National Qualifications 2022

2022 Applications of Mathematics

Paper 2

National 5

Finalised Marking Instructions

These marking instructions have been prepared by examination teams for use by SQA appointed markers when marking external course assessments.

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:

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

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

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

$\frac{15}{0{\cdot}3}$ must be simplified to 50 $\frac{4/5}{3}$ must be simplified to $\frac{4}{15}$

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

*The square root of perfect squares up to and including 100 must be known.

(k) Commonly Observed Responses (COR) are shown in the marking instructions to help mark common and/or non-routine solutions. CORs may also be used as a guide when marking similar non-routine candidate responses.

(l) 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

(m) 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.

(n) 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.

(o) 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.

(p) 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.	$\bullet^1$ Strategy: know how to calculate percentage decrease $\bullet^2$ Strategy: know how to calculate percentage increase $\bullet^3$ Strategy: identify power or equivalent $\bullet^4$ Process/communication: calculate the sales figure after 3 years and round to 3 significant figures	$\bullet^1$ Evidence of 0.958 or equivalent $\bullet^2$ Evidence of 1.053 or equivalent $\bullet^3$ $\ldots^2$ or equivalent $\bullet^4$ $(254937.36\ldots =)255000$	**4**

Notes:

1. Correct answer with no working award 4/4
2. When working in pounds, where rounding or truncating has taken place, working must be given to at least 2 decimal places
3. $\bullet^4$ can only be awarded for a calculation involving 3 years and rounding to 3 significant figures
4. $\bullet^1$ is not available 0.958^n where $n \neq 1$

Commonly Observed Responses:

1. **No working necessary:**
   a) 254 937.36 or 254 937.37 award 3/4 ✓✓✓×

2. **Working must be shown:**
   For the following, award 3/4 ×✓✓✓

   a) $240000 \times 1.042 \times 0.947^2 = 224273.99$ leading to 224 000

   For the following, award 3/4 ✓✓×✓

   b) $229920 + 229920 \times 0.053 \times 2 = 254291.52$ leading to 254 000

   c) $240000 \times 1.042 \times 1.053^2 = 277290.95\ldots$ leading to 277 000

   For the following, award 3/4 ✓×✓✓

   d) $240000 \times 0.958 \times 0.947^2 = 206194.32\ldots$ leading to 206 000

   For the following, award 2/4 ✓✓××

   e) $240000 \times 0.958 \times 1.053 = 242105.76$ leading to 242 000

Question			Generic scheme	Illustrative scheme	Max mark
2.	(a)	(i)	•[1] Process: calculate mean	•[1] 70.5	**1**
Notes:					
Commonly Observed Responses:					
		(ii)	•[2] Process: calculate $(x-\bar{x})^2$ •[3] Strategy/process: calculate $\sum(x-\bar{x})^2$ and substitute into formula •[4] Process: calculate standard deviation	•[2] 2.25, 20.25, 6.25, 6.25, 30.25, 0.25 •[3] $\sqrt{\frac{65.5}{6-1}}$ •[4] 3.62	**3**
			Alternative Strategy •[2] Process: calculate $\sum x$ and $\sum x^2$ •[3] Strategy/process: substitute into formula •[4] Process: calculate standard deviation	•[2] 423, 29887 •[3] $\sqrt{\frac{29887-\frac{423^2}{6}}{6-1}}$ •[4] 3.62	**3**

Notes:

1. Correct answer with no working award 0/3
2. Accept rounding or truncating to at least 1 decimal place for final answer
3. For •[3] do not penalise a square root sign that does not extend to the denominator
4. •[4] can only be awarded for a calculation involving at least 2 steps including a division and a square root

Commonly Observed Responses:

For the following, award 3/3 ✓✓✓

1. $\sqrt{\frac{65.5}{6-1}} = 3.6$

2. $\sqrt{\frac{65.5}{6-1}} = 3.619... \rightarrow 3.60$, working subsequent to a correct answer

For the following, award 2/3 ✓✓×

3. $\sqrt{\frac{65.5}{6-1}} = 3.60$

4. $\frac{\sqrt{65.5}}{5} \rightarrow 1.618...$

For the following, award 1/3 ✓××

5. $\frac{65.5}{5} = 13.1$

Question			Generic scheme	Illustrative scheme	Max mark
	(b)		•5 Communication: comment regarding mean •6 Communication: comment regarding standard deviation	•5 eg on average prices in August were cheaper. •6 eg prices in August were less consistent	**2**

Notes:

1. Answer must be consistent with answer to part (a)
2. Comments **must** refer to prices in August and/or September
3. Numerical comparisons are not required, but when used must be accurate
4. For the award of •5
   (a) Accept eg
   - On average the price in September was more expensive than in August
   - The average price from August to September has increased

   (b) **Do not** accept eg
   - On average the mean is more
   - The mean price in August was less
   - On average the price in August was better
   - On average the August price was more varied

4. For the award of •6
   (a) Accept eg
   - The spread of prices is less in September
   - The prices in August are more varied

   (b) **Do not** accept eg
   - Standard deviation is more in August
   - On average the price in August was more varied
   - The standard deviation was more consistent
   - The standard deviation was more varied in August

Commonly Observed Responses:

For the following, award 2/2 ✓✓

1. The average price in September was higher and the prices were more consistent

For the following, award 1/2 ✓×

2. On average the prices in September were higher and more consistent
3. The average price in September was higher and more consistent

Question			Generic scheme	Illustrative scheme	Max mark
3.			•[1] Strategy/process: calculate amount taxed at 12% •[2] Process: calculate national insurance	•[1] 40 560 – 9568 = 30 992 •[2] 3719.04	**2**

Notes:

1. Correct answer with no working award 2/2
2. Where final answer is not a whole number •[2] is only available where final answer is rounded or truncated to 2 decimal places
3. If 40 560 is not used in any calculation award 0/2
4. •[2] is not available for candidates who subtract a calculated National Insurance from any value unless they clearly state their national insurance value.

Commonly Observed Responses:

For the following, award 1/2 ✓×

1. $3719.04 \rightarrow 36840.96$
2. $88\%\ \text{of}\ 30992 = 27272.96$

For the following, award 1/2 ×✓

3. 12% of 40 560 = 4867.20
4. $12\%\ \text{of}\left(50270 - 40560\right) = 1165.20$

For the following, award 0/2 ××

5. $40560 - 4867.20 = 35692.80$
6. $12\%\ \text{of}\left(50270 - 9568\right) = 4884.24$
7. 12% of 9568 = 1148.16

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		$\bullet^1$ Process: calculate the number of boxes along the length and breadth of the crate for one arrangement $\bullet^2$ Process: calculate the number of boxes along the length and breadth of the crate for the other arrangement $\bullet^3$ Process/Communication: calculate maximum number of boxes	$65 \div 15 = 4.33...$ $\bullet^1$ $48 \div 10 = 4.8$ $(25 \div 8 = 3.1...)$ $65 \div 10 = 6.5$ $\bullet^2$ $48 \div 15 = 3.2$ $(25 \div 8 = 3.1...)$ $(25 \div 8 = 3.125 \rightarrow 3)$ $\bullet^3$ $4 \times 4 \times 3 = 48$ $6 \times 3 \times 3 = 54$ Maximum 54 boxes	**3**

Notes:

1. Correct answer with no working award 0/3
2. Where the candidate only considers volume award 0/3
3. $\bullet^2$ can only be awarded where the 8 is consistent with the same dimension as $\bullet^1$
4. Where $\bullet^1$ is lost for an incorrect process, $\bullet^2$ can be awarded for repeated incorrect process where there are no arithmetic errors in the calculations
5. $\bullet^3$ is still available if the candidate states $4 \times 4 = 16$ instead of $4 \times 4 \times 3 = 48$
6. Where the candidate considers more than two arrangements do not award $\bullet^3$
7. Where the candidate only considers one arrangement $\bullet^2$ and $\bullet^3$ are not available
8. $\bullet^1$ is not available for candidates who incorrectly convert units, but $\bullet^2$ and $\bullet^3$ are still available

Commonly Observed Responses:

For the following, award 2/3 ✓✓×

1. $4 \times 5 \times 3 = 60$ and $3 \times 7 \times 3 = 63 \rightarrow 63$ boxes
2. $5 \times 5 \times 3 = 75$ and $4 \times 7 \times 3 = 84 \rightarrow 84$ boxes
3. $5 \times 5 \times 4 = 100$ and $4 \times 7 \times 4 = 112 \rightarrow$ 112 boxes

Question			Generic scheme	Illustrative scheme	Max mark
4.	(b)		$\bullet^4$ Strategy: know to use inverse proportion $\bullet^5$ Process: calculate the time for 1 employee $\bullet^6$ Process: calculate the time for 11 employees	$\bullet^4$ evidence of multiplying by 7 and dividing by 11 $\bullet^5$ $7 \times 44 = 308$ $\bullet^6$ $308 \div 11 = 28$	**3**
			Alternative Strategy $\bullet^4$ Strategy: know to use inverse proportion $\bullet^5$ Process: calculate the time for 1 employee to make 1 sandwich $\bullet^6$ Process: calculate the time for 11 employees	 $\bullet^4$ evidence of multiplying by 7 and dividing by 11 $\bullet^5$ $44 \times 7 \div 100 = 3.08$ $\bullet^6$ $3.08 \div 11 \times 100 = 28$	**3**

Notes:

1. Correct answer with no working — award 3/3
2. For an answer of eg "it takes 16 minutes less" — award 3/3
3. Do not penalise any working subsequent to a listed COR
4. $\bullet^6$ is available for dividing 44 or 308 by 11
5. If the candidate subtracts 7 to find the number of minutes, $\bullet^6$ is not available
6. Within calculations, rounding or truncating must be to at least 2 decimal places

Commonly Observed Responses:

For the following, award 3/3 ✓✓✓

1. $44 \div (11 \div 7) = 28$

For the following, award 2/3 ×✓✓

2. $7 \div 44 \times 11 = 1.75$
3. $11 \div (44 \div 7) = 1.75$
4. $44 \div 7 \times 11 = 69.14...$
5. $44 \div 7 = 6.3 \rightarrow 6.3 \times 4 = 25.2$
6. $44 \div 7 = 6.28... \rightarrow 6.28... \times 4 = 25.14...$
7. $7 \div 44 \times 11 = 1.75 \rightarrow (44 \div 1.75 =) 25.14...$

For the following, award 1/3 ×✓×

8. $44 \div 7 = 6.3$

For the following, award 1/3 ××✓

9. $44 \div 11 = 4$
10. $44 \div 11 = 4 \rightarrow 44 - 4 = 40$

For the following, award 0/3 ×××

11. $100 \div 7 = 14.2...$

Question			Generic scheme	Illustrative scheme	Max mark
	(c)		$\bullet^7$ Process: calculate total selling price $\bullet^8$ Process: calculate loss $\bullet^9$ Process: calculate percentage loss	$\bullet^7$ 90.55 $\bullet^8$ 2.10 or 2.1 $\bullet^9$ 2.266…	**3**

Notes:

1. For an answer of 2.26… with no working — award 3/3
2. For an answer of 2.3 with no working — award 2/3
3. 2.10 with or without working — award 2/3
4. $\bullet^7$ can be implied by $\bullet^8$
5. With the exception of COR 3 and COR 5, $\bullet^9$ is only available for a calculation of the form $\frac{\text{calculated loss}}{92.65}\times 100$
6. For an answer of 2% or 2.3%, with no evidence of note 5, $\bullet^9$ is not available
7. For $\bullet^9$ multiplication by 100 can be implied by the answer
8. $\bullet^9$ is only available for answers of less than 100%

Commonly Observed Responses:

For the following, award 3/3 ✓✓✓

1. $100-\left(\frac{90.55}{92.65}\times 100\right)=2.26...$

For the following, award 2/3 ✓✓×

2. $\frac{2.1}{92.65}=0.0226...$
3. $\frac{2.1}{90.55}\times 100=2.319...$

For the following, award 2/3 ✓×✓

4. $\frac{90.55}{92.65}\times 100=97.73...$

For the following, award 1/3 ✓××

5. $\frac{92.65}{90.55}\times 100=102.319...$

Question			Generic scheme	Illustrative scheme	Max mark
	(d)		•[10] Communication: identify the price to be paid for each type of sandwich •[11] Process: calculate total cost of the sandwiches •[12] Process: calculate the total including delivery charge	•[10] 1.75, 2.05, 1.45 •[11] 118.25 •[12] 134.75	**3**

Notes:

1. Correct answer with no working or annotation award 0/3
2. Correct answer with no working except the correct values annotated award 3/3
3. Where final answer is not a whole number •[3] is only available where final answer is rounded or truncated to 2 decimal places
4. •[10] can be awarded for annotations at **only** the correct values on the table
5. •[11] can be implied by •[12]

Commonly Observed Responses:

For the following, award 2/3 ✓✓×

1. $20\times1.75+30\times2.05+15\times1.45+2.75=121a$

For the following, award 2/3 ✓×✓

2. $1.75+2.05+1.45+6\times2.75=21.75$

For the following, award 1/3 ✓××

3. $1.75+2.05+1.45+2.75=8$

Question			Generic scheme	Illustrative scheme	Max mark
5.	(a)		$\bullet^1$ Communication: identify correct entry in table	$\bullet^1$ 1160	**1**
Notes: 1. When 1160 is the only number identified from the table, ignore any subsequent working					
Commonly Observed Responses:					
	(b)		$\bullet^5$ Communication: select correct time from the table $\bullet^6$ Process: convert time $\bullet^7$ Process: calculate average speed in **metres per second**	$\bullet^5$ 2 minutes 8 seconds $\bullet^6$ 128 or 2.133… $\bullet^7$ 6.25	**3**
Notes: 1. Correct answer with no working award 2/3 2. 6.2 or 6.3 with no working award 0/3 3. $\bullet^5$ is available for annotating the table 4. $\bullet^6$ and $\bullet^7$ are available for a calculation involving any time converted from the table eg see COR 3 5. $\bullet^5$ can be implied by $\bullet^6$					
Commonly Observed Responses: For the following, award 2/3 ✓✓× 1. $\frac{128}{800} = 0.16$ 2. $\frac{800}{2.133...} = 375$ For the following, award 2/3 ×✓✓ 3. $\frac{800}{129} = 6.20...$ For the following, award 1/3 ✓×× 4. $\frac{800}{2.08} = 384.6...$ 5. $\frac{800}{2.8} = 285.7...$					

Question			Generic scheme	Illustrative scheme	Max mark
5.	(c)		•[8] Process: use flight time to calculate time in Doha when flight left •[9] Process: use time difference to calculate time in Manchester when flight left	•[8] 11:55 •[9] 09:55	**2**
			Alternative Strategy 1 •[8] Process: use time difference to calculate time in Manchester when flight landed •[9] Process: use flight time to calculate time in Manchester when flight left	•[8] 17:18 •[9] 09:55	
			Alternative Strategy 2 •[8] Process: add time difference to flight time •[9] Process: calculate time flight left Manchester	•[8] 9 hours 23 minutes •[9] 09:55	

Notes:

1. Correct answer with no working award 2/2
2. Do not penalise 17:18pm or equivalent
3. The use of am and pm with 24 hour time should only be penalised if the answer is in the wrong part of the day eg 09:55pm
4. In alternative strategy 2, accept 9.23 for •[8], (bad form)

Commonly Observed Responses:

For the following, award 2/2 ✓✓

1. 9:55

For the following, award 1/2 ✓×

2. 13:55
3. 00:41
4. 10:05

For the following, award 0/2 ××

5. 02:41
6. 04:41

Question			Generic scheme	Illustrative scheme	Max mark
	(d)		$\bullet^{10}$ Process: exchange pounds to riyals	$\bullet^{10}$ 7005	4
			$\bullet^{11}$ Process: calculate left over riyals	$\bullet^{11}$ 1825	
			$\bullet^{12}$ Process: convert riyals to pounds	$\bullet^{12}$ 390.79…	
			$\bullet^{13}$ Process: convert pounds to euro	$\bullet^{13}$ 453.32	

Notes:

1. For the correct answer with no working award 4/4
2. $\bullet^{12}$ can be rounded or truncated to a whole number or any number of decimal places
3. The final answer can be rounded or truncated to a whole number of euro, one or two decimal places
4. $\bullet^{13}$ is available when a candidate multiplies their answer to $\bullet^{11}$ by 1.16, omitting $\bullet^{12}$
5. If the candidate calculates a negative answer at $\bullet^{11}$ then $\bullet^{12}$ and $\bullet^{13}$ are not available eg COR 9
6. Do not penalise the wrong units in the final answer

Commonly Observed Responses:

For the following, with or without working, award 4/4 ✓✓✓✓

1. 453, 453.3, 453.30, 453.31, 453.33
2. $7005 \rightarrow 1825 \rightarrow 390 \rightarrow 452.4(0)$

For the following, award 3/4 ✓✗✓✓

3. $(7005 - 418 - 1836) \div 4.67 \times 1.16 = 1180.11$ or 1180.12
4. $(7005 - 1836) \div 4.67 \times 1.16 = 1283.94$ or 1283.95
5. $(7005 - 8 \times 418) \div 4.67 \times 1.16 = 909.37$

For the following, award 3/4 ✓✓✓✗

6. $1825 \div 4.67 \div 1.16 = 336.88$ or 336.89

For the following, award 3/4 ✓✓✗✓

7. $1825 \times 4.67 \times 1.16 = 9886.39$
8. $1825 \times 1.16 = 2117$

For the following, award 2/4 ✓✓✗✗

9. $1825 \times 4.67 \div 1.16 = 7347.19$ or 7347.20

For the following, award 1/4 ✗✓✗✗

10. $(1500 \div 4.67) - 5180 = -4858.80$

Question			Generic scheme	Illustrative scheme	Max mark
6.	(a)		$\bullet^1$ Process: calculate mean price $\bullet^2$ Process: calculate commission earned $\bullet^3$ Process: calculate gross wage	$\bullet^1$ $\left(\frac{8185.50}{107}=\right)76.5(0)$ or $\bullet^2$ 1268.75… $\bullet^3$ (£)2468.75 or 2468.76	**3**

Notes:
1. For the correct answer with no working award 2/3
2. Where final answer is not a whole number $\bullet^3$ is only available where final answer is rounded or truncated to 2 decimal places
3. $\bullet^2$ is only available if the percentage used is taken from the table
4. $\bullet^2$ is only available for calculating a percentage of 8185.50
5. $\bullet^3$ is only available for adding 1200 to a previously calculated commission

Commonly Observed Responses:
For the following, award 2/3 ×✓✓
1. 15.5% of $8185.50+1200=2468.75$, with no evidence of 76.50

For the following, award 2/3 ✓×✓
2. $76.5\rightarrow 15.5\%\text{ of }1200+1200=1386$
3. $76.5\rightarrow 15.5\%\text{ of }76.50=11.86\rightarrow 11.86\times 107+1200=2469.02$

For the following, award 1/3 ×✓×
4. 1268.75 with no working

For the following, award 1/3 ××✓
5. 15.5% of $1200+1200=1386$, with no evidence of 76.50

	(b)		$\bullet^4$ Strategy/process: calculate multiplier $\bullet^5$ Process: calculate total amount of extinguishers	$\bullet^4$ 8 $\bullet^5$ 120	**2**

Notes:
1. Correct answer with no working award 2/2
2. For commonly observed answers illustrated below, 3.73 or 3.74, multiplied by 6, 2 or 7 $\bullet^5$ can be awarded
3. Where the candidate attempts more than one COR all calculations must be correct for $\bullet^5$ to be awarded
4. $\bullet^4$ cannot be awarded if the candidate has also calculated $56\div 2$ and/or $56\div 6$ and/or $56\div 15$

Commonly Observed Responses:
For the following, award 1/2 ×✓
1. $56\div 15\times 6=22.4$
2. $56\div 15\times 2=7.46\ldots$
3. $56\div 15\times 7=26.13\ldots$

Question			Generic scheme	Illustrative scheme	Max mark
	(c)		$\bullet^6$ Process: calculate cost for company A $\bullet^7$ Process: calculate cost for company B $\bullet^8$ Strategy/process: choose cheapest option and reduce by 5%	$\bullet^6$ 774 $\bullet^7$ 780 $\bullet^8$ 735.30	**3**

Notes:

1. For correct answer with no working award 3/3
2. Where final answer is not a whole number $\bullet^8$ is only available where final answer is rounded or truncated to 2 decimal places
3. $\bullet^8$ is only available when the candidate compares company C with at least one of the other companies

Commonly Observed Responses:

For the following, award 2/3 ✓×✓

1. B: 156, A: 774 $\rightarrow$ 145.20

For the following, award 2/3 ×✓✓

2. B: 780, A: 654 $\rightarrow$ 621.30
3. B: 780, A: 618 $\rightarrow$ 587.10
4. A: > 780, B: 780 $\rightarrow$ 741

For the following, award 0/3

5. 95% of 900 = 855 with no other working
6. 95% of $(78+15) = 88.35$

	(d)		$\bullet^9$ Process: calculate limits $\bullet^{10}$ Process: identify safe extinguishers $\bullet^{11}$ Process/communication: express as fraction	$\bullet^9$ 9.36 and 11.44 $\bullet^{10}$ 9.80, 10.94, 11.10,10.55 or annotations $\bullet^{11}$ $\frac{4}{7}$	**3**

Notes:

1. For any answer with no working award 0/3
2. $\bullet^{10}$ can only be awarded if there is evidence of the limits used
3. $\bullet^{10}$ can be implied by $\bullet^{11}$
4. Where answer is incorrect $\bullet^{11}$ can be awarded if there is evidence of where the fraction has come from
5. $\bullet^{11}$ can be awarded for a fraction not in its simplest form

Commonly Observed Responses:

Special Case - award 2/3

$10\% = 1.04 \rightarrow \frac{4}{7}$ where the limits have not been explicitly stated but safe extinguishers have been identified

Question			Generic scheme	Illustrative scheme	Max mark
7.	(a)		•[1] Strategy/process: change to consistent units •[2] Process: calculate volume of conditioner	•[1] 20 (l) or 14 000(ml) •[2] 0.0035 (l) or 3.5 (ml)	**2**

Notes:

1. Correct answer with no working award 2/2
2. Incorrect units should not be penalised

Commonly Observed Responses:

For the following, award 1/2 ×✓

1. 2 (litres) → 35 (ml)
2. 200 (litres) → 0.35 (ml)
3. 1 400 (ml) → 0.35 (ml)
4. 140 000 (ml) → 35 (ml)

Question			Generic scheme	Illustrative scheme	Max mark
	(b)		$\bullet^3$ Strategy: substitute correctly into cylinder formula	$\bullet^3$ $\pi \times 5^2 \times 8$	4
			$\bullet^4$ Process: calculate volume of cylinder	$\bullet^4$ 628.318…	
			$\bullet^5$ Strategy/Process: calculate volume of cuboid with height 40cm	$\bullet^5$ 36 000	
			$\bullet^6$ Strategy/Process: calculate volume of water	$\bullet^6$ 35 371.6…	

Notes:

1. Correct answer with no working award 0/4
2. $\bullet^3$ can be implied by subsequent working
3. $\bullet^4$ is only available for any calculation involving π and a power
4. With the exception of COR 2, $\bullet^6$ is only available for the subtraction of two calculated volumes
5. When a candidate uses a height of 42cm, $\bullet^6$ is still available when 2 is subtracted from the volume of the cuboid or the final answer see COR 2
6. Accept legitimate variations of π
7. For the final answer accept any legitimate rounding or truncating to at least 3 significant figures
8. Accept answers given in millilitres or litres
9. For candidates who square root the volume of the cylinder $\bullet^4$ is not available

Commonly Observed Responses:

For the following, award 3/4 ✓✓×✓

1. $30 \times 30 \times 42 - \pi \times 5^2 \times 8 = 37\,171.68$
2. $30 \times 30 \times 42 - \pi \times 5^2 \times 8 - 2 = 37\,169.68$

For the following, award 3/4 ×✓✓✓

3. $30 \times 30 \times 40 - \pi \times 10^2 \times 8 = 33\,486.72$

For the following, award 2/4 ×✓×✓

4. $30 \times 30 \times 42 - \pi \times 10^2 \times 8 = 35\,286.72$

Question			Generic scheme	Illustrative scheme	Max mark
	(c)		$\bullet^7$ Strategy/communication: correct substitution into Pythagoras' theorem	$\bullet^7$ $30^2 + 30^2$	4
			$\bullet^8$ Process: calculate length of diameter	$\bullet^8$ 42.426…	
			$\bullet^9$ Process: calculate area of table top	$\bullet^9$ 1413.7…	
			$\bullet^{10}$ Process/communication: convert to square metres	$\bullet^{10}$ 0.14137…	

Notes:

1. For correct answer with no working award 0/4
2. For $\bullet^8$ and $\bullet^9$ do not penalise candidates who truncate or round to the nearest whole number
3. Accept legitimate variations of π
4. $\bullet^9$ is only available for a calculation involving πr^2, where r is half the calculated diameter, 30 or 15
5. For candidates who add 900 to the area of the circle, $\bullet^9$ is not available
6. For candidates who subtract 900 from the area of the circle, $\bullet^9$ is not available
7. $\bullet^{10}$ is available to candidates who correctly convert lengths from centimetres to metres at any stage
8. For candidates who square root the area of the circle $\bullet^9$ is not available

Commonly Observed Responses:

For the following, award 4/4 ✓✓✓✓

1. $42 \rightarrow \pi \times 21^2 \rightarrow 0.1385...$

For the following, award 3/4 ✓✓×✓

2. $\pi \times 42.426^2 \rightarrow 0.5654...$

For the following, award 2/4 ××✓✓

3. $\pi \times 30^2 \rightarrow 0.2827...$
4. $\pi \times 15^2 \rightarrow 0.0706...$

[END OF MARKING INSTRUCTIONS]