Pearson Edexcel

INTERNATIONAL GCSE

Mathematics A (9-1)

EXEMPLARS WITH EXAMINER COMMENTARIES

PAPER 1

Pearson Edexcel International GCSE in Mathematics A (4MA1)

Contents

Introduction

1.1 About this booklet

This booklet has been produced to support teachers delivering the Pearson Edexcel International GCSE in Mathematics 4MA1 specification. The Paper 1H exemplar materials will enable teachers to guide their students in the application of knowledge and skills required to successfully complete this course. The booklet looks at questions 1, 8, 9, 10, 11, 12b, 15, 16, 18 and 20 from the June 2019 examination series, showing real candidate responses to questions and how examiners applied the mark schemes, demonstrating how candidate responses should be marked.

1.2 How to use this booklet

Each example covered in this booklet contains:

- Question
- Mark scheme
- Exemplar responses for the selected question
- Example of the marker grading decision based on the mark scheme, accompanied by examiner commentary including the rationale for the decision and where relevant, guidance on how the answer can be improved to earn more marks.

The examples highlight the achievement of the assessment objectives at lower to higher levels of candidate responses.

Centres should use this content to support their internal assessment of students and incorporate examination skills into the delivery of the specification.

1.3 Further support

A range of materials is available from the Pearson qualifications website to support you in planning and delivering this specification.

Centres may find it beneficial to review this document in conjunction with the Examiner's Report and other assessment and support materials available on the Pearson Qualifications website.

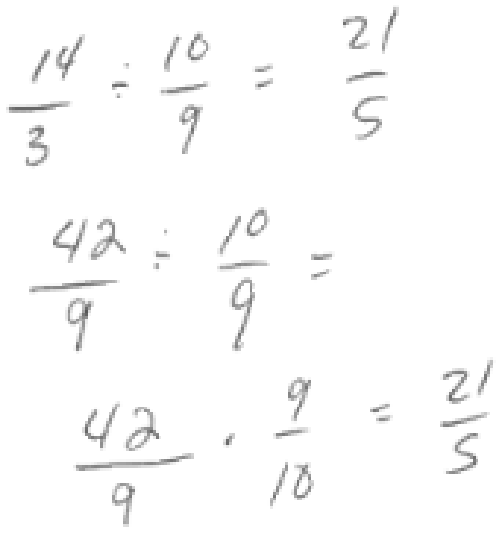
Question 1

1 Show that $4\frac{2}{3} \div 1\frac{1}{9} = 4\frac{1}{5}$

Mark scheme

1	e.g. $\frac{14}{3}$ **and** $\frac{10}{9}$			M1	Both fractions expressed as improper fractions
	e.g. $\frac{14}{3} \times \frac{9}{10}$ **or** $\frac{126}{30}$			M1	**or** for both fractions expressed as equivalent fractions with denominators that are a common multiple of 3 and 9 e.g. $\frac{42}{9} \div \frac{10}{9}$ **or** $\frac{126}{27} \div \frac{30}{27}$
	e.g. $\frac{14}{3} \times \frac{9}{10} = \frac{126}{30} = \frac{21}{5} = 4\frac{1}{5}$ **or** $\frac{14}{3} \times \frac{9}{10} = \frac{126}{30} = 4\frac{6}{30} = 4\frac{1}{5}$ **or** $\frac{\cancel{14}^{7}}{3^{1}} \times \frac{\cancel{9}^{3}}{\cancel{10}^{5}} = \frac{21}{5} = 4\frac{1}{5}$ **or** $\frac{126}{27} \div \frac{30}{27} = \frac{126}{30} = \frac{21}{5} = 4\frac{1}{5}$	**Shown**	3	A1	Dep on M2 for conclusion to $4\frac{1}{5}$ from correct working – either sight of the result of the multiplication e.g. $\frac{126}{30}$ must be seen or correct cancelling prior to the multiplication to $\frac{21}{5}$ NB: use of decimals scores no marks
					Total 3 marks

Exemplar response A



Examiner's comments

This response was given 2 marks.

We saw some very good responses for this question, but also some very poor ones and some candidates probably could have gained full marks but they omitted a stage. It is essential that candidates know that with a ***show that*** question on a calculator paper, they must show every stage of their working.

This candidate showed a correct first stage (M1), writing both fractions as improper fractions.

They then showed two options that could be awarded the second method mark – either writing both fractions over the same common denominator ($\frac{42}{9} \div \frac{10}{9}$) or inverting the second fraction and multiplying.

For use of the common denominators, the candidate then needed to show $\frac{42}{10} = \frac{21}{5}$ to gain the final mark.

For their other method, they either needed to show cancelling or the stage they would get to by multiplying the numerators and multiplying the denominators ($\frac{378}{90}$) and that this cancels to $\frac{21}{5}$

Awarded M1M1A0.

Exemplar response B

Examiner's comments:

This response was given 1 mark.

The candidate gained M1 for correctly writing both mixed numbers as improper fractions. Unfortunately, they then just stated that this was equal to $\frac{21}{5}$ with no suggestion how they got $\frac{21}{5}$ from the improper fractions. No more marks can be awarded.
Candidates need to show each stage of their working in any 'show that' question.

Awarded M1M0A0.

Question 8

8 On 1st January 2016 Li bought a boat for $170 000
The value of the boat depreciates by 8% per year.

Work out the value of the boat on 1st January 2019
Give your answer correct to the nearest dollar.

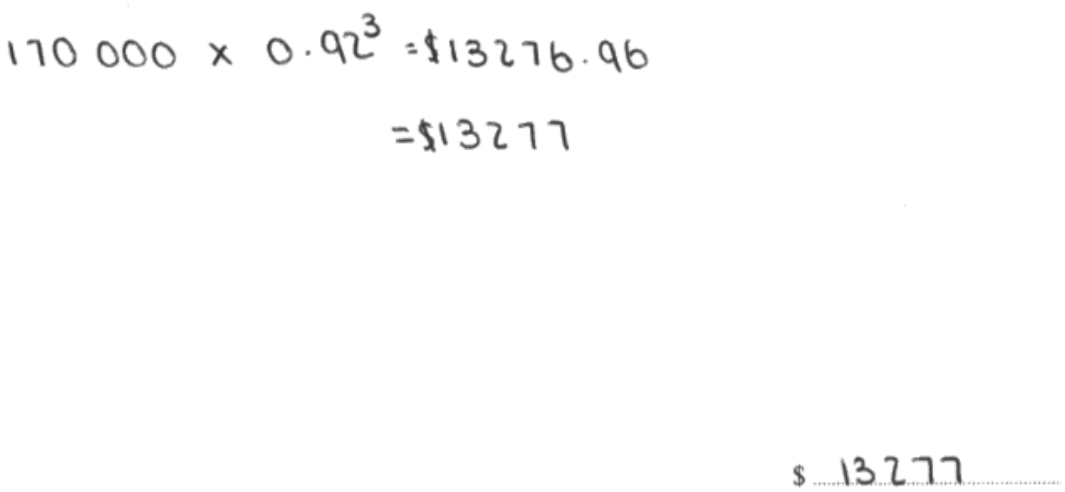
$ .....

(Total for Question 8 is 3 marks)

Mark scheme

8	0.08 × 170 000 (= 13 600) **or** 0.92 × 170 000 (=156 400)		3	M1	oe e.g. 170 000 ÷ 12.5	M2 for 170 000 × 0.92^3
	e.g. 0.92 × (0.92 × "156 400")			M1	(dep)for a complete method	
		132 377		A1	**or** 132 376.96	
					(SCB2 for 170 000 ×0.92^4) (= 121 786.(810)) (SCB1 for 170 000 × 0.24 (= 40 800) **or** 170 000 ×0.76 (=129 200) **or** 170 000 × 1.08 (= 183 600) **or** 170 000 × 1.08^3 (= 214 151) **or** an answer of 129 200 **or** an answer of 214 151 – 214 151.1(0))	
					Total 3 marks	

Exemplar response A



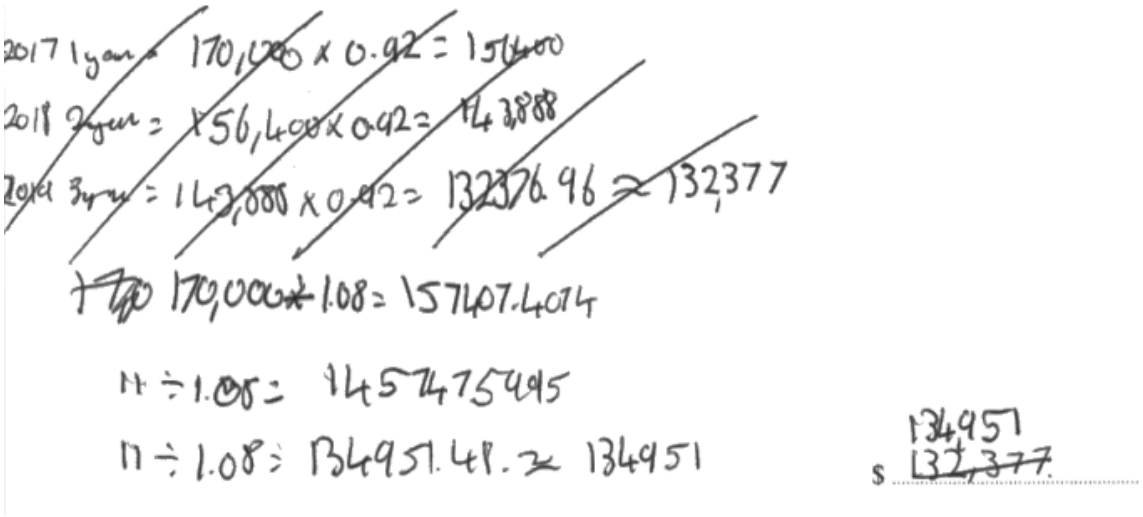
Examiner's comments:

This response was given 2 marks.

The candidate gained M2 for showing a fully correct method that would result in the correct answer if followed through correctly.
However, the answer was incorrect and should have been 132 377, not 13 277.
It seems likely that the candidate misread the answer from their calculator; it must be stressed to candidates that mistakes caused by forgetfulness such as here happen a lot and candidates must guard against it by checking carefully**.**

Awarded M2A0.

Exemplar response B



Examiner's comments:

This response was given 0 marks.

What a pity to see the correct answer crossed out and replaced by a response that is worth no marks. Candidates must ensure they really are incorrect before starting again.
We saw many candidates using 8% in the incorrect way and although some of the ways were able to gain a special case B1 or B2 mark, dividing by 1.08 was not one of these.

Awarded M0M0A0.

Question 9

9 The diagram shows a shape made from a right-angled triangle and a semicircle.

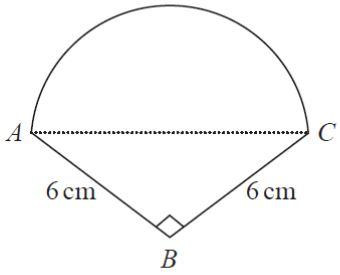


Diagram **NOT** accurately drawn

AC is the diameter of the semicircle.
$BA = BC = 6$ cm
Angle $ABC = 90°$

Work out the area of the shape.
Give your answer correct to 1 decimal place.

Mark scheme

9	**$0.5 \times 6 \times 6$ (=18)**		5	M1	For area of triangle, or may use $\frac{1}{2} \times 6 \times 6\sqrt{2}\sin 45$ **or** $\frac{1}{2} \times 6\sqrt{2} \times 3\sqrt{2}$ oe
	$(d^2 =)\ 6^2 + 6^2\ (= 72)$ or $\frac{AC}{(\sin 90)} = \frac{6}{\sin 45}$			M1	
	$\sqrt{6^2+6^2}\ (= \sqrt{72} = 6\sqrt{2}$ **$= 8.4(85\ldots)$ or 8.5 or** $AC = \frac{6(\sin 90)}{\sin 45} = 6\sqrt{2}$ **$= 8.4(85\ldots)$ or 8.5 oe**			M1	
	$0.5 \times \pi \times \left(\frac{"8.48.."}{2}\right)^2$ (= 9π or 28…)			M1	
		46.3		A1	for 46.2 – 46.3
					Total 5 marks

Exemplar response A

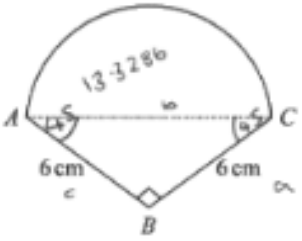


Diagram **NOT** accurately drawn

AC is the diameter of the semicircle.
$BA = BC = 6$cm
Angle $ABC = 90°$

Work out the area of the shape.
Give your answer correct to 1 decimal place.

πr^2

$a^2 + b^2 = c^2$

$AC = 8.48528$

M1

$\pi \times 4.24264^2 = 13.32864666$

$6^2 + 6^2 = 72$

$\sqrt{72} = 8.48528$

$\frac{8.48528}{2} = 4.24264$

$8 \times 6 = 48$

$\frac{48}{2} = 24$

$180 - 90^\circ = 90$

$\frac{90}{2} = 45$

$\frac{1}{2}ab\sin C$

$\frac{1}{2} \times 6 \times 8.48528 \sin 45 = 17.99999708$

$13.32864666 + 17.99999708 = 31.3286$

31.3 cm²

Examiner's comments:

This response was given 3 marks.

This candidate gained M1 for a correct method to find the area of the triangle.
The next M1 was awarded for a correct statement of Pythagoras' theorem to find the length AC – this would also have been awarded for a correct trigonometric statement for the length AC.
The third M1 was awarded for getting as far as $\sqrt{72}$ in the Pythagoras' theorem calculation.
No further marks were awarded, as the candidate found the area of a whole circle and not a semicircle.

Awarded M1M1M1M0A0.

Question 10

10 $A = 2^n \times 3 \times 5^m$

Write $8A$ as a product of powers of its prime factors.

Mark scheme

10	**(8 =) 2 × 2 × 2 or 2^3 or 2^{3+n}**		2	M1	For clearly writing 8 as a product of prime factors or as 2^3
		$2^{n+3} \times 3 \times 5^m$		A1	
					Total 2 marks

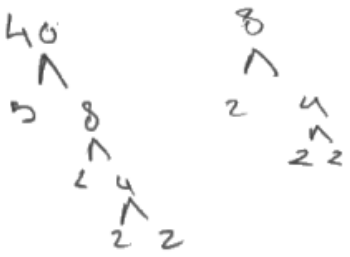
Exemplar response A

10 $A = 2^n \times 3 \times 5^m$

Write $8A$ as a product of powers of its prime factors.

$2^{3+n} \times (3 \times 8) \times 5^{3+n}$

$2^{3+n} \times 24 \times 5^{3+n}$



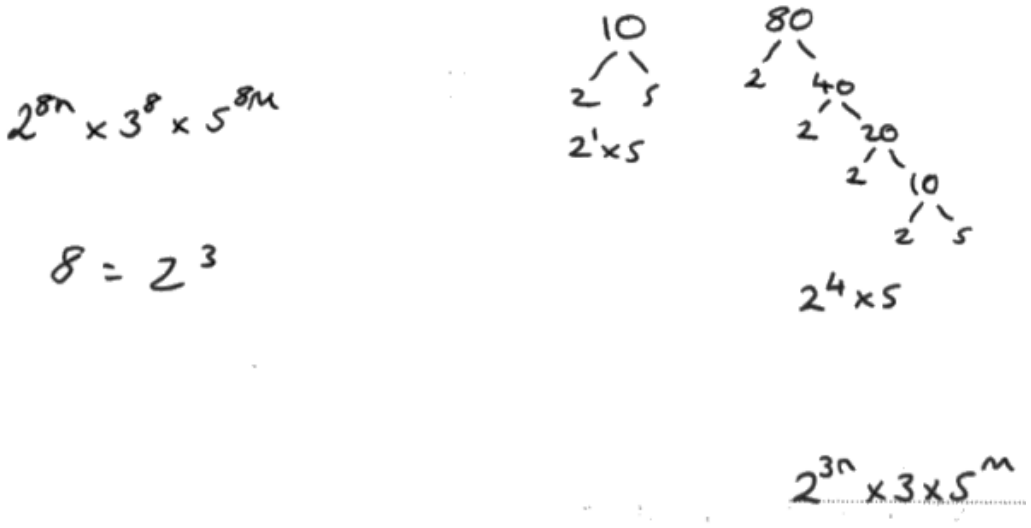
Examiner's comments:

This response was given 1 mark.

This question was very poorly answered and the modal mark was zero.
The candidate gained M1 for writing 8 as 2^3, as seen in the power of 2. Unfortunately, as was often the case, the candidate felt that they needed to multiply the other terms by 8, although the power of 5 showed a lack of understanding of 2^3

Awarded M1A0.

Exemplar response B



Examiner's comments:

This response was given 1 mark.

The candidate gained M1 for showing 8 can be written as 2^3

It is unfortunate that the candidate has put all the terms to the power of 8, rather than combining the powers of base 2 correctly.

Awarded M1A0.

Question 11

11 $C = b - a$

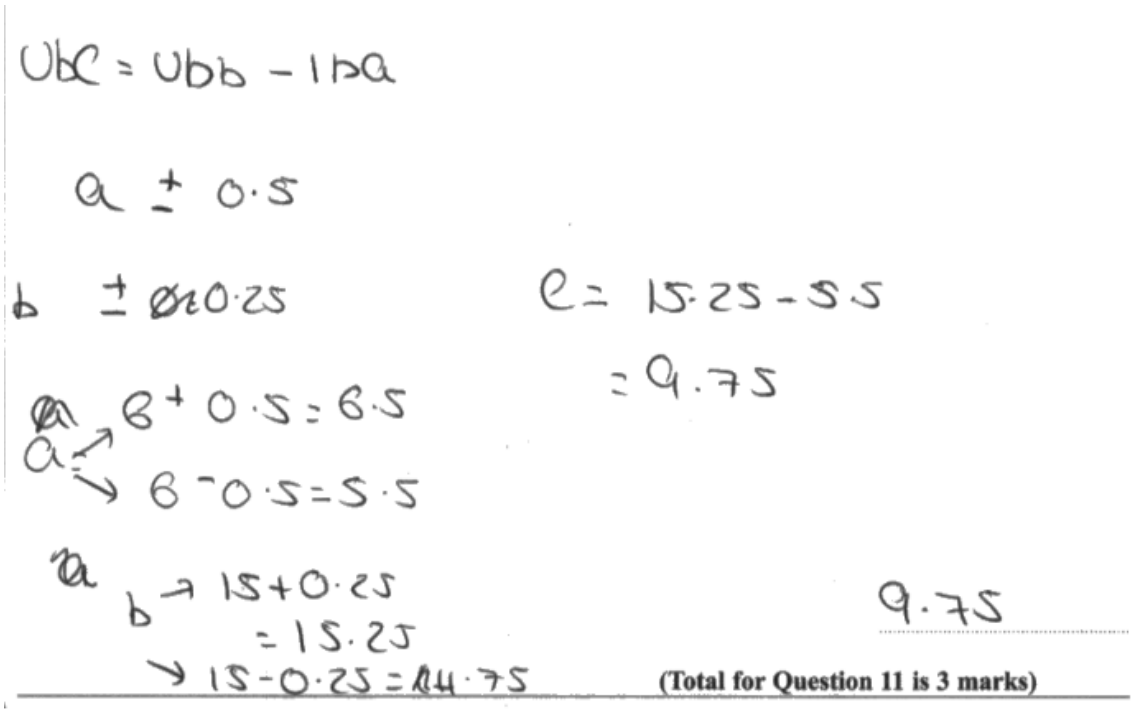
$a =$ 6 correct to the nearest integer
$b =$ 15 correct to the nearest 5

Work out the upper bound for the value of C
Show your working clearly.

Mark scheme

11	5.5 **or** 6.5 **or** 12.5 **or** 17.5		3	M1	Accept $6.\dot{4}9$ for 6.5 and $17.\dot{4}9$ for 17.5
	17.5 – 5.5			M1	for UB – LB where $15 < \text{UB} \leq 17.5$ and $5.5 \leq \text{LB} < 6$
		12		A1	dep on M2
					Total 3 marks

Exemplar response A



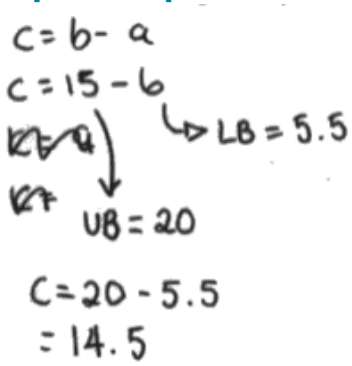
Examiner's comments:

This response was given 2 marks.

For candidates who knew something of upper and lower bounds, there was ample opportunity to gain marks for this question.
This candidate gained M1 for 5.5 or 6.5
They also gained the second M1 for using values that showed they knew they must subtract the lower bound of a from the upper bound of b.
They did not gain the final mark, as they did not use the fully correct values.

Awarded M1M1A1.

Exemplar response B



14.5

Examiner's comments:

This response was given 1 mark.

M1 was awarded for the value 5.5
No further marks were awarded as the candidate used 20 rather than the upper bound of 15 to the nearest 5
We also saw some candidates work out $b \quad -a$ with the given values and then try to find the upper bound of the answer – this is incorrect.

Awarded M1M0A0.

Question 12b

(b) Solve $\frac{4m + 9}{3} = 7 - 2m$

Show clear algebraic working.

Mark scheme

12b	$4m + 9 = 3(7 - 2m)$			M1	for removing fraction
	$4m + 9 = 21 - 6m$			M1	for correct expansion of bracket in a correct equation
	$4m + 6m = 21 - 9$ **or** $10m = 12$ **or** $-21 + 9 = -6m - 4m$ **or** $-10m = -12$			M1	for a correct equation with m terms isolated on one side ft their equation if first M1 awarded
		$\frac{12}{10}$ oe		A1	dep on at least M2 [SC: B2 for an answer of $m = 2$ with working shown (from $4m + 9 = 21 - 2m$ oe) **or** $m = -0.2$ oe with working shown (from $4m + 9 = 7 - 6m$ oe)]
	Alternative				
	$\frac{4}{3}m + 3 = 7 - 2m$		4	M1	Division of each term on LHS by 3
	$\frac{4}{3}m + 2m = 7 - 3$ oe			M1	for a correct equation with m terms isolated on one side ft their equation if first M1 awarded
	$10m = 3 \times 4$ oe			M1	For removing fraction in a fully correct equation
		$\frac{12}{10}$ oe		A1	dep on at least M2
					Total 4 marks

Exemplar response A

~~1.3m+~~

(÷3) $\frac{4m+9}{3} = 7-2m$

$1.3m + 3 = 7-2m$

$13m+2m = 7-3$

$3.3m = 4$

$m = 4/3.3$

$m = 1.21$

$m =$ 1.21

Examiner's comments:

This response was given 2 marks.

The candidate used the alternative method included in the mark scheme and divided the LHS by 3, although slightly inaccurately, by using 1.3 rather than $\frac{4}{3}$. We awarded M1 here.

The next M1 was also awarded for a 'correct' equation with the m terms isolated on one side – this was a ft mark if the first M1 was awarded.

The next M1 was not awarded, as the candidate did not correctly remove the fraction, since they used the coefficient of 1.3 rather than $\frac{4}{3}$. The answer was therefore inaccurate.

Awarded M1M1M0A0.

Exemplar response B

$4m + 9 = 3(7 - 2m)$

$4m + 9 = 21 - 2m$

$6m + 9 = 21$

$6m = 12$

$m = 2$

$m =$ 2

(4)

Examiner's comments:

This response was given 2 marks.

There was a sufficient number of candidates multiplying only one of the terms on the RHS by 3 that we made a special case in the mark scheme. As is the case here, some candidates even used brackets but still continued to multiply only one of the 7 or the $-2m$ by 3 (so we often saw $7 - 6m$ on the RHS). Candidates must be reminded to multiply the whole of the side or the contents of brackets by the numerator of the other side in an equation of this style.
This candidate gained special case marks of B2 for an answer of $m = 2$ from correct working shown for $4m + 9 = 21 - 2m$

Awarded B2M0A0.

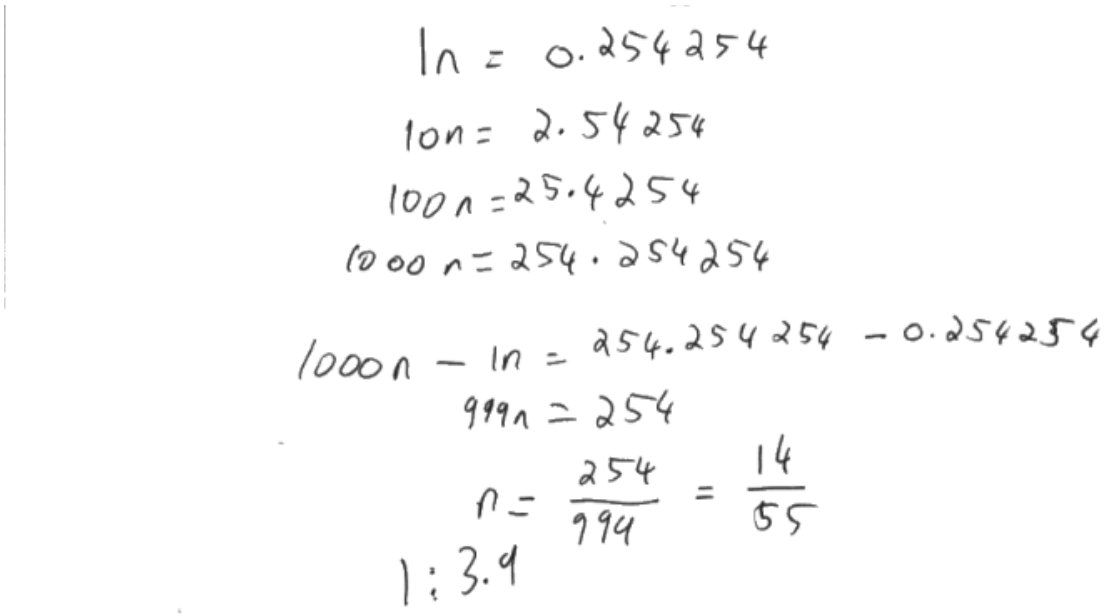
Question 15

15 Use algebra to show that the recurring decimal $0.2\dot{5}\dot{4} = \frac{14}{55}$

Mark scheme

15	$x = 0.25454\ldots$ $100x = 25.454\ldots$ $10x = 2.5454\ldots$ $1000x = 254.54\ldots$		2	M1	For 2 recurring decimals that when subtracted give a whole number or terminating decimal e.g. 25.2 or 252 etc. e.g. $100x = 25.454\ldots$ and $x = 0.25454\ldots$ **or** $1000x = 254.54\ldots$ and $10x = 2.545\ldots$ with intention to subtract. (if recurring dots not shown then showing at least the digits 25454, i.e. 5sf)
	e.g. $100x - x = 25.454\ldots - 0.254\ldots$ $= 25.2$ and $\frac{25.2}{99} = \frac{14}{55}$ or $1000x - 10x = 254.545\ldots - 2.545\ldots = 252$ and $\frac{252}{990} = \frac{14}{55}$	show		A1	for completion to $\frac{14}{55}$
					Total 2 marks

Exemplar response A



Examiner's comments:

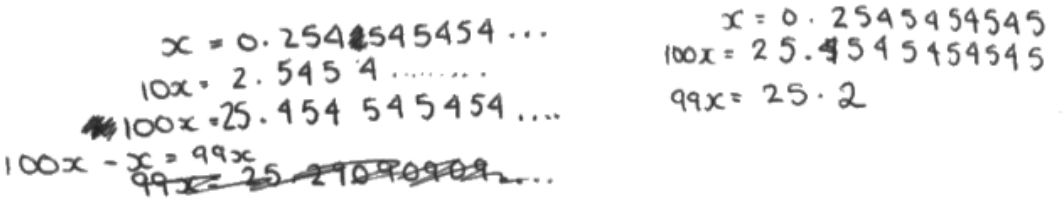
This response was given 0 marks.

The candidate demonstrated a common misunderstanding of the recurring dots over the number, thinking that all three of the digits 254 were recurring. Although the candidate has stated $\frac{254}{999} = \frac{14}{55}$, this is not correct as they have misinterpreted the recurring decimal to be 0.254254... as opposed to 0.25454...

Candidates need to fully understand the recurring dot terminology.

Awarded M0A0.

Exemplar response B



Examiner's comments:

This response was given 1 mark.

The candidate showed two recurring decimals that when subtracted give a terminating decimal, so gaining M1.
They subtracted x from $100x$ correctly but they did not continue to complete the ***show that*** $\frac{25.2}{99} = \frac{14}{55}$ as required in the question.
Candidates must complete their working in order to gain full marks.

Awarded M1A0.

Question 16

16 Here are the first five terms of an arithmetic sequence.

7 10 13 16 19

Find the sum of the first 100 terms of this sequence.

Mark scheme

16	$a = 7$ and $d = 3$ $\frac{100}{2}(2 \times 7 + (100 - 1) \times 3)$ **or** 100th term is $7 +$ $(100 - 1) \times 3$ $(= 304)$ **and** $100 \times (7 + \text{“}304\text{”}) \div 2$ **or** 100^{th} term is $3 \times 100 + 4$ $(= 304)$ **and** $100 \times (7 + \text{“}304\text{”}) \div 2$		2	M1	for a method to find the sum – brackets $(100 - 1)$ must be used correctly
		15 550		A1	
					Total 2 marks

Exemplar response A

Find the sum of the first 100 terms of this sequence.

$3n + 4$

$S_n = \frac{n}{2}[2a + (n-1)d$

$\frac{100}{2}[(2 \times 3) + 99 \times 4]$

20,100

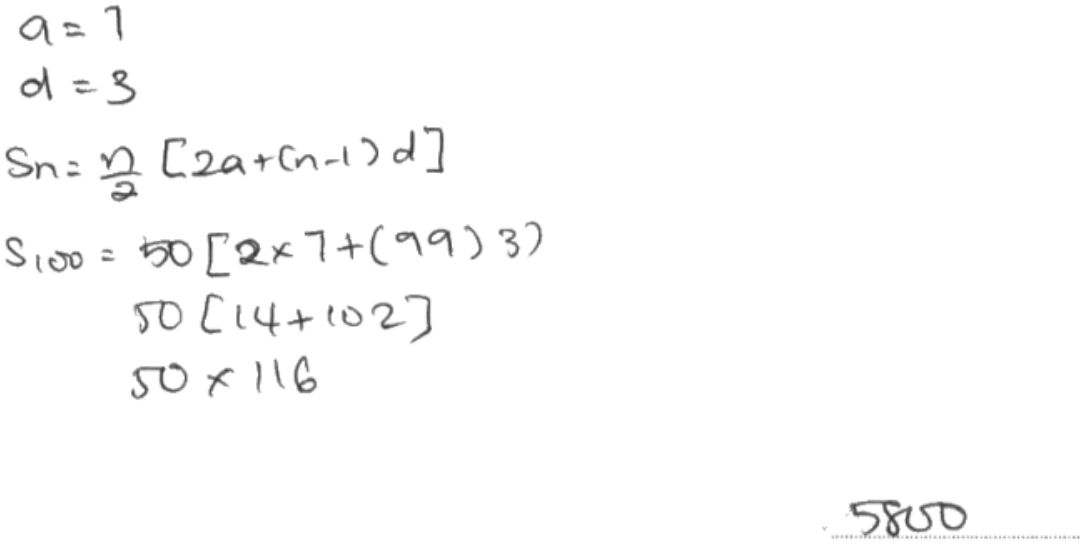
Examiner's comments:

This response was given 0 marks.

This candidate's response was similar to many that were seen.
Candidates frequently showed the correct expression for the nth term of the arithmetic sequence and then used the values of 3 and 4 from their expression in the formula for the total of the first 100 terms, using the 3 (coefficient of n) as their value of a and the 4 as the common difference; this showed a lack of understanding of the summation formula.
Candidates need to be able to understand each part of a formula and know how to use various formulae correctly.

Awarded M0A0.

Exemplar response B



Examiner's comments:

This response was given 1 mark.

The candidate clearly showed the correct values of a and d and was able to correctly substitute them into the formula for the sum of the sequence, so gaining M1. It was unfortunate that the candidate added 99 and 3 rather than multiplying them and therefore got an incorrect answer.
In any substitution question, some candidates tend to make this sort of mistake and it must be clear to them which mathematical operations are to be carried out.

Awarded M1A0.

Question 18

18 The diagram shows triangle PQR.

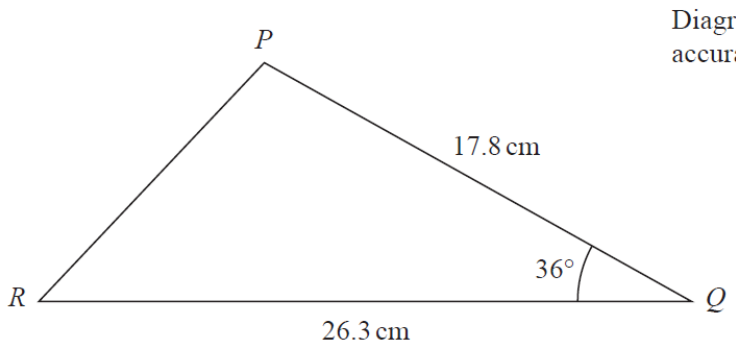


Diagram **NOT** accurately drawn

Calculate the length of PR.
Give your answer correct to 3 significant figures.

Mark scheme

18	$17.8^2 + 26.3^2 - 2 \times 17.8 \times 26.3 \times \cos 36$		3	M1	
	e.g. $1008.5\ldots - 757\ldots$. **or** $251(.06\ldots)$			M1	for correct order of operations
		15.8		A1	for ans in range 15.8 – 15.9
					Total 3 marks

Exemplar response A

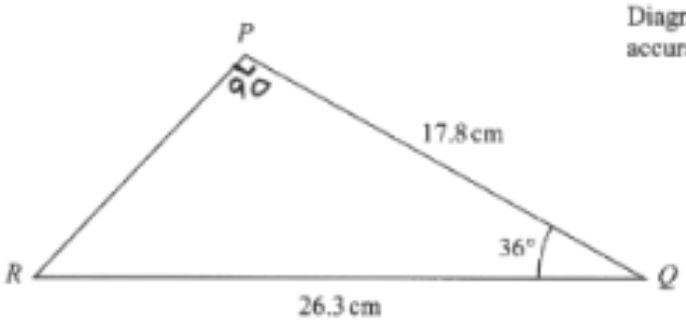


Diagram **NOT** accurately drawn

Calculate the length of *PR*.
Give your answer correct to 3 significant figures.

$\frac{26.3}{\sin 90}$

$\frac{26.3}{\sin 90} = \frac{x}{\sin 36}$ $\frac{a}{\sin A} = \frac{b}{\sin B}$

$\frac{26.3}{\sin 90} \times \sin 36 = 15.458752 14 = x$ 15.5 (3sf) cm

Examiner's comments:

This response was given 0 marks.

The candidate incorrectly believed the triangle was right-angled. Candidates will be given an indication of a right angle – usually by a symbol or written number, but sometimes by a statement. Here, no such notation or statement exists, so candidates must realise a right angle is not present in the triangle.
We saw several instances of candidates using Pythagoras' theorem or trigonometry as if the triangle was right angled; such responses gained no marks.

Awarded M0M0A0.

Exemplar response B

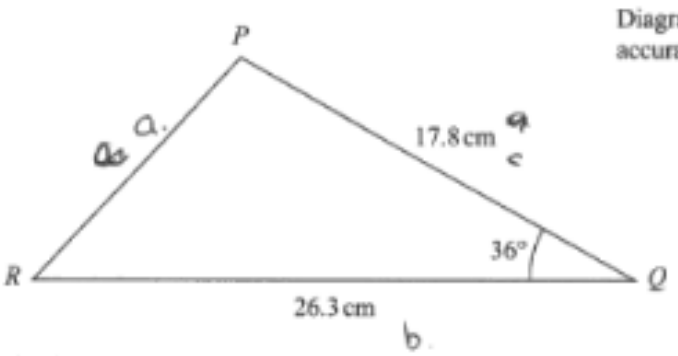


Diagram **NOT** accurately drawn

Calculate the length of *PR*.
Give your answer correct to 3 significant figures.

$a^2 = b^2 + c^2 - 2bc \cos A$

$a^2 = 26.3^2 + 17.8^2 - 2 \times 26.3 \times 17.8 \cos 36$

$a^2 = 1008.58 - 936 \cos 36$

$a^2 = 72.2 \cos A.36$

$72.2 \cos 36 = 58.4$

$a = \sqrt{58.4}$

$a^2 = 72.5 \cos 36$

$a^2 = \sqrt{58.7}$

$a = 7.6$

7.7 cm

(Total for Question 18 is 3 marks)

Examiner's comments:

This response was given 1 mark.

M1 was awarded for correctly substituting the values from the triangle into the cosine rule formula. The candidate then subtracted the terms and multiplied the answer by $\cos 36°$. In effect, they did the calculation $(26.3 + 17.82 - 2 \times 26.3 \times 17.8) \times \cos 36°$, which was incorrect. This is a common error and students must be shown that this is an incorrect execution of the cosine rule.

Awarded M1M0A0.

Question 20

20

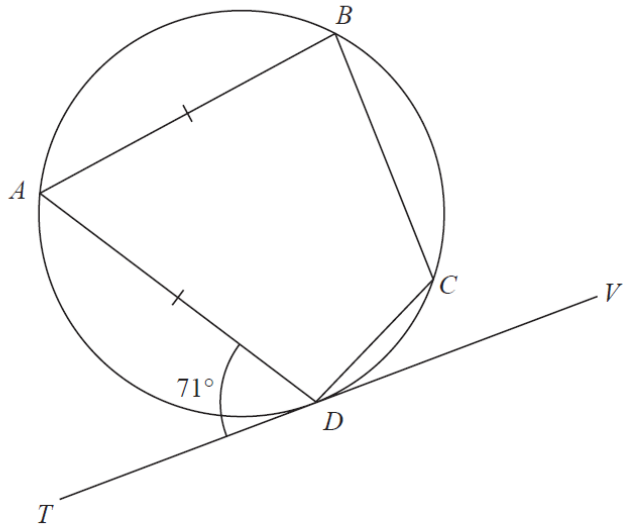


Diagram **NOT** accurately drawn

A, *B*, *C* and *D* are points on a circle.
TDV is the tangent to the circle at *D*.

AB = *AD*
Angle *ADT* = 71°

Work out the size of angle *BCD*.
Give a reason for each stage of your working.

Mark scheme

20	angle *ABD* = 71 **or** angle *ACD* = 71 **or** using *O* as centre of circle, angle *ADO* = 90 – 71 (= 19)		5	M1	clearly labelled or stated
	angle *ADB* = 71 **or** angle *ACB* = 71 **or** angle *BAD* = 19 × 2 (= 38) **or** reflex angle *BOD* = 2 × 142 \ (= 284)			M1	dep clearly labelled or stated
	angle *BCD* = 142	142		A1	Clearly labelled or stated, from no incorrect working for their method
				B2	dep on A1 for fully correct reasons for each stage of working, repeated if used more than once. e.g. alternate segment theorem, base angles in an isosceles triangle are equal, angles in a triangle sum to 180°, angle between tangent and radius(diameter) is 90° congruent triangles (equal triangles) oe opposite angles of a cyclic quadrilateral sum to 180° angles in the same segment angle at the centre is 2 × angle at

				circumference oe equal chords subtend equal angles at the circumference If not B2 then award B1 dep on M1 for any one correct circle theorem reason associated with angle(s) found
				Total 5 marks

Exemplar response A

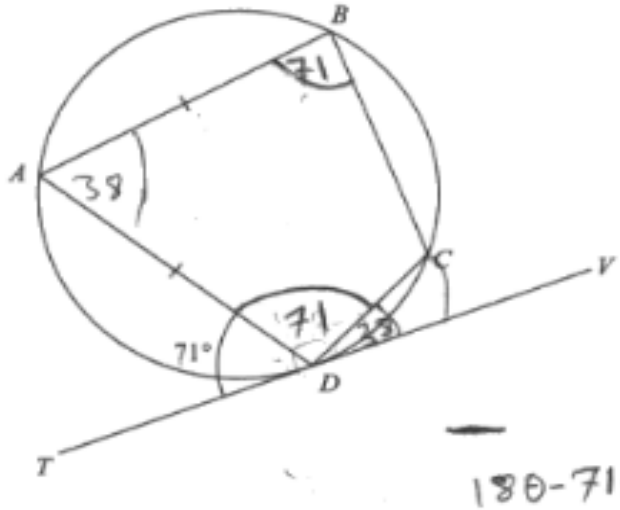


Diagram **NOT** accurately drawn

180-71=109

ABC = 71, because ADT is 71 because of the alternate segment theorem so they are the same

~~ADT~~ = ADC = ~~109~~ 71, ~~because~~ ~~Angles in cyclic~~ opposite ~~quadrilateral~~ add up to ~~180~~°

~~180-71=109~~ because B and D Angles in a cyclic ~~quadrilateral~~ are the same angle add upto 360 -> 360-(38+71+71)

=180

180

Examiner's comments:

This response was given 0 marks.

The candidate incorrectly understood the alternate segment theorem and did not appear to realise that a triangle would be needed at the circumference for this to be true.
We also saw many candidates believe that angle $BAD = 71°$ because of either alternate angles or alternate segment theorem. Candidates must understand that if angles and parallel lines are to be used, they will be told the lines are parallel or given suitable information that should tell them they are parallel.
In Higher level angle questions, candidates must be prepared to add additional lines to the diagrams to find missing angles – in this case, adding a line from B to D enabled the alternate segment theorem to be used. A hint could have been the equal sides $AB = AD$.

Awarded M0M0A0B0B0.

Exemplar response B

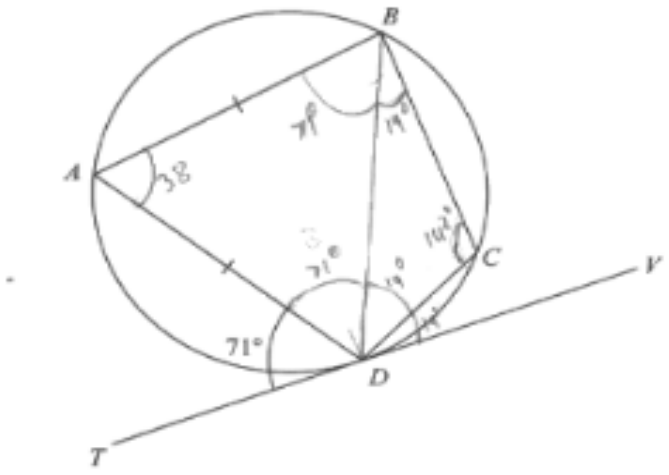


Diagram **NOT** accurately drawn

142

Examiner's comments:

This response was given 3 marks.

The candidate showed their angles on the diagram, which was perfectly acceptable. They correctly used circle theorems to find the angles of 71°, 38° and 142°.
Many candidates gave no reasons and therefore could not gain the B2 marks – they either did not know them or missed the sentence that told them to give a reason for each stage of their working. This candidate showed the ability to find the angles, so it was a shame they did not give the reason for each stage of their working – candidates need to be persuaded to learn angle reasons.

Awarded M1M1A1B0B0.

For information about Pearson Qualifications, including Pearson Edexcel, BTEC and LCCI qualifications visit qualifications.pearson.com

Pearson Education Limited. Registered in England and Wales No. 872828
Registered Office: 80 Strand, London WC2R 0RL

VAT Reg No GB 278 537121

Getty Images: Alex Belmonlinsky

Pearson
Edexcel