High School Mathematics Test 2014

Year 10

Non Right Triangle Trigonometry

Non Calculator

Skills and Knowledge Assessed:

- Apply Pythagoras' theorem and trigonometry to solving three - dimensional problems in right- angled triangles (ACMMG276)
- Use the unit circle to define trigonometric functions, and graph them with and without the use of digital technologies (ACMMG274)
- Solve simple trigonometric equations (ACMMG275)
- Establish the sine, cosine and area rules for any triangle and solve related problems (ACMMG273)

Name_____

Section 1 Short Answer Section

NB THE DIAGRAMS IN THIS TEST ARE NOT DRAWN TO SCALE UNLESS OTHERWISE STATED.
Write all working and answers in the spaces provided on this test paper.

1. Write a statement of the sine rule that could be used to find $\angle P$ in ΔPQR.

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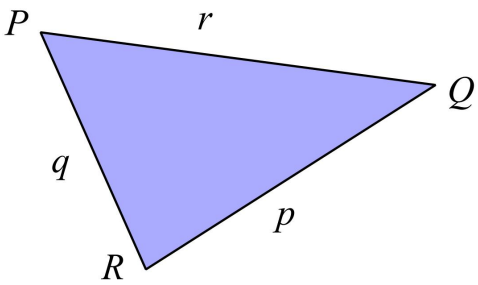

2. Use the cosine rule to find the value of θ, correct to the nearest degree.

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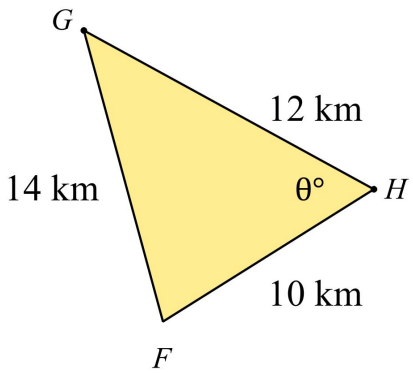
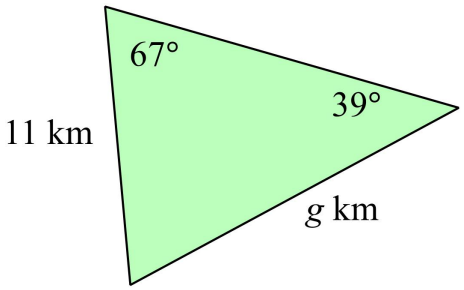


3. Use the sine rule to find the value of g, correct to 1 decimal place.



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4. Use the area formula to find the area of ΔHIJ, correct to the nearest square cm.

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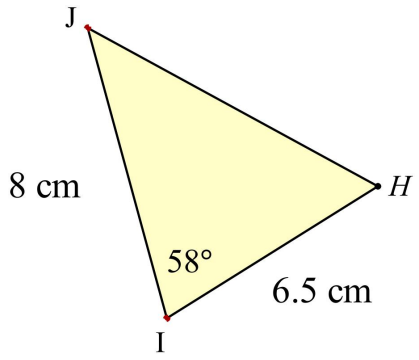
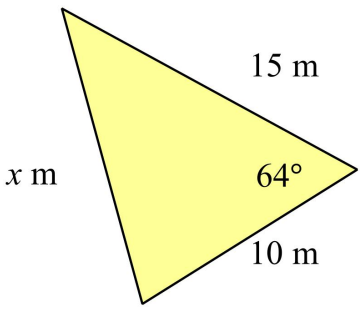


5. Calculate the value of x correct to one decimal place.



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6. Find the value of δ, to the nearest degree.

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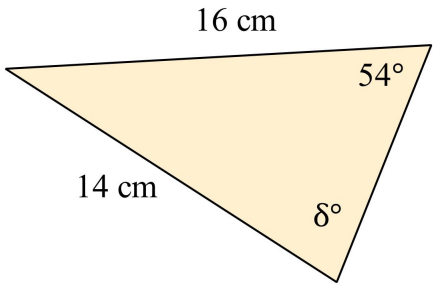
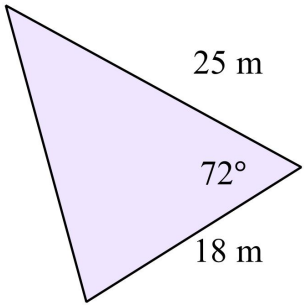


7. Find the area of the triangle shown correct to the nearest square metre.



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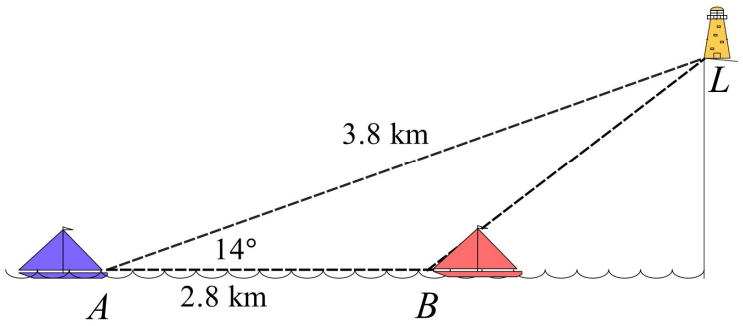
8. The distance from ship A to the lighthouse L is 3.8 km and from ship A to ship B is 2.8 km.

The angle of elevation of the lighthouse from A is 14°.

Find the distance from ship B to the lighthouse L correct to the nearest 100 m.



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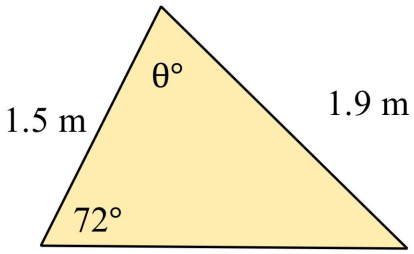
9. Find the value of θ correct to the nearest degree.



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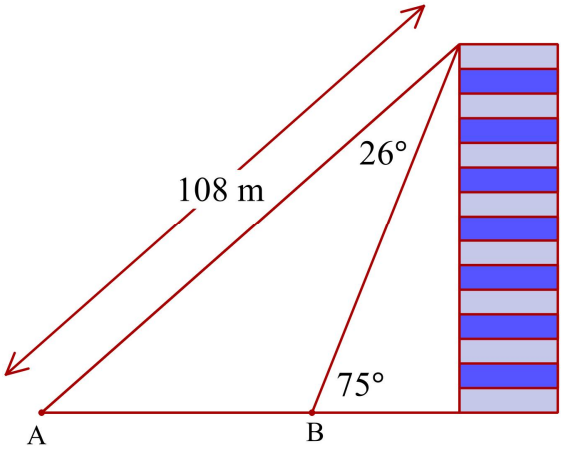
10. Calculate the distance AB, correct to the nearest 10^{th} of a metre.



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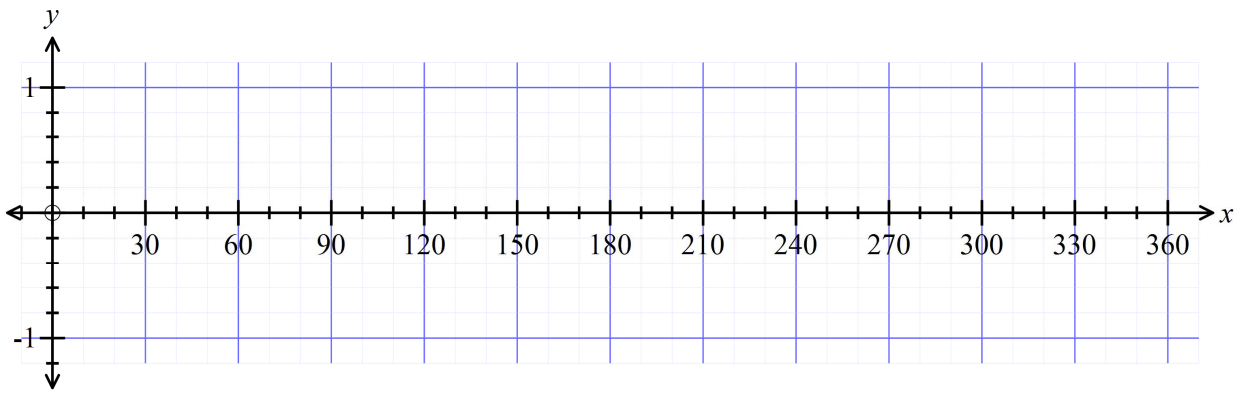
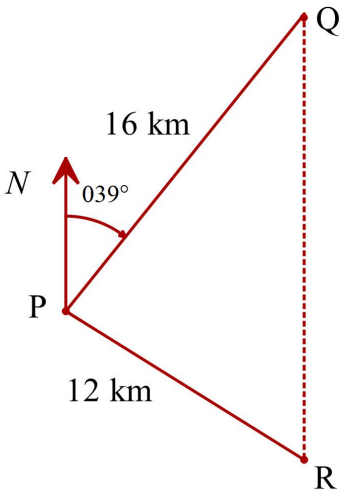
11. Use the grid to draw a sketch of $y = \cos x$ for $0 \leq x \leq 360^{\circ}$.



12. Two boats Q and R left port P at the same time and sailed on straight courses. After they had sailed 16 km and 12 km respectively, Q was due north of R.

If Q sailed on a bearing of 039°, what bearing did R sail on?



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High School Mathematics Test 2014

Year 10

Non Right Triangle Trigonometry

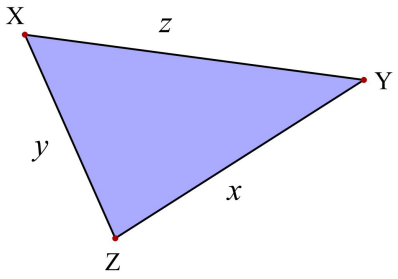
Calculator Allowed

Name_____

Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. Which equation could be used to find the value of x in ΔXYZ?



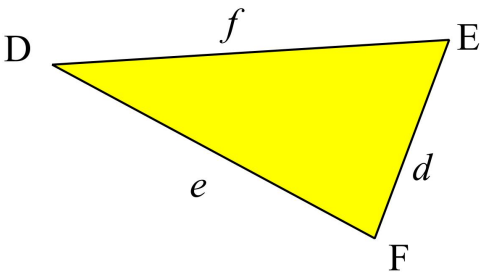
A. $x^2 = y^2 + z^2 + 2yz \cos X$

B. $x^2 = y^2 + z^2 - 2yz \cos X$

C. $\dfrac{x}{\sin X} = \dfrac{y}{\sin Z}$

D. $\dfrac{x}{\sin Y} = \dfrac{z}{\sin Z}$

2. Which is a correct statement for Δ DEF?



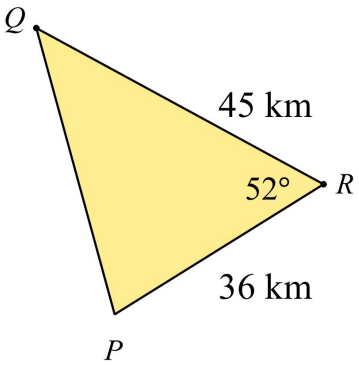
A. $\angle D = e^2 + f^2 - 2ef \cos D$

B. $\cos D = \dfrac{e^2 + d^2 - f^2}{2ed}$

C. $\cos D = \dfrac{f^2 + d^2 - e^2}{2fd}$

D. $\cos D = \dfrac{e^2 + f^2 - d^2}{2ef}$

3. Use the cosine rule to find the length of PQ.



A. 36.4 km

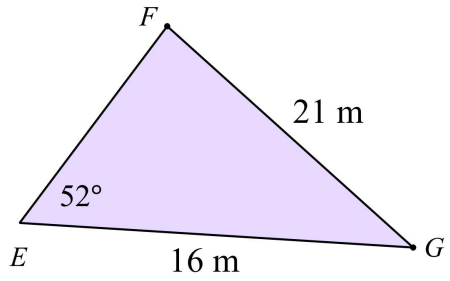
B. 57.6 km

C. 72.9 km

D. 1 326.3 km

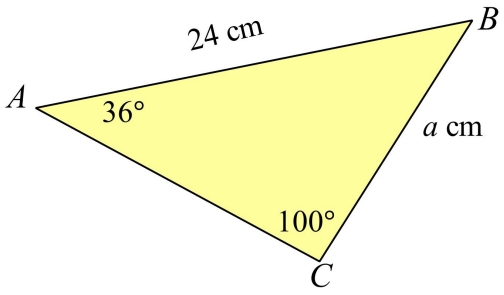
4. Use the sine rule to find the size of $\angle EFG$. .

A. 16°
B. 31°
C. 37°
D. 53°



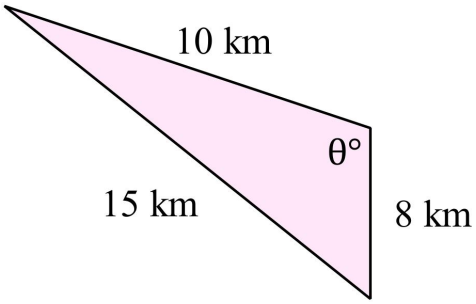
5. Find the value of a.

A. 3.9
B. 14.3
C. 31.1
D. 84.3



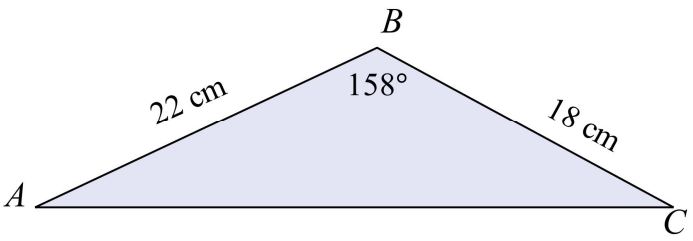
6. What is the value of θ?

A. 22°
B. 44°
C. 68°
D. 112°



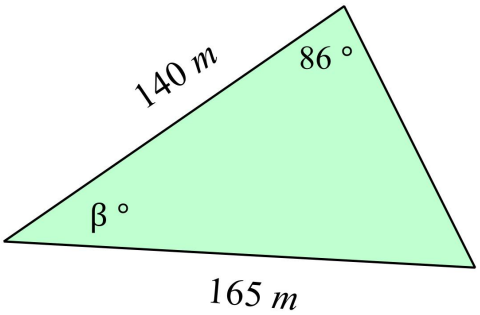
7. Find the area of Δ ABC.

A. 16 cm²
B. 28 cm²
C. 74 cm²
D. 88 cm²



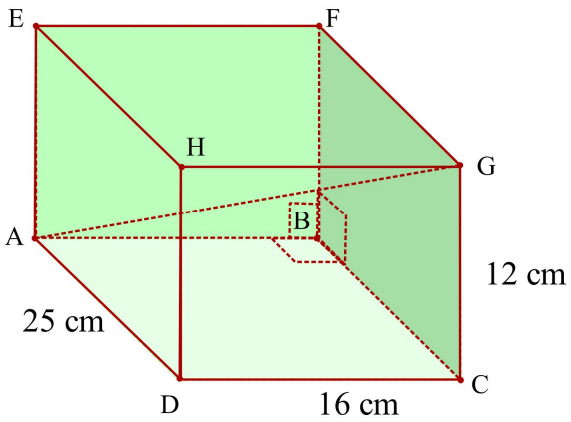
8. Find the value of β.

A. 36°
B. 54°
C. 84°
D. 144°



9. What is the length of the interval AG in the rectangular prism shown?

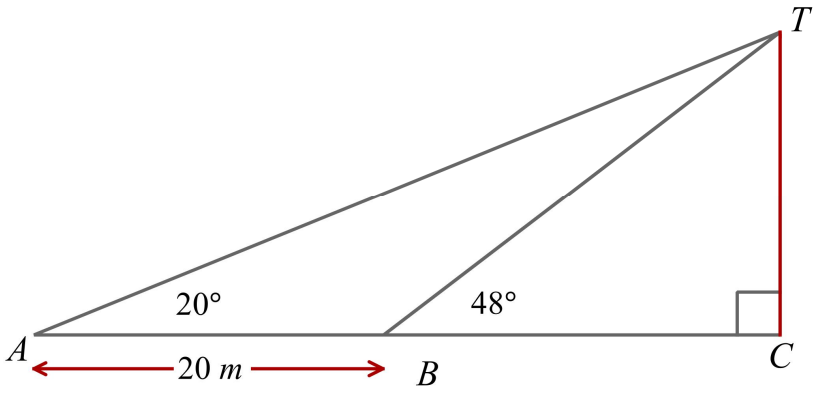
A. 20 cm
B. 30 cm
C. 32 cm
D. 69 cm



10. Anne and Bertie measure the angle of elevation of the top of a tower (T) to be 20° and 48° respectively.

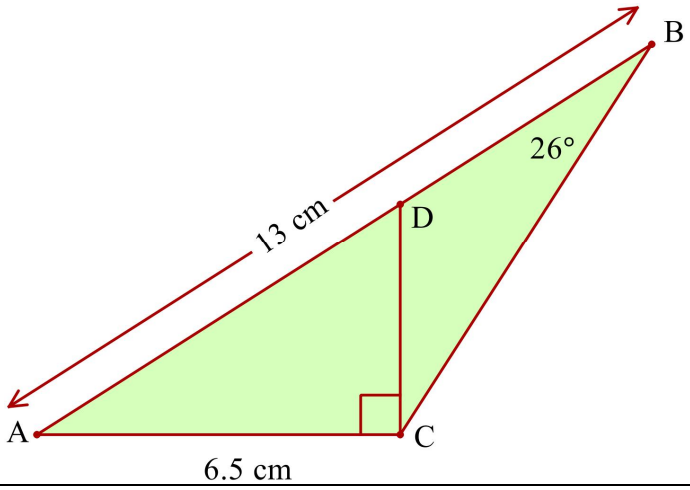
If Anne and Bertie are 20 m apart on a direct line to the tower, calculate the distance BT.

A. 6.8 cm
B. 14.6 cm
C. 22.7 cm
D. 27.5 cm



11. Find the size of $\angle ACB$, correct to the nearest degree.

A. 29°
B. 45°
C. 61°
D. 119°



12. A plane L is picked up by two radar stations J and K.

J is 652 km due north of K.

The bearing of L from J is 238° and from K is 290°.

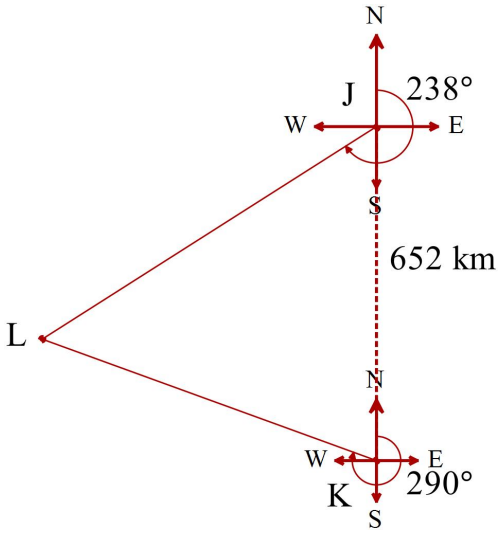
How far is L from K?

A. 702 km

B. 778 km

C. 856 km

D. 958 km



High School
Mathematics Test 2014

Non Right Triangle Trigonometry

Multiple Choice Answer Sheet

Name _____

Completely fill the response oval representing the most correct answer.

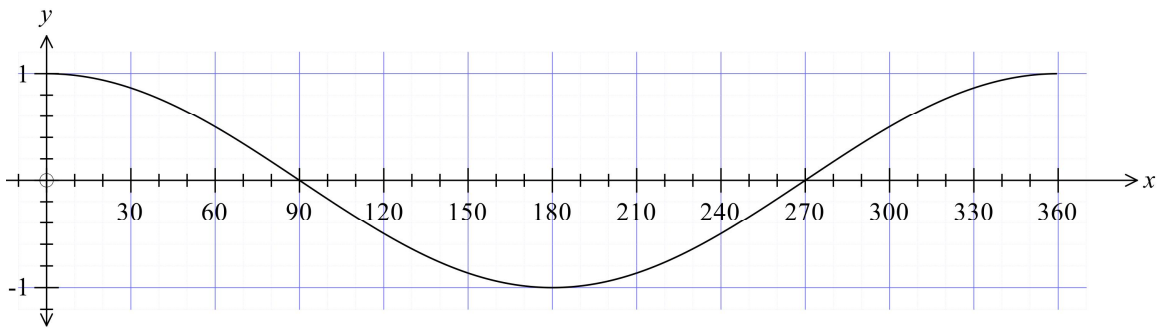
1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭

High School
Mathematics Test 2014

Non Right Triangle Trigonometry

ANSWERS

Section 1 (1 mark each)	
	Working and Answers
1.	$\frac{\sin P}{p} = \frac{\sin Q}{q}$ or $\frac{\sin P}{p} = \frac{\sin R}{r}$
2.	$\cos\theta = \frac{12^2 + 10^2 - 14^2}{2 \times 10 \times 12}$ $= 0.2$ $\theta = 78°$ (nearest degree)
3.	$\frac{g}{\sin 67} = \frac{11}{\sin 39}$ $g = \frac{\sin 67 \times 11}{\sin 39}$ $g = 16.089$ $g = 16.1$ km
4.	Area $= \frac{1}{2} \times 8 \times 6.5 \times \sin 58$ $= 22.04925$ $= 22$ cm^2 (nearest cm^2)
5.	$x^2 = 15^2 + 10^2 - 2 \times 15 \times 10 \times \cos 64$ $= 193.489$ $x = \sqrt{193.489}$ $x = 13.910$ $= 13.9$ (to 1 dec place)
6.	$\frac{\sin\delta}{16} = \frac{\sin 54}{14}$ $\sin\delta = \frac{16 \times \sin 54}{14}$ $\sin\delta = 0.92459$ $\delta = 67.6067$ $= 68°$ (nearest degree)
7.	Area $= \frac{1}{2} \times 25 \times 18 \times \sin 72$ $= 213.987$ $= 214$ m^2 (nearest m^2)

8.	$LB^2 = 3.8^2 + 2.8^2 - 2 \times 3.8 \times 2.8 \times \cos 14$ $= 1.6321$ $LB = \sqrt{1.6321}$ $LB = 1.27753$ $= 1.3$ km (to nearest 100 m)
9.	Let the third angle be α $\frac{\sin \alpha}{1.5} = \frac{\sin 72}{1.9}$ $\sin \alpha = \frac{1.5 \times \sin 72}{1.9}$ $\sin \alpha = 0.7508$ $\alpha = 48.6626$ $= 49°$ (nearest degree) $\therefore \theta = 180° - (72° + 49°)$ $\theta = 59°$ (nearest degree)
10.	$\frac{AB}{\sin 26} = \frac{108}{\sin 105}$ $AB = \frac{108 \times \sin 26}{\sin 105}$ $= 49.0142$ $AB = 49.0$ m (nearest 10th metre)
11.	

12.

$\angle Q = 39°$ (alternate angles)

$$\frac{\sin R}{16} = \frac{\sin 39}{12}$$

$$\sin R = \frac{16 \times \sin 39}{12}$$

$\sin R = 0.83909$

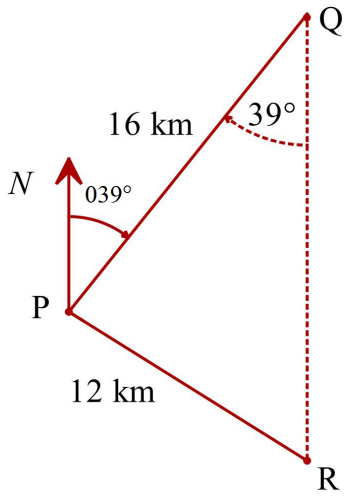
$R = 57.0445$

$\angle QPR = 180 - (39 + 57)$

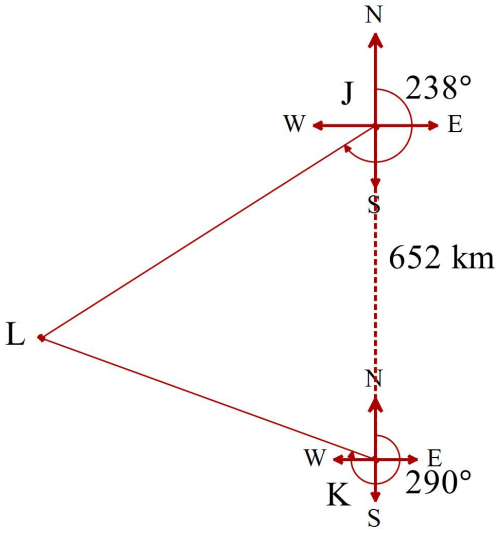
$\angle QPR = 84°$

Bearing = $\angle NPR = 84 + 39$

Bearing of R is 123°



Section 2 (1 mark each)		
	Working	Answers
1.	$x^2 = y^2 + z^2 - 2yz \cos X$	B
2.	$\cos D = \dfrac{e^2 + f^2 - d^2}{2ef}$	D
3.	$PQ^2 = 36^2 + 45^2 - 2 \times 36 \times 45 \times \cos 52$ $= 1326.2568$ $PQ = \sqrt{1326.2568}$ $PQ = 36.4178$ $= 36.4$ km (to nearest 100 m)	A
4.	$\dfrac{\sin F}{16} = \dfrac{\sin 52}{21}$ $\sin F = \dfrac{16 \times \sin 52}{21}$ $\sin F = 0.60038914$ $F = 36.89777$ $= 37°$ (nearest degree)	C
5.	$\dfrac{a}{\sin 36} = \dfrac{24}{\sin 100}$ $a = \dfrac{24 \times \sin 36}{\sin 100}$ $= 14.32446\ldots$ $a = 14.3$ cm (nearest millimetre)	B
6.	$\cos \theta = \dfrac{10^2 + 8^2 - 15^2}{2 \times 10 \times 8}$ $= -0.38125$ $\theta = 112°$ (nearest degree)	D
7.	$\text{Area} = \dfrac{1}{2} \times 22 \times 18 \times \sin 158$ $= 74.172$ $= 74$ cm^2 (nearest cm^2)	C
8.	Let the third angle be γ $\dfrac{\sin \gamma}{140} = \dfrac{\sin 86}{165}$ $\sin \gamma = \dfrac{140 \times \sin 86}{165}$ $\sin \gamma = 0.8464$ $\gamma = 57.8241$ $= 58°$ (nearest degree) $\beta = 180 - 58 - 86$ $\beta = 36°$	A
9.	$DG^2 = 12^2 + 16^2$ $= 400$ $DG = 20$ $AG^2 = AD^2 + DG^2$ $= 25^2 + 20^2$ $= 1025$ $AG = \sqrt{1025} = 32.015$ $= 32$ cm (nearest cm)	C

10.	$\angle ATB = 48 - 20 = 28$ (exterior angle Δ) $\frac{BT}{\sin 20} = \frac{20}{\sin 28}$ $BT = \frac{20 \times \sin 20}{\sin 28}$ $= 14.57043$ $= 14.6$ m (1 dec place)	B
11.	$\frac{\sin C}{13} = \frac{\sin 26}{6.5}$ $\sin C = \frac{13 \times \sin 26}{6.5}$ $= 0.8767$ $C = 61°$ However since $\angle ACB$ is obtuse $\angle ACB = 180 - 61 = 119°$	D
12.	$\angle LJK = 238 - 180 = 58°$ $\angle JKL = 360 - 290 = 70°$ $\angle JLK = 180 - 58 - 70 = 52°$ $\frac{LK}{\sin 58} = \frac{652}{\sin 52}$ $LK = \frac{652 \times \sin 58}{\sin 52}$ $= 701.67488$ $= 702$ km (nearest km)  	A

High School
Mathematics Test 2014

Non Right Triangle Trigonometry

Multiple Choice Answer Sheet

Name ___Marking Sheet

Completely fill the response oval representing the most correct answer.

1.	A ○	B ●	C ○	D ○
2.	A ○	B ○	C ○	D ●
3.	A ●	B ○	C ○	D ○
4.	A ○	B ○	C ●	D ○
5.	A ○	B ●	C ○	D ○
6.	A ○	B ○	C ○	D ●
7.	A ○	B ○	C ●	D ○
8.	A ●	B ○	C ○	D ○
9.	A ○	B ○	C ●	D ○
10.	A ○	B ●	C ○	D ○
11.	A ○	B ○	C ○	D ●
12.	A ●	B ○	C ○	D ○