FOR OFFICIAL USE

N5

Teisteanais
Nàiseanta
EISIMPLEIR A-MHÀIN

Comharra

S874/75/02

Matamataig
Pàipear 2

Deit — Gun bhuinteanas

Ùine — 1 uair 30 mionaid

* S 8 7 4 7 5 0 2 *

Lìon na bogsaichean seo agus leugh na tha air a chlò-bhualadh gu h-ìosal.

Làn ainm na sgoile no colaiste

Baile

Ciad ainm(ean)

Sloinneadh

Àireamh an t-suidheachain

Latha-breith

Latha | Mìos | Bliadhna

Àireamh an oileanaich

Comharran gu lèir — 50

Feuch na ceistean UILE.

Faodaidh tu àireamhair a chleachdadh.

Gus na comharran gu lèir fhaighinn, feumaidh tu d' obrachadh a-mach a shealltainn sna freagairtean agad.

Cuir na h-aonadan anns na freagairtean agad far a bheil sin iomchaidh.

Sgrìobh do fhreagairtean gu soilleir anns na beàrnan san leabhran seo. Tha àite a bharrachd airson fhreagairtean aig deireadh an leabhrain seo. Ma chleachdas tu an t-àite seo, feumaidh tu àireamh na ceiste a tha thu a' freagairt a chomharrachadh gu soilleir.

Cleachd inc **gorm** no **dubh**.

Mus fàg thu seòmar na deuchainne feumaidh tu an leabhran seo a thoirt don Fhreiceadan; mura dèan thu sin, dh'fhaodadh tu na comharran gu lèir airson a' phàipeir seo a chall.

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* S 8 7 4 7 5 0 2 0 1 *

LIOSTA FHOIRMLEAN

Na freumhan aig $ax^2 + bx + c = 0$ is iad $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

An riaghailt sine $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

An riaghailt cosine $a^2 = b^2 + c^2 - 2bc\cos A$ no $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Farsaingeachd triantain $A = \dfrac{1}{2}ab\sin C$

Tomhas-lìonaidh cruinne $V = \dfrac{4}{3}\pi r^3$

Tomhas-lìonaidh còin $V = \dfrac{1}{3}\pi r^2 h$

Tomhas-lìonaidh pioramaid $V = \dfrac{1}{3}Ah$

Claonadh àbhaisteach $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}}$

no $s = \sqrt{\dfrac{\Sigma x^2 - \dfrac{(\Sigma x)^2}{n}}{n - 1}}$, far as e n meud an taghaidh.

Comharran gu lèir — 50

Feuch na ceistean UILE

1. Rinn dachaighean ann am baile-mòr 125 000 tunnaichean de sgudal gu h-iomlan ann an 2017.

Tha dùil gun tuit an àireamh iomlan de sgudal 2% gach bliadhna.

Obraich a-mach an àireamh iomlan de sgudal a thathar an dùil a nì na dachaighean sin ann an 2020. **3**

[Tionndaidh an duilleag

2. Leudaich agus sìmplich $(2x+3)(x^2-4x+1)$. **3**

3. Factaraich gu h-iomlan $3x^2 - 48$. **2**

4. Chlàraich sgioba ball-lìn na sgoile an àireamh de shuidhe an-àirde a rinn gach cluicheadair ann am mionaid.

B' e na h-àireamhan airson nan seachd cluicheadairean:

29 27 24 31 22 19 30

(a) Obraich a-mach meadhan agus claonadh àbhaisteach nan àireamhan de shuidhe an-àirde. **4**

[Tionndaidh an duilleag

4. (a' leantainn)

Chlàraich cuid de chluicheadairean ann an sgioba hocaidh na sgoile cuideachd an àireamh de shuidhe an-àirde a rinn iad ann am mionaid.

Thug na h-àireamhan acasan meadhan de 29 agus claonadh àbhaisteach de 3.2.

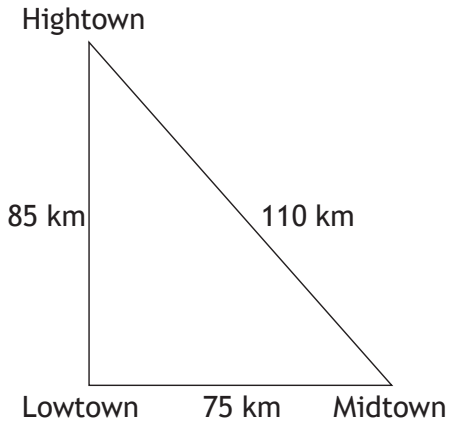
(b) Thoir seachad dà bheachd dligheach a' dèanamh coimeas eadar àireamhan suidhe an-àirde nan cluicheadairean san sgioba ball-lìn agus an sgioba hocaidh. **2**

5. Tha an diagram gu h-ìosal a' sealltainn suidheachadh trì bailtean.

Tha Lowtown dìreach an iar air Midtown.

Tha an astar bho:

- Lowtown gu Midtown 75 cilemeatair
- Midtown gu Hightown 110 cilemeatair
- Hightown gu Lowtown 85 cilemeatair.



A bheil Hightown dìreach tuath air Lowtown?

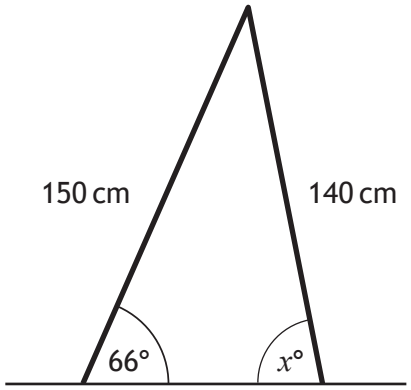
Dearbh do fhreagairt. **4**

[Tionndaidh an duilleag

6. Reic buidheann theatar 4830 tiogaid airson an taisbeanaidh aca.
Bha seo 15% a bharrachd na reic iad an-uiridh.
Cia mheud tiocaid a reic iad an-uiridh? **3**

7. Tha casan 150 ceudameatairean agus 140 ceudameatairean de dh'fhaid ann an seata de àraidhean ceum.

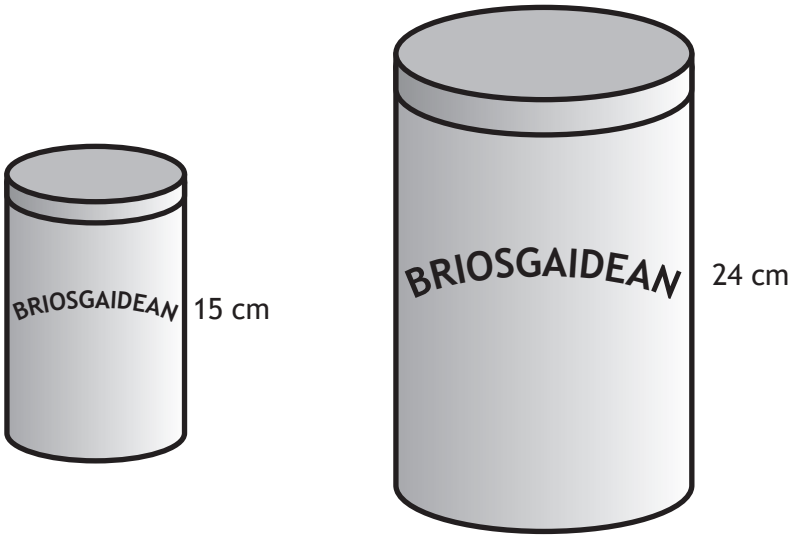
Nuair a tha an àradh ceum fosgailte gu tur, is e 66° an ceàrn eadar a' chas nas fhaide agus an talamh.



Obraich a-mach x°, meud na ceàrn eadar a' chas as giorra agus an talamh. **3**

[Tionndaidh an duilleag

8. Bidh mòr-bhùth a' reic cnagain bhriosgaid siolandair a tha coltach gu matamataigeach.



Tha àirde a' chnagain as lugha 15 ceudameatairean agus tomhas-lìonaidh de 750 ceudameatairean ciùbach.

Tha àirde a' chnagain as motha 24 ceudameatairean.

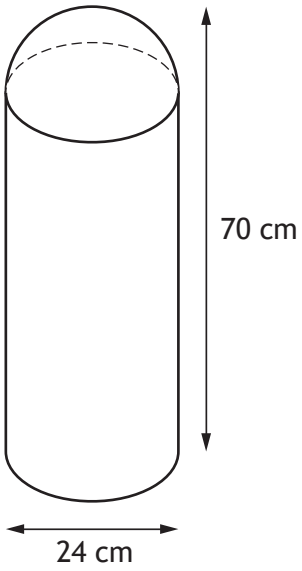
Obraich a-mach tomhas-lìonaidh a' chnagain as motha. **3**

9. Fuasgail an co-aontar $11\cos x° - 2 = 3$, airson $0 \leq x \leq 360$. **3**

[Tionndaidh an duilleag

10. Tha bollard trafaic ann an cruth siolandair le leth-chruinne air a mhullach.
Tha aig am bollard:

- trast-thomhas 24 ceudameatairean
- àirde 70 ceudameatairean.

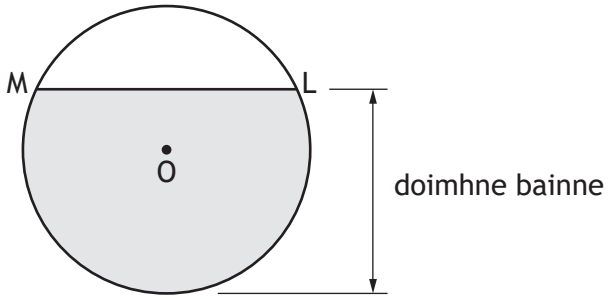


Obraich a-mach tomhas-lìonaidh am bollard.
Sgrìobh do fhreagairt ceart gu 3 fhigear brìgheil. **5**

11. Sgrìobh $\frac{3}{a^2}-\frac{2}{a}$, $a \neq 0$, mar cho-aontar singilte anns an riochd as sìmplidhe. **2**

[Tionndaidh an duilleag

12. Tha an dealbh gu h-ìosal a' sealltainn crois-earrann cruinn de tanca bainne.



Tha radius a' chearcaill, le O sa mheadhan, 1.2 meatairean.

Is e leud uachdar a' bhainne san tanca, air a riochdachadh le ML san dealbh, 1.8 meatairean.

Obraich a-mach doimhneachd a' bhainne anns an tanca. **4**

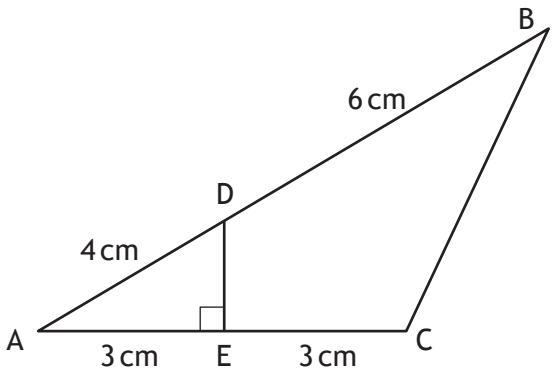
13. Sgrìobh $\sin x° \cos x° \tan x°$ anns a' chruth as sìmplidh.

Seall an obair agad. **2**

[Tionndaidh an duilleag

14. Anns an diagram gu h-ìosal:

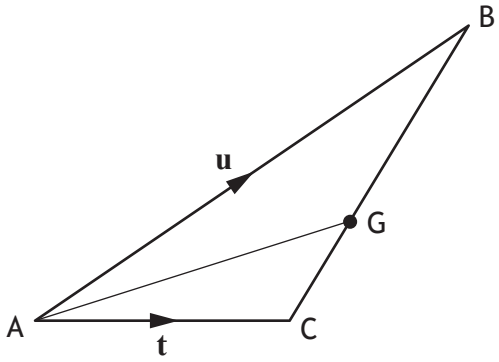
- tha DE ceart-cheàrnach do AC
- AD = 4 ceudameatairean
- DB = 6 ceudameatairean
- AE = EC = 3 ceudameatairean.



Obraich a-mach faid BC.

Sgrìobh do fhreagairt ceart gu aon fhigear brìgheil. **4**

15. Tha an triantan ABC ri fhaicinn gu h-ìosal



$\overrightarrow{AB} = \mathbf{u}$ agus $\overrightarrow{AC} = \mathbf{t}$.

Is e G am puing mar sin $CG = \frac{1}{3}CB$.

Sgrìobh $\overrightarrow{AG}$ a thaobh $\mathbf{u}$ agus $\mathbf{t}$.

Sgrìobh do fhreagairt anns an riochd as sìmplidhe. **3**

[CRÌOCH A' PHÀIPEIR EISIMPLEIR]

COMHARRAN NA SGRÌOBH AN SEO

ÀITE A BHARRACHD AIRSON FHREAGAIRTEAN

COMHARRAN NA SGRÌOBH AN SEO

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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.

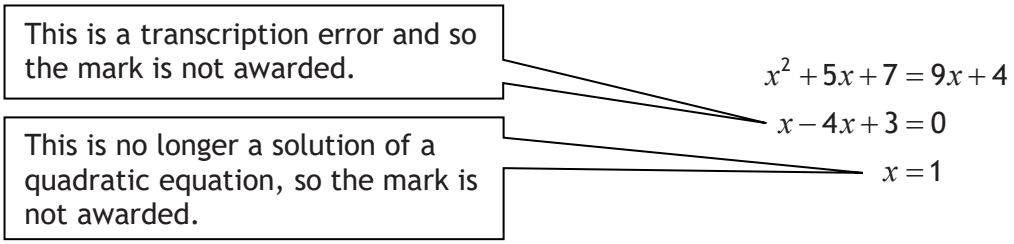
(d) If a candidate's response contains an error, all working subsequent to this error must still be marked. Only award marks if the level of difficulty in their working is similar to the level of difficulty in the illustrative scheme.

(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.

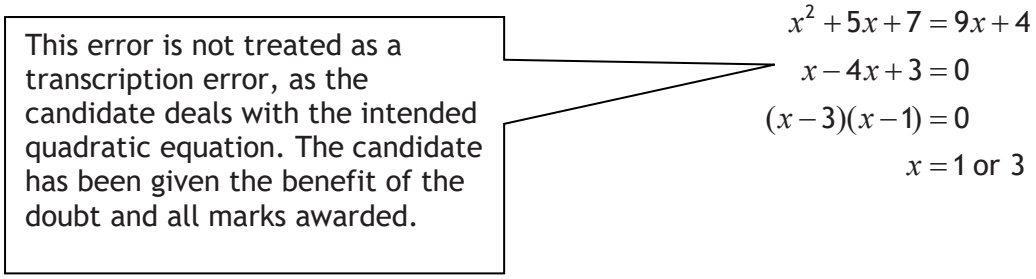
(f) Candidates may use any mathematically correct method to answer questions, except in cases where a particular method is specified or excluded.

(g) If an error is trivial, casual or insignificant, for example 6 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



The following example is an exception to the above



(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

$\frac{15}{0.3}$ 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 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.

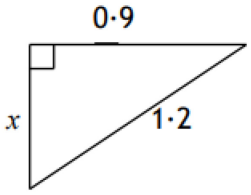
Marking Instructions for each question

Question			Generic scheme	Illustrative scheme	Max mark
1.			•[1] know how to decrease by 2% •[2] know how to calculate new total •[3] carry out calculations correctly within a valid strategy	•[1] $\times 0.98$ •[2] $125\ 000 \times 0.98^3$ •[3] 117 649 (tonnes)	**3**
2.			•[1] start to expand •[2] complete expansion •[3] collect like terms which must include a term in x^3 and a negative coefficient	•[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.			•[1] begin to factorise •[2] factorise fully	•[1] $3\left(x^2 - 16\right)$ •[2] $3\left(x+4\right)\left(x-4\right)$	**2**

Question			Generic scheme	Illustrative scheme	Max mark
4.	(a)		**Method 1**		**4**
			•[1] calculate mean	•[1] 26	
			•[2] calculate $(x-\overline{x})^2$	•[2] 9, 1, 4, 25, 16, 49, 16	
			•[3] substitute into formula	•[3] $\sqrt{\frac{120}{6}}$	
			•[4] calculate standard deviation	•[4] $4.47(2\ldots)$	
			Method 2		
			•[1] calculate mean	•[1] 26	
			•[2] calculate $\sum x$ and $\sum x^2$	•[2] 182, 4852	
			•[3] substitute into formula	•[3] $\sqrt{\frac{4852-\frac{182^2}{7}}{6}}$	
			•[4] calculate standard deviation	•[4] $4.47(2\ldots)$	
	(b)		•[5] valid comment comparing means	•[5] eg on average the hockey team recorded a higher number of sit-ups	**2**
			•[6] valid comment comparing standard deviations	•[6] eg the hockey team's **numbers of sit-ups** were more consistent	

Question			Generic scheme	Illustrative scheme	Max mark
5.			**Method 1** •[1] valid strategy •[2] evaluation •[3] explicit comparison •[4] conclusion with valid reason **Method 2** •[1] valid strategy •[2] evaluation •[3] explicit comparison •[4] conclusion with valid reason **Method 3** •[1] valid strategy •[2] evaluation •[3] explicit comparison •[4] conclusion with valid reason	•[1] 75^2+85^2 and 110^2 •[2] $75^2+85^2=12\,850$ and $110^2=12100$ •[3] $75^2+85^2\neq 110^2$ •[4] No, since not right-angled •[1] $75^2+85^2=12\,850$ •[2] $\sqrt{12\,850}=(113.357\ldots)$ •[3] $110\neq 113(.357\ldots)$ •[4] No, since not right-angled •[1] $(\cos x=)\dfrac{75^2+85^2-110^2}{2\times 75\times 85}$ •[2] $(\cos x=)\dfrac{750}{12\,750}\quad\left(=\dfrac{1}{17}\right)$ •[3] $86(.6\ldots)\neq 90$ •[4] No, since not right-angled	**3**
6.			•[1] evidence that $115\%=4830$ •[2] begin valid strategy •[3] complete calculation within valid strategy	•[1] $115\%=4830$ •[2] $1\%=\dfrac{4830}{115}$ or equivalent •[3] 4200	**4**

Question			Generic scheme	Illustrative scheme	Max mark
7.			•[1] correct substitution into sin rule •[2] rearrange equation •[3] calculate x	•[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** •[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)	•[1] $\frac{24}{15}$ or equivalent •[2] $\left(\frac{24}{15}\right)^3\times 750$ •[3] 3072 (cm^3)	**3**
9.			•[1] rearrange equation •[2] find first value of x •[3] find second value of x	•[1] $\cos x=\frac{5}{11}$ •[2] 63 •[3] 297	**5**
10.			•[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	•[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 cm^3	**3**

Question	Generic scheme	Illustrative scheme	Max mark
11.	•[1] valid common denominator	•[1] $\frac{}{a^2}$ or $\frac{}{a^3}$ or $\frac{}{a^2 \times a}$	**2**
	•[2] answer in simplest form	•[2] $\frac{3-2a}{a^2}$	
12.	•[1] marshal facts and recognise right angled triangle	•[1] 	**4**
	•[2] consistent Pythagoras statement	•[2] $x^2 = 1.2^2 - 0.9^2$	
	•[3] calculate x	•[3] 0.8 or $0.79(\ldots)$	
	•[4] calculate width	•[4] $2.0\,(\text{cm})$ or $1.99\,(\text{cm})$	
13.	•[1] correct substitution for $\tan x$	•[1] $\sin x \cos x \frac{\sin x}{\cos x}$	**2**
	•[2] express in simplest form	•[2] $\sin^2 x$	
14.	•[1] identify $\cos A$ or angle A	•[1] $\cos A = \frac{3}{4}$ or $A = 41.4$	**4**
	•[2] substitute into cosine rule (cos A or angle A must have been found using trigonometry)	•[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] calculate BC^2	•[3] $BC^2 = 46$	
	•[4] calculate BC correct to one decimal place	•[4] $BC = 6.8\,(\text{cm})$	

Question			Generic scheme	Illustrative scheme	Max mark
15.			$\bullet^1$ express $\overrightarrow{AG}$ in terms of $\overrightarrow{AC}$ and $\overrightarrow{CB}$ or express $\overrightarrow{CB}$ in terms of $\mathbf{u}$ and $\mathbf{t}$ $\bullet^2$ express $\overrightarrow{AG}$ in terms of $\mathbf{u}$ and $\mathbf{t}$ $\bullet^3$ express $\overrightarrow{AG}$ in simplest form	$\bullet^1$ $\overrightarrow{AC}+\frac{1}{3}\overrightarrow{CB}$ or $\overrightarrow{CB}=-\mathbf{t}+\mathbf{u}$ $\bullet^2$ $\mathbf{t}+\frac{1}{3}(-\mathbf{t}+\mathbf{u})$ $\bullet^3$ $\frac{2}{3}\mathbf{t}+\frac{1}{3}\mathbf{u}$ or equivalent	**3**

[END OF SPECIMEN MARKING INSTRUCTIONS]