)(-300)}}{2 \times 7}$ oe</p> <p>B2 for 5 and 8.57 or 8.571...</p>	4		<p>B1 for $\sqrt{([-]25)^2 - 4(7)(-300)}$ or better</p> <p>or for $\frac{[-]25 + \sqrt{q}}{2 \times 7}$ or $\frac{[-]25 - \sqrt{q}}{2 \times 7}$</p> <p>B1 for each or SC1 for final answers 5 and -8.57</p>	
(d)	84 to 84.01...	2		<p>FT $\frac{720}{\text{their positive answer}}$ to 3 sf or better</p> <p>M1 for $\frac{12}{\text{their positive answer}} [\times 60]$ oe</p>	

3

	$\frac{2x - 5}{a - 2b}$ final answer	5		<p>B2 for $(2x - 5)(x + 3)$ or B1 for $(2x + p)(x + q)$ where $pq = -15$ or $p + 2q = 1$</p> <p>B2 for $(x + 3)(a - 2b)$ or B1 for $x(a - 2b) + 3(a - 2b)$ or $a(x + 3) - 2b(x + 3)$</p>	
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4

<p>M2 for $x^2 + 6x - 40 [= 0]$ or $y^2 - 40y - 41 [= 0]$</p> <p>M1 for $(x + 4)(x + 10) [= 0]$ or $(y - 41)(y + 1) [= 0]$</p> <p>B2 for $x = 4, y = -1$ $x = -10, y = 41$</p>	<p>5</p>		<p>M1 for correct method to eliminate one variable e.g. $x^2 - 2(11 - 3x) = 18$ or $\frac{(11 - y)^2}{3^2} - 2y = 18$</p> <p>or for correct factors for <i>their</i> quadratic equation or for correct use of quadratic formula for <i>their</i> quadratic equation or for correctly completing the square for <i>their</i> quadratic equation</p> <p>B1 for $x = 4, x = -10$ or for $y = -1, y = 41$ or for a correct pair of x and y values</p> <p>If B0 scored and at least 1 method mark scored SC1 for correct substitution shown of both of <i>their</i> x values or <i>their</i> y values into $3x + y = 11$ or $x^2 - 2y = 18$</p>
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5

<p>$x = 3, x = -3$ nfww</p>	<p>5</p>		<p>M2 for $x + 9 + 9(x + 1) = (x + 1)(x + 9)$ oe or better</p> <p>or M1 for $x + 9 + 9(x + 1)$ or $(x + 1)(x + 9)$ oe or better</p> <p>B1 for $x^2 + x + 9x + 9$ seen</p> <p>M1 dep for $[0 =]x^2 - 9$ oe simplified or better</p>
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6

M3 for $3x^2 - 16x - 35 [= 0]$
or $3y^2 - 8y - 51 [= 0]$

M1 for $(3x + 5)(x - 7) [= 0]$
or $(3y - 17)(y + 3) [= 0]$

B2 for $x = 7, y = 3$

$$x = -\frac{5}{3}, y = 5\frac{2}{3}$$

6

M1 for
 $x^2 + 2(4 - x)^2 = 67$
or $(4 - y)^2 + 2y^2 = 67$
seen

B1 for $16 - 8x + x^2$ or
 $16 - 8y + y^2$

or for correct factors for
their equation
or for correct use of
quadratic formula
or completing the square
for *their* equation

B1 for $x = 7, x = -\frac{5}{3}$
or for $y = -3, y = 5\frac{2}{3}$
or for a correct pair of x
and y values

7

(a)	89, 111	2		B1 for each If 0 scored, SC1 for two terms with a difference of 22	
(b)	$22n - 21$ oe final answer	2		B1 for final answers $22n$ $+ j$ or $kn - 21$ $k \neq 0$ or for correct answer seen and spoilt	

8

	8 11 16	2		B1 for two correct	
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9

	$32 - 7n$ oe final answer	2		B1 for $32 - kn$ oe $k \neq 0$ or $j - 7n$ oe or $32 - 7n$ seen then spoilt	
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10

(a)	25, 87, 329 circled	1			
(b)	7	1			

(c)	8	2		M1 for $\frac{349}{39}$ or B1 for at least four of 39, 78, 117, 156, 195, 234, 273, 312	
(d)(i)	$2n - 1$ oe	2		B1 for $2n + c$ or $kn - 1$, $k \neq 0$	
(d)(ii)	79	1		FT <i>their (d)(i)</i> if linear	
(d)(iii)	175	2		M1 for <i>their</i> $(2n - 1) = 349$ or $\frac{348}{2} + 1$ or $\frac{350}{2}$	
(e)(i)	$350 - 2n$ oe	2		B1 for $-2n + c$ or $kn + 350$, $k \neq 0$	
(e)(ii)	174 $n \geq 175$ gives house numbers that are zero/negative	2		B1 for each If 0 scored, SC1 for 175	

11

(a)	$1 - 2n$ oe	2		B1 for $-2n + k$ oe or $pn + 1$ ($p \neq 0$) oe	
(b)	$n^3 + 1$ oe	2		M1 for cubic expression	

12

(a)	18 28	2		B1 for each	
(b)	$3n + 3$ oe	2		B1 for $3n + k$ oe or $cn + 3$ oe $c \neq 0$	
(c)	45	2		M1 for identifying 7th pattern or M1 for <i>their</i> $(3n + 3) = 24$	

(d)	$[a =] \frac{3}{2}$ oe $[b =] \frac{13}{3}$ oe	6	<p>M1 for any correct substitution e.g. $\frac{1}{6} (2)^3 + 2^2 a + 2b$</p> <p>A1 for one of e.g. $\frac{1}{6} + a + b = 6$ oe $\frac{8}{6} + 4a + 2b = 16$ oe $\frac{27}{6} + 9a + 3b = 31$ oe $\frac{64}{6} + 16a + 4b = 52$ oe</p> <p>A1 for another of the above</p> <p>M1 for correctly eliminating one variable from their equations</p> <p>A1 for $a = \frac{3}{2}$</p> <p>A1 for $b = \frac{13}{3}$ oe</p>
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13	175	3	<p>M1 for $y = k(x - 1)^2$ oe</p> <p>A1 for $k = 7$ or M2 for</p> $\frac{63}{(4 - 1)^2} = \frac{y}{(6 - 1)^2}$ <p>oe</p>
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14	97.2[0]	3	<p>M1 for $C = k r^2$ A1 for $k = 30$ or M2 for</p> $\frac{202.8}{2 \cdot 6^2} = \frac{c}{1.8^2}$ <p>oe</p>
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15	(a) $125x^{12}$	2	B1 for $125x^k$ or kx^{12}
	(b) $8x^{96}$	2	B1 for $8x^k$ or kx^{96}

16

	A correct equation leading to 41	3		M2 for $4x = 164$ or M1 for $x + 2(x - 24) + x - 16 = 100$ oe or M1 for correctly simplifying <i>their</i> equation to the form $kx = c$ provided at least one part correct from [2]($x - 24$) oe or $x - 16$ or B1 for answer 41 without an equation in x shown	
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17

M2 for $x^2 + x - 156 [= 0]$ or $y^2 + 15y - 100 [= 0]$	5	M1 for $x^2 + x = 7 + 149$ or correct substitution or for correct factors for <i>their</i> quadratic equation or for correct use of quadratic formula or completing the square for <i>their</i> equation
M1 for $(x - 12)(x + 13) [= 0]$ or $(y - 5)(y + 20) [= 0]$		B1 for $x = 12, x = -13$ or for $y = 5, y = -20$ or for a correct pair of x and y values If B0 scored and at least 2 method marks scored SC1 for correct substitution of both of <i>their</i> x values or <i>their</i> y values into $x - y = 7$ or $x^2 + y = 149$

18

M3 for $3x^2 - 16x - 35 [= 0]$ or $3y^2 - 8y - 51 [= 0]$	6		M1 for $x^2 + 2(4 - x)^2 = 67$ or $(4 - y)^2 + 2y^2 = 67$ seen B1 for $16 - 8x + x^2$ or $16 - 8y + y^2$ or for correct factors for <i>their</i> equation or for correct use of quadratic formula or completing the square for <i>their</i> equation B1 for $x = 7$, $x = -\frac{5}{3}$ or for $y = -3$, $y = 5\frac{2}{3}$ or for a correct pair of x and y values	
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19

(a)	M2 for $(4x - 5)(x + 3) + (x + 1)(x - 3) = 342$ or $2x(4x - 5) - (3x - 6)(x - 3) = 342$ M2 for $4x^2 + 12x - 5x - 15$ oe and $x^2 + x - 3x - 3$ oe seen OR $8x^2 - 10x$ and $3x^2 - 15x + 18$ seen A1 for $5x^2 + 5x - 18 = 342$ leading to $x^2 + x - 72 = 0$	5		M1 for $(4x - 5)(x + 3)$ or $(x + 1)(x - 3)$ or for $2x(4x - 5)$ or $(3x - 6)(x - 3)$ M1 for each no errors or omission	
(b)	M2 for $(x + 9)(x - 8)$ B1 for 8, -9	3		B1 for $(x - a)(x + b)$ where $ab = -72$ or $a + b = 1$ and a, b are integers	
(c)	86	2		FT for $12 \times$ <i>their</i> $x - 10$ (x positive) B1 for any one of 27, 11, 16 seen or for $2x + 2x + 4x - 5 + 4x - 5$ oe or better soi	
(d)	22.2 or 22.16 to 22.17	2		M1 for $\tan = \frac{11}{27}$ or $\frac{\text{their } x + 3}{4 \times \text{their } x - 5}$	

20

$\frac{g}{2m+g}$ final answer	4		M1 for expanding brackets or $\div g$ M1 for isolating terms in h M1 for factorising M1 for dividing by bracket to isolate h Incorrect/unsimplified final answer scores max 3 marks
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