AQA

GCSE
Methods in Mathematics
93652H: Higher Tier
Mark scheme

9365
June 2016

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. e.g. accept 0.5 as well as $\frac{1}{2}$
[*a, b*]	Accept values between *a* and *b* inclusive.
[a, b)	Accept values a ≤ value < b
3.14 …	Accept answers which begin 3.14 e.g. 3.14, 3.142, 3.1416
Q	Marks awarded for quality of written communication
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a candidate has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the candidate. In cases where there is no doubt that the answer has come from incorrect working then the candidate should be penalised.

Questions which ask candidates to show working

Instructions on marking will be given but usually marks are not awarded to candidates who show no working.

Questions which do not ask candidates to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Candidates often copy values from a question incorrectly. If the examiner thinks that the candidate has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the candidate intended it to be a decimal point.

Q	Answer	Mark	Comments
1	**Alternative method 1**		
	0.45 or 0.55	M1	oe
	158.4 or 352 × 0.45 or 352 × 0.55	M1dep	oe
	193.6	A1	Ignore any units or extra zeros Ignore rounding (correct or incorrect) after correct answer seen but do not allow any contradictory further work
	Alternative method 2		
	10% = 35.2 or any equivalent percentage and value	M1	oe
	A build up to 45% or 55% of their values as long as a correct combination shown	M1dep	oe
	193.6	A1	Ignore any units or extra zeros Ignore rounding (correct or incorrect) after correct answer seen but do not allow any contradictory further work

Q	Answer	Mark	Comments
	Additional Guidance		
1	35.2 140.8 5% = 35.2 ÷ 2 = 18.2 45% = 140.8 + 18.2 = 159 193		M1 M1dep A0
	35.2 140.8 17.6 35.2 + 140.8 + 17.6 = 193.6 158.4		M1 M1dep A0
	325 × 0.45 146.25 205.75	Misread	M1 M1dep A0
	352 × 0.45 = 158.4 352 – 158.4 = 194		M1, M1dep A1
	352 × 0.55 = 193.6 352 – 193.6 = 158.4		M1, M1dep A0
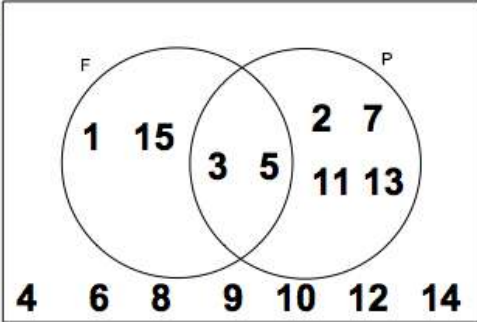
Q	Answer	Mark	Comments
2(a)	6.38(...) or 6,38(…) or 6.4 or 6,4 or $\dfrac{1040}{163}$	B1	Accept 6.38 followed by any digits **NB** Allow B1 if correct answer seen, followed by incorrect rounding or change of form, ie fraction to decimal Ignore any indication of recurrence, eg dots, lines, superscript r

| **2(b)** | 200 | B1 | |

| **2(c)** | 18.0 or 18,0 | B1 | Do not accept 18 or 18.00 or 18,00 |

| **3(a)** | $5(3x - 2y + 4)$
or $5 \times (3x - 2y + 4)$
$5(3x - 2y + 4$ | B1 | Allow a different order of terms inside brackets, eg $5(3x + 4 - 2y)$
Do not accept $(3x - 2y + 4) \times 5$
or $(3x - 2y + 4)5$ |

Q	Answer	Mark	Comments
3(b)	$7x - 3x$ or $4x$ or $-1 - 9$ or -10	M1	
	$4x = -10$	A1	oe
	-2.5 oe	A1ft	ft on one error if equation of form $4x = a$ where $a \neq \pm 1$ or ± 9 or $bx = -10$ where $b \neq 7$ or 3
	Additional Guidance		
	$4x = 8$ 2		M1, A0 A1ft
	$10x = -10$ -1		M1, A0 A1 ft
	$4x = 10$ 2.5		M1, A0 A1ft
	$4x = -8$ 2		M1, A0 A0ft
	$10x = -8$		M0

Q	Answer	Mark	Comments
4	*DBC* **and** *DCB* = 74 or *ADB* = 37	M1	Must be clearly stated or shown on diagram
	DBC **and** *DCB* = 74 **and** *ADB* = 37	M1dep	Must be clearly stated or shown on diagram
	States that sum of two opposite interior angles equals exterior angles or writes 37 + 37 = 74 **and** writes 2 angles same (oe) **or** shows or states that *ABD* = 106 **and** writes 2 angles same (oe) **or** shows or states that *ADC* = 69 **and** writes 2 angles same (oe)	Q1	strand (ii)
	Additional Guidance		
	Diagram with all angles correctly marked is M2		

Q	Answer	Mark	Comments
5(a)	(0, 3)	B1	

Q	Answer	Mark	Comments
5(b)	3.5 or 3,5 or (3.5, 10) or (3,5, 10) or (3.5, 0) or (3,5, 0)	B1	Allow any extra zeros, eg 3.50

Q	Answer	Mark	Comments
5(c)	No ticked and valid reason eg $2 \times 7.5 + 3 \neq 20$ 'When you put 7.5 in the equation the answer is not 20' $2x + 3 = 20 \Rightarrow x = 8.5$ $2 \times 7.5 + 3 = 18$	B1	Calculations must be correct eg $2x + 3 = 20 \Rightarrow x = 9.5$ is B0

Q	Answer	Mark	Comments
6	**Alternative method 1**		
	4×8 or 32	B1	Look for values on diagram
	$65 -$ their 32 or 33	M1	
	their $33 \times 2 \div$ their 12 or 5.5	M1dep	
	$8 -$ their 5.5	M1dep	
	2.5	A1	
	Alternative method 2		
	$8 - d$	M1	oe Look for values or expressions on diagram
	$4d + 10 \times (8 - d)$ oe	M1	$\dfrac{1}{2} \times 12 \times (8 - d)$ oe
	$4d + 80 - 10d = 65$ oe	M1dep	oe $\dfrac{1}{2} \times 12 \times (8 - d) = 33$ oe
	$6d = 15$	M1dep	oe
	2.5	A1	

Q	Answer	Mark	Comments
	Additional Guidance		
6	Line drawn vertically on diagram to create rectangle and triangle with 10 marked as base of triangle 4 × 8 = 36 65 – 36 = 29 29 × 2 ÷ 10 = 5.8 8 – 5.8 2.2	B1 M1 M1dep M1dep A0	
	4 × 8 = 32 65 – 32 = 33 33 × 2 ÷ 16 = 4.125 8 – 4.125 3.875	B1 M1 M0dep M0dep A0	

| 7 | | B2 | B1 Any two sections correct |

Q	Answer	Mark	Comments	
8	Area circle = $\pi \times 10^2$ or 100π or [314, 314.2]	M1		
	Square root of their circle area or 17.7….	M1dep		
	17.7	A1	SC2 8.9 from using 5 as radius SC1 any value square rooted and rounded correctly to 1 dp	
	Additional Guidance			
	$\pi \times 20$ $\sqrt{20\rho}$ 7.9		Must see square root	SC1

Q	Answer	Mark	Comments
9	List of at least 3 correct multiples of 21 and at least 3 correct multiples of 24 or 3×7 or $2 \times 2 \times 2 \times 3$	M1	Ignore any incorrect multiples Prime factors can be seen in a 'tree' oe eg $21 \div 7 = 3$
	168 or $2 \times 2 \times 2 \times 3 \times 7$ or $2^3 \times 3 \times 7$	A1	SC1 336 or 504

Q	Answer	Mark	Comments
10	Sets up a correct equation eg $6(x - 12) = 3(x + 4)$ $6x - 72 = 3x + 12$ $6x - 72 + 3x = 180$ $3(x + 4) + 3x = 180$ $6x - 72 + 3x + 12 + 3x + 3x = 360$	M1	Brackets do not need to be expanded for M1 but if they are allow one error
	Rearranges to get letter terms on one side and number terms on other or collects letter or number terms	M1dep	Allow one error if no previous error (sign, arithmetic, expansion or rearrangement)
	$2x = 56$ $9x = 252$ $6x = 168$ $15x = 420$	A1	
	28	A1ft	ft their equation if both Ms awarded and at most one error

Additional Guidance

$6x - 72 = 3x + 12$ $9x = 84$ $9.333…$	M1, M1dep, A0 A1 ft
$3x + 12 + 3x = 180$ $9x = 192$ 21.33	M1, M0dep, A0 A0 ft
$6(x - 12) + 3x = 180$ $9x = 108$ 12	M1 M1dep, A0 A1ft
$6x - 72 + 3x + 12 + 3x + 3x = 180$ $15x = 240$ 16	M0 M0dep, A0 A0ft

Q	Answer	Mark	Comments
11	816 ÷ their (2 × 2 × 4) 816 ÷ their (2 × 4 × 6) or 816 ÷ their (4 × 4 × 6) or 816 ÷ their 192 (from stack of 4)	M1	16, 32, 48, 64, 80 (at least 4 values) or 48, 96, 144, 192, 240, (at least 4 values) or 96, 192, 288, 384 (at least 4 values)
	51 or 17 or 8.5 or 8 layers or 4.25 (stack of 4)	A1ft	ft their value in (a) Continues series to at least 816
	(51 – 3) ÷ 2 or 8 × 3 or 8.5 × 3 or 4.25 × 6 or 25.5 after 8.5 or 4.25 seen	M1dep	oe
	24	A1	

Q	Answer	Mark	Comments
12	$2x + 1 + 6x = 3$ or $\dfrac{2x + 1 + 6x}{3} = 1$	M1	$2x + 1 + 2x = 3$ or $2x + 1 + 6x = 1$ oe eg $4x + 2 + 12x = 6$
	$8x + 1 = 3$	A1	oe
	0.25	A1ft	ft on their $8x + 1 = 3$ but only from wrongly simplifying $2x + 1 + 6x = 3$ and no further errors

	Additional Guidance	
$2x + 1 + 6x = 3$ $8x = 4$ 0.5		M1 A0 A1 ft
$2x + 1 + 2x = 3$ $4x = 2$ 0.5		M1 A0 A0ft
$6x + 3 + 2x = 1$ $8x = –2$ – 0.25		M0 A0 A0ft

Q	Answer	Mark	Comments
13	$6 \div 2$ or 3 or – 3 or $20n + b = 40$ and $22n + b = 34$	B1	
	$-3n$ or $3n$ seen or $-2n = 6$ or $2n = -6$	M1	
	$-3 \times 20 + k = 40$ or $-3 \times 22 + k = 34$ or $3 \times 20 + k = 40$ or $3 \times 22 + k = 34$	M1dep	
	$-3n + 100$ or $100 - 3n$	A1	oe eg $-4n + (100 + n)$ $3n - 20$ or $3n - 32$ implies B1, M1, M1dep

Q	Answer	Mark	Comments
	Alternative method 1		
	$AD = 2$	B1	May be on diagram
	tan used with their 2 and 4	M1	
	tan ABD = their 2 ÷ 4	M1dep	oe
	[26.5, 27]	A1ft	27 with working ft their 2 if both Ms awarded
	Alternative method 2		
	$AD = 2$	B1	May be on diagram
14	Uses Pythagoras to work out AB [4.47, 4.5] if correct **and** uses a trigonometric ratio other than tangent with their 2 and AB **or** uses sine rule with their 2, AB, angle ABD and 90°	M2	Must be a complete method
	[26.5, 27]	A1ft	27 with working ft their 2 if both M2 awarded but must be accurate to 3sf
	Alternative method 3		
	$AD = 2$	B1	May be on diagram
	Uses Pythagoras to work out AB [4.47, 4.5] if correct **and** $\cos x = \dfrac{\text{their } AB^2 + 4^2 - \text{their } 2^2}{2 \times \text{their } AB \times 4}$	M2	Must be a complete method
	[26.5, 27]	A1ft	27 with working ft their 2 if both M2 awarded but must be accurate to 3sf

Q	Answer	Mark	Comments
15(a)	**Alternative method 1**		
	$\dfrac{\sin x}{11} = \dfrac{\sin 43}{9}$	M1	oe
	$\sin x = \dfrac{11 \times \sin 43}{9}$ or 0.83..	A1	
	[56, 56.5]	A1	
	Alternative method 2		
	Shows the perpendicular from top vertex to base and calculates $h = 11 \times \sin 43 \ (= 7.50…)$	M1	Must show perpendicular
	$\sin x = \dfrac{\text{their } 7.5}{9}$ or 0.83…..	A1	
	[56, 56.5]	A1	

Q	Answer	Mark	Comments
15(b)	$(y^2 =) \ 8^2 + 9^2 - 2 \times 8 \times 9 \times \cos 105$	M1	oe
	[182, 182.3]	A1	
	[13.49, 13.502]	A1	
	Additional Guidance		
	$y^2 = 8^2 + 9^2 - 2 \times 8 \times 9 \times \cos 105$ –0.258… 0.508..	M1 A0 A0	

Q	Answer	Mark	Comments
16(a)	38	B1	Could be on diagram
	Alternate segment Tangent–chord theorem The angle between a tangent and a chord meeting the tangent at the point of contact is equal to the inscribed angle on opposite side of the chord.	B1	

Q	Answer	Mark	Comments
16(b)	*PAO* or *PBO* = 90 stated or implied	B1	oe
	360 – (90 + 90 + 80) or 180 – 80 if at least one right angle shown or stated.	M1	
	100	A1	

Q	Answer	Mark	Comments
16(c)	their answer for (b) ÷ 2	B1ft	ft their (b) ÷ 2

Q	Answer	Mark	Comments
17(a)	$7.5^2 + 10^2 = 156.25$ **and** $12.5^2 = 156.25$ or $7.5^2 + 10^2 = 156.25$ **and** $\sqrt{156.25} = 12.5$ or $12.5^2 - 10^2 = 56.25$ **and** $7.5^2 = 56.25$ or $12.5^2 - 10^2 = 56.25$ **and** $\sqrt{56.25} = 7.5$ or $12.5^2 - 7.5^2 = 100$ **and** $10^2 = 100$ or $12.5^2 - 7.5^2 = 100$ **and** $\sqrt{100} = 10$ or $\dfrac{7.5^2 + 10^2 - 12.5^2}{2 \times 7.5 \times 10}$	B1	
	The values obey Pythagoras theorem or $\cos 90 = 0$	Q1	Strand (i) Q0 without some calculation to back it up

Additional Guidance

$7.5^2 + 10^2 = 156.25$ **and** $12.5^2 = 156.25$ so it is right angled		B1 Q0
Use Pythagoras $7.5^2 + 10^2 = 12.5^2$ ✓		Q1 B0
It's Pythagoras theorem		Q0
$7.5^2 + 10^2 = 156.25$ $\sqrt{156.25} = 12.5$, so it is right angled		B1 Q0
$7.5^2 + 10^2 = 12.5^2$ so it is right angled		B0 Q0
$7.5^2 + 10^2 = 12.5^2$ so Pigoras	Allow poor spelling as long as meaning is clear.	B0 Q1

Q	Answer	Mark	Comments
17(b)	**Alternative method 1**		
	(X-sectional area =) 1200 ÷ 16 = 75	B1	
	Base BC = 75 $\times$ 2 ÷ 10 or 15	B1	
	XC = 7.5 (from Pythagoras)	B1	
	BX = 7.5 so X is midpoint	Q1	Strand (ii). Clear explanation why X is midpoint using lengths
	Alternative method 2		
	XC = 7.5	B1	
	$\dfrac{1}{2} \times 7.5 \times 10 \times 16$	B1	
	Volume half prism = 600	B1	
	2 $\times$ 600 = 1200 so X must be midpoint of BC	Q1	
	Alternative method 3		
	(X-sectional area =) 1200 ÷ 16 = 75	B1	
	XC = 7.5 (from Pythagoras)	B1	
	Area AXC = $\dfrac{1}{2} \times 7.5 \times 10 = 37.5$	B1	
	$37.5 = \dfrac{1}{2} \times 75$ so $BX = CX$	Q1	Strand (ii). Clear explanation why X is midpoint using areas
	Alternative method 4		
	$BX = XC = 7.5$	B1	
	$\dfrac{1}{2} \times 15 \times 10$	B1	
	Area triangle = 75	B1	
	75 $\times$ 16 = 1200	Q0	Strand (ii). Result is assumed

Q	Answer	Mark	Comments
	Additional Guidance		

	XC = 7.5	B1	
	Volume = $\frac{1}{2}$ × 7.5 X 10 × 16 = 600	B1, B1	
	600 = $\frac{1}{2}$ × 1200 so $BX = CX$	Q1	

Q		Mark	Comments
18	$r = \sqrt{121}$ or 11	M1	
	$\frac{1}{2}$ × $\frac{4}{3}$ × π × (their 11)³	M1dep	oe Halving may be seen after calculating volume of whole sphere (5575.28)
	[2786, 2788]	A1	$\frac{2662}{3}p$

Q		Mark	Comments
19	$(2x - 5)(2x + 5)$	B1	
	$(ax \pm c)(bx \pm d)$	M1	$ab = 6$, $cd = \pm35$
	$(2x - 5)(3x + 7)$	A1	
	$\frac{2x + 5}{3x + 7}$	A1ft	ft their factorisations if B1, M1 awarded or $4x^2 - 25 = (2x - 5)(2x - 5)$ and M1 awarded and cancelling possible Do not award if further contradictory work

Q	Answer	Mark	Comments
	Additional Guidance		
	$(2x - 5)(2x - 5)$ $(2x - 5)(3x + 7)$ $\dfrac{2x - 5}{3x + 7}$		B0 M1 A1 A1ft
	$(2x - 5)(2x + 5)$ $(2x + 5)(3x - 7)$ $\dfrac{2x - 5}{3x - 7}$		B1 M1 A0 A1ft
19	$(2x - 5)(2x - 5)$ $(2x + 5)(3x - 7)$ $\dfrac{\left(2x - 5\right)\left(2x - 5\right)}{\left(2x + 5\right)\left(3x - 7\right)}$		B0 M1 A0 A0ft
	$(2x - 5)(2x + 5)$ $(2x - 5)(3x + 7)$ $\dfrac{2x + 5}{3x + 7} = 1$ $2x + 5 = 3x + 7$ $x = -2$	Non contradictory work	B1 M1 A1 A1
	$(2x - 5)(2x + 5)$ $(2x - 5)(3x + 7)$ $\dfrac{2x + 5}{3x + 7} = -x - 2$	Contradictory work	B1 M1 A1 A0

Q	Answer	Mark	Comments
	Alternative method 1		
	$\dfrac{-9 \pm \sqrt{(9)^2 - 4(1)(-3)}}{2(1)}$	M1	Allow one error from: wrong sign for b, wrong sign for $-4ac$. Do not allow wrong formula or short divisor unless recovered
	$\dfrac{-9 \pm \sqrt{93}}{2}$	A1	
	0.32 and –9.32	A1ft	ft on wrong sign for b (9.32 and –0.32) or wrong sign for $-4ac$ (–0.35 and –8.65)
	Alternative method 2		
20	$(x + 4.5)^2 - 20.25$	M1	
	$x + 4.5 = \pm \sqrt{23.25}$	A1	
	0.32 and –9.32	A1ft	ft on wrong sign for $(x - 4.5)^2 - 20.25$ (9.32 and –0.32) or +3 for –3 (–0.35 and –8.65) SC2 for 0.32 from $x + 4.5 = \sqrt{23.25}$
	Additional Guidance		
	$\dfrac{-9 \pm \sqrt{9^2 - 4(1)(-3)}}{2(1)}$ $\dfrac{-9 \pm \sqrt{69}}{2}$ –0.35 and –8.65	M1 A0 A1ft	

Q	Answer	Mark	Comments
21(a)	$£\dfrac{3}{5}\,x$	B1	

Q	Answer	Mark	Comments
21(b)	**Starts again or chooses $\dfrac{3}{5}x$ in (a)**		
	Alternative method 1		
	$\dfrac{5}{7}x = \dfrac{3}{5}x + 8$	M1	$\dfrac{2}{7}x = \dfrac{2}{5}x - 8$ oe
	$(\dfrac{5}{7} - \dfrac{3}{5})\, x = 8$	M1dep	$(\dfrac{2}{7} - \dfrac{2}{5})\, x = -8$ oe
	$\dfrac{4}{35}\, x = 8$	A1	oe
	70	A1	SC1 answer only or T&I used
	Alternative method 2		
	$\dfrac{2}{5}x - 8 : \dfrac{3}{5}x + 8 = 2 : 5$	M1	
	$\dfrac{\dfrac{2}{5}x - 8}{\dfrac{3}{5}x + 8} = \dfrac{2}{5}$	M1dep	
	$10x - 200 = 6x + 80$	A1	oe
	70	A1	SC1 answer only or T&I used
	Alternative method 3		
	$\dfrac{2}{5} \triangleright \dfrac{2}{7}$ and $\dfrac{14}{35} \triangleright \dfrac{10}{35}$	M1	$\dfrac{3}{5} \triangleright \dfrac{5}{7}$ and $\dfrac{21}{35} \triangleright \dfrac{25}{35}$
	(difference) $\dfrac{4}{35}$	M1dep	
	$\dfrac{4}{35}x = 8$	A1	oe
	70	A1	

Q	Answer	Mark	Comments
	Chooses $\dfrac{2}{3}x$ **in (a)**		
	Alternative method 1		
	$\dfrac{5}{7}x = \dfrac{2}{3}x + 8$	M1	$\dfrac{2}{7}x = \dfrac{1}{3}x - 8$
	$(\dfrac{5}{7} - \dfrac{2}{3})\,x = 8$	M1dep	$(\dfrac{2}{7} - \dfrac{1}{3})\,x = -8$
	$\dfrac{1}{21}x = 8$	A1	oe
	168	A1	SC1 answer only or T&I used
	Alternative method 2		
	$\dfrac{1}{3}x - 8 : \dfrac{2}{3}x + 8 = 2 : 5$	M1	
21(b)	$\dfrac{\frac{1}{3}x - 8}{\frac{2}{3}x + 8} = \dfrac{2}{5}$	M1dep	
	$5x - 120 = 4x + 48$	A1	oe
	168	A1	SC1 answer only or T&I used
	Alternative method 3		
	$\dfrac{2}{3} \triangleright \dfrac{5}{7}$ and $\dfrac{14}{21} \triangleright \dfrac{15}{21}$	M1	$\dfrac{1}{3} \triangleright \dfrac{2}{7}$ and $\dfrac{7}{21} \triangleright \dfrac{6}{21}$
	(difference) $\dfrac{1}{21}$	M1dep	
	$\dfrac{1}{21}x = 8$	A1	oe
	168	A1	

Q	Answer	Mark	Comments
21(b)	**Chooses $\dfrac{2}{5}x$ in (a)**		
	Alternative method 1		
	$\dfrac{5}{7}x = \dfrac{2}{5}x + 8$	M1	$\dfrac{2}{7}x = \dfrac{3}{5}x - 8$
	$(\dfrac{5}{7} - \dfrac{2}{5})\,x = 8$	M1dep	$(\dfrac{2}{7} - \dfrac{3}{5})\,x = -8$
	$\dfrac{11}{35}x = 8$	A1	oe
	$25\dfrac{5}{11}$ or 25 or 26	A1	SC1 answer only or T&I used
	Alternative method 2		
	$\dfrac{3}{5}x - 8 : \dfrac{2}{5}x + 8 = 2 : 5$	M1	
	$\dfrac{\dfrac{3}{5}x - 8}{\dfrac{2}{5}x + 8} = \dfrac{2}{5}$	M1dep	
	$15x - 200 = 4x + 80$	A1	oe
	$25\dfrac{5}{11}$ or 25 or 26	A1	SC1 answer only or T&I used
	Alternative method 3		
	$\dfrac{2}{5} \triangleright \dfrac{5}{7}$ and $\dfrac{14}{35} \triangleright \dfrac{25}{35}$	M1	$\dfrac{3}{5} \triangleright \dfrac{2}{7}$ and $\dfrac{21}{35} \triangleright \dfrac{10}{35}$
	(difference) $\dfrac{11}{35}$	M1dep	
	$\dfrac{11}{35}x = 8$	A1	oe

Q	Answer	Mark	Comments
21(b) Cont	$25\dfrac{5}{11}$ or 25 or 26	A1	SC1 answer only or T&I used

Q	Answer	Mark	Comments
	Chooses $\dfrac{5}{8}x$ in (a)		
	Alternative method 1		
	$\dfrac{5}{7}x = \dfrac{5}{8}x + 8$	M1	$\dfrac{2}{7}x = \dfrac{3}{8}x - 8$
	$(\dfrac{5}{7} - \dfrac{5}{8})\,x = 8$	M1dep	$(\dfrac{2}{7} - \dfrac{3}{8})\,x = -8$
	$\dfrac{5}{56}x = 8$	A1	oe
	$89\dfrac{3}{5}$ or 89 or 90	A1	SC1 answer only or T&I used
	Alternative method 2		
21(b)	$\dfrac{3}{8}x - 8 : \dfrac{5}{8}x + 8 = 2 : 5$	M1	
	$\dfrac{\dfrac{3}{8}x - 8}{\dfrac{5}{8}x + 8} = \dfrac{2}{5}$	M1dep	
	$15x - 320 = 10x + 128$	A1	oe
	$89\dfrac{3}{5}$ or 89 or 90	A1	SC1 answer only or T&I used
	Alternative method 3		
	$\dfrac{5}{8} \triangleright \dfrac{5}{7}$ and $\dfrac{35}{56} \triangleright \dfrac{40}{56}$	M1	$\dfrac{3}{8} \triangleright \dfrac{2}{7}$ and $\dfrac{21}{56} \triangleright \dfrac{16}{56}$
	(difference) $\dfrac{5}{56}$	M1dep	
	$\dfrac{5}{56}x = 8$	A1	oe
	$89\dfrac{3}{5}$ or 89 or 90	A1	SC1 answer only or T&I used