



National
Qualifications
SPECIMEN ONLY

S847/75/02

**Mathematics
Paper 2**

Marking Instructions

These marking instructions have been provided to show how SQA would mark this specimen question paper.

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General marking principles for National 5 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 $6 \times 6 = 12$, 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:

$$\begin{array}{cc} \bullet^5 & \bullet^6 \\ \bullet^5 & x = 2 \quad x = -4 \\ \bullet^6 & y = 5 \quad y = -7 \end{array}$$

Horizontal: $\bullet^5 x = 2 \text{ and } x = -4$
 $\bullet^6 y = 5 \text{ and } y = -7$

Vertical: $\bullet^5 x = 2 \text{ and } y = 5$
 $\bullet^6 x = -4 \text{ and } y = -7$

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

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

$$\frac{43}{1} \text{ must be simplified to } 43$$

$$\frac{15}{0.3} \text{ must be simplified to } 50$$

$$\frac{4\cancel{5}}{3} \text{ must be simplified to } \frac{4}{15}$$

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

*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.

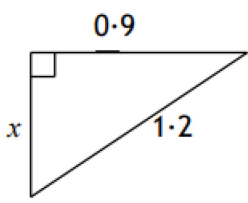
Marking Instructions for each question

Question			Generic scheme	Illustrative scheme	Max mark
1.			<ul style="list-style-type: none"> •¹ know how to decrease by 2% •² know how to calculate new total •³ carry out calculations correctly within a valid strategy 	<ul style="list-style-type: none"> •¹ $\times 0.98$ •² $125\,000 \times 0.98^3$ •³ 117 649 (tonnes) 	3
2.			<ul style="list-style-type: none"> •¹ start to expand •² complete expansion •³ collect like terms which must include a term in x^3 and a negative coefficient 	<ul style="list-style-type: none"> •¹ evidence of any 3 correct terms eg $2x^3 - 8x^2 + 2x$ •² $2x^3 - 8x^2 + 2x + 3x^2 - 12x + 3$ •³ $2x^3 - 5x^2 - 10x + 3$ 	3
3.			<ul style="list-style-type: none"> •¹ begin to factorise •² factorise fully 	<ul style="list-style-type: none"> •¹ $3(x^2 - 16)$ •² $3(x + 4)(x - 4)$ 	2

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		<p>Method 1</p> <ul style="list-style-type: none"> •¹ calculate mean •² calculate $(x - \bar{x})^2$ •³ substitute into formula •⁴ calculate standard deviation <p>Method 2</p> <ul style="list-style-type: none"> •¹ calculate mean •² calculate $\sum x$ and $\sum x^2$ •³ substitute into formula •⁴ calculate standard deviation 	<ul style="list-style-type: none"> •¹ 26 •² 9, 1, 4, 25, 16, 49, 16 •³ $\sqrt{\frac{120}{6}}$ •⁴ 4.47(2...) <ul style="list-style-type: none"> •¹ 26 •² 182, 4852 •³ $\sqrt{\frac{4852 - \frac{182^2}{7}}{6}}$ •⁴ 4.47(2...) 	4
	(b)		<ul style="list-style-type: none"> •⁵ valid comment comparing means •⁶ valid comment comparing standard deviations 	<ul style="list-style-type: none"> •⁵ eg on average the hockey team recorded a higher number of sit-ups •⁶ eg the hockey team's numbers of sit-ups were more consistent 	2

Question			Generic scheme	Illustrative scheme	Max mark
5.			Method 1 • ¹ valid strategy • ² evaluation • ³ explicit comparison • ⁴ conclusion with valid reason	• ¹ $75^2 + 85^2$ and 110^2 • ² $75^2 + 85^2 = 12850$ and $110^2 = 12100$ • ³ $75^2 + 85^2 \neq 110^2$ • ⁴ No, since not right-angled	3
			Method 2 • ¹ valid strategy • ² evaluation • ³ explicit comparison • ⁴ conclusion with valid reason	• ¹ $75^2 + 85^2 = 12850$ • ² $\sqrt{12850} = (113.357\dots)$ • ³ $110 \neq 113(.357\dots)$ • ⁴ No, since not right-angled	
			Method 3 • ¹ valid strategy • ² evaluation • ³ explicit comparison • ⁴ conclusion with valid reason	• ¹ $(\cos x =) \frac{75^2 + 85^2 - 110^2}{2 \times 75 \times 85}$ • ² $(\cos x =) \frac{750}{12750} \left(= \frac{1}{17} \right)$ • ³ $86(.6\dots) \neq 90$ • ⁴ No, since not right-angled	
6.			• ¹ evidence that $115\% = 4830$ • ² begin valid strategy • ³ complete calculation within valid strategy	• ¹ $115\% = 4830$ • ² $1\% = \frac{4830}{115}$ or equivalent • ³ 4200	4

Question			Generic scheme	Illustrative scheme	Max mark
7.			<ul style="list-style-type: none"> •¹ correct substitution into sin rule •² rearrange equation •³ calculate x 	<ul style="list-style-type: none"> •¹ $\frac{\sin x}{150} = \frac{\sin 66}{140}$ or $\frac{150}{\sin x} = \frac{140}{\sin 66}$ •² $\sin x = \frac{150 \sin 66}{140}$ •³ $x = 78(.18...)$ 	3
8.			Method 1 <ul style="list-style-type: none"> •¹ linear scale factor •² know to multiply volume by cube of linear scale factor •³ calculate volume (calculation must include a power of the linear scale factor) 	<ul style="list-style-type: none"> •¹ $\frac{24}{15}$ or equivalent •² $\left(\frac{24}{15}\right)^3 \times 750$ •³ 3072 (cm³) 	3
9.			<ul style="list-style-type: none"> •¹ rearrange equation •² find first value of x •³ find second value of x 	<ul style="list-style-type: none"> •¹ $\cos x = \frac{5}{11}$ •² 63 •³ 297 	5
10.			<ul style="list-style-type: none"> •¹ correct substitution into formula for volume of sphere •² consistent substitution into formula for volume of cylinder •³ know to add volume of hemisphere to volume of cylinder •⁴ all calculations correct (must involve the sum or difference of two volume calculations involving π) •⁵ round final answer to 3 significant figures and state correct units 	<ul style="list-style-type: none"> •¹ $\frac{4}{3} \times \pi \times 12^3$ •² $\pi \times 12^2 \times 58$ •³ $\frac{1}{2} \times \frac{4}{3} \times \pi \times 12^3 + \pi \times 12^2 \times 58$ •⁴ $(3619.1... + 26238.5...) = 29\,857....$ •⁵ 29 900 cm³ 	3

Question			Generic scheme	Illustrative scheme	Max mark
11.			<ul style="list-style-type: none"> •¹ valid common denominator •² answer in simplest form 	<ul style="list-style-type: none"> •¹ $\frac{1}{a^2}$ or $\frac{1}{a^3}$ or $\frac{1}{a^2 \times a}$ •² $\frac{3-2a}{a^2}$ 	2
12.			<ul style="list-style-type: none"> •¹ marshal facts and recognise right angled triangle •² consistent Pythagoras statement •³ calculate x •⁴ calculate width 	<ul style="list-style-type: none"> •¹  •² $x^2 = 1.2^2 - 0.9^2$ •³ 0.8 or 0.79(...) •⁴ 2.0(cm) or 1.99 (cm) 	4
13.			<ul style="list-style-type: none"> •¹ correct substitution for $\tan x$ •² express in simplest form 	<ul style="list-style-type: none"> •¹ $\sin x \cos x \frac{\sin x}{\cos x}$ •² $\sin^2 x$ 	2
14.			<ul style="list-style-type: none"> •¹ identify $\cos A$ or angle A •² substitute into cosine rule (cos A or angle A must have been found using trigonometry) •³ calculate BC^2 •⁴ calculate BC correct to one decimal place 	<ul style="list-style-type: none"> •¹ $\cos A = \frac{3}{4}$ or $A = 41.4$ •² $BC^2 = 6^2 + 10^2 - 2 \times 6 \times 10 \times \frac{3}{4}$ or $BC^2 = 6^2 + 10^2 - 2 \times 6 \times 10 \times \cos 41.4$ •³ $BC^2 = 46$ •⁴ $BC = 6.8$ (cm) 	4

Question			Generic scheme	Illustrative scheme	Max mark
15.			<ul style="list-style-type: none"> •¹ express \overrightarrow{AG} in terms of \overrightarrow{AC} and \overrightarrow{CB} or express \overrightarrow{CB} in terms of \mathbf{u} and \mathbf{t} •² express \overrightarrow{AG} in terms of \mathbf{u} and \mathbf{t} •³ express \overrightarrow{AG} in simplest form 	<ul style="list-style-type: none"> •¹ $\overrightarrow{AC} + \frac{1}{3}\overrightarrow{CB}$ or $\overrightarrow{CB} = -\mathbf{t} + \mathbf{u}$ •² $\mathbf{t} + \frac{1}{3}(-\mathbf{t} + \mathbf{u})$ •³ $\frac{2}{3}\mathbf{t} + \frac{1}{3}\mathbf{u}$ or equivalent 	3

[END OF SPECIMEN MARKING INSTRUCTIONS]