GCSE
MATHEMATICS
8300/3F

Foundation Tier Paper 3 Calculator

Mark scheme

November 2019

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19bG8300/3F/MS

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 Examiner.

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. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values $a \leq$ value $< b$
3.14 …	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
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 student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

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

Questions which do not ask students to show working

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

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student 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 student intended it to be a decimal point.

Question	Answer	Mark	Comments
1	circumference	B1	
2	$3 \times c \times d$	B1	
3	9 and 18	B1	
4	2500 grams	B1	
5(a)	$5\frac{7}{8}$	B1	
	Additional Guidance		
	$5\frac{7}{8}$ in working with 5.875 on answer line		B0
5(b)	0.476(…) or 0.477	B1	may be implied
	0.48	B1ft	only ft decimal seen with more than 2dp
	Additional Guidance		
	Do not accept answers in standard form		
	Answer 0.48		B1B1
	0.47 with no other decimal seen		B0B0
	2.098(…) and 2.10		B0B1ft

Question	Answer	Mark	Comments
6	Notes £10 £5 Coins 50p 50p 50p 5p	B2	either order for notes any order for coins units must be included for all values B1 correct answer with units not included for all values or two notes and four coins totalling [£16.50, £16.60] with correct units or another combination of notes and coins totalling £16.55 with correct units

Additional Guidance	
Any correct units (may be shown in working) eg 50p may be £0.50, £1 may be 100p, £5 may be 5 pounds Condone £0.50p, £0.05p Condone 10£ for 10 pounds	
Accept use of £1 £5 £10 notes Accept use of 1p 2p 5p 10p 20p 50p £1 £2 £5 coins	
Notes 10 5 Coins 50 50 50 5 (correct answer with missing units)	B1
Notes £10 £5 Coins 100p 50p 2p 2p (total £16.54)	B1
Notes £10 £5 Coins £1 50p 5p (total £16.55 but only three coins)	B1
Notes £10 £5 Coins £1 50p 2p 2p 1p (total £16.55 but five coins)	B1
Notes £5 £5 Coins £2 £2 £2 50p 5p (total £16.55 but five coins)	B1
Notes £5 £5 £5 Coins £1 50p 5p (total £16.55 but three notes and three coins)	B1
Incorrect answers may have missing units for the notes for B1 eg Notes 10 5 Coins £1 50p 2p 2p 1p (total £16.55 but five coins)	B1
Incorrect answers must have correct units for the coins for B1 eg Notes £10 £5 Coins 1 50 2 2 1 (missing units)	B0
Incorrect units eg do not allow 0.50p 0.05p 0.5p	B0
Do not allow £0.5 £0.2 £0.1	B0

Question	Answer	Mark	Comments
7	is greater than	B1	allow >
	is equal to	B1	allow =
	is equal to	B1	allow =
	is less than	B1	allow <
	Additional Guidance		
	Do not allow ⩾ or ⩽ or ≡		
	Do not allow contradictions eg < is greater than		
8	26 37 40 48 with no other numbers	B2	any order B1 all 4 correct with one other number or 3 correct with at most two other numbers
	Additional Guidance		
	Ignore repeated numbers		
	26 37 40 48 in working with 4 on answer line		B2
	Ignore numbers with a difference of 4 between their digits out of range for B1 eg 15 26 37 40 48 51		B1
9(a)	$p = m - 2$ or $p = -2 + m$	B1	
	Additional Guidance		
	$m - 2 = p$ or $-2 + m = p$		B1
	Answer without $p =$ or $= p$		B0
9(b)	$4x^2$	B1	
	Additional Guidance		

Question	Answer	Mark	Comments
10	(3, 1) marked on the grid or stated for *P*	B1	implied by (3, 5) or (3, –3)
	(3, 5) and (3, –3)	B2ft	ft 4 squares vertically above their (3, 1) and 4 squares vertically below their (3, 1) with *P* on the line *AB* but not at *A* or *B* B1ft (3, 5) or (3, –3) SC2 (3, 5) and (3, –3) correctly marked on grid SC1 (3, 5) or (3, –3) correctly marked on grid
	Additional Guidance		
	If more than one point marked on the line *AB* then *P* must be labelled or used to locate *C*		
	P (4, 1) Answers (4, 5) and (4, –3)		B0 B2ft
	P (4, 1) Answers (4, 5) and (4, 9)		B0 B1ft

Question	Answer	Mark	Comments
11(a)	5×60 or 300 or $60 \div 6$ or 10 or $\frac{5}{6}$ (hours) or 0.83(3…) (hours) or $\frac{50}{60}$ (hours) or $60 \div \frac{6}{5}$	M1	oe
	50	A1	
	Additional Guidance		
	$5 \times 60 \times 6$		M0
11(b)	✓ It is shorter than the answer to part (a) ☐ It is the same as the answer to part (a) ☐ It is longer than the answer to part (a)	B1	

Question	Answer	Mark	Comments
12	**Alternative method 1**		
	1.5 × 1000 or 1500	M1	oe
	their 1500 – 650 or 850	M1dep	oe eg 1000 – 650 + 500
	850 millilitres	A1	oe eg 850 ml
	Alternative method 2		
	650 ÷ 1000 or 0.65(0)	M1	oe
	1.5 – their 0.65(0) or 0.85(0)	M1dep	oe eg 1 – 0.65 + 0.5
	0.85(0) litres	A1	oe eg 0.85(0) l
	Alternative method 3		
	1.5 × 100 or 150 and 650 ÷ 10 or 65	M1	oe
	their 150 – their 65 or 85	M1dep	oe eg 100 – 65 + 50
	85 centilitres	A1	oe eg 85 cl
	Additional Guidance		
	Ignore incorrect conversion attempt if correct answer has been seen		
	850 on answer line with 850 ml in working		M1M1A1
	1.5 – 650 = 850 ml		M1M1A1
	1.5 – 650 = 0.85(0) l		M1M1A1
	1.5 – 650 = 850		M1M1A0
	1.5 – 650 = 0.85(0)		M1M1A0
	Condone incorrect spelling – mark intention		

Question	Answer	Mark	Comments
13	**Alternative method 1**		
	3.2(0) ÷ 5 or 0.64 or 0.29 × 3 or 0.87	M1	oe eg working in pence
	3.2(0) ÷ 5 × 12 + 0.29 × 3 or 7.68 + 0.87	M1dep	oe eg working in pence must be consistent units
	8.55	A1	condone £8.55p
	Alternative method 2		
	12 ÷ 5 or 2.4 or 5 ÷ 12 or 0.41(6…) or 0.417 or 0.42	M1	
	3.2(0) × their 2.4 + 0.29 × 3 or 3.2(0) ÷ their 0.41(6…) + 0.29 × 3	M1dep	oe eg working in pence must be consistent units
	8.55	A1	condone £8.55p
	Additional Guidance		
	Inconsistent units may be recovered in final answer		
	7.68 in working implies M1		

Question	Answer	Mark	Comments
14(a)	(2^{nd} term =) 20	B1	may be implied by 12
	(3^{rd} term =) 12	B1ft	ft $\frac{\text{their } 20+4}{2}$
	Additional Guidance		
	12 with no incorrect working		B1B1
	20 12 on answer line or in working with answer line blank		B1B1
	(20) 12 8 on answer line or in working with answer line blank		B1B0
	(20) 12 8 with 8 on answer line		B1B0
	Answer 8 without 20 or 12 seen		B0B0
14(b)	60 – 10 or 50	M1	
	150	A1	SC1 170 or 210 or 16.$\dot{6}$ oe
	Additional Guidance		
	60 – 10 or 50 scores M1 even if subsequent working is incorrect		
	Accept 16.66(…) or 16.67 for 16.$\dot{6}$		
	Embedded answer without 150 on answer line $\frac{150}{3}+10$ (= 60)		M1A0

Question	Answer	Mark	Comments
15	No and fully correct reason	B2	eg No and it is (£)10 (per day after the first day) or No and it is (£)10.8(0) per day for five days or No and it would be (£)70 for five days or No and you pay more for the first day B1 No and partially correct reason eg No and (£)10.8(0) or fully correct reason with no decision or incorrect decision eg it is (£)10 (per day after the first day)
	Additional Guidance		
	Equivalent values for (£)10.8(0) per day for five days (£)11.(00) per day for four days (£)11.33 per day for three days (£)12.(00) per day for two days		
	Equivalent values for (£)70 for five days (£)56 for four days (£)42 for three days (£)28 for two days		
	Do not ignore incorrect reasons with a correct reason for B2		
	Calculations must be correct for B2		
	Ignore irrelevant reasons with a correct reason		
	No, 24 – 14 = 10		B2
	No, as next would be 28		B2
	No and (C =) $10n + 4$		B2

Additional Guidance continues on next page

Question	Answer	Mark	Comments

15	Correct reason stated with decision yes	B1
	No, it is £28 (partially correct reason)	B1
	No, it is £12	B1
	No, 5 × 14 is not 54	B1
	States No with no reason	B0
	States No with incorrect reason	B0
	No, it does not go up by (£)14 per day	B0

16	☐ $x + 10$ is always positive ☐ $x + 10$ is always negative ☐ $x + 10$ cannot be zero ✓ $x + 10$ could be positive or negative or zero	B1	

Question	Answer	Mark	Comments
17(a)	1	B1	
	Additional Guidance		
	1 and frequency 9		B1
	1 and 9 times		B1
	1 and 9 or 1, 9		B0
17(b)	(0 × 5 and) 1 × 9 and 2 × 8 and 3 × 6 and 4 × 2 or (0 and) 9 and 16 and 18 and 8 or 51	M1	allow one error
	(0 + 9 + 16 + 18 + 8) ÷ 30 or 51 ÷ 30 or their 51 ÷ 30	M1dep	without working their 51 must be the correct sum of their products
	1.7	A1	oe
	Additional Guidance		
	1.7 seen with 2 on answer line		M1M1A1
	(5 + 9 + 16 + 18 + 8) ÷ 30		M1M1
	Products 5 9 16 18 8 and 55 ÷ 30		M1M0
	51 ÷ 5		M1M0
	0 + 9 + 16 + 18 + 8 ÷ 30 unless recovered		M1M0
	Correct products seen with 30 ÷ 5 or 30 ÷ 10		M0

Question	Answer	Mark	Comments
18(a)	20	B1	
	Additional Guidance		
18(b)	Horizontal line from (09.00, 20) to (10.00, 20)	B1	
	Straight line with a negative gradient from their (10.00, 20) to (11.30, 0)	B1ft	ft their (10.00, 20)
	Additional Guidance		
	Tolerance within one small square		
	Accept unruled line if intention for straight line is clear		
	Their (10.00, 20) can be (09.00, 20)		
	Their 10.00 cannot be earlier than 09.00		

Question	Answer	Mark	Comments
19	$4x + 12$ or $2(2x + 6)$ or $4(x + 3)$	B3	B2 correct expression for half the perimeter of T eg $x + 2 + x + 2 + (x + 2 – x)$ $x + 2 + x + 2 + 2$ $2(x + 2) + (x + 2 – x)$ $2(x + 2) + 2$ $2x + 4 + (x + 2 – x)$ $2x + 4 + 2$ $2x + 6$ $2(x + 3)$ or correct expression for the perimeter of T eg $x + 2 + x + 2 + x + 2 + x + 2 + 2(x + 2 – x)$ $x + 2 + x + 2 + x + 2 + x + 2 + 2 + 2$ $2(x + 2 + x + 2) + 2(x + 2 – x)$ $2(x + 2 + x + 2) + 2 \times 2$ $2(2x + 4) + 2(x + 2 – x)$ $2(2x + 4) + 2 \times 2$ $4x + 8 + 4$ B1 simplified correct expression for the longer side of T $2(x + 2)$ or $2x + 4$ seen or simplified correct expression for the two longer sides of T $4(x + 2)$ or $2(2x + 4)$ or $4x + 8$ seen SC1 $8x + 12$

Additional Guidance is on the next page

Question	Answer	Mark	Comments

	Additional Guidance	
19	Ignore further work with an incorrect attempt to factorise after $4x + 12$ eg $4x + 12$ and $2(2x + 12)$	B3
	Ignore further work with an incorrect attempt to expand after $2(2x + 6)$ or $4(x + 3)$ eg $2(2x + 6)$ and $4x + 6$	B3
	Do not ignore further work with an incorrect attempt to simplify after $4x + 12$ eg $4x + 12$ and $16x$	B2
	Ignore further work with an incorrect attempt to simplify after a correct B2 or B1 expression	
	Do not accept $2x + 4$ seen as part of $x^2 + 2x + 2x + 4$ for B1	B0

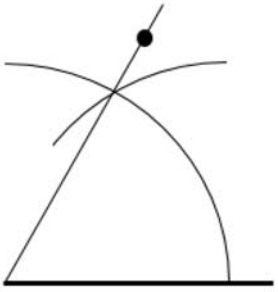
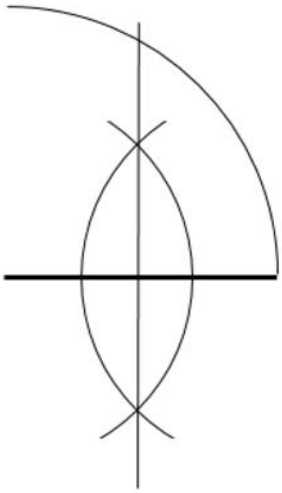
20	$a = 7b$	B1	

Question	Answer	Mark	Comments
21	Five different factors of 100 on the spinner	B1	1 2 4 5 10 20 25 50 100
	Exactly three single digit numbers on the spinner all of which are factors of 100	B1	1 2 4 5 allow repeats
	Exactly one multiple of 25 on the spinner	B1	
	Additional Guidance		
	A fully correct answer will consist of a spinner with three of 1 2 4 5 and exactly one of 25 50 100 and exactly one of 10 20		
	Spinner with 2 4 5 10 25		B1B1B1
	Spinner with 2 4 5 25 50		B1B1B0
	Spinner with 2 5 10 20 25		B1B0B1
	Spinner with 1 2 4 10 75		B0B1B1
	Spinner with 2 2 5 25 50		B0B1B0
	Spinner with 1 2 25 only		B0B0B1
	Spinner with 1 2 4 25 25		B0B1B0
	Spinner with 1 2 10 10 25		B0B0B1
	Spinner with 1 2 5 5 10		B0B0B0
	Spinner with 1 2 3 4 20		B0B0B0
	Spinner with 1 2 25 40 75		B0B0B0

Question	Answer	Mark	Comments
22	**Alternative method 1**		
	6 × 2 × 2 or 2 × 2 × 2 × 3 or 24 or 6 × 2 × 2 + 2 × 2 × 2 × 3 or 48	M1	oe volume of one layer oe volume of two layers
	336 ÷ their 24 or 14 or 336 ÷ their 48 or 7	M1dep	oe eg 336 ÷ 2 ÷ their 24
	21	A1	
	Alternative method 2		
	6 × 2 × 2 × 2 + 2 × 2 × 2 × 6 or 96	M1	oe volume of four layers
	336 ÷ their 96 or 3.5	M1dep	oe
	21	A1	
	Alternative method 3		
	336 ÷ 2 or 168	M1	oe total volume of all cubes
	their 168 ÷ (2 × 2 × 2) or their 168 ÷ 8	M1dep	oe
	21	A1	
	Alternative method 4		
	6 × 2 × 2 or 2 × 2 × 2 × 3 or 24 or 6 × 2 × 2 × 2 + 2 × 2 × 2 × 6 or 96	M1	oe volume of one layer oe volume of four layers
	(336 – their 96) ÷ their 24 + 4 or 240 ÷ their 24 + 4 or 10 + 4 or 14	M1dep	oe using volume of additional layers
	21	A1	
	Additional Guidance		
	24, 48 and 96 must not come from area or perimeter calculations		

Question	Answer	Mark	Comments
23(a)	3 × 18 or 54 or 2 × 18 + 14 or 50 or 18 + 3 × 14 or 60 or 4 × 14 or 56 or 1 – 0.25 or 0.75 seen	M1	oe
	3 × 18 × (1 – 0.25) or 3 × 18 × 0.75 or 40.5 or 18 × (1 – 0.25) or 18 × 0.75 or 13.5(0)	M1dep	oe
	40.50	A1	condone £40.50p
	Additional Guidance		
	40.5 on answer line		M1M1A0

Question	Answer	Mark	Comments
23(b)	Should have multiplied 15 by 6 or 90	B1	oe eg 15 × 6 accept $\frac{240 \times 600}{40 \times 40}$ or $\frac{144000}{1600}$
	Additional Guidance		
	Ignore irrelevant statements alongside a correct answer		
	15 × 6 seen but evaluated incorrectly		B1
	Should have multiplied not added		B1
	Should have multiplied at the end		B1
	Adding was wrong		B1
	He has added		B1
	Times the number for length and width		B1
	Times the length and width		B0
	Calculation at the end is wrong		B0
	Should have multiplied		B0
	Needs to work out the area		B0
	21 is wrong		B0
	Answer is wrong		B0

Question	Answer	Mark	Comments
24	Side of length [7.8, 8.2] cm drawn	B1	
	Correct construction with intersecting arcs, same radius as their base ± 2 mm to identify the third vertex or correct construction with intersecting arcs, equal radii ± 2 mm, line drawn at 60° and third vertex correctly positioned or correct construction with intersecting arcs, equal radii ± 2 mm and construction arc drawn to correctly identify the third vertex	M1	 or  or 
	Triangle with equal sides [7.8, 8.2], with correct construction seen	A1ft	ft B0M1 triangle with equal sides ± 2 mm, with correct construction seen
	Additional Guidance		
	No construction arcs drawn can score a maximum of B1		

Question	Answer	Mark	Comments
25(a)	$\frac{2}{5} \times 35$ or $\frac{3}{8} \times 48$	M1	oe
	14 or 18	A1	
	32	A1	
	Additional Guidance		
	Do not ignore further working after 32 seen		
	$\frac{32}{83}$ on answer line		M1A1A0
25(b)	**Alternative method 1**		
	35 + 48 – their 32 or 35 – their 14 + 48 – their 18 or 51	M1	oe their 32 from (a) their 14 and their 18 from (a)
	$\frac{51}{83}$ or 0.61(4…) or 61(.4…)%	A1ft	ft their 32 from (a)
	Alternative method 2		
	$\left(1-\frac{2}{5}\right) \times 35 + \left(1-\frac{3}{8}\right) \times 48$ or $\frac{3}{5} \times 35 + \frac{5}{8} \times 48$ or 21 + 30	M1	oe
	$\frac{51}{83}$ or 0.61(4…) or 61(.4…)%	A1	
	Additional Guidance		
	Ignore incorrect conversion if correct fraction seen		
	If their answer in part (a) is a fraction, only allow follow through if their numerator is used in part (b)		
	Alt 1 ft decimal or percentage answers accept rounding to at least 2 sf		
26	÷ 8	B1	

Question	Answer	Mark	Comments
27	**Alternative method 1**		
	$7x - 3x = 36 - 16$	M1	oe elimination of one variable implied by $4x = n$, where $n < 36$ and $n \neq 16$
	$4x = 20$ or $x = 5$	A1	oe
	$y = 0.5$	A1	oe
	Alternative method 2		
	$7 \times 2y - 3 \times 2y = 7 \times 16 - 3 \times 36$ or $14y - 6y = 112 - 108$	M1	oe elimination of one variable implied by $21x + 14y = 112$ and $21x + 6y = 108$ followed by $8y = n$, where $n < 112$ and $n \neq 36$, 16 or 20
	$8y = 4$ or $y = 0.5$	A1	oe
	$x = 5$	A1	
	Alternative method 3		
	$36 - 7x = 16 - 3x$ or $\frac{36-2y}{7} = \frac{16-2y}{3}$	M1	oe elimination of one variable
	$4x = 20$ or $x = 5$ or $8y = 4$ or $y = 0.5$	A1	oe collects terms oe
	$x = 5$ and $y = 0.5$	A1	oe
	Additional Guidance		
	$x = 5$ and $y = 0.5$		M1A1A1
	One correct value with one incorrect value (or no second value) and no working eg $x = 5$ and $y = 2$ or eg $x = 5$		M1A1A0
	Embedded, correct values in both equations eg $7 \times 5 + 2 \times 0.5 = 36$ and $3 \times 5 + 2 \times 0.5 = 16$		M1A1A0
	Embedded, correct values in one equation only eg $7 \times 5 + 2 \times 0.5 = 36$		M1A0A0

Question	Answer	Mark	Comments
28	**Alternative method 1**		
	$\frac{450}{65-35}$ or $\frac{450}{30}$ or 15	M1	oe
	(360 – 65 – 35) × their 15 or 260 × their 15	M1dep	oe M2 $\frac{260}{30}$ × 450 or 8.66(…) × 450 or 8.67 × 450
	3900	A1	
	Alternative method 2		
	$\frac{360}{65-35}$ × 450 or $\frac{360}{30}$ × 450 or 12 × 450 or 5400	M1	oe
	$\frac{360-65-35}{360}$ × their 5400 or $\frac{260}{360}$ × their 5400	M1dep	oe eg 0.72(…) × their 5400
	3900	A1	
	Additional Guidance		
	260 ÷ 30 = 8.6 and 8.6 × 450 fully correct working seen		M1M1A0

Question	Answer	Mark	Comments
29	**Alternative method 1**		
	280 ÷ 35 or 8	M1	oe eg 80 ÷ 10
	(350 – 280) ÷ (40 – 35) or 70 ÷ 5 or 14	M1	oe
	6	A1	
	Alternative method 2		
	320 or 350 – 320 or 30 or 350 – 280 and 320 – 280 or 70 and 40	M1	oe
	(350 – 320) ÷ 5 or (70 – 40) ÷ 5 or 30 ÷ 5	M1dep	oe
	6	A1	
	Additional Guidance		
	Do not allow a misread from the graph		
	Alt 2 40 must come from 320 – 280 and not 40 hours worked		

Question	Answer	Mark	Comments
30	8	B1	
	$\frac{1}{0.4}$ or $\frac{10}{4}$ or 2.5 or $\frac{1}{\frac{2}{5}}$ or $\frac{5}{2}$ or $2\frac{1}{2}$	M1	8 × 0.4 or 3.2 implies B1M1 16 : 5 or equivalent ratio implies B1M1
	3.2 : 1 or $\frac{16}{5}$: 1 or $3\frac{1}{5}$: 1	A1ft	ft B0M1
	Additional Guidance		
	8^3 = 512 or 8 × 8 × 8 = 512 alone is not sufficient for B1		
	ft answers must have n exact or correctly rounded to at least 2 sf eg $\sqrt{512}$ = 22.62 (incorrect and truncated) 2.5 9.05 : 1		B0 M1 A1ft
	ft answer exact surd value eg $\sqrt{512} = 16\sqrt{2}$ 2.5 9.05 : 1 or $\frac{32}{5}\sqrt{2}$: 1		B0 M1 A1ft

Question	Answer	Mark	Comments
31	**Alternative method 1**		
	cos 39 = $\frac{x}{20}$ or 20 × cos 39	M1	oe eg sin (90 – 39) = $\frac{x}{20}$ or sin 51 = $\frac{x}{20}$ or 20 × sin 51
	15.5(4…)	A1	allow 16 with M1 seen
	Alternative method 2		
	$20^2 – (20 \times \sin 39)^2$	M1	oe eg $20^2 – (20 \times \cos 51)^2$
	15.5(4…)	A1	allow 16 with M1 seen
	Additional Guidance		
	cos = $\frac{x}{20}$ unless recovered		M0
	20 × 0.78		M1
	20 × 0.78 with an answer of 16		M1A1
	20 × 0.78 with an answer of 15.6		M1A0
	20 × 0.77		M1
	20 × 0.77 with an answer of 16		M1A1
	20 × 0.77 with an answer of 15.4		M1A0
	cos (39 × 20 unless recovered		M0
	Answer from scale drawing with no trigonometry		M0A0