N5

National Qualifications
SPECIMEN ONLY

Mark

S844/75/01

Applications of Mathematics
Paper 1 (Non-calculator)

Date — Not applicable

Duration — 50 minutes

S8447501

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day | Month | Year | Scottish candidate number

Total marks — 35

Attempt ALL questions.

You must NOT use a calculator.

To earn full marks you must show your working in your answers.

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.
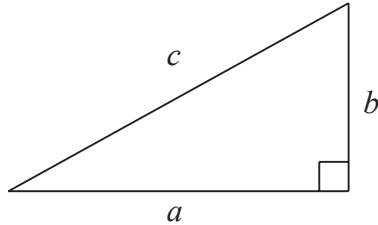
S844750101

FORMULAE LIST

Circumference of a circle $\qquad C = \pi d$

Area of a circle $\qquad A = \pi r^2$

Theorem of Pythagoras

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

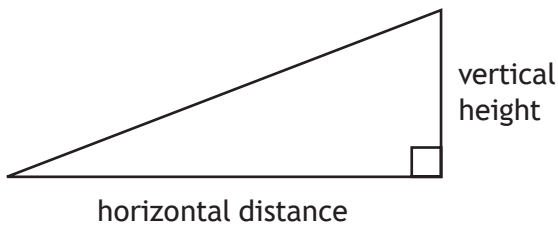Volume of a cylinder $\qquad V = \pi r^2 h$

Volume of a prism $\qquad V = Ah$

Volume of a cone $\qquad V = \frac{1}{3}\pi r^2 h$

Volume of a sphere $\qquad V = \frac{4}{3}\pi r^3$

Standard deviation $\qquad s = \sqrt{\dfrac{\Sigma(x-\bar{x})^2}{n-1}}$

$$\text{or} \quad s = \sqrt{\dfrac{\Sigma x^2 - \dfrac{(\Sigma x)^2}{n}}{n-1}}, \text{ where } n \text{ is the sample size.}$$

Gradient

$$\text{gradient} \ = \ \frac{\text{vertical height}}{\text{horizontal distance}}$$

Total marks — 35

Attempt ALL questions

1. Helen makes and sells candles.

   These candles should be 22.5 cm tall.

   She rejects any candle that is outwith the range of ±2 mm of this height.

   Below are the heights, in centimetres, of 10 candles chosen at random.

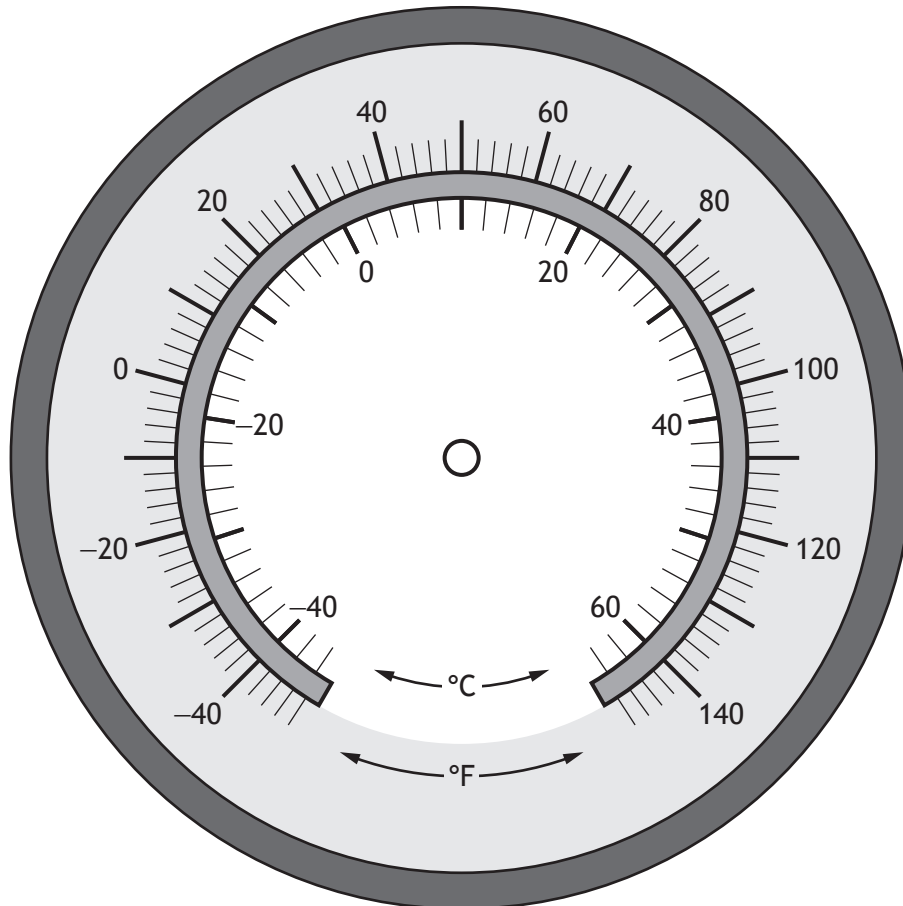   22.2, 22.6, 22.5, 22.9, 22.3, 21.6, 22.6, 22.4, 22.7, 22.8

   Calculate the percentage of candles that she rejects.   **3**

2. Lynn is flying an aircraft and has been told that the outside temperature is 34 °C lower than the ground temperature.

The ground temperature is 6 °C.

Calculate the outside temperature and mark it on the gauge below.

(An additional gauge, if required, can be found on *page 15*.)

2

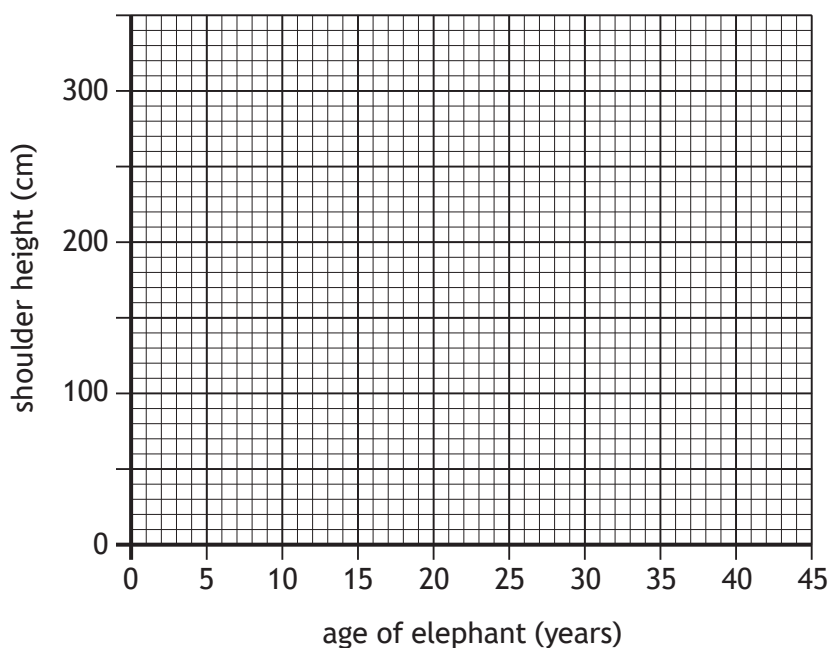**3.** African elephants continue to grow for the duration of their lives.

The table below shows the age of a sample of African elephants and their shoulder heights.

Age of elephant (years)	12	17	28	35	43
Shoulder height (cm)	230	250	270	275	300

(a) On the grid below draw a scattergraph to show this data. **2**

(An additional grid, if required, can be found on *page 16*.)

(b) Draw a line of best fit on your scattergraph. **1**

(c) Use your line of best fit to estimate the age of an African elephant that has a shoulder height of 260 cm. **1**

4. Bryan, Jamie and Jessica bought **two** medium pizzas between them.

- Bryan ate $\frac{5}{7}$ of a pizza.

- Jamie ate $\frac{2}{3}$ of a pizza.

- Jessica ate the rest.

Calculate the total amount of pizza that Jessica ate.

Give your answer as a fraction of a pizza.

3

5. Steven flew to Hong Kong to start a new job.

The flight included a stop in Doha.

He flew from Edinburgh to Doha then from Doha to Hong Kong.

- The flight from Edinburgh to Doha took 6 hours 35 minutes.
- The flight from Doha to Hong Kong took 7 hours 20 minutes.
- Hong Kong is 8 hours ahead of Edinburgh.

Steven's plane took off from Edinburgh at 9:15 am local time.

It landed in Hong Kong at 8:50 am local time.
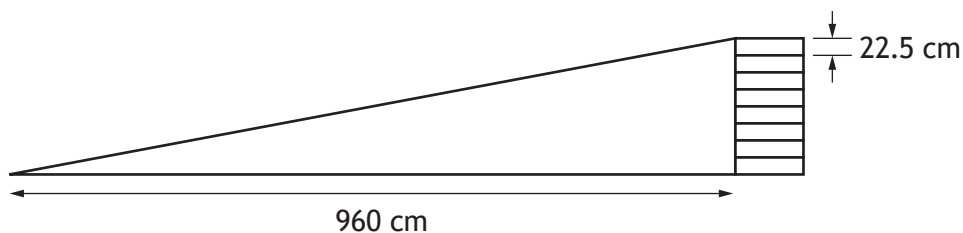
How long was the stop in Doha?

3

6. John has a slope in his back garden.

The slope is the height of 8 planks.

Each plank is 22.5 cm in height.

The planks are 960 cm away from the bottom of the slope.

22.5 cm

960 cm

(a) Calculate the gradient of the slope.

2

His neighbour Helen also has a slope.

The gradient of her slope is 20%.

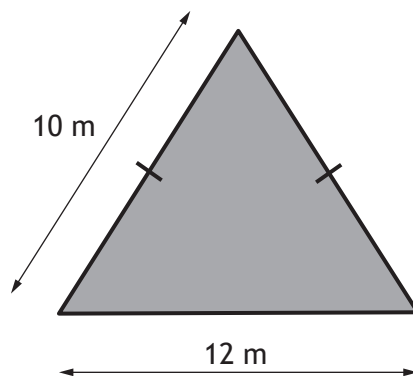Helen thinks her slope is steeper than John's slope.

(b) Determine if she is correct.

2

7. A lawn is to be created in the shape of an isosceles triangle with dimensions as shown below.

10 m

12 m

Calculate the area of the lawn.　　　　　　　**3**

8. Jack is going to a festival in the Czech Republic from his home in Glasgow.

   His mum orders the tickets costing 1500 Czech koruna.

   His mum lives in Poland so he must pay her back in Polish zloty.

Rates of exchange	
Pounds sterling (£)	**Other currencies**
1	30.00 Czech koruna
1	4.96 Polish zloty

   Calculate how many Polish zloty he must give to his mum. **2**

9. Paul usually works 30 hours each week.

He is paid time and a half for any **additional** hours that he works.

His basic rate of pay is £12.50.

Last week, he worked a total of 37 hours.

(a) Calculate his gross pay for last week. **3**

9. **(continued)**

Paul is buying a new TV.

It is advertised at a price of £825.

He decides to use a payment plan to buy the TV.

The total cost of the TV using the payment plan is £845.80.
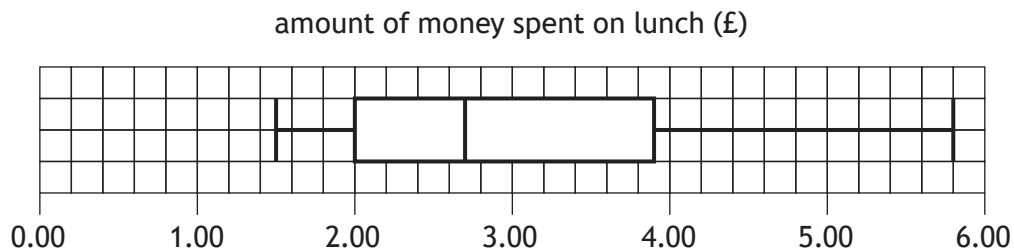
The payments are calculated as follows:

- deposit of $\frac{1}{5}$ of **advertised** price

- 8 equal monthly instalments

- final payment of £100.

(b) Calculate the monthly instalment.   **3**

10. Mr Kenneth asked his class how much money they had spent on their lunch.

The results are shown in the boxplot.

amount of money spent on lunch (£)

(a) Calculate the inter-quartile range. **2**

The money spent on lunch by Mrs Campbell's class had an inter-quartile range of £1.82.

(b) Make one valid comment comparing the money spent on lunch by Mr Kenneth's class and Mrs Campbell's class. **1**

11. A company delivers parcels to people's homes.

The probability of a parcel arriving damaged is 0.023.

In one month, the company delivered 700 parcels, of which 15 were damaged.
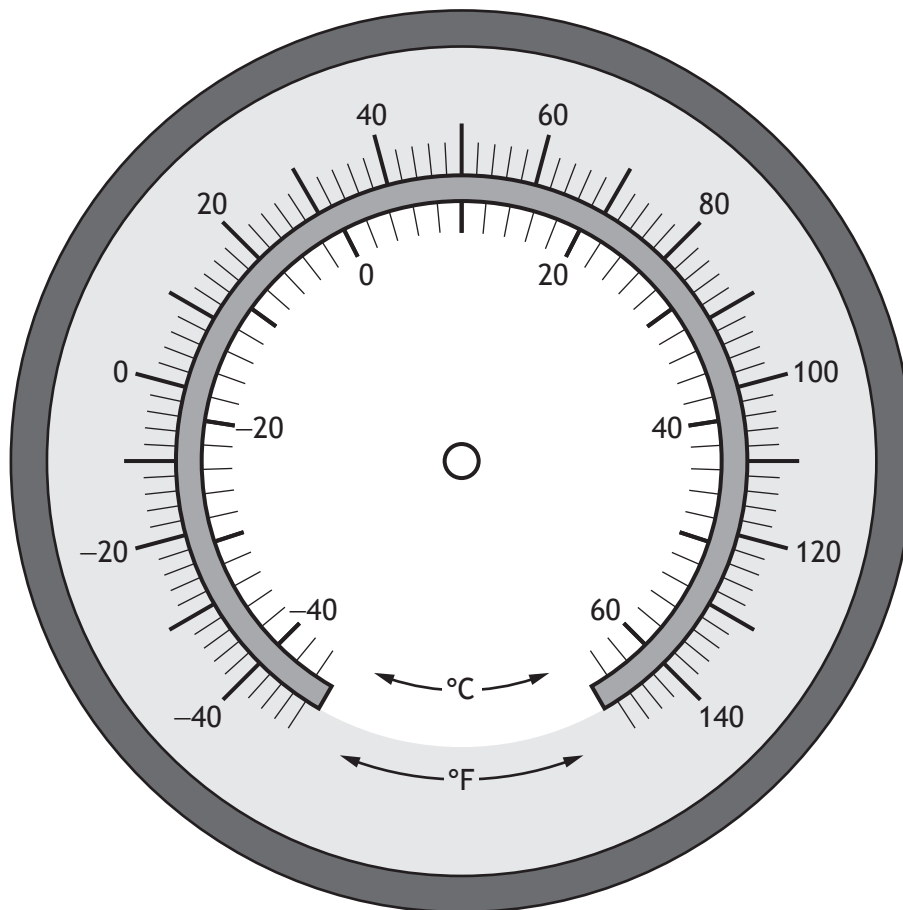
Determine if this is more or less than expected. **2**
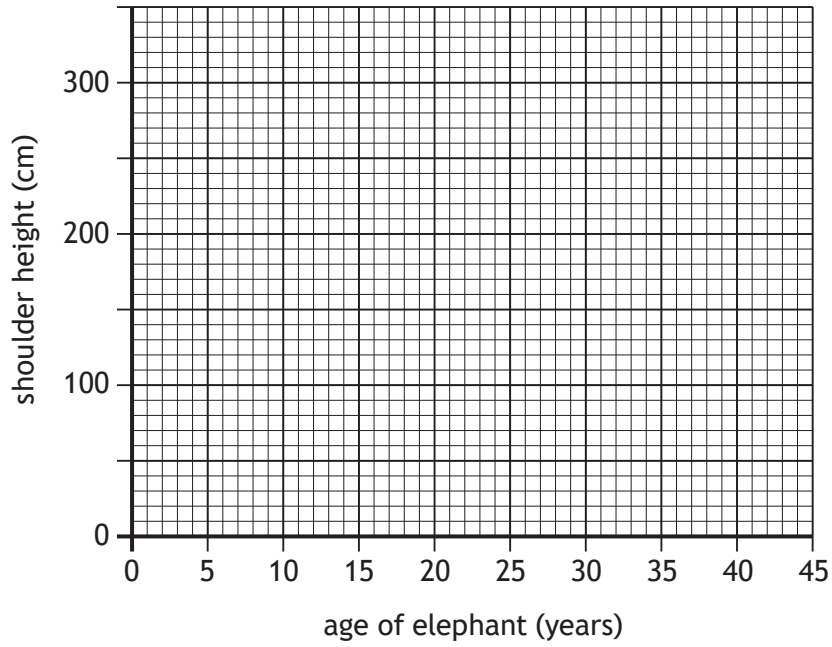
[END OF SPECIMEN QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

Additional gauge for use with question 2

ADDITIONAL SPACE FOR ANSWERS

Additional grid for use with question 3 (a)

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**Applications of Mathematics
Paper 1 (Non-calculator)**

Marking Instructions

SQA ©

General marking principles for National 5 Applications of Mathematics

Always apply these general principles. Use them in conjunction with the detailed marking instructions, which identify the key features required in candidates' responses.

For each question, the marking instructions are generally in two sections:

generic scheme — this indicates why each mark is awarded
illustrative scheme — this covers methods which are commonly seen throughout the marking

In general, you should use the illustrative scheme. Only use the generic scheme where a candidate has used a method not covered in the illustrative scheme.

(a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.

(b) If you are uncertain how to assess a specific candidate response because it is not covered by the general marking principles or the detailed marking instructions, you must seek guidance from your team leader.

(c) One mark is available for each •. There are no half marks.

(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(e) Only award full marks where the solution contains appropriate working. A correct answer with no working receives no mark, unless specifically mentioned in the marking instructions.

(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(g) If an error is trivial, casual or insignificant, for example 6 x 6 = 12, candidates lose the opportunity to gain a mark, except for instances such as the second example in point (h) below.

(h) If a candidate makes a transcription error (question paper to script or within script), they lose the opportunity to gain the next process mark, for example

This is a transcription error and so the mark is not awarded.

This is no longer a solution of a quadratic equation, so the mark is not awarded.

$$x^2 + 5x + 7 = 9x + 4$$
$$x - 4x + 3 = 0$$
$$x = 1$$

The following example is an exception to the above

This error is not treated as a transcription error, as the candidate deals with the intended quadratic equation. The candidate has been given the benefit of the doubt and all marks awarded.

$$x^2 + 5x + 7 = 9x + 4$$
$$x - 4x + 3 = 0$$
$$(x - 3)(x - 1) = 0$$
$$x = 1 \text{ or } 3$$

(i) **Horizontal/vertical marking**
If a question results in two pairs of solutions, apply the following technique, but only if indicated in the detailed marking instructions for the question.

Example:

$$\bullet^5 \qquad \bullet^6$$
$$\bullet^5 \quad x = 2 \quad x = -4$$
$$\bullet^6 \quad y = 5 \quad y = -7$$

Horizontal: $\bullet^5\, x = 2$ and $x = -4$ Vertical: $\bullet^5\, x = 2$ and $y = 5$
$\bullet^6\, y = 5$ and $y = -7$ $\bullet^6\, x = -4$ and $y = -7$

You must choose whichever method benefits the candidate, **not** a combination of both.

(j) In final answers, candidates should simplify numerical values as far as possible unless specifically mentioned in the detailed marking instruction. For example

$\dfrac{15}{12}$ must be simplified to $\dfrac{5}{4}$ or $1\dfrac{1}{4}$ $\dfrac{43}{1}$ must be simplified to 43

$\dfrac{15}{0.3}$ must be simplified to 50 $\dfrac{4/5}{3}$ must be simplified to $\dfrac{4}{15}$

$\sqrt{64}$ must be simplified to 8*****

*The square root of perfect squares up to and including 144 must be known.

(k) Do not penalise candidates for any of the following, unless specifically mentioned in the detailed marking instructions:

- working subsequent to a correct answer
- correct working in the wrong part of a question
- legitimate variations in numerical answers/algebraic expressions, for example angles in degrees rounded to nearest degree
- omission of units
- bad form (bad form only becomes bad form if subsequent working is correct), for example

$(x^3 + 2x^2 + 3x + 2)(2x + 1)$ written as

$(x^3 + 2x^2 + 3x + 2) \times 2x + 1$

$= 2x^4 + 5x^3 + 8x^2 + 7x + 2$

gains full credit

- repeated error within a question, but not between questions or papers

(l) In any 'Show that…' question, where candidates have to arrive at a required result, the last mark is not awarded as a follow-through from a previous error, unless specified in the detailed marking instructions.

(m) You must check all working carefully, even where a fundamental misunderstanding is apparent early in a candidate's response. You may still be able to award marks later in the question so you must refer continually to the marking instructions. The appearance of the correct answer does not necessarily indicate that you can award all the available marks to a candidate.

(n) You should mark legible scored-out working that has not been replaced. However, if the scored-out working has been replaced, you must only mark the replacement working.

(o) If candidates make multiple attempts using the same strategy and do not identify their final answer, mark all attempts and award the lowest mark. If candidates try different valid strategies, apply the above rule to attempts within each strategy and then award the highest mark.

For example:

Strategy 1 attempt 1 is worth 3 marks.	Strategy 2 attempt 1 is worth 1 mark.
Strategy 1 attempt 2 is worth 4 marks.	Strategy 2 attempt 2 is worth 5 marks.
From the attempts using strategy 1, the resultant mark would be 3.	From the attempts using strategy 2, the resultant mark would be 1.

In this case, award 3 marks.

Marking Instructions for each question

Question			Generic scheme	Illustrative scheme	Max mark
1.			•^{1} Process: calculate limits •^{2} Process: identify rejected candles (or accepted candles) •^{3} Process/communication: calculate percentage rejected	•^{1} 22.3 and 22.7 •^{2} 22.2, 22.9, 21.6, 22.8 (or 22.6, 22.5, 22.3, 22.6, 22.4, 22.7) •^{3} 40%	3
2.			•^{1} Process: calculate new temperature •^{2} Communication: mark temperature on Celsius scale	•^{1} −28 •^{2} evidence	2
3.	(a)		•^{1} Communication: 3 points correct •^{2} Communication: all 5 points correct	•^{1} evidence •^{2} evidence	2
	(b)		•^{3} Strategy: consistent line of best fit	•^{3} evidence	1
	(c)		•^{4} Communication: answer consistent with line of best fit	•^{4} evidence	1
4.			•^{1} Strategy: evidence of common denominator •^{2} Process: add fractions •^{3} Process: calculate the fraction that Jessica ate.	•^{1} evidence of 21 or equivalent •^{2} $\dfrac{29}{21}$ •^{3} $\left(\dfrac{42}{21} - \dfrac{29}{21} = \right)\dfrac{13}{21}$	3
5.			•^{1} Strategy/process: know how to deal with flight time •^{2} Strategy: know how to deal with time difference •^{3} Process: calculate stop time	•^{1} 11:10pm or equivalent •^{2} eg 11:10 + 8 = 7:10am or 8:50 − 8 = 00:50am or equivalent •^{3} 1 hour 40 minutes	3

Question			Generic scheme	Illustrative scheme	Max mark
6.	(a)		$\bullet^1$ Strategy: know how to find the gradient	$\bullet^1$ $(8 \times 22.5) \div 960$	**2**
			$\bullet^2$ Process: calculate gradient of ramp in simplest form	$\bullet^2$ $\dfrac{3}{16}$	
	(b)		$\bullet^3$ Strategy/Process: know how to compare gradients	$\bullet^3$ $\dfrac{3}{16}$ and $\dfrac{3}{15}$ or equivalent	**2**
			$\bullet^4$ Strategy/communication: consider both gradients and consistent conclusion	$\bullet^4$ $\dfrac{3}{16} < \dfrac{3}{15}$ she is correct	
7.			$\bullet^1$ Strategy: substitute correctly into Pythagoras' Theorem	$\bullet^1$ $h^2 = 10^2 - 6^2$	**3**
			$\bullet^2$ Process: calculate height	$\bullet^2$ 8	
			$\bullet^3$ Process: calculate area	$\bullet^3$ $8 \times 12 \div 2 = 48$	
8.			$\bullet^1$ Strategy: know to divide by 30 then multiply by 4.96	$\bullet^1$ Evidence	**2**
			$\bullet^2$ Process: all calculations correct	$\bullet^2$ $1500 \div 30 = 50$ $50 \times 4.96 = 248$	
9.	(a)		$\bullet^1$ Process: calculate basic pay	$\bullet^1$ $30 \times 12.50 = 375$	**3**
			$\bullet^2$ Strategy: know how to calculate overtime pay	$\bullet^2$ $1.5 \times 12.50 \times 7$	
			$\bullet^3$ Process: calculate total gross pay	$\bullet^3$ $375 + 131.25 = 506.25$	
	(b)		$\bullet^4$ Process: calculate the deposit	$\bullet^4$ $\dfrac{1}{5} \times 825 = 165$	**3**
			$\bullet^5$ Process: calculate amount still payable	$\bullet^5$ $845.80 - (165 + 100) = 580.80$	
			$\bullet^6$ Process: calculate how much each monthly payment is	$\bullet^6$ $580.80 \div 8 = 72.60$	

Question			Generic scheme	Illustrative scheme	Max mark
10.	(a)		$\bullet^1$ Communication: values of Q_1 and Q_3 identified	$\bullet^1$ 2 and 3.9	2
			$\bullet^2$ Process: calculate the inter-quartile range	$\bullet^2$ 1.90	
	(b)		$\bullet^3$ Communication: comment regarding inter-quartile range	$\bullet^3$ eg Mr Kenneth's class lunch expenditure is more varied	1
11.			$\bullet^1$ Process: calculate expected frequency	$\bullet^1$ $(700 \times 0.023 =)16.1$	2
			$\bullet^2$ Communication: conclusion consistent with working	$\bullet^2$ less	
			Alternative Strategy $\bullet^1$ Process: calculate probability	$\bullet^1$ $(15 \div 700 =)\ 0.021(4285714...)$	
			$\bullet^2$ Communication: conclusion consistent with working	$\bullet^2$ less	

[END OF SPECIMEN MARKING INSTRUCTIONS]