Unit 2 Higher Tier: Number, Algebra, Geometry 1

5MB2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
1.	(a)	84 = 2 × 42 = 2 × 2 × 21 = 2 × 2 × 3 × 7 OR Use of factor trees	2 × 2 × 3 × 7	2	M1 for a systematic method of at least 2 correct divisions by a prime number or an equivalent factor tree or a full process with one calculation error A1 for 2 × 2 × 3 × 7 or 2^2 × 3 × 7
	(b)	LCM of 4, 6 and 8 is **24** **OR** Red = after 4, 8, 12, 16, 20, **24**, 28, …….. Blue = after 6, 12, 18, **24**, 30, 36, …….. White = after 8, 16, **24**, 32, 40, ……. **OR** Table of times from midday onwards into the next day, with indication when a red, blue and white pill are to be taken.	Midday on the following day	2	M1 for an attempt to find the LCM A1 for midday (or equivalent) the next day **OR** M1 for listing multiples of 4, 6 and 8 A1 for midday (or equivalent) the next day **OR** M1 for a correct timetable showing when pills are taken A1 for midday (or equivalent) the next day
					Total for Question: 4 marks

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Question	**Working**	**Answer**	**Mark**	**Additional Guidance**
2.	Colin saves $\frac{1}{1+9} = \frac{1}{10}$ of his wage Anwar saves 12%, Bethany saves $1 - \frac{7}{8} = \frac{1}{8}$ of her wage $\frac{1}{10}$ = 0.1, 12% = 0.12, $\frac{1}{8}$ =0.125 **OR** $\frac{1}{10}$ = 10%, 12%, $\frac{1}{8}$ = 12.5% **OR** Let the weekly wage be £100 say Colin saves $\frac{1}{1+9} = \frac{1}{10}$ of his wage Anwar saves 12%, Bethany saves $1 - \frac{7}{8} = \frac{1}{8}$ of her wage $\frac{1}{10}$ of £100 = $\frac{1}{10} \times 100 = 10$ 12% of £100 = $\frac{12}{100} \times 100 = 12$ $\frac{1}{8}$ of £100 = $\frac{1}{8} \times 100 = 12.5$	Bethany	4	B1 for $\frac{1}{1+9} = \frac{1}{10}$ B1 for $1 - \frac{7}{8} = \frac{1}{8}$ M1 for conversion to a decimal or 0.1 or 0.12 or 0.125 seen A1 cao for Bethany **OR** M1 for conversion to a percentage or 10% or 12.5% seen A1 cao for Bethany **OR** B1 for $\frac{1}{1+9} = \frac{1}{10}$ [or M1 for 100 ÷ (1+9)] B1 for $1 - \frac{7}{8} = \frac{1}{8}$ {or A1 ft for £100 – "£87.50" (= £12.50)} M1 for $\frac{1}{10} \times 100$ (=10) [or A1 for 10] or $\frac{12}{100} \times 100$ (=12) or $\frac{1}{8} \times 100$ (=12.5) {or $\frac{7}{8} \times 100$ (=87.5)} A1 cao for Bethany
				Total for Question: 4 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
3.	(a)		$3n + 2$	2	B2 for $3n + 2$ or equivalent [B1 for $3n + k$ where $k \neq 2$]
	(b)	$3 \times 42 + 2 = 3 \times 16 + 2 = 48 + 2$	50	2	M1 for $3 \times 42 + 2$ with a clear intention to square the 4 independent of the scalar 3. A1 cao
					Total for Question: 4 marks
4.		Angle PQR = angle QRS = $\frac{(10-2)\times 180}{10} = 144°$ (interior angle of an n-sided polygon) Angle QPR = angle QRP $= \frac{180-144}{2}$ $= 18°$ (base angles of isos triangle) Angle PRS $= 144 - 18 = 126°$ $x = 180 - 126 = 54°$ (angles on a straight line)	54°	5	M1 for $\frac{(10-2)\times 180}{10}$ oe A1 for interior angle = 144 M1 for $\frac{180-144}{2}$ or 18° seen M1 (dep) for "180 – ('144' – '18')" A1 cao
					Total for Question: 5 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
5. **QWC (i, ii, iii)** **FE**	(a)	Wall area = 330 × 40 + 90 × 30 = 13200 + 2700 = 15900 cm^2 Tile A area = 10 × 10 = 100 cm^2 No of tiles = 15900 ÷ 100 = 159 No of boxes needed = 8 (20 × 8 = 160 tiles) £9.99 × 8 = £79.92 Tile B area = 15 × 15 = 225 cm^2 No of tiles = 15900 ÷ 225 = 70(225 × 70 = 15700) + 1 No of boxes needed = 6 (12 × 6 = 72 tiles) but some tiles will need to be cut, so 7 boxes needed £11.49 × 7 = £80.43 **OR** 330 ÷ 10 = 33 A tiles per long row 40 ÷ 10 = 4 long rows 33 × 4 = 132 tiles 90 ÷ 10 = 9 tiles per short row 30 ÷ 10 = 3 short rows 9 × 3 = 27 tiles 132 + 27 = 159 tiles No of boxes needed = 8 (20 × 8 = 160 tiles) £9.99 × 8 = £79.92 330 ÷ 15 = 22 B tiles per long row 40 ÷ 15 = 3 long rows (1 row of tiles will be cut) 22 × 3 = 66 A tiles 90 ÷ 15 = 6 tiles per short row 30 ÷ 15 = 2 short rows 6 × 2 = 12 tiles 66 + 12 = 78 tiles No of boxes needed = 7 (12× 7 = 84 tiles) £11.49 × 7 = £80.43	Tile A is the most economical	6	M1 for either 330 × 40 or 90 × 30 or 10 × 10 or 15 × 15 A1 for 15900 and (100 or 225) M1 for 15900 ÷ 100 or 15900 ÷ 225 A1 ft for 10 A boxes needed ('15900' ÷ '100') ÷ 20 rounded up to nearest whole number) or 7 B boxes needed ('15900' ÷ '225') ÷ 12 rounded up to nearest whole number) B1 for answers or £79.92 and £80.43 to justify the choice C1 for comment on the need to cut some Type B tiles **QWC: Decision must be stated, with all calculations attributable** **OR** M1 for 330 ÷ 10 or 90 ÷ 10 or 330 ÷ 15 or 90 ÷ 15 A1 for (33 and 9) or (22 and 6) M1 for 33 × 4 + 9 × 3 or 22 × 3 + 6 × 2 A1 ft for 10 A boxes needed ('33 × 4' ÷ '9 × 3') ÷ 20 rounded up to nearest whole number) or for 7A boxes needed ('22 × 3' ÷ '6 × 2') ÷ 12 rounded up to nearest whole number) B1 for answers or £79.92 and £80.43 to justify the choice C1 for comment on the need to cut some Type B tiles **QWC: Decision must be stated, with all calculations attributable**

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
5.	(b)	The carton can have dimensions 42 cm × 31.5 cm × 21 cm or 63 cm × 21 cm × 21 cm or 84 cm × 31.5 cm × 10.5 cm or 63 cm × 42 cm × 10.5 cm or 126 cm × 21 cm × 10.5 cm	Net	3	B1 for quoting a correct set of dimensions (could be simply on the diagram) M1 for a net showing 6 rectangles that could form a cuboid A1 for an accurate scale drawing or lengths labeled accurately
					Total for Question: 9 marks
6.	(a)		$4p(2pq + 3)$	2	B2 for $4p(2pq + 3)$ [B1 for $2p(2pq + 6)$ or $4(p^2q + 3p)$ or $p(4pq + 12)$ or $2(2p^2q + 6p)$]
	(b)	$5 – 2(m – 3) = 5 – 2m + 6$	$11 – 2m$	2	M1 for $5 – 2m + 6$ A1 cao
					Total for Question: 4 marks
7.	(a)	Table of values $x = –1 \quad 0 \quad 1 \quad 2 \quad 3$ $y = –4 \quad 1 \quad 6 \quad 11 \quad 16$ **OR** Using $y = mx + c$, gradient = 5, y- intercept = 1	Single line from (–1, –4) to (3, 16)	3	B3 for a correct single line from (–1, –4) to (3, 16) [B2 for at least 3 correct points plotted and joined with line segments **OR** 3 correct points plotted two of which must be the extremes with no joining **OR** a single line of gradient 5 passing through (0, 1)] B1 for 2 correctly plotted points **OR** a single lie of gradient 5 **OR** a single line passing through (0, 1)
	(b)		D	1	B1 cao
	(c)	Gradient = $-\frac{1}{5}$, $c = 0$	$y = -\frac{1}{5}x$	2	M1 for $y = -\frac{1}{5}x + c$ A1 cao
					Total for Question: 6 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
8.		Volume of water in pool when full = $\frac{(2+1)}{2}$ × 12 × 4 = 72 m^3 = 72 000 000 cm^3 (ml) Time to fill pool = 72 000 000 ÷ 200 = 360 000 seconds = 360 000 ÷ 60 = 6000 mins = 100 hours	100 hours or 4 days and 4 hours, Friday 13 00	6	M1 for $\frac{(2+1)}{2}$ × 12 A1 for 72 m^3 B1 for 72 000 000 cm^3 (ml) or multiplying volume by 1 000 000 M1 for "72 000 000" ÷ 200 M1 for "360 000" ÷ 3600 A1 for 100 hours or 4 days and 4 hours, Friday at 1300 [B1 for an answer left as 360 000 seconds, if the last M1 not awarded]
					Total for Question: 6 marks
9.	(i)		1	4	B1 cao
	(ii)	$\left(\frac{3}{1}\right)^2$ or $\left(\frac{1}{9}\right)^{-1}$	9		B1 cao
	(iii)	$(16)^{\frac{3}{2}} = \left(\sqrt{16}\right)^3$	64		B2 cao [B1 for $(16)^{\frac{3}{2}}$ or equivalent]
					Total for Question: 4 marks
10.		$\frac{x+3}{4}+\frac{x-5}{3}$ $=\frac{3(x+3)+(x-5)}{12}$	$\frac{7x-11}{12}$	3	M1 resolution of denominator to 12 M1 expansion and simplification of brackets A1 cao
					Total for Question: 3 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
11. **QWC, (i, ii, iii)**		PS = PT and PQ = PR (equal tgts from a point) Let angle SPT = x Angle PST = angle PTS = $\frac{180-x}{2}$ (base angles of isos triangle) Angle QPR = x (vertically opposite angles) Angle PQR = angle PRQ = $\frac{180-x}{2}$ (base angles of isos triangle) Therefore angle PQR = angle PTS which are alternate angles. Hence QR is parallel to ST	Proof	5	B1 for PS = PT or PQ = PR B1 for equal tangents from a point B1 for angle PST = angle PTS = $\frac{180-x}{2}$ or angle PQR = angle PRQ = $\frac{180-x}{2}$ C1 for base angles of isos triangle are equal or vertically opposite angles are equal **QWC: Working should be clearly laid out in a logical sequence, with calculations atributable** C1 for alternate angles implying parallel **QWC: Any technical language should be correct**
					Total for Question: 5 marks

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Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
12.		A = $3(x + 1)(2x + 7) – (x – 4)(x + 1)$ $= 3(2x^2 + 9x + 7) – (x^2 – 3x – 4)$ $= 5x^2 + 30x + 25$ Factorising gives $5(x + 1)(x + 5)$ **OR** Splitting shape A into rectangles, area to be added: e.g. $3(x + 1)(x + 11) + (x – 4)(2x + 2)$ $= 3(x^2 + 12x + 11) +$ $(2x^2 – 6x – 8)$ $= 5x^2 + 30x + 25$ Factorising gives $5(x + 1)(x + 5)$	5x + 5 by x + 5 or 5x + 25 by x + 1	6	M1 for attempting to subtract the area of small rectangle from area of large rectangle in A M1 for $3(x + 1)(2x + 7) – (x – 4)(x + 1)$ A1 for $3(2x^2 + 9x + 7)$ and $(x^2 – 3x – 4)$ A1 for $5x^2 + 30x + 25$ M1 for attempting to factorise "$5x^2 + 30x + 25$" to get dimensions of B A1 for $5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$ **OR** M1 for attempting to add the area of two (or more) rectangles that make up the shape A M1 for $3(x + 1)(x + 11) + (x – 4)(2x + 2)$ oe equivalent A1 for $3(x^2 + 12x + 11)$ and $(2x^2 – 6x – 8)$ A1 for $5x^2 + 30x + 25$ M1 for attempting to factorise "$5x^2 + 30x + 25$" to get dimensions of B A1 for $5x + 5$ by $x + 5$ or $5x + 25$ by $x + 1$
					Total for Question: 6 marks