

X747/75/02

Mathematics Paper 2

Marking Instructions

06 May 2014

Strictly Confidential

These instructions are **strictly confidential** and, in common with the scripts you will view and mark, they must never form the subject of remark of any kind, except to Scottish Qualifications Authority staff.

Marking

The utmost care must be taken when entering Item level marks into Scoris Assessor.

It is of particular importance that you enter a zero (0) when the candidate has attempted a question but has not gained a mark and press the **No Response** button when the candidate has not attempted a question.



General Marking Principles for National 5 Mathematics

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the detailed marking instructions, which identify the key features required in candidate responses.

- (a) Marks for each candidate response must always be assigned in line with these General Marking Principles and the Detailed Marking Instructions for this assessment.
- (b) Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.
- (c) Credit must be assigned in accordance with the specific assessment guidelines.
- (d) Candidates may use any mathematically correct method to answer questions except in cases where a particular method is specified or excluded.
- (e) Working subsequent to an error must be followed through, with possible credit for the subsequent working, provided that the level of difficulty involved is approximately similar. Where, subsequent to an error, the working is easier, candidates lose the opportunity to gain credit.
- (f) Where transcription errors occur, candidates would normally lose the opportunity to gain a processing mark.
- (g) Scored out working which has not been replaced should be marked where still legible. However, if the scored out working has been replaced, only the work which has not been scored out should be marked.
- (h) Where a candidate has made multiple attempts, mark all attempts and award the lowest mark.
- (i) Unless specifically mentioned in the specific assessment guidelines, do not penalise:
 - Working subsequent to a correct answer
 - Correct working in the wrong part of a question
 - Legitimate variations in solutions
 - Bad form
 - Repeated error within a question

Detailed Marking Instructions for each question

Question			Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •	,	
1.			Ans: 590	3			
			•1 know how to decrease by 15%		• ¹ ×0·85		
			• ² know how to calculate roll		• ² 964×0-85 ³		
			 ³ carry out calculations correctly within a valid strategy and round to the nearest ten 		• ³ 590		
Note	es:						
1. Fo	or an	answe	er of 590 without working		award 3/3	$\checkmark \checkmark \checkmark$	
2. F	or an	answ	ver of 592 or 592.0165 without work	king	award 2/3	√√x	
3. V t	3. Where an incorrect percentage has been used, the working must be followed through to give the possibility of awarding 2/3 $\times \checkmark \checkmark$						
4. F	4. For an answer of 2460 (964×0·85×3) with working, award 1/3 \checkmark ×					√xx	
5. For an answer of 530 $(964-964\times0.15\times3)$ with working, award 1/3					√xx		
6. For an answer of 430 (964×0·15×3)					award 0/3	xxx	

Question			Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
2.			Ans: B (8, 4, 10), C (4, 0, 10)	2	
			• ¹ state coordinates of B		• ¹ (8, 4, 10)
			• ² state coordinates of C		• ² (4, 0, 10)
Notes: 1. For e.g. B(8, 4, 9) leading to C(4, 0, 9) award 1/2 ×√ 2. The maximum mark available is 1/2 where (a) brackets are omitted (a) brackets are omitted (b) answers are given in component form					

Que	Question		Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
3.	(a)		Ans: $5a + 3c = 158 \cdot 25$	1	
			• ¹ construct equation		• $^{1}5a + 3c = 158.25$
Note	es:			1	
	1. Ac	cept	variables other than a and c .		
	(b)		Ans: $3a + 2c = 98$	1	
			 ¹ construct equation 		• 1 3 <i>a</i> + 2 <i>c</i> = 98
Note	es:			I	
	(c)		Ans: Adult ticket costs £22.50 Child ticket costs £15.25	4	
			• ¹ evidence of scaling		• $e^{1} e^{1} e^{10a+6c} = 316 \cdot 50$ 9a+6c = 294
			 ² follow a valid strategy through to produce values for <i>a</i> and <i>c</i> 		• ² values for a and c
			 ³ calculate correct values for <i>a</i> and <i>c</i> 		• $a^{3} = 22.5$ and $c = 15.25$
			 ⁴ communicate answers in money 		• ⁴ Adult £22·50 Child £15·25
Note	es:	I		1	
1	1. Th	e fou	rth mark may only be awarded whe	en all of the	e following are given in the final
	de	cimal	figures.	c r siglis di	

Question			Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •			
4.	(a)	(i)	Ans: $\bar{x} = 56-5$	1				
			• ¹ calculate mean		• $\bar{x} = 56.5$			
Not	Notes: 1. Do not accept 56·5 rounded to 57.							
		(ii)	Ans: <i>s</i> = 2·4	3				
			• ¹ calculate $(x-\bar{x})^2$		• ¹ 0·25, 0·25, 2·25, 2·25, 12·25, 12·25, 12·25			
			• ² substitute into formula		$\bullet^2 \sqrt{\frac{29\cdot 5}{5}}$			
			• ³ calculate standard deviation		• ³ 2·4(2)			
Not	es: 1. Fo	or use	of alternative formula, award mar	ks as follov	vs:			
			• ¹ calculate $\sum x$ and $\sum x^2$		• ¹ 339, 19183			
			• ² substitute into formula					
			• ³ calculate standard deviation		• ³ 2·4(2)			
	2. Fo	or cor	rect answer without working		award 0/3			
	(b)		Ans: No, standard deviation is greater OR No, times are more spread out	1				
			• ¹ no, with valid explanation		• ¹ e.g. No, standard deviation is greater			
Not	es: 1. A 2. A 3. O	nswei ccept nly a	r must be consistent with answer to t "No, as 3·2 > 2·4" ward the mark if it is clear that the	part (a)(ii reason is	i). based on standard deviation only .			

Do not accept "No, times are less consistent" without further explanation. 4.

Question			Expected Answer(s)	Max	Illustrations of evidence for
			Give one mark for each •	Mark	awarding a mark at each •
5.			Ans: 3072 cm ³	3	
			• ¹ state linear scale factor		• $\frac{1}{15}$ or 1.6
			• ² state volume scale factor		• ${}^{2}\left(\frac{24}{15}\right)^{3}$ or 1.6 ³ (= 4.096)
			• ³ calculate volume (calculation must involve a power of the scale factor) and state correct units		• ³ 3072cm ³
Note	s:				
1	. Co	rrect	answer without working award	3/3	
2	2. So (a	me co) 3072	award	2/3 √√×	
	(b)1920	$\operatorname{cm}^3\left(\left(\frac{24}{15}\right)^2 \times 750\right)$ award	2/3 √×√	*
	(c)1200	$\operatorname{cm}^3\left(\left(\frac{24}{15}\right)\times750\right)$ award	1/3 √××	
	(d)6750	00000cm ³ ($\left(\frac{24}{15}\right) \times 750^3$) award	1/3 √××	
	(e)183c	m ³ ($\left(\frac{15}{24}\right)^3 \times 750$) award	2/3 ×√√	
	(f)	933c	$m^3 \left(\left(\frac{15}{24} \right)^3 \times 750 + 750 \right)$ award	2/3 ×√√	
3	8. Th e.	e thir g. 4∙′	rd mark is not available where prer 1 × 750 = 3075cm ³ award	nature rour 2/3 √√×	nding leads to an incorrect answer.
4	I. Al	ternat	tive Method		
	• ¹	know	how to find radius of smaller cylir	nder •	$\sqrt{\frac{750}{15\pi}}$
	• ²	know	how to find radius of larger cylinc	ler •	$\frac{2}{15}\left(\frac{24}{15}\right) \times \sqrt{\frac{750}{15\pi}}$
	• ³	calcı	Ilate volume and state correct un i	ts •	³ 3072cm ³

Question			Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
6.			Ans: no, with valid reason.	4	
			• ¹ valid strategy		 ¹ use Converse of Pythagoras' Theorem e.g. 110² and 85² + 75²
			• ² evaluation		• ² 12 100 and 12 850
			• ³ comparison		• ³ e.g. $110^2 \neq 75^2 + 85^2$
			• ⁴ valid conclusion		\bullet^4 No, since not right angled

Notes for question 6 are on next page.

Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •			
Notes:						
1. For alternative methods, award marks as follows:						
(i)	• ¹ valid strategy		 ¹ use Pythagoras' Theorem e.g. 85² + 75² 			
	• ² evaluation		• 2 h = 113.36			
	• ³ comparison		• ³ e.g. 113·36 > 110			
	• ⁴ valid conclusion		$ ightarrow ^4$ No, since not right angled			
(ii)	• ¹ valid strategy		• ¹ substitute correctly into cosine rule e.g. $\frac{85^2 + 75^2 - 110^2}{2 \times 85 \times 75}$			
	• ² evaluation		• ² 86-6°			
	• ³ comparison		• ³ 86-6° < 90°			
	• ⁴ valid conclusion		ullet ⁴ No, since not right angled			
2. Theren e.g. √8 No	hust be an explicit comparison for t $35^2 + 75^2 = 113 \cdot 36$. b, since not right angled.	he award o	of the third mark. award 3/4 ✓✓×✓			
3. Conclus e.g. 11	tion must involve reference to "not $10^2 = 85^2 + 75^2 \rightarrow 12100 \neq 12850$	a right an <u>i</u>	gle".			
N	o, Hightown is not due north of Lov	vtown.	award 3/4 √√√×			
4. The fina stateme e.g. "N	al mark is not available where the c ent involving the word bearing. o, Hightown is on a bearing of 87° f	candidate's rom Lowto	s only conclusion is an invalid own, not 90°"			

Question		Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
7.		Ans: 150 cm ³	5	
		• ¹ substitute correctly into formula for volume of cone		• ¹ $\frac{1}{3} \times \pi \times 4^2 \times 15$ (= 251.32)
		• ² substitute correctly into formula for volume of sphere or hemisphere		• ² $\frac{4}{3} \times \pi \times 3 \cdot 7^3$ (=212.17) or $\frac{1}{2} \times \frac{4}{3} \times \pi \times 3 \cdot 7^3$ (=106.08)
		• ³ know to subtract volume of hemisphere from volume of cone		• ³ evidence
		• ⁴ carry out all calculations correctly (must involve difference or sum of two volume calculations)		• ⁴ 145·24
		 ⁵ round final answer to 2 significant figures 		• ⁵ 150 (cm ³)
Notes:				
1. Accept 2. Some	comn	ations in π . non answers (working must be show	'n):	
(i)	39	$\left(\frac{1}{3}\times\pi\times4^2\times15-\frac{4}{3}\times\pi\times3\cdot7^3\right)$	award 4	4/5 √√×√√
(ii)	120	$\left(\frac{1}{3}\times\pi\times4^{2}\times15-\frac{1}{2}\times\frac{4}{3}\times\pi\times4^{3}\right)$	award 4	4/5 √×√√√
(iii)	110	$\left(\frac{1}{3}\times\pi\times3\cdot7^{2}\times15-\frac{1}{2}\times\frac{4}{3}\times\pi\times3\cdot7^{3}\right)$	award 4	4/5 ×√√√√
(iv)	160	$\left(\frac{1}{3} \times \pi \times 8^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 7 \cdot 4^3\right)$	award 4	4/5 ×√√√√
(V)	360	$\left(\frac{1}{3} \times \pi \times 4^2 \times 15 + \frac{1}{2} \times \frac{4}{3} \times \pi \times 3 \cdot 7^3\right)$	award 4	4/5 √√×√√
(vi)	460	$\left(\frac{1}{3}\times\pi\times4^2\times15+\frac{4}{3}\times\pi\times3\cdot7^3\right)$	award 4	/5 √√×√√
(vii)	80	$\left(\frac{1}{3} \times \pi \times 3 \cdot 7^2 \times 15 - \frac{1}{2} \times \frac{4}{3} \times \pi \times 4^3\right)$	award 3	/5 ××√√√
(viii)	250	$(\frac{1}{3} \times \pi \times 4^2 \times 15)$	award 2	/5 √×××√
3. The fi	nal ma	ark is only available where answers	to all inter	mediate steps involve
e.g.	251·	$32 - 106 \cdot 08 = 250 - 110 = 140$	award 4	/5

Question			Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
8.			Ans: 5 <i>n</i> ⁴	3	
			• ¹ simplify powers in numerator		• ¹ 10 <i>n</i> ⁶
			• ² cancel constants		$\bullet^2 \frac{5n^6}{n^2}$
			• ³ eliminate <i>n</i> from denominator		• 3 5 n^{4}
Note	es:				
1	l. Fo	r 5 <i>n</i> ⁴	without working award	3/3	
2	2. Fo	r a fii	nal answer of $\frac{5n^4}{1}$ award	2/3 √×√	
3	3. Fo	r an a	answer of $5n^3$		
	(a)) (i)	$\frac{10n^5}{2n^2} = 5n^3 \qquad \text{award}$	2/3 ×√√	
		(ii)	$\frac{10n^6}{2n^2} = 5n^3 \qquad \text{award}$	2/3 √√×	
	(b) (i)	$\frac{n^4 \times 10}{2n} = \frac{n^3 \times 10}{2} = 5n^3 \qquad \text{award} $	1/3 ×√×	
		(ii)	$5n^3$ without working award	1/3	

Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •				
9.	Ans: $\frac{4x-15}{x(x+5)}$ • ¹ correct common denominator (or correct numerator) • ² consistent numerator (or denominator) • ³ simplify	3	• ${}^{1}x(x+5)$ or $7x-3(x+5)$ • ${}^{2}\frac{7x-3(x+5)}{x(x+5)}$ • ${}^{3}\frac{4x-15}{x(x+5)}$				
Notes:	t answer without working	award 3/3	3				
2. For —	$\frac{7x}{x+5} - \frac{3(x+5)}{x(x+5)}$	award 2/3 √√×					
3. For subsequent incorrect working, the final mark is not available.							

Question			Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •		
10.	(a)		Ans: 84·8°	3			
			•1 substitute correctly into cosine rule		• $\cos B = \frac{8^2 + 11^2 - 13^2}{2 \times 8 \times 11}$		
			• ² calculate cos B correctly		• ² cos B = 0.09		
			• ³ calculate angle ABC correctly		• ³ 85 or 84·8		
Note	es:						
1	. Fo	r 1•48	3 (uses RAD) or 94.2 (uses GRAD), w	/ith working	g award 3/3		
2	. Th	e 2 nd	mark can be awarded for $\cos^{-1}\left(\frac{1}{17}\right)$	$\left(\frac{6}{76}\right)$			
	(b)		Ans: 155·2°	2			
			•1 know how to calculate the angle		•1 360 – 120 – [answer to (a)] or equivalent		
			 ² correctly calculate the angle within a valid strategy 		• ² 155·2		
Note	Notes:						

Question		Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •		
		2(r-st)	3			
		Ans: $a = \frac{2(3-ut)}{t^2}$				
		• ¹ subtract <i>ut</i>		$\bullet^1 \ s - ut = \frac{1}{2}at^2$		
		• ² multiply by 2		• ² 2 (s - ut) = at^2		
		• ³ divide by t^2		• ³ $a = \frac{2(s-ut)}{t^2}$		
es:				v.		
Со	rrect	answer without working	aw	vard 3/3		
2. For subsequent incorrect working, the final mark is not available.						
For $a = \frac{s - ut}{\frac{1}{2}t^2}$ award 2/3			vard 2/3			
	es: Co Fo	estion estion estimation correct For subs a = For	stionExpected Answer(s) Give one mark for each •Ans: $a = \frac{2(s - ut)}{t^2}$ • ¹ subtract ut • ² multiply by 2• ³ divide by t^2 • still correct answer without workingFor subsequent incorrect working, the fination $a = \frac{s - ut}{\frac{1}{2}t^2}$	stionExpected Answer(s) Give one mark for each •Max MarkAns: $a = \frac{2(s-ut)}{t^2}$ 3• ¹ subtract ut• ¹ subtract ut• ² multiply by 2 • ³ divide by t^2 • a• S: Correct answer without working For subsequent incorrect working, the final mark is not $a = \frac{s-ut}{\frac{1}{2}t^2}$		

Question			Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •				
12.			Ans: <i>x</i> ° = 63°, 297°	3					
			 ¹ rearrange equation 		$\bullet^1 \cos x = \frac{5}{11}$				
			• ² find one value of x		• $x = 63$				
			• ³ find another value of x		• ³ $x = 297$				
Notes:									
1.	. Correct answer without working, award 2/3								
2.	The 2 nd angle must be consistent with the first angle.								
3.	For $x = 1.1,358.9$ (uses RAD), award 3/3 (with working), award 2/3 (without working)								
4.	For x = 70, 290 (uses GRAD), award 3/3 (with working),award 2/3 (without working)								

Question		Expected Answer(s)	Max Mark	Illustrations of evidence for
			mai K	awarunig a mark at each •
13.		Ans: 151·3 m ²	5	
		 •1 know how to find area of segment 		 •1 evidence of e.g. major sector + triangle or circle – minor sector + triangle
		 know to express sector as a fraction of a circle 		$\frac{310}{360}$ or $\frac{50}{360}$
		 *³ know how to find area of sector 		$ \frac{310}{360} \times \pi \times 7^{2} (= 132.56) $ or $ \frac{50}{360} \times \pi \times 7^{2} (= 21.38) $
		 ⁴ know how to calculate area of triangle 		$\cdot^4 \frac{1}{2} \times 7 \times 7 \times \sin 50 (=18.77)$
		 ⁵ carry out all calculations correctly within a valid strategy 		• ⁵ 151·3 m ²

Notes for question 13 are on next page.

Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •						
Notes:									
1. Accept variations in π ; disregard premature or incorrect rounding of $\frac{310}{360}$ or $\frac{50}{360}$.									
2. Use of RAD or GRAD (working must be shown) (a) For 149.9 [uses GRAD] (b) Where the use of RAD leads to an answer of 126.1(-6.43+132.56) award 5/5 award 5/5 award 4/5									
01 133-0(0	J ⁴ J ⁺ 1J ² J ⁰)								
3. Some common answers (working must be shown):									
$56.6 \left(\frac{310}{360}\right)$	$\times \pi \times 14 + \frac{1}{2} \times 7 \times 7 \times \sin 50^{\circ}$	award	4/5 √√×√√						
$40.1 \left(\frac{50}{360}\right)$	$\times \pi \times 7^2 + \frac{1}{2} \times 7 \times 7 \times \sin 50^\circ$	award 4	4/5 ×√√√√						
$2.6 \left(\frac{50}{360}\right)$	$\times \pi \times 7^2 - \frac{1}{2} \times 7 \times 7 \times \sin 50^\circ $	award 4	4/5 ×√√√√						
$24.9 \left(\frac{50}{360}\right)$	$\times \pi \times 14 + \frac{1}{2} \times 7 \times 7 \times \sin 50^{\circ}$	award 3	}/5 ×√×√√						
$132.6 \left(\frac{310}{360}\right)$	$\times \pi \times 7^2$	award 2	/5 x√√xx						
$21.4 \left(\frac{50}{360}\right)$	$\times \pi \times 7^2$	award 2	2/5 ×√√××						
$18.8 \left(\frac{1}{2} \times 7\right)$	$\times 7 \times \sin 50^{\circ}$	award 1	/5 ×××√×						
153.9 $(\pi \times 7^2)$)	award (0/5						
4. The fifth mark is only available when the area of triangle MON is calculated using									

trigonometry.

[END OF MARKING INSTRUCTIONS]