Pearson Edexcel

International GCSE Mathematics A

Exemplar Material for Paper 1 Foundation produced from the 2018 May/June Series

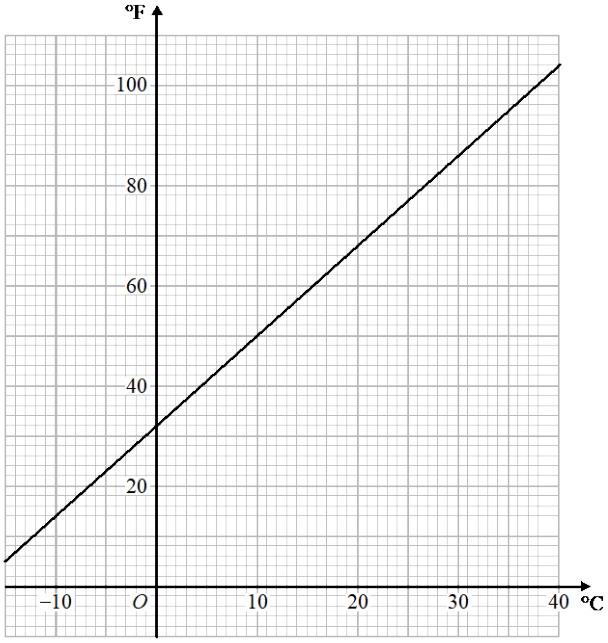
4MA1/01

Paper 1F (Calculator)

Exemplar Question 1

Foundation tier Paper 1 Question 9ab

You can use this graph to change between temperatures in degrees Celsius (°C) and temperatures in degrees Fahrenheit (°F).



The temperature in Dubai on Monday increased by 20 °C from midnight to midday.

(*a*) What is this temperature increase in degrees Fahrenheit?

..... °F

(2)

Maninder says,

"30 °C is the same as 86 °F, therefore 60 °C will be the same as 172 °F."

(*b*) Is Maninder correct?
Give a reason for your answer.

(1)

(Total for Question 9 is 3 marks)

Mean score: (a) 0.15/2 (b) 0.23/1

Examiner Comments

This question is within the context of AO1 Algebra. This question is not a straightforward one as students need to understand it is not a straight conversion that is required in part (a) but an increase of 20 degrees. In part (b) students need to consider whether the temperatures are in direct proportion and answer appropriately.

Mark Scheme

9	a	Two readings from graph 20°C apart eg. readings from 0°C (30 – 34 °F) and 20°C (66 – 70 °F)	36	2	M1 A1	 accept answer in range 34 – 38
	b		No with explanation	1	B1	e.g. graph does not go through (0,0) (accept 0) **or** temperatures in °F are not proportional to temperatures in °C **or** gives counter example that doubling does not work **or** 60°C is the same as 140°F (135 – 145) **or** 15°C is not 43°F

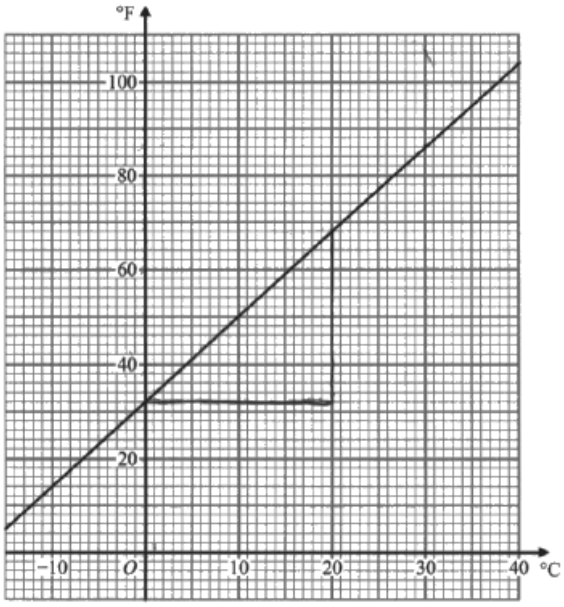
Examiner Comments

The majority of students misinterpreted the information in part (a) and gave the Fahrenheit equivalent of 20°C instead of the equivalent of a 20°C increase in temperature. However, correct answers were seen, albeit somewhat rarely. The method mark was awarded for two readings from the graph 20°C apart – which could be correct figures on the diagram. We allowed a range of values from 34 – 38.

Part (b) produced a mixture of responses, many agreeing (wrongly) that doubling a temperature in °C would mean a doubling in °F, some disagreeing but unable to express a reason for this and a good number able to indicate in some way that doubling doesn't work; this they sometimes did by producing a counter-example and a few by stating that the temperatures are not directly proportional.

Student Response A

9 You can use this graph to change between temperatures in degrees Celsius (°C) and temperatures in degrees Fahrenheit (°F).



The temperature in Dubai on Monday increased by 20 °C from midnight to midday.

(a) What is this temperature increase in degrees Fahrenheit? **2** Q09a

36 °F

(2)

Maninder says,

"30 °C is the same as 86 °F, therefore 60 °C will be the same as 172 °F."

(b) Is Maninder correct? **1** Q09b
Give a reason for your answer.

no, because 60°C would equal 140°F. Every increase of 10°C is an increase of 18°F therefore if 30°C = 86°F, 60°C = 140°F (1)

(Total for Question 9 is 3 marks) 3

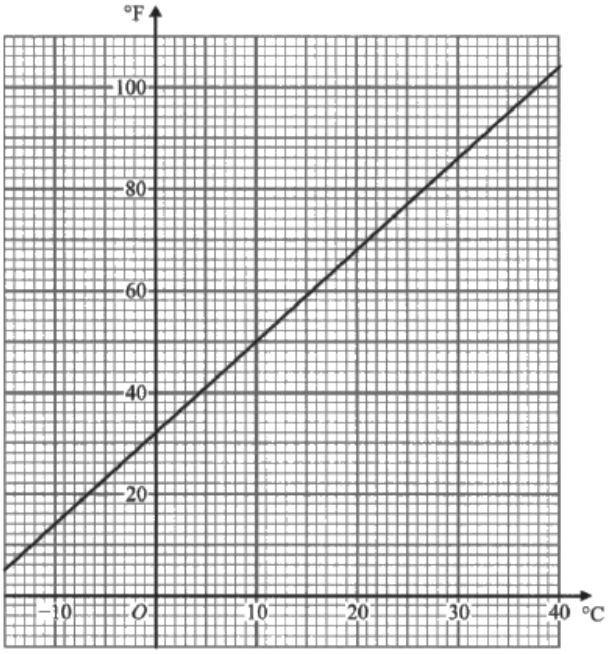
Examiner Comments:

This student shows a fully correct response for both parts of the question. The triangle on the diagram shows they understand what is required and they give a correct answer. It is wise to show an actual method, such as the values on the drawn diagram, just in case a small slip is made in the accuracy and then no marks would have been awarded; in this case the answer was correct.

(b) The given answer to part shows an understanding that Maninder is incorrect and why.

Student Response B

9 You can use this graph to change between temperatures in degrees Celsius (°C) and temperatures in degrees Fahrenheit (°F).



The temperature in Dubai on Monday increased by 20 °C from midnight to midday.

(a) What is this temperature increase in degrees Fahrenheit? 0 Q09a

68 °F

(2)

Maninder says,

"30 °C is the same as 86 °F, therefore 60 °C will be the same as 172 °F."

(b) Is Maninder correct? 1 Q09b
Give a reason for your answer.

Maninder is not correct. If 30°C is doubled 86°F will not be doubled.

(1)

(Total for Question 9 is 3 marks) 1

Examiner Comments

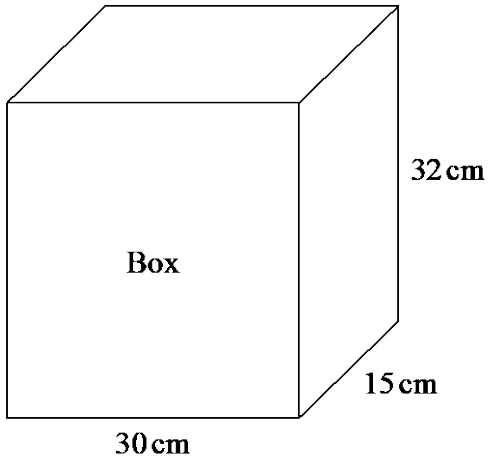
(a) This is the most common answer seen which is incorrect as the student just converts 20°C to a temperature in °F

(b) The mark was awarded for knowing that if one temperature is doubled the other is not and in addition stating that Maninder is not correct.

Exemplar Question 2

Foundation tier Paper 1 Question 11

11



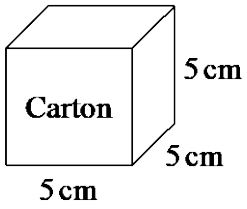


Diagram NOT accurately drawn

A wooden box measures 30 cm by 15 cm by 32 cm.
The box has a lid.

A carton measures 5 cm by 5 cm by 5 cm.

James has 110 cartons.
He wants to put all these cartons in the box and be able to shut the lid.

Can James put all 110 cartons in the box and shut the lid?
Show your working clearly.

Mean score: 0.84/3

Examiner Comments

This question is within the context of shape and space.

Students were required to see the practical side of whether 110 cartons could fit in the box and make a valid conclusion. For this question, considering the number of boxes along the length and width of the box and then how many high they can be stacked was the best approach.

Mark Scheme

11	32 ÷ 5 (= 6.4 or 6) **or** 15 ÷ 5 (=3) **or** 30 ÷ 5 (=6) "6" × "3" × "6" (=108)	No with 108	3	M1 M1 A1	integer values must be used SC: If no marks awarded then award B1 for an answer of 'yes' with 115(.2) **OR** 'yes' and 14400 and 13750

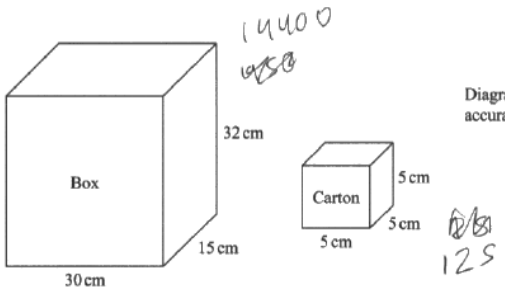
Examiner Comments

The practical context of this question was missed by the majority of students, who failed to recognise that the dimensions of the box and the cartons would mean that not the whole volume of the box could be filled by cartons. Thus they worked only with the total volumes. Some of these divided the volume of the box by the volume of a carton to give 115.2 and a conclusion that 110 cartons would therefore fit in the box. Others calculated the volume of the box and the volume of 110 cartons and concluded that the cartons would therefore fit with room to spare. With a relevant conclusion, such responses were awarded one mark (Special Case B1), but a noticeable number of students failed to give one. There were students who appreciated what was needed here and used the dimensions appropriately to work out that only 108 cartons would fit. Provided they stated their conclusion, full marks were awarded.

NB: as a question was asked, a response to this was needed along with all relevant working.

Student Response A

11



1 Q11

Diagram **NOT** accurately drawn

A wooden box measures 30 cm by 15 cm by 32 cm.
The box has a lid.

A carton measures 5 cm by 5 cm by 5 cm.

James has 110 cartons.
He wants to put all these cartons in the box and be able to shut the lid.

Can James put all 110 cartons in the box and shut the lid?
Show your working clearly.

14400 ÷ 125 = 115.2

he wants to put 110

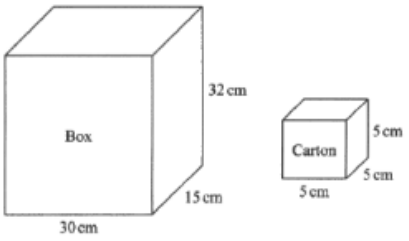
So yes

Examiner Comments

This shows the common incorrect response where the student finds the volume of the box and the volume of the carton and divides one by the other; concluding by answer 'yes'. This was not a correct method, but as it shows some understanding of the problem we awarded a Special Case B1 mark for it. Students must consider any practical problem like this very carefully by realising the cartons cannot be reshaped.

Student Response B

11



1 Q11

Diagram **NOT** accurately drawn

A wooden box measures 30 cm by 15 cm by 32 cm.
The box has a lid.

A carton measures 5 cm by 5 cm by 5 cm.

James has 110 cartons.
He wants to put all these cartons in the box and be able to shut the lid.

Can James put all 110 cartons in the box and shut the lid?
Show your working clearly.

V = Volume

V of Box = 14,400

V of carton = 125

110 x 125 = 13,750

yes he can fit them in

Examiner Comments

This shows another version of the response where the student does not take into the account the way the cartons fit into the box.

The Special Case B1 is awarded again as working and a response which goes with this is given.

Student Response C

11

3 Q11

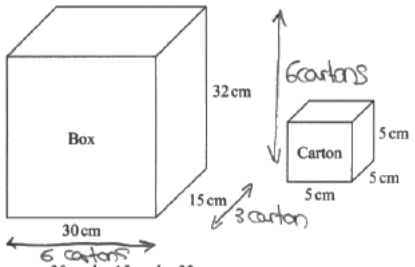


Diagram **NOT** accurately drawn

A wooden box measures 30 cm by 15 cm by 32 cm.
The box has a lid.

A carton measures 5 cm by 5 cm by 5 cm.

James has 110 cartons.
He wants to put all these cartons in the box and be able to shut the lid.

Can James put all 110 cartons in the box and shut the lid?
Show your working clearly.

5x6=30
5x3=15

Each layer = 3x6 = 18 cartons
6 layers = 18x6 = 108 cartons

6x3x6 = 108 cartons

110-108 = 2 cartons don't fit

Examiner Comments

This student has fully understood the problem and gains
M1 for a correct number of carton along one side
M1 for a fully correct method to find the number of cartons needed
A1 for No with 108

Student Response D

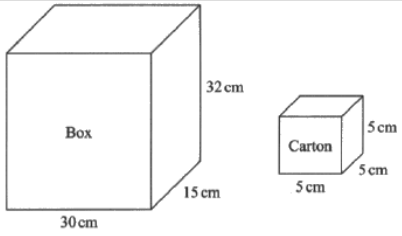


Diagram **NOT** accurately drawn

A wooden box measures 30 cm by 15 cm by 32 cm.
The box has a lid.

A carton measures 5 cm by 5 cm by 5 cm.

James has 110 cartons.
He wants to put all these cartons in the box and be able to shut the lid.

Can James put all 110 cartons in the box and shut the lid?
Show your working clearly.

30x15x32 = 14400 cm³
5x5x5 = 125 cm³

14400 ÷ 125 = 115.2

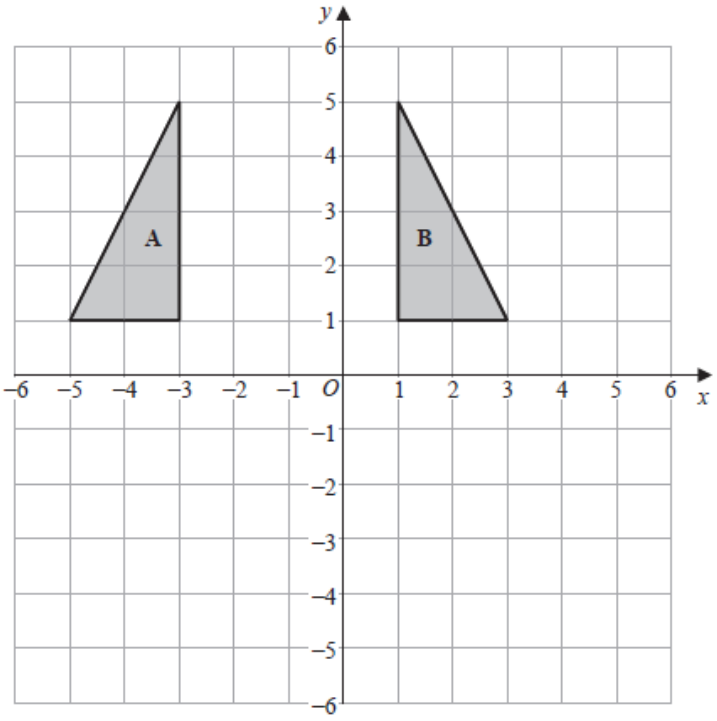
There's not enough space in the box.
James cannot put 110 cartons in the box.

Examiner Comments

This student has used the commonly used incorrect method. However, they have got doubly confused by stating there is not enough space while their answer shows that 115.2 cartons could fit into the box. Students need to think about what their answer is showing them.
No marks awarded.

Exemplar Question 3

Foundation tier Paper 1 Question 12ab



(a) Describe fully the single transformation that maps triangle **A** onto triangle **B**.

(2)

(b) On the grid, translate triangle **B** by the vector $\begin{pmatrix} 2 \\ -6 \end{pmatrix}$

Label your triangle **C**.

(1)

(c) Describe fully the single transformation that maps triangle **C** onto triangle **B**.

(1)

(Total for Question 12 is 4 marks)

Mean score: (a) 0.67/2, (b) 0.41/1, (c) 0.14/1

Examiner Comments

A question on transformations where in (a) a description was required and in (b) a transformation to be actually carried out.

Students often miss something out of a description such as the line of reflection or the vector for the translation.

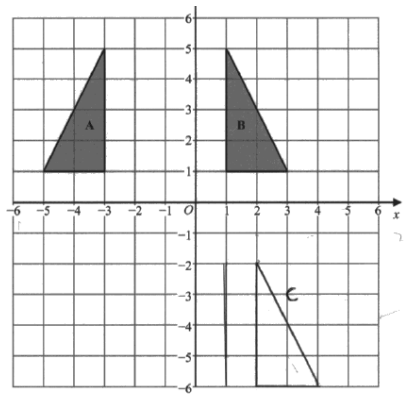
Mark Scheme

Question	Working	Answer	Mark	Notes
12 a		Reflection in $x = -1$	2	B1 for reflection B1 for $x = -1$ NB. If more than one transformation then award no marks
b		$(3, -1)$ $(3, -5)$ $(5, -5)$	1	B1 condone missing label
c		Translation $\begin{pmatrix} -2 \\ 6 \end{pmatrix}$	1	B1 NB. If more than one transformation then award no marks

Examiner Comments

In part (a), the correct answer of reflection in the line $x = -1$ for describing fully the transformation was given by some students but many, who could at least recognise the reflection, omitted to state the line of reflection or gave it as $y = -1$ or $x - 1$. A huge variety of incorrect responses was seen, with translation, rotation and even enlargement making an appearance, and non-mathematical descriptions, such as the triangle being flipped were common. Translating a triangle in part (b) produced many correctly positioned triangles but equally many that were in the incorrect position, most often sitting on the lower edge of the given grid. While many students could recognise that the transformation needed in part (c) was a translation, only a few could additionally give the correct vector to gain the mark. Many others simply gave a description of the transformation in terms of number of squares moved to the left/right, up/down, not appreciating that vector notation is required in describing a translation.

Student Response A



(a) Describe fully the single transformation that maps triangle **A** onto triangle **B**. 1 Q12a

Reflection

(2)

(b) On the grid, translate triangle **B** by the vector $\begin{pmatrix} 2 \\ -6 \end{pmatrix}$ 0 Q12b

Label your triangle **C**.

(1)

(c) Describe fully the single transformation that maps triangle **C** onto triangle **B**. 0 Q12c

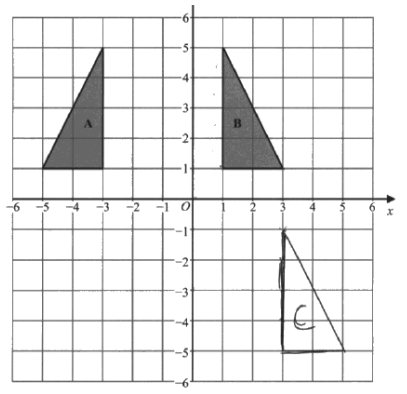
(1)

(Total for Question 12 is 4 marks) 1

Examiner Comments

(a)This student knows the transformation is a reflection but omits to give us the line the shape is reflected in. B1B0
(b) a translation has been carried out but by the incorrect column vector.B0
(c) No response.B0

Student Response B



(a) Describe fully the single transformation that maps triangle **A** onto triangle **B**. 1 Q12a

Reflection in the y axis

(2)

(b) On the grid, translate triangle **B** by the vector $\begin{pmatrix} 2 \\ -6 \end{pmatrix}$ 1 Q12b

Label your triangle **C**.

(1)

(c) Describe fully the single transformation that maps triangle **C** onto triangle **B**. 0 Q12c

Rotation

(1)

(Total for Question 12 is 4 marks) 2

Examiner Comments

(a)This student knows the transformation is a reflection but gives the incorrect line of reflcetion. B1B0
(b) The correct translation has been executed. B1
(c) The student does not realise the link between parts (b) and (c) B0

Exemplar Question 4

Foundation tier Paper 1F Question 13

There are some people in a cinema.
$\frac{3}{5}$ of the people in the cinema are children.
For the children in the cinema,
number of girls : number of boys = 2 : 7
There are 170 girls in the cinema.
Work out the number of adults in the cinema.

Mean score: 1.85/5

Examiner Comments

This question is AO1, Number. It is set in a problem situation and there are a number of elements that need to be carried out to find the answer.

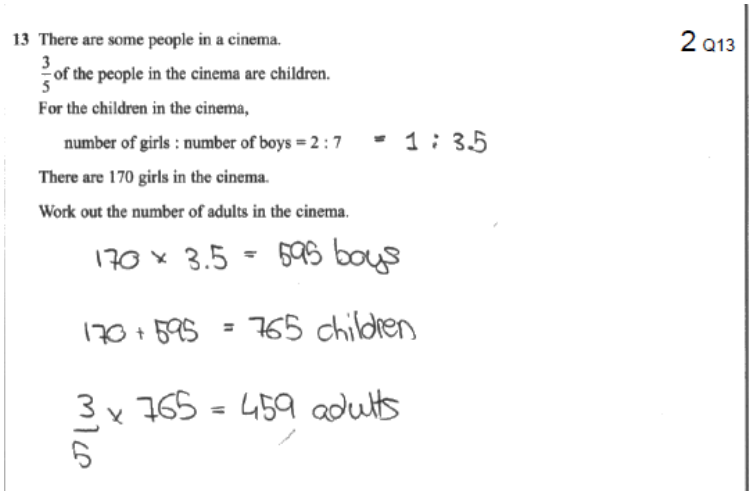
Mark Scheme

Question	Working	Answer	Mark	Notes
13	170 ÷ 2 (=85) **or** 170 ÷ 2 × 7 (=595) **or** 7 ÷ 2 (=3.5)	510	5	M1
	7 × "85" + 170 (=765) **or** 9 × "85" (=765) **or** "595" + 170 (=765) **or** 170 × "3.5" + 170 (=765)			M1 award of this mark implies the first M1
	"765" ÷ 3 (=255) **or** "765" ÷ 3 × 5 (=1275)			M1 dep on M2
	"255" × 2 **or** "1275" – "765" **or** "1275" ÷ 5 × 2			M1
				A1
	Alternative scheme			
	(girls =) $\frac{2}{9}$ (of children)	510	5	M1
	(girls =) $\frac{2}{9}\times\frac{3}{5}\left(=\frac{2}{15}\right)$ (of total) **or** G : C : A = $\frac{2}{9}\times\frac{3}{5}:\frac{3}{5}:\frac{2}{5}\left(=\frac{2}{3}:3:2\right)$			M1 award of this mark implies the first M1
	"$\frac{15}{2}$"×170 (=1275) **or** G : A = 2 : 6 oe			M1 dep on M2
	"1275" ÷ 5 × 2 **or** 3 × 170			M1
				A1

Examiner Comments

Given the ratio of the number of girls to the number of boys, and the number of girls, most students started promisingly to find the number of children in a cinema and gained the first two method marks. Given also that 3/5 of the people in the cinema were children, some were able to proceed to find the number of adults, and gain the full five marks. However, the majority at this stage incorrectly went on to work out 3/5 of the 765 children.

Student Response A



13 There are some people in a cinema.

$\frac{3}{5}$ of the people in the cinema are children.

For the children in the cinema,

number of girls : number of boys = 2 : 7 = 1 : 3.5

There are 170 girls in the cinema.

Work out the number of adults in the cinema.

170 × 3.5 = 595 boys

170 + 595 = 765 children

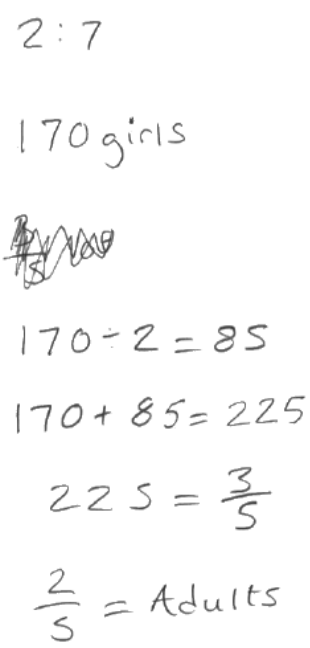
$\frac{3}{5}$ × 765 = 459 adults

2 Q13

Examiner Comments

This student has made a good start by finding the number of boys ie 595 (M1) and then finding the number of children (M1). They then think that 765 is the total number of people at the cinema and think that 3/5 of them are adults.
M1M1M0M0A0

Student Response B



2 : 7

170 girls

170 ÷ 2 = 85

170 + 85 = 225

225 = $\frac{3}{5}$

$\frac{2}{5}$ = Adults

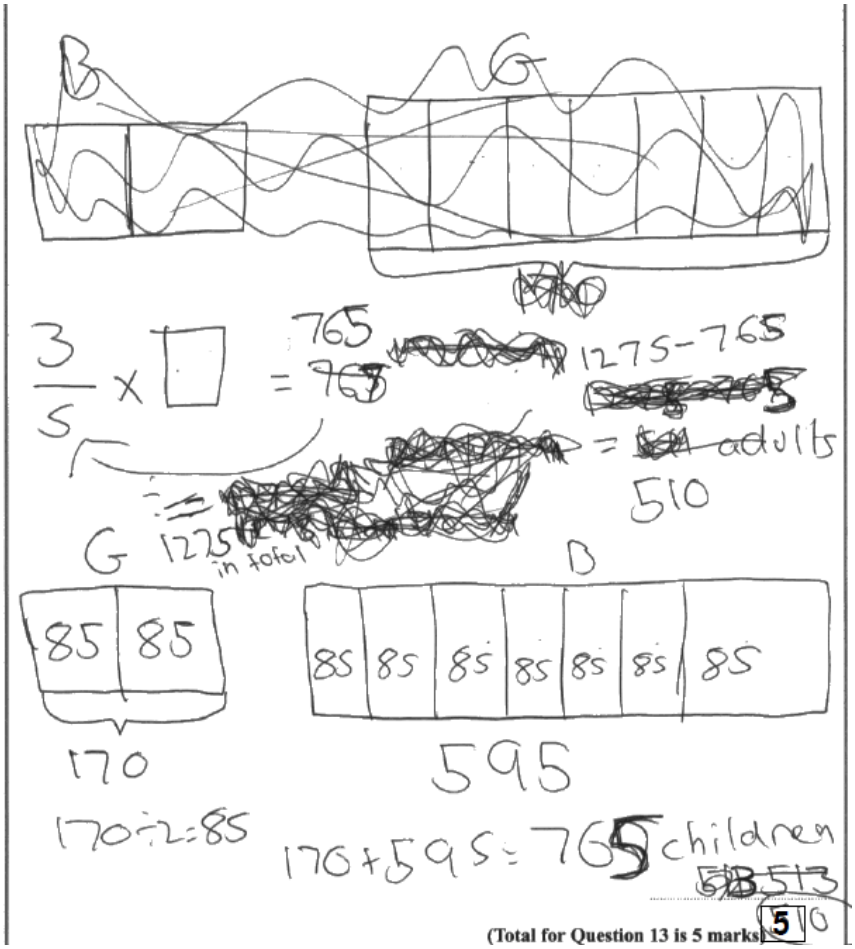
90

(Total for Question 13 is 5 marks) 1

Examiner Comments

This student has only gained 1 mark for finding one share of children. The rest of the working is incorrect and they have not really understood the problem.
M1M0M0M0A0

Student Response C



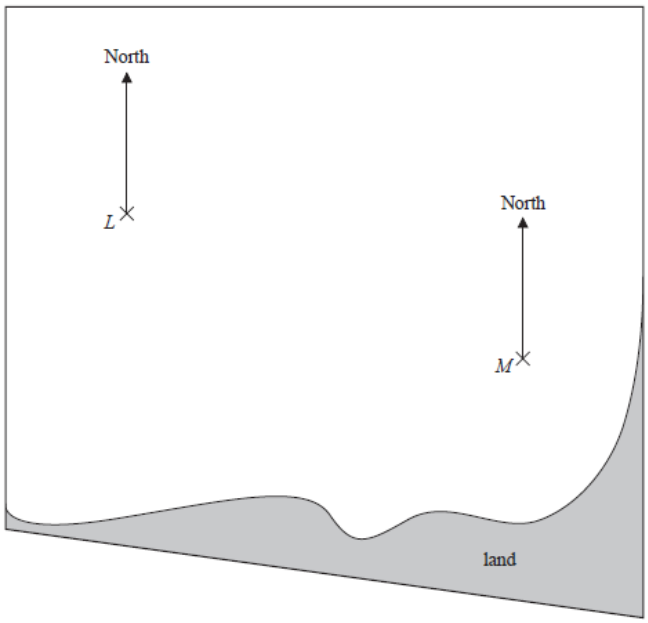
Examiner Comments

This response is fully correct and gains 5 marks.
The student has shown working that shows they have fully engaged with the problems. The diagrammatic way of working for the number of children makes sense. They have not shown us how they got to 1275 people, but may have used trial and improvement – however the value of 1275 alone gains the first 3 marks. The correct answer is under the mark of 5. M1M1M1M1A1

Exemplar Question 5

Foundation tier Paper 1F Question 14ab

14 The accurate scale drawing shows the positions of two ships, L and M.



(a) Find the bearing of ship M from ship L.

(1)

The scale of the drawing is 1 cm to 5 km.

Ship P is 40 km from L and on a bearing of 240° from M.

(b) On the diagram, mark with a cross (×) the position of ship P.

(3)

(Total for Question 14 is 4 marks)

Mean score: (a) 0.22/1 (b) 0.88/3

Examiner Comments: This question is in the context of AO2 Shape, Space and Measure.

Students needed knowledge of bearings and scale drawings in order to answer the question.

Mark Scheme

Question	Working	Answer	Mark	Notes
14 a		110	1	B1 for 108 – 112
b		cross marked in correct position	3	M1 for arc drawn radius 7.8 cm – 8.2 cm centre *L* **or** *P* marked 7.8 cm – 8.2 cm from *L* **or** 40 ÷ 5 (= 8) M1 for bearing of 238 ° – 242 ° from *M* A1 Overlay (*P* 7.8 cm – 8.2 cm from *L* and on a bearing of 238 ° – 242° from *M*)

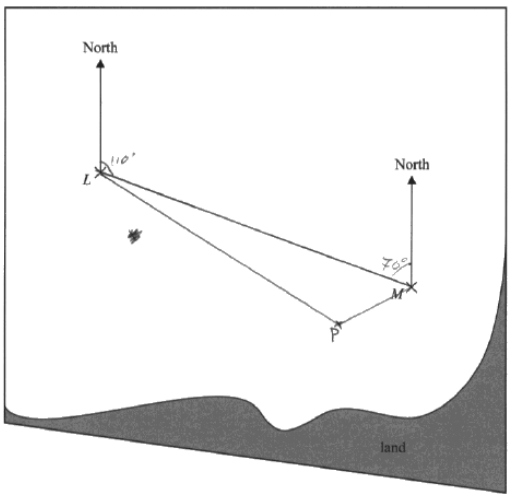
Examiner Comments

Those who knew which angle to measure generally gained the mark in part (a) but the vast majority of students measured either the acute or reflex angle at *M* once *LM* had been drawn.

Marking the position of a ship given a distance and bearing proved problematical for most students. Some could work out that the required distance on the scale drawing was 8cm and gained a mark either for stating this or for showing 8cm on the drawing. However, a significant number measured 8 cm from *M* rather than from *L* suggesting that they had not read the question carefully enough. A smaller number were able to indicate the correct bearing to gain one mark. Surprisingly, there were students who could do both but were still unable to mark the correct position, although successful answers were seen. Many responses showed little understanding of what was required and blank drawings were regularly seen.

Student Response A

14 The accurate scale drawing shows the positions of two ships, *L* and *M*.



(a) Find the bearing of ship *M* from ship *L*.

70 °

(1) 0 Q14a

The scale of the drawing is 1 cm to 5 km.

Ship *P* is 40 km from *L* and on a bearing of 240° from *M*.

(b) On the diagram, mark with a cross (×) the position of ship *P*.

(3) 3 Q14b

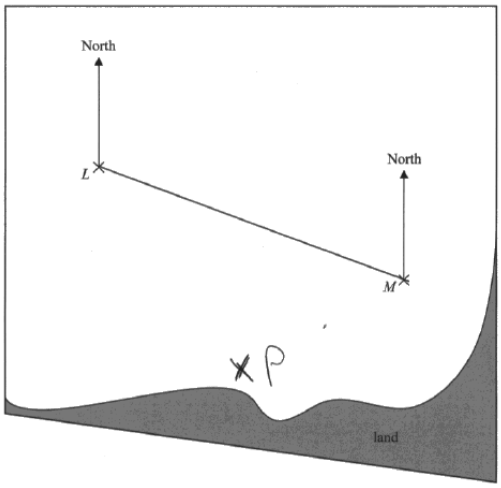
3

Examiner Comments

(a) An incorrect answer is given – the student has given the acute angle between the North line at M and the line joining LM. B0
(b) Full marks are awarded for point *P* in the correct position. M1M1A1

Student Response B

14 The accurate scale drawing shows the positions of two ships, *L* and *M*.



(a) Find the bearing of ship *M* from ship *L*.

70 °

(1) 0 Q14a

The scale of the drawing is 1 cm to 5 km.

Ship *P* is 40 km from *L* and on a bearing of 240° from *M*.

(b) On the diagram, mark with a cross (×) the position of ship *P*.

360 ÷ 240 = 1.5

240 ÷ 2 = 120

40 ÷ 5 = 8 cm

~~240 ÷ 360~~

(3) 2 Q14b

(Total for Question 14 is 4 marks) 2

Examiner Comments

(a) An incorrect answer is given – the student has given the acute angle between the North line at *M* and the line joining *LM*. B0
(b) M1 is awarded for 40 ÷ 5
M1 is awarded for the correct bearing marked from *M*
A0 as *P* is in the incorrect position.

Exemplar Question 6

Foundation tier Paper 1F Question 15ab

15 The table shows information about the weights, in kg, of 40 parcels.

Weight of parcel (p kg)	**Frequency**
$0 < p \leqslant 1$	19
$1 < p \leqslant 2$	12
$2 < p \leqslant 3$	5
$3 < p \leqslant 4$	2
$4 < p \leqslant 5$	2

(a) Write down the modal class.

.....

(1)

(b) Work out an estimate for the mean weight of the parcels.

..... kg

(4)

Mean score: (a) 0.52/1 (b) 1.48/4

Examiner Comments:

This question examines AO3, Handling data. This type of question has come up on 4MA0 many times in the past. Students need to know the statistical terms 'modal class' and 'estimate for the mean'.

Mark Scheme

15	a		$0 < p \leq 1$	1	B1	
	b	$0.5 \times 19 + 1.5 \times 12 + 2.5 \times 5 + 3.5 \times 2 + 4.5 \times 2$ (=56) **or** $9.5 + 18 + 12.5 + 7 + 9$ (=56)	1.4	4	M2	for at least 4 correct products added (need not be evaluated) If not M2 then award M1 for consistent use of value within interval (including end points) for at least 4 products which must be added **OR** correct mid-points used for at least 4 products and not added
		"56" ÷ 40			M1	dep on at least M1 Allow division by their $\sum f$ provided addition or total under column seen
					A1	for 1.4 or $1\frac{2}{5}$

Examiner Comments:

Common incorrect answers in part (a) were 2 (the mode of the numbers in the frequency column) and 19 (the frequency rather than the modal class).

In part (b), a pleasing number of students now recognise what is required to work out the mean for grouped data and a good number of fully correct answers were seen. Some understanding was also shown by students who used end-points of the class intervals instead of the mid-points but who otherwise worked correctly. Where an error followed from a correct start, this was usually to divide by 5 rather than by 40 Incorrect responses included the sum of the frequency column divided by 5 and the mid-point values summed and divided by 5

Student Response A

15 The table shows information about the weights, in kg, of 40 parcels.

Weight of parcel (p kg)	Frequency	mid.	fx
$0 < p \leqslant 1$	19	0·5	9·5
$1 < p \leqslant 2$	12	1·5	18
$2 < p \leqslant 3$	5	2·5	12·5
$3 < p \leqslant 4$	2	3·5	7
$4 < p \leqslant 5$	2	4·5	9
	40		56

(a) Write down the modal class. 1 Q15a

0 < p ≤ 1

(1)

(b) Work out an estimate for the mean weight of the parcels. 4 Q15b

mean = $\frac{\text{sum of } fx}{\text{sum of } f}$ =

1·4 kg

(4)

(Total for Question 15 is 5 marks) 5

Examiner Comments

(a) A correct answer gains B1
(b) A correct answer gains M2M1A1
The working has been done by the side of the table, which we often see and markers are requested to mark work here. This student has been not shown us the interim stage of 56 ÷ 40 Which in this case does not matter as they have the correct answer. However, it is advisable to show all working to maximise mark potential – the working with an incorrect final answer would have been awarded only M2 in this case.

Student Response B

15 The table shows information about the weights, in kg, of 40 parcels.

Weight of parcel (p kg)	Frequency
$0 < p \leqslant 1$	19
$1 < p \leqslant 2$	12
$2 < p \leqslant 3$	5
$3 < p \leqslant 4$	2
$4 < p \leqslant 5$	2

(a) Write down the modal class. 1 Q15a

0 < p ≤ 1

(1)

(b) Work out an estimate for the mean weight of the parcels. 0 Q15b

8 kg

(4)

(Total for Question 15 is 5 marks) 1

Examiner Comments

(a)a correct answer gains B1

(b) An incorrect answer with no working – this could have come from 40 (parcels) ÷ 5 (number of class intervals) M0M0A0

Exemplar Question 7

Foundation tier Paper 1F Question 16abcd

16 (*a*) Simplify $y^5 \times y^9$

.....

(1)

(*b*) Simplify $(2m^3)^4$

.....

(2)

(*c*) Solve $5(x + 3) = 3x - 4$
Show clear algebraic working.

$x =$ .....

(3)

(*d*) (i) Factorise $x^2 + 2x - 24$

.....

(2)

(ii) Hence, solve $x^2 + 2x - 24 = 0$

.....

(1)

Mean Score: (a) 0.68/1 (b) 0.46/2 (c) 1.05/3 (di) 0.28/2 (dii) 0.04/1

Examiner Comments: This question is on AO1 Algebra and is testing indices, equations and factorising and solving a quadratic equation.

It is important for students to notice that for part (c) 'clear algebraic working' is required and without this no marks will be awarded. For parts (di) and (dii) students need to see the link between the two parts.

.

Mark Scheme

Question	Working	Answer	Mark	Notes
16 a		y^{14}	1	B1
b		$16m^{12}$	2	B2 if not B2 then B1 for am^{12} **or** $16m^{b}$ **or** $2^{4}m^{12}$ $b \neq 0, 12$ $a \neq 1, 16$
c	$5x + 15 = 3x - 4$ **or** $x + 3 = \frac{3x}{5} - \frac{4}{5}$ e.g. $5x - 3x = -4 - 15$	$-\frac{19}{2}$ oe	3 2	M1 for removing bracket in a correct equation or dividing all terms by 5 in a correct equation M1 ft from $ax + b = cx + d$ for correctly isolating terms in x on one side of equation and constant terms on the other side A1 dep on at least M1
d (i)		$(x - 4)(x + 6)$		M1 for $(x + a)(x + b)$ where either $ab = -24$ **or** $a + b = +2$ e.g $(x - 6)(x + 4)$ A1
(ii)		4, −6	1	B1 cao **or** ft from any $(x + p)(x + q)$

Examiner Comments:

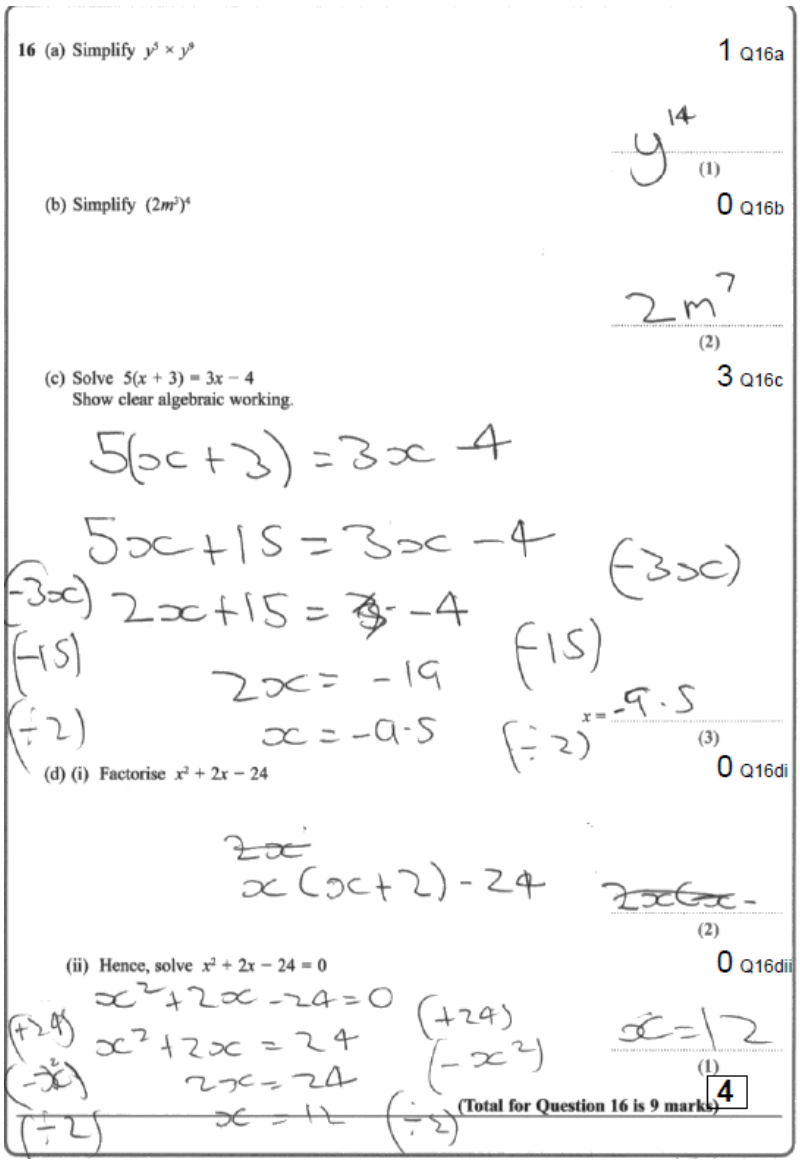
In part (a) very occasionally the indices were multiplied rather than added giving a common incorrect answer of y^{45}; $2y^{14}$ was also seen fairly regularly.

Fully correct answers in (b) for $(2m^3)^4$ were rare, with the common error being not to realise that the index number 4 applies to the 2 as well as to m^3 – thus $2m^{12}$ appeared far more often than the correct answer and gained one mark. $2m^7$ was also a very common incorrect answer from adding the indices and gained no marks.

Showing algebraic working to solve an equation appears to be more generally attempted than in the past and full marks in part (c) were quite often awarded. Where this was not the case, many students could multiply out the brackets and knew that the terms in x needed to be one side of the equation and the constants on the other, but were very muddled by whether terms should be added or subtracted. While most students did make at least a correct start, there were also a number of seemingly random attempts.

In part (d), only a handful of students knew how to factorise the given quadratic and even fewer how to move from that to the solution of the corresponding quadratic equation but very occasionally full marks were awarded. There were some attempts to factorise the first two terms or the last two terms giving the un-factorised term as part of an answer. In (ii), most students, even those few who had been able to give a correct answer in (i), started to solve the quadratic equation from the beginning, but the majority of attempts suggested no knowledge of how to do so.

Student Response A



16 (a) Simplify $y^5 \times y^9$ — 1 Q16a

y^{14}

(1)

(b) Simplify $(2m^3)^4$ — 0 Q16b

$2m^7$

(2)

(c) Solve $5(x + 3) = 3x - 4$
Show clear algebraic working. — 3 Q16c

$5(x+3) = 3x - 4$

$5x + 15 = 3x - 4$ (−3x)

$2x + 15 = -4$ (−15)

$2x = -19$ (÷2)

$x = -9.5$

(3)

(d) (i) Factorise $x^2 + 2x - 24$ — 0 Q16di

$x(x+2) - 24$

(2)

(ii) Hence, solve $x^2 + 2x - 24 = 0$ — 0 Q16dii

$x^2 + 2x - 24 = 0$ (+24)

$x^2 + 2x = 24$ (−x²)

$2x = 24$ (÷2)

$x = 12$

(1)

Total for Question 16 is 9 marks 4

Examiner Comments:

(a) is correct so B1

(b)This student neither raises 2 to the power 4 or raises m^3 to the power 4. B0

(c) A cully correct answer with correct working gains M1M1A1

(d)(i)(ii) Not correctly factorised and an incorrect solution. M0A0B0

Student Response B

16 (a) Simplify $y^5 \times y^9$

1 Q16a

y^{14}

(1)

(b) Simplify $(2m^3)^4$

$2^4 = 16$

2 Q16b

$16m^{12}$

(2)

(c) Solve $5(x + 3) = 3x - 4$
Show clear algebraic working.

$5x + 15 = 3x - 4$
$5x - 3x = -15 - 4$
$2x = -19$
$x = \frac{-19}{2}$
$x = -9.5$

3 Q16c

$x = -9.5$

(3)

(d) (i) Factorise $x^2 + 2x - 24$

$(x + 6)(x - 4)$
$-4x + 6x$

2 Q16di

$(x+6)(x-4)$

(2)

(ii) Hence, solve $x^2 + 2x - 24 = 0$

$(x+6)(x-4) = 0$

$(x+6)(x-4)=0$

(1)

0 Q16di

Examiner Comments:

(a) correct B1

(b) this student has correctly completed the simplification and gains B2

(c) A fully correct solution with full working shown. M1M1A1

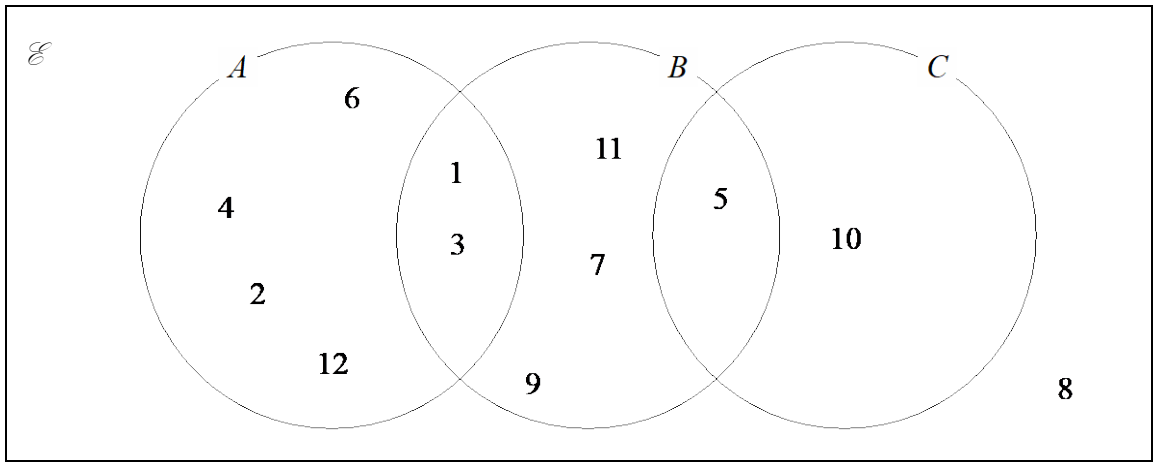
(d)(i) Correct factorisation M1A1

(d)(ii) The student does not realise the significance of the factorisation to their answer and gains no marks.B0

Exemplar Question 8

Foundation tier Paper 1F Question 19

Here is a Venn diagram.



(*a*) Write down the numbers that are in the set

(i) A

.....

(ii) $B \cup C$

.....

(2)

Brian writes down the statement $A \cap C = \emptyset$

(*b*) Is Brian's statement correct?
You must give a reason for your answer.

.....

.....

(1)

One of the numbers in the Venn diagram is picked at random.

(*c*) Find the probability that this number is in set C'

.....

(2)

Mean Score: (a)(i) 0.56/1 (a)(ii) 0.24/1 (b) 0.45/1 (c) 0.54/2

Examiner Comments: A question on a Venn diagram and set notation from AO1, Number with some AO3, probability at the end.

Students need to know the meaning of the various symbols used with set notation to be able to answer this question successfully.

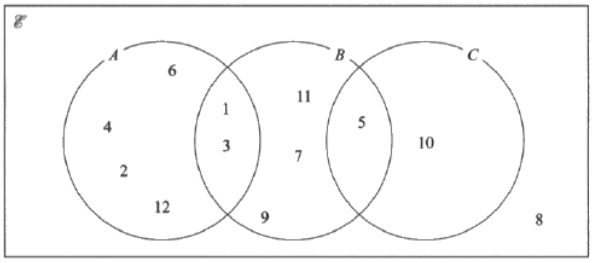
Mark Scheme

17	ai		1, 2, 3, 4, 6, 12	1	B1	cao
	aii		1, 3, 5, 7, 9, 10, 11	1	B1	cao
	b		Yes with reason	1	B1	e.g. no numbers in both A and C **or** A and C do not intersect **or** A and C do not overlap **or** A and C are mutually exclusive
	c		$\frac{10}{12}$ oe	2	M1	for $12 - 2$ (=10) **or** $\frac{a}{12}$ with $a < 12$ **or** 10 and 12 used with incorrect notation E.g. 10 : 12
					A1	for $\frac{10}{12}$ oe **or** 0.83(3...) **or** 83(.3..)%

Examiner Comments:

In part (a), given a Venn diagram, many students could write down the numbers in set A, although a common error was to omit the numbers that were in the intersection with set B. Writing down the numbers in set $B \cup C$ was slightly less well done, again with the values in the intersection omitted, or interpreting $B \cup C$ as the intersection of these sets. Giving a reason for a statement in part (b) regarding a null set was very well done, with many able to explain that the two sets in question had no numbers that were in both sets or that there was no intersection between the sets. Occasionally the mark was lost by failing to state whether a candidate agreed with the statement or not. Part (c) required recognition of the notation for the complement of a set, which was rare. A frequent error therefore was to give the probability of picking at random a number that was in C, instead of in C' – this gained the method mark, as did any understanding that the probability was 'out of 12' provided it was written using acceptable probability notation.

Student Response A



(a) Write down the numbers that are in the set

(i) A

0 Q17a

6, 4, 2, 12

(ii) $B \cup C$

0 Q17a

5

(2)

Brian writes down the statement $A \cap C = \emptyset$

(b) Is Brian's statement correct?
You must give a reason for your answer.

1 Q17b

yes because no same numbers are in both a and C.

(1)

One of the numbers in the Venn diagram is picked at random.

(c) Find the probability that this number is in set C'

1 Q17c

2/12

(2)

(Total for Question 17 is 5 marks) 2

Examiner Comments:

(a)(i) this student has missed out the members of *A* that are also in set *B*. B0

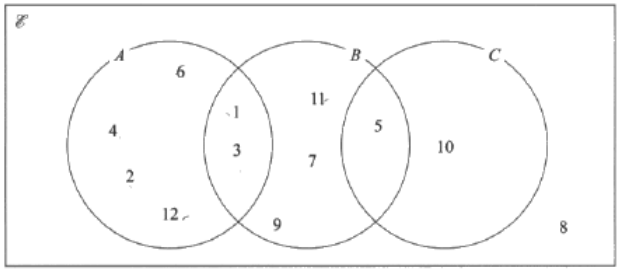
(a)(ii) this student seems to have misunderstood union and instead used intersectio of the sets. B0

(b) Correct B1

(c) M1 for a probability out of 12 but A0 as the student has answered – the probability that the student is in set *C*

Student Response B

17 Here is a Venn diagram.



(a) Write down the numbers that are in the set

(i) A 1 Q17ai

4, 2, 12, 6, 1, 3

(ii) $B \cup C$ 1 Q17aii

1, 3, 11, 7, 9, 5, 10

(2)

Brian writes down the statement $A \cap C = \emptyset$

(b) Is Brian's statement correct? 0 Q17b
You must give a reason for your answer.

Yes because they are all even numbers

(1)

One of the numbers in the Venn diagram is picked at random.

(c) Find the probability that this number is in set C' 1 Q17c

$\frac{1}{12}$

(2)

(Total for Question 17 is 5 marks) 3

Examiner Comments:

(a)(i) correct B1

(a)(ii) correct B1

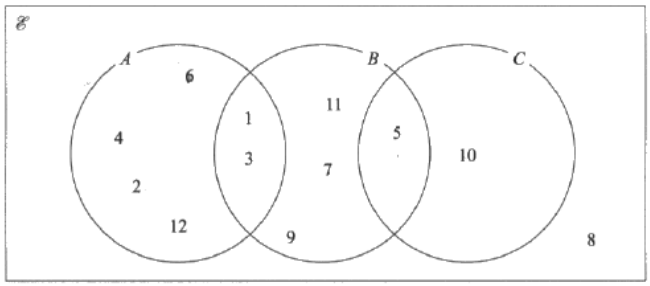
(b) incorrect as the student thinks the answer is correct because they are all even numbers which has nothing to do with the statement. B0

(c) M1 for a probability over 12

A0 as it is the incorrect probability.

Student Response C

17 Here is a Venn diagram.



(a) Write down the numbers that are in the set

(i) A 1 Q17ai

2, 4, 6, 12, 1, 3

(ii) $B \cup C$ 1 Q17aii

1, 3, 11, 7, 9, 5, 10

(2)

Brian writes down the statement $A \cap C = \emptyset$

(b) Is Brian's statement correct? 1 Q17b
You must give a reason for your answer.

Yes, because no number of A is the same as C.

(1)

One of the numbers in the Venn diagram is picked at random.

(c) Find the probability that this number is in set C' 0 Q17c

$\frac{2}{11}$

(2)

(Total for Question 17 is 5 marks) 3

Examiner Comments:

(a)(i) correct B1

(a)(ii) correct B1

(b) correct B1

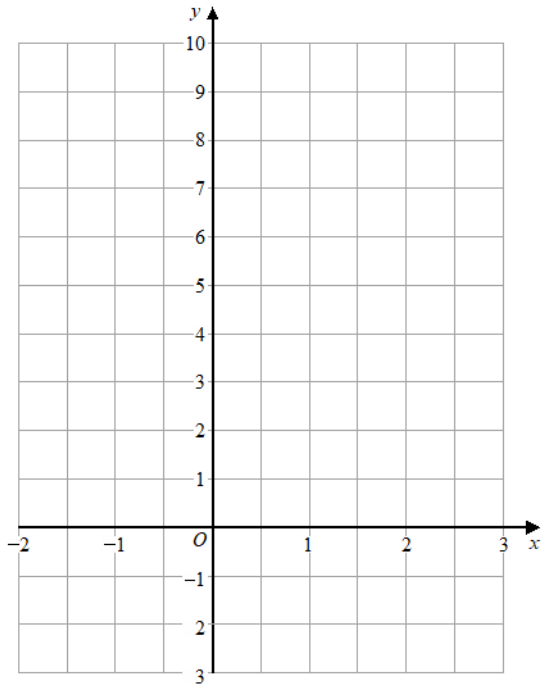
(c) M0 as the probability does not have the correct numerator or denominator.

A0 incorrect.

Exemplar Question 9

Foundation tier Paper 1F Question 19

19 (*a*) On the grid, draw the graph of $y = 2x + 3$ for values of x from -2 to 3.



(3)

(*b*) Show, by shading on the grid, the region that satisfies **all three** of the inequalities

$x \leqslant 2$	$y \geqslant 1$	$y \leqslant 2x + 3$

Label the region **R**.

(2)

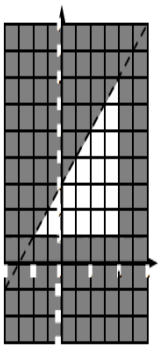
(Total for Question 19 is 5 marks)

Mean Score: (a) 1.48/3 (b) 0.36/2

Examiner Comments: This question is one on AO1, Algebra.

Students are frequently asked to draw a graph of a straight line so this should be a well-rehearsed question. Part (b) uses the line drawn in part (a) as well as 2 other lines for a region defined by 3 inequalities to be shaded.

Mark Scheme

Question	Working	Answer	Mark	Notes
19 a		x −2 −1 0 1 2 3 y −1 1 3 5 7 9 	3	B3 For a correct line between $x = -2$ and $x = 3$ B2 For a correct straight line segment through at least 3 of (−2, −1) (−1, 1) (0, 3) (1, 5) (2, 7) (3, 9) **OR** for all of (−2, −1) (−1, 1) (0, 3) (1, 5) (2, 7) (3, 9) plotted but not joined B1 For at least 2 correct points plotted or stated (ignore incorrect points) **OR** for a line drawn with a positive gradient through (0, 3) **and** clear intention to use a gradient of 2 (eg. a line through (0, 3) and (0.5, 5) **OR** a line drawn with a gradient of 2
b			2	M1 for $x = 2$ **and** $y = 1$ drawn A1 for correct region identified NB: Region may be unshaded or shaded, condone missing label

Examiner Comments:

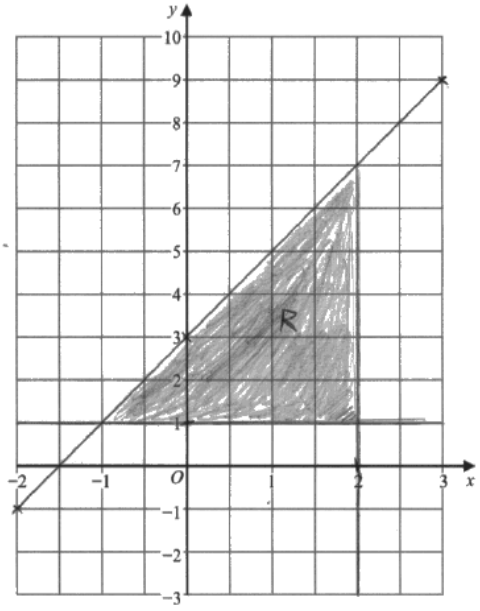
From responses in part (a) it would seem that an increasing number of students are able to draw a straight line graph. A few missed one or two marks by not giving the complete line, or by failing to join the points, or by working out but not drawing two or more points. However, there were a number of lines with a negative gradient, seemingly random lines and some blank responses.

Finding a region defined by three inequalities in part (b) was far more problematical, with blank responses and incorrect rectangles often seen. A small number of students were able to indicate the lines $x = 2$ and $y = 1$ for one mark and even fewer the correct region.

Student Response A

19 (a) On the grid, draw the graph of $y = 2x + 3$ for values of x from -2 to 3 **3** Q19a

x	-2	0	3
y	-1	3	9



(3)

(b) Show, by shading on the grid, the region that satisfies **all three** of the inequalities **2** Q19b

$x \leqslant 2$ $y \geqslant 1$ $y \leqslant 2x + 3$

Label the region **R**.

(2)

(Total for Question 19 is 5 marks) **5**

Examiner Comments:

This response is fully correct.

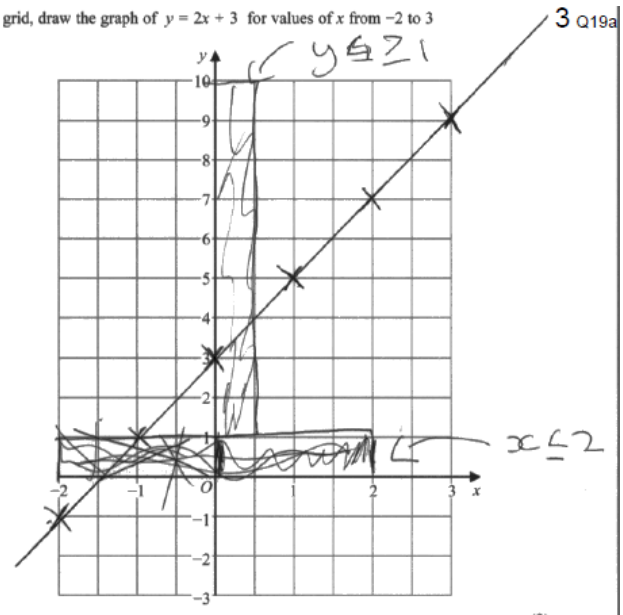
In part (a) the student shows a small table of values which is a method that is to be recommended when finding the coordinates for a line. B3

In part (b) the fully correct region is shaded. M1A1

Student Response B

19 (a) On the grid, draw the graph of $y = 2x + 3$ for values of x from -2 to 3

3 Q19a



(3)

(b) Show, by shading on the grid, the region that satisfies **all three** of the inequalities

0 Q19b

$x \leqslant 2$ $y \geqslant 1$ $y \leqslant 2x + 3$

Label the region **R**.

(2)

(Total for Question 19 is 5 marks) 3

x	−2	−1	0	1	2	3
y	−1	1	3	5	7	9

Examiner Comments:

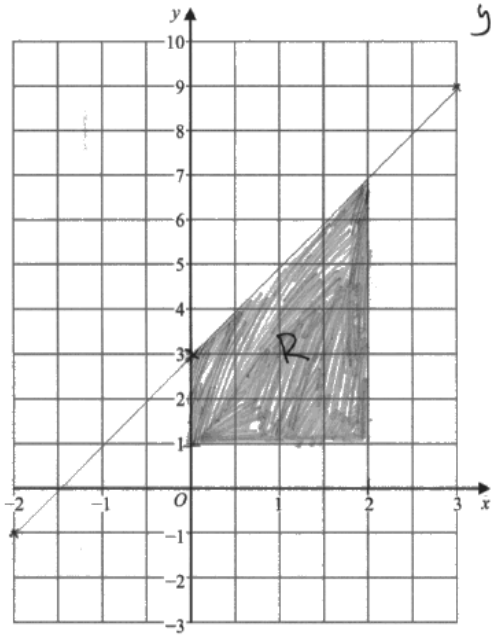
Part (a) is fully correct and scores B3 for a fully correct line.

Part (b) is incorrect and the student does not appear to know what is needed to shade the regions defined by the inequalities.

Student Response C

19 (a) On the grid, draw the graph of $y = 2x + 3$ for values of x from -2 to 3

x -2 0 3
y -1 3 9 Q19a



(3)

(b) Show, by shading on the grid, the region that satisfies **all three** of the inequalities

$x \leqslant 2$ $y \geqslant 1$ $y \leqslant 2x + 3$

1 Q19b

Label the region **R**.

(2)

(Total for Question 19 is 5 marks) **4**

Examiner Comments:

Part (a) is fully correct and scores B3 for a fully correct line.

Part (b) is almost correct – the student misses the part of the region that is to the left of the y-axis. B1 is awarded for the lines $x = 2$ and $y = 1$ which bound the shaded region to the right of the y-axis.

Exemplar Question 10

Foundation tier Paper 1F Question 20

20

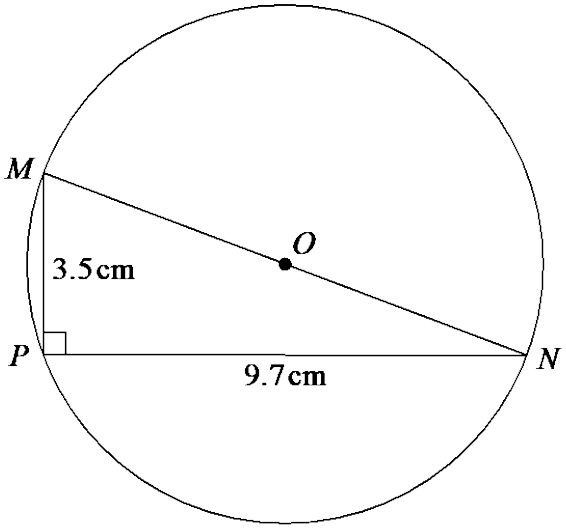


Diagram **NOT** accurately drawn

M, *N* and *P* are points on a circle, centre *O*.
MON is a diameter of the circle.

MP = 3.5 cm
PN = 9.7 cm

Angle *MPN* = 90°

Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 20 is 4 marks)

Mean Score: 1.05/4

Examiner Comments: This question is one on AO3, Shape, Space and Measure.

Students need to use Pythagoras' theorem to find the diameter of the circle and then use this to find the circumference of the circle. This means it is set in the context of a problem as there is no guidance as to how to proceed through the question to enable the circumference to be found.

Mark Scheme

Question	Working	Answer	Mark	Notes	
20	$9.7^2 + 3.5^2 (=106.34)$	32.4	4	M1	M1 for the use of MN and a correct angle (70.1… or 70.2, 19.8…) in a correct trig statement eg $\cos 70.2 = \frac{3.5}{MN}$
	$\sqrt{9.7^2 + 3.5^2}$ or $\sqrt{"106.34"}$ (=10.3…)			M1	M1 for a complete method to find MN eg $MN = \frac{3.5}{\cos 70.2}$ (=10.3…)
	$\pi \times$ "10.3…" or $2 \times \pi \times \frac{"10.3..."}{2}$			M1 dep on M2	
				A1 for answer in range 32.3 – 32.41	

Examiner Comments:

The correct use of Pythagoras' theorem to work out the length of the diameter of a circle and then the correct use of this to find the circumference of the circle enabled some students to gain the full four marks.

For those who made a correct start, the main error was in using the wrong formula for the circumference. Confusion between the circumference and area formulae and whether diameter or radius was needed was much in evidence; some did use 9.7 cm as the diameter.

A large number of students were not able to appreciate that Pythagoras' theorem was needed and the values given in the question, both the lengths of the two sides and the 90o angle, were incorporated into a variety of meaningless calculations.

Student Response A

20

2 Q20

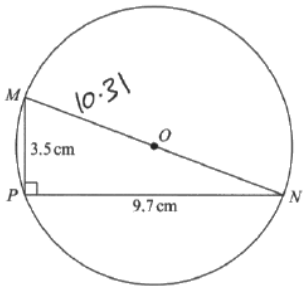


Diagram **NOT** accurately drawn

M, *N* and *P* are points on a circle, centre *O*.
MON is a diameter of the circle.

MP = 3.5 cm
PN = 9.7 cm

Angle *MPN* = 90°

Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

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

$3.5^2 + 9.7^2 = ?^2$

$12.25 + 94.09 = ?^2$

$106.34 = ?^2$

$\sqrt{106.34} = 10.31$

$r = 5.155$

$C = \pi \times 5.155^2$

$C = 83.85$ (3sF)

83.5 cm

(Total for Question 20 is 4 marks) 2

Examiner Comments:

This student has correctly worked out the diameter by using Pythagoras and gains M1M1

Unfortunately the student then uses the formula for the area of the circle rather than the circumference of the circle. M0A0

Student Response B

20

0 Q20

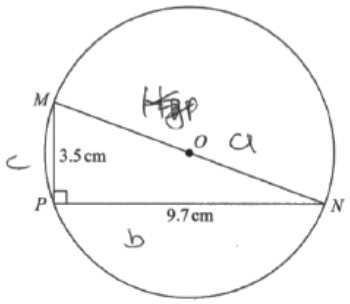


Diagram **NOT** accurately drawn

M, *N* and *P* are points on a circle, centre *O*.
MON is a diameter of the circle.

MP = 3.5 cm
PN = 9.7 cm

Angle *MPN* = 90°

Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

SOHCAH TOA

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

$a^2+9.7^2=3.5^2$

$a^2+3.5^2=9.7^2$

$a^2+12.25=94.09$

$94.09-12.25=81.84$

$\sqrt{81.84}=9.046546302$

$\div 2 = 4.523273151$

πr^2

$\pi \wedge 2 = 64.2769$

64.3

64.3 cm

(Total for Question 20 is 4 marks) 0

Examiner Comments:

This student has used Pythagoras incorrectly by subtracting the values of the sides rather than adding them. No more marks can be awarded as the Circumference calculation is dep on M2. It looks as though even if the student had calculated the diameter correctly they would have continued by finding the area, rather than the circumference of the circle.
M0M0M0A0

Student Response C

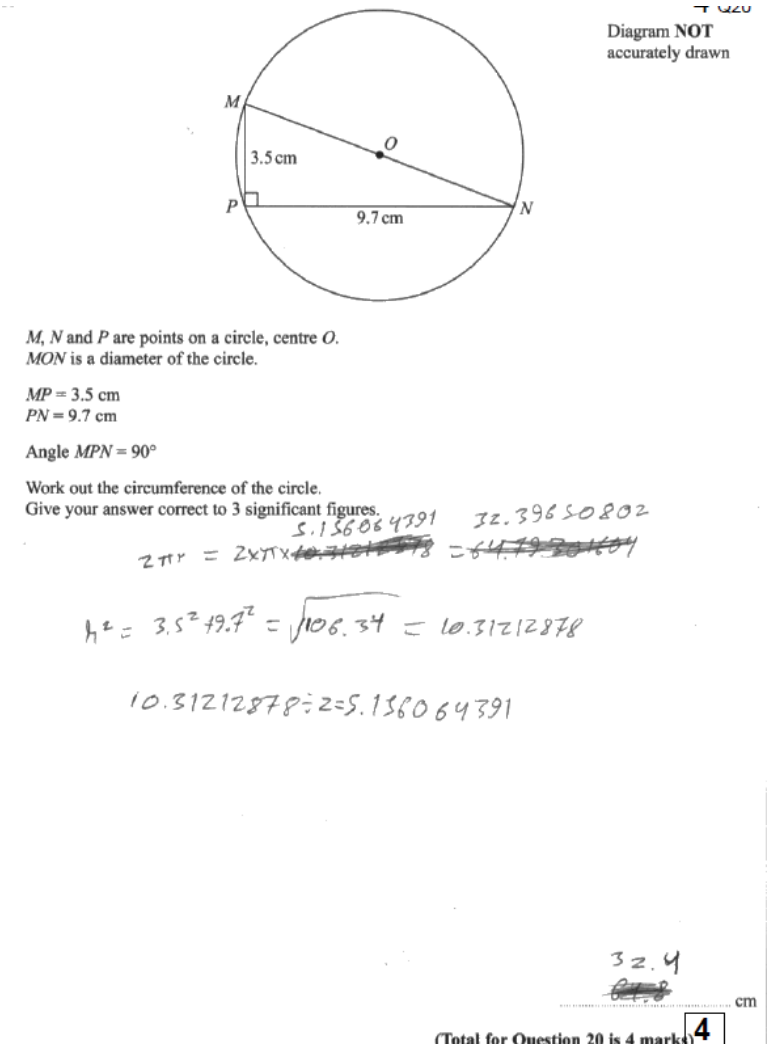


Diagram **NOT** accurately drawn

M, *N* and *P* are points on a circle, centre *O*.
MON is a diameter of the circle.

MP = 3.5 cm
PN = 9.7 cm

Angle *MPN* = 90°

Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

5.156064791 32.396508802

$2\pi r = 2 \times \pi \times$ [illegible] = [illegible]

$h^2 = 3.5^2 + 9.7^2 = \sqrt{106.34} = 10.31212878$

$10.31212878 \div 2 = 5.156064791$

32.4 cm

(Total for Question 20 is 4 marks) **4**

Examiner Comments:

The answer for this response is correct and follows no incorrectly working so full marks are awarded.

The student does not show the working for the Circumference of the circle and students should be persuaded to show all working just in case a slip is made when working or copying from the calculator.

Exemplar Question 11

Foundation tier Paper 1F Question 21ab

21 Chao bought a boat for HK$160 000.
The value of the boat depreciates by 4% each year.

(*a*) Work out the value of the boat at the end of 3 years.
Give your answer correct to the nearest HK$.

HK$.....
(3)

Jalina gets a salary increase of 5%
Her salary after the increase is HK$252 000.

(*b*) Work out Jalina's salary before the increase.

HK$.....
(3)

(Total for Question 21 is 6 marks)

Mean Score: (a) 1.03/3 (b) 0.34/3

Examiner Comments: This question is one on AO1, Number.

Part (a) is a depreciation question and part (b) is reverse percentages. Both are at the top end of the grades for this paper and students found them challenging.

Mark Scheme

Question		Working	Answer	Mark	Notes	
21	a	$\frac{4}{100} \times 160\,000$ oe (=6400)	141 558	3	M1	M2 for $160\,000 \times 0.96^3$ **or** $160\,000 \times 0.96^4$ (=135 895.44..))
		$\frac{4}{100} \times$ (160 000 – "6400") (= 6144) $\frac{4}{100} \times$ (160 000 – "6400" – "6144") (= 5898.24) 160 000 – "6400" – "6144" – "5898.24"			M1 for a complete method (condone 4 years rather than 3)	If not M2 then award M1 for $160\,000 \times 0.96$ (=153 600) **or** $160\,000 \times 0.96^2$ (=147 456)
						accept (1 – 0.04) in place of 0.96 throughout
					A1 for 141 557.76 - 141 558 **SC** If no other marks gained, award B1 for 160 000 × 0.12 oe (=19 200) **or** 160 000 × 0.88 oe (=140 800) **or** an answer of 140 800 **or** an answer of in the range 179 978 – 179 978.24	
	b	E.g. 252 000 ÷ 1.05	240 000	3	M2 If not M2 then M1 for $x \times 1.05 = 252\,000$ **or** $252\,000 \div 105$ oe A1 NB: An answer of 239 400 scores M0 M0 A0	

Examiner Comments:

While there were students in part (a) who could work out the value at the end of three years of a boat that depreciated in value by 4% per year, incorrect answers appeared far more often than the correct one. Working with simple interest rather than compound was the most frequent means of this happening, but usually gained a candidate one mark, as did increasing the value over the three years. There was almost no evidence of use of the more efficient method of $160\,000 \times 0.96^3$, with the 'year at a time' method often shown in full, with the likelihood of incorporating errors and introducing premature rounding.

Even fewer students were successful in part (b), where understanding that the given value had already been increased by 5% was rare. The incorrect method of finding 5% of 252000 and then subtracting was widespread.

Student Response A

21 Chao bought a boat for HK$160 000
The value of the boat depreciates by 4% each year.

1 Q21a

(a) Work out the value of the boat at the end of 3 years.
Give your answer correct to the nearest HK$.

6400 = 1 year
6400 × 3 = 19200

HK$ 19200
(3)

Jalina gets a salary increase of 5%
Her salary after the increase is HK$252 000

(b) Work out Jalina's salary before the increase.

0 Q21b

5 × 252000 = 1260000
1260000 ÷ 100 = 12600

HK$ 12600
(3)

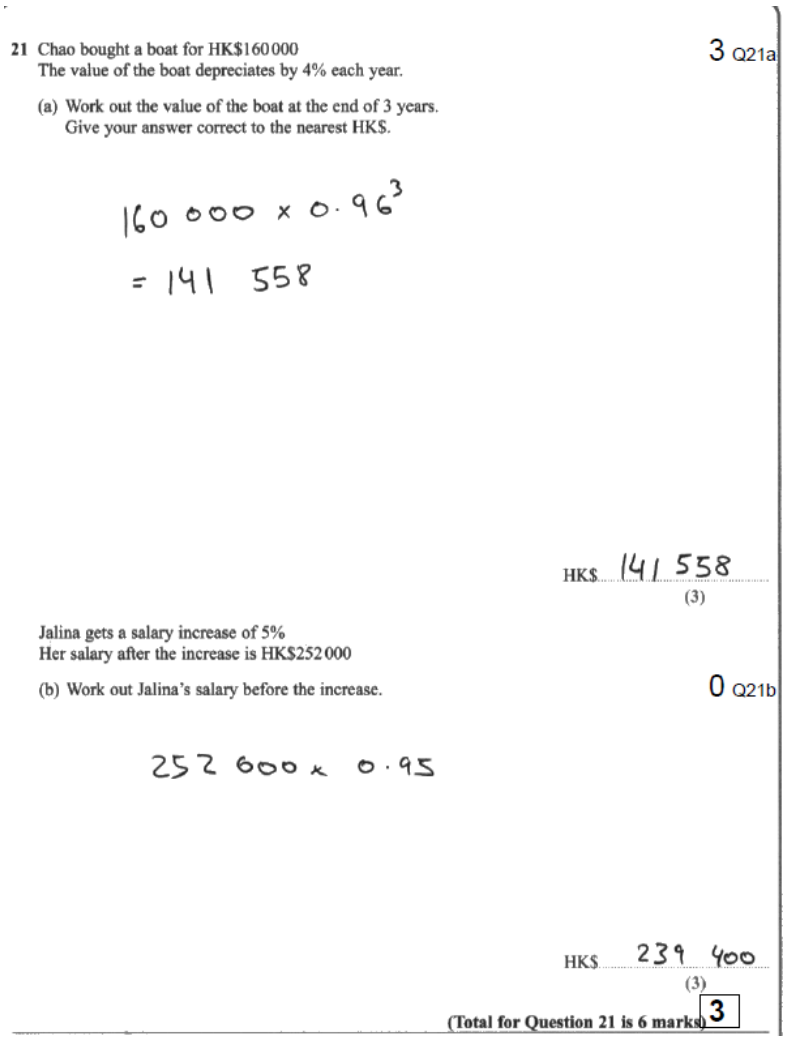
(Total for Question 21 is 6 marks) 1

Examiner Comments:

(a) This response shows the student who uses a simple interest method – M1 is awarded for finding 4% of 160 000. No more marks are awarded.

(b) No marks are awarded for finding 5% of 252 000. The student has not understood the question correctly.

Student Response B



21 Chao bought a boat for HK$160 000
The value of the boat depreciates by 4% each year.

3 Q21a

(a) Work out the value of the boat at the end of 3 years.
Give your answer correct to the nearest HK$.

$160\,000 \times 0.96^3$

$= 141\,558$

HK$ 141 558
(3)

Jalina gets a salary increase of 5%
Her salary after the increase is HK$252 000

(b) Work out Jalina's salary before the increase.

0 Q21b

$252\,600 \times 0.95$

HK$ 239 400
(3)

(Total for Question 21 is 6 marks) 3

Examiner Comments:

(a) This response is fully correct, showing the little seen method of using 0.96^3, M1M1A1

(b) This student decreases 252 000 by 5% using the multiplier 0.95 but gains no marks. M0M0A0