

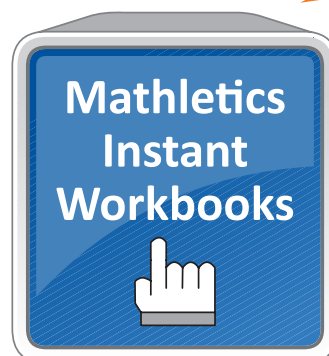
MATHLETICS

Inspiring Better Results

Trigonometry

Student Book - Series K-1

$\sin \theta$ $\cos \theta$
 $\tan \theta$



Trigonometry

Student Book - Series K

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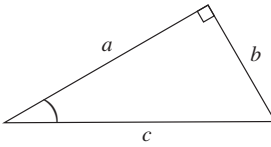
Author of The Topics and Topic Tests: AS Kalra

Trigonometry

Topic 1: Naming the sides of a right-angled triangle

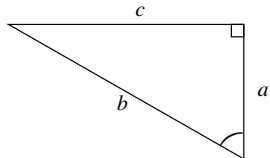
QUESTION 1 In each of the following triangles, state whether a , b and c are the opposite side, adjacent side or hypotenuse with reference to the angle marked.

a



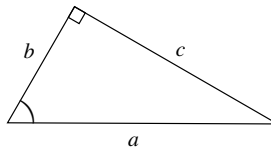
$a = \underline{\hspace{1cm}}, b = \underline{\hspace{1cm}}, c = \underline{\hspace{1cm}}$

b



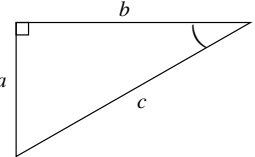
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c



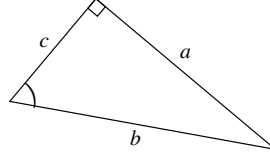
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d



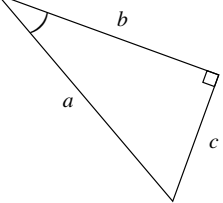
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e



$a = \underline{\hspace{1cm}}, b = \underline{\hspace{1cm}}, c = \underline{\hspace{1cm}}$

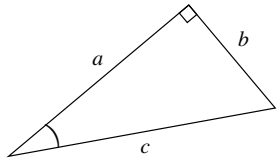
f



$a = \underline{\hspace{1cm}}, b = \underline{\hspace{1cm}}, c = \underline{\hspace{1cm}}$

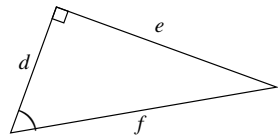
QUESTION 2 Name the sides in the following right-angled triangles with reference to the angle marked.

a



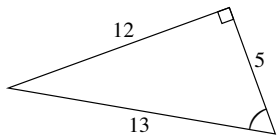
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b



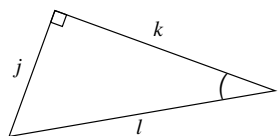
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c



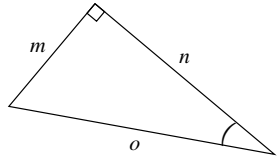
$g = \underline{\hspace{1cm}}, h = \underline{\hspace{1cm}}, i = \underline{\hspace{1cm}}$

d



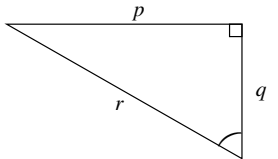
$j = \underline{\hspace{1cm}}, k = \underline{\hspace{1cm}}, l = \underline{\hspace{1cm}}$

e



$m = \underline{\hspace{1cm}}, n = \underline{\hspace{1cm}}, o = \underline{\hspace{1cm}}$

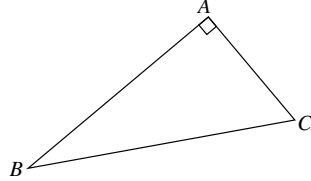
f



$p = \underline{\hspace{1cm}}, q = \underline{\hspace{1cm}}, r = \underline{\hspace{1cm}}$

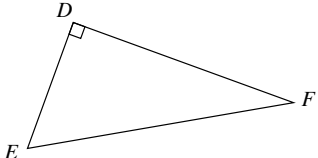
QUESTION 3 Name the hypotenuse in each triangle given below.

a



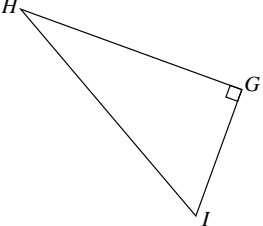
$\underline{\hspace{10cm}}$

b



$\underline{\hspace{10cm}}$

c

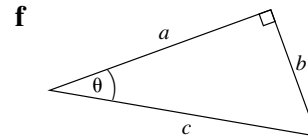
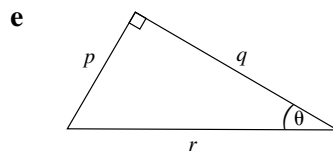
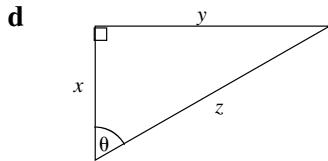
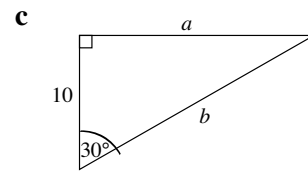
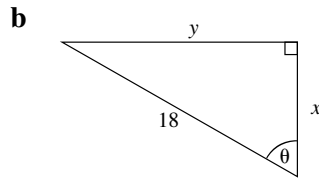
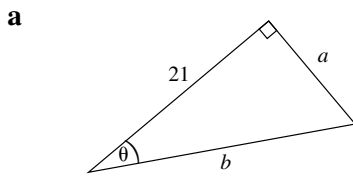


$\underline{\hspace{10cm}}$

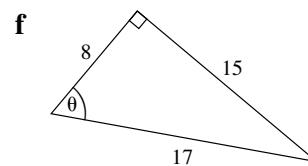
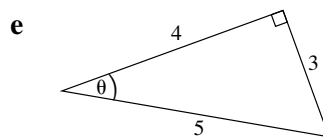
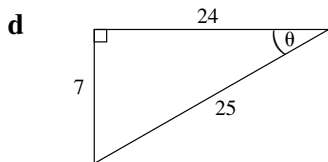
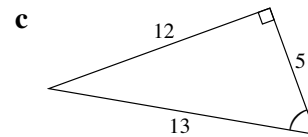
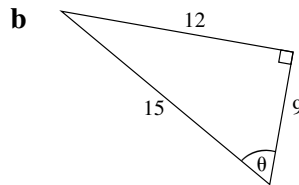
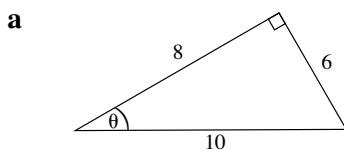
Trigonometry

Topic 2: The trigonometric ratios

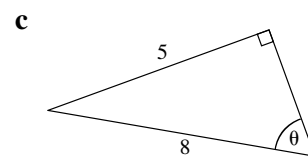
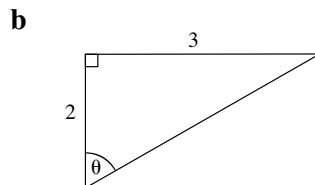
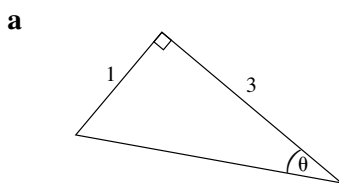
QUESTION 1 Write the trigonometric ratios (sine, cosine and tangent) for the following triangles.



QUESTION 2 Find $\sin \theta$, $\cos \theta$ and $\tan \theta$ in the following triangles.



QUESTION 3 Use Pythagoras' theorem to calculate the unknown side. Then find $\sin \theta$, $\cos \theta$ and $\tan \theta$.



Trigonometry

Topic 3: Using a calculator for angles

QUESTION 1 Round off to the nearest degree.

- a 38.648° _____ b 89.257° _____ c 71.847° _____
d 32.5° _____ e 84.836° _____ f 62.35° _____
g $83^\circ 28'$ _____ h $59^\circ 43' 14''$ _____ i $74^\circ 23' 34''$ _____

QUESTION 2 Round off to the nearest minute.

- a $83^\circ 24' 36''$ _____ b $89^\circ 34' 27''$ _____ c $63^\circ 28' 18''$ _____
d $54^\circ 38' 15''$ _____ e $51^\circ 46' 13''$ _____ f $54^\circ 17' 29''$ _____
g $27^\circ 15' 32''$ _____ h $41^\circ 45' 26''$ _____ i $30^\circ 45' 32''$ _____

QUESTION 3 Express to the nearest degree.

- a $27^\circ 15'$ _____ b $46^\circ 19' 32''$ _____ c 29.348° _____
d 78.325° _____ e 77.638° _____ f 82.5° _____
g $21^\circ 34'$ _____ h $55^\circ 18' 59''$ _____ i $64^\circ 43' 32''$ _____

QUESTION 4 Express as an angle in decimal form, correct to two decimal places.

- a $47^\circ 28' 36''$ _____ b $72^\circ 11' 27''$ _____ c $54^\circ 22' 34''$ _____
d $64^\circ 51' 27''$ _____ e $59^\circ 16' 23''$ _____ f $83^\circ 16' 14''$ _____
g $32^\circ 54' 18''$ _____ h $35^\circ 34' 26''$ _____ i $15^\circ 34' 43''$ _____

QUESTION 5 Change to degrees, minutes and seconds.

- a 53.238° _____ b 18.752° _____ c 21.386° _____
d 36.752° _____ e 27.369° _____ f 84.543° _____
g 47.315° _____ h 34.835° _____ i 73.128° _____

QUESTION 6 Round off to the nearest minute.

- a 24.76° _____ b 57.349° _____ c 54.469° _____
d 32.83° _____ e 63.235° _____ f 62.763° _____
g 81.125° _____ h 20.846° _____ i 73.128° _____

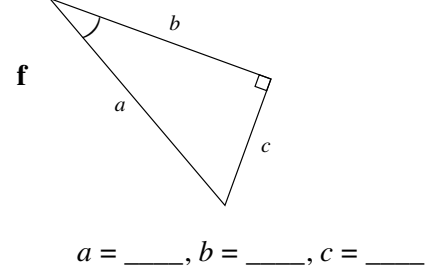
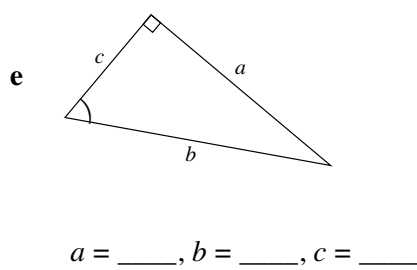
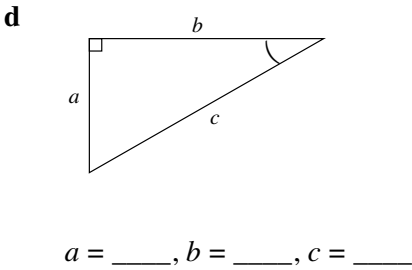
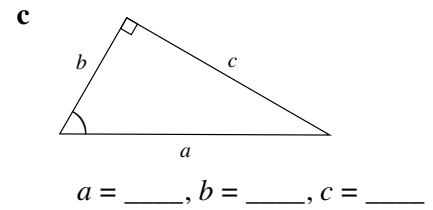
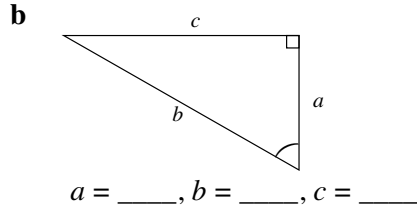
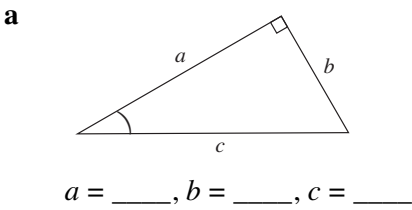
QUESTION 7 Express as an angle in decimal form, correct to two decimal places.

- a $8^\circ 24' 36''$ _____ b $49^\circ 32' 18''$ _____ c $71^\circ 25' 31''$ _____
d $15^\circ 38' 29''$ _____ e $54^\circ 28' 33''$ _____ f $36^\circ 16' 10''$ _____
g $35^\circ 27' 32''$ _____ h $63^\circ 29' 15''$ _____ i $85^\circ 25' 37''$ _____

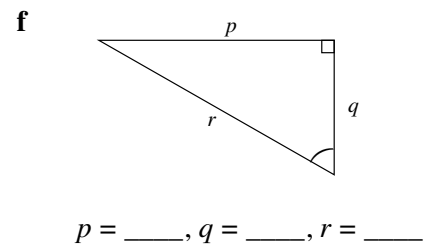
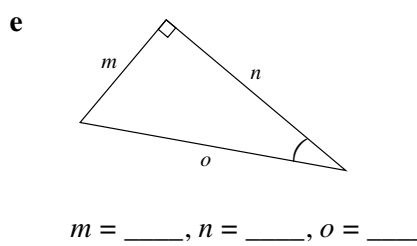
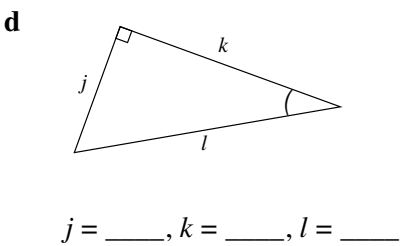
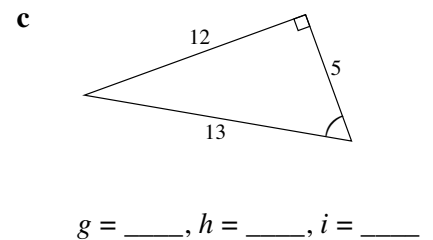
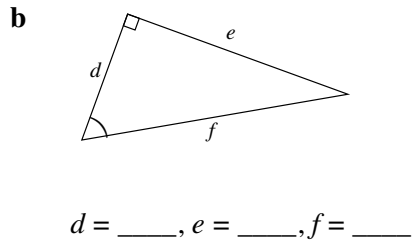
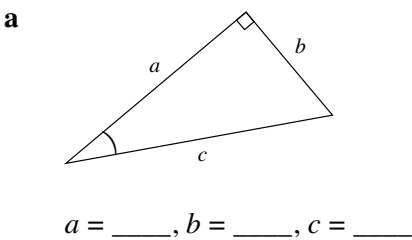
Trigonometry

Topic 4: Trigonometric ratios and the calculator

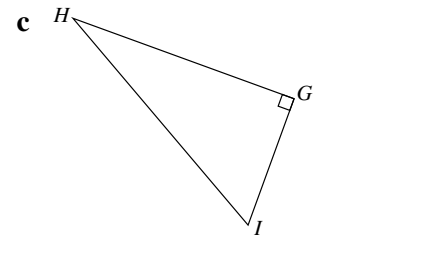
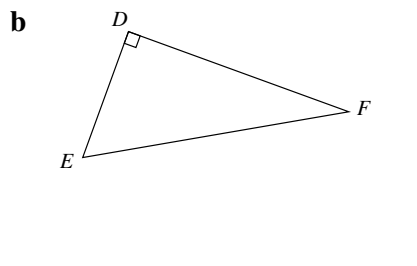
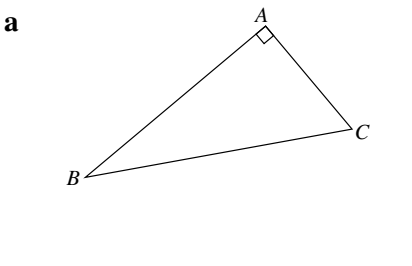
QUESTION 1 In each of the following triangles, state whether a , b and c are the opposite side, adjacent side or hypotenuse with reference to the angle marked.



QUESTION 2 Name the sides in the following right-angled triangles with reference to the angle marked.



QUESTION 3 Name the hypotenuse in each triangle given below.



Trigonometry

Topic 5: Calculating the size of an angle

QUESTION 1 A is an acute angle. Find its size to the nearest degree.

- a $\sin A = 0.5671$ _____ b $\cos A = 0.5632$ _____ c $\tan A = 3.3815$ _____
d $\cos A = 0.8321$ _____ e $\tan A = 2.6815$ _____ f $\cos A = 0.6953$ _____
g $\tan A = 1.3654$ _____ h $\sin A = 0.3496$ _____ i $\sin A = 0.8325$ _____

QUESTION 2 B is an acute angle. Find its size in degrees and minutes.

- a $\tan B = 1.6837$ _____ b $\sin B = 0.3153$ _____ c $\cos B = 0.5673$ _____
d $\sin B = 0.3459$ _____ e $\cos B = 0.4567$ _____ f $\tan B = 0.8364$ _____
g $\cos B = 0.8621$ _____ h $\tan B = 2.8327$ _____ i $\sin B = 0.5389$ _____

QUESTION 3 Find the size of the acute angle C in degrees and minutes.

- a $\cos C = 0.8312$ _____ b $\tan C = 2.1312$ _____ c $\sin C = 0.4569$ _____
d $\tan C = 1.3147$ _____ e $\cos C = 0.2359$ _____ f $\tan C = 3.1256$ _____
g $\sin C = 0.8485$ _____ h $\sin C = 0.7651$ _____ i $\cos C = 0.6357$ _____

QUESTION 4 θ is an acute angle. Find its size in degrees and minutes.

- a $\sin \theta = 0.3125$ _____ b $\cos \theta = 0.8765$ _____ c $\tan \theta = 2.8210$ _____
d $\cos \theta = 0.8135$ _____ e $\tan \theta = 3.1234$ _____ f $\sin \theta = 0.7105$ _____
g $\tan \theta = 1.6218$ _____ h $\sin \theta = 0.1928$ _____ i $\cos \theta = 0.6118$ _____

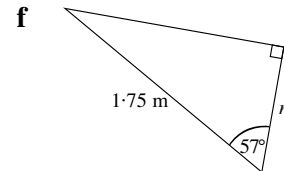
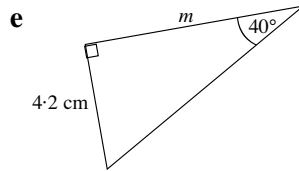
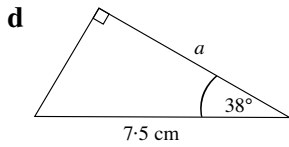
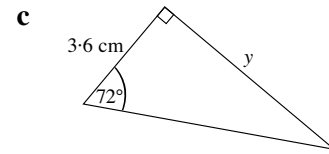
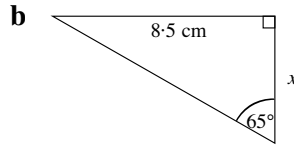
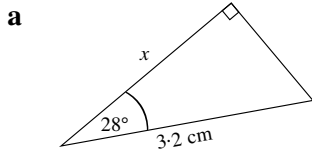
QUESTION 5

- a If $\sin A = 0.5647$, what is the value of $\sin \frac{A}{2}$? _____
b If $\cos B = 0.7652$, what is the value of $\cos \frac{B}{3}$? _____
c If $\tan C = 1.2384$, find $\tan 3C$. _____

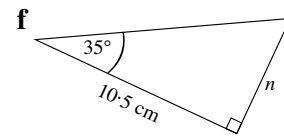
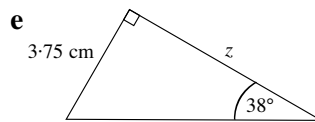
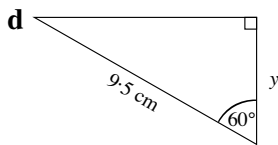
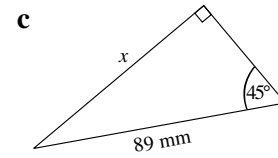
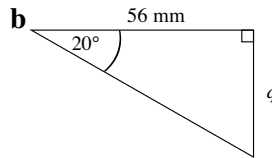
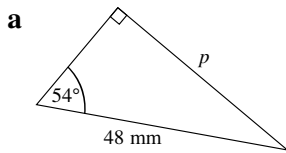
Trigonometry

Topic 6: Finding the unknown side

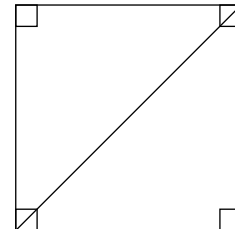
QUESTION 1 Find the value of the unknown side correct to one decimal place.



QUESTION 2 Find the value of the pronumeral in each triangle correct to two decimal places.



QUESTION 3 The diagonal of a square is 24.6 cm long.
Find the length of one side to the nearest millimetre.



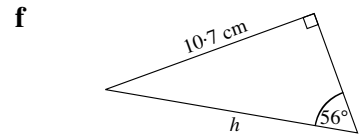
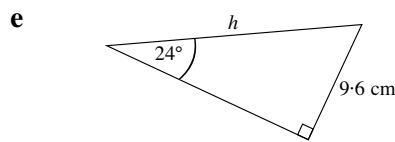
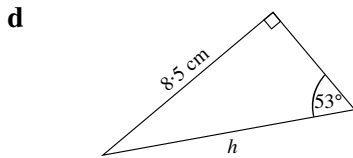
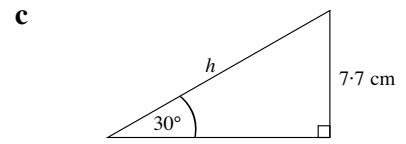
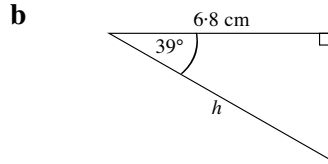
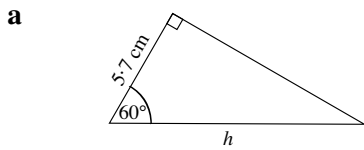
QUESTION 4 In $\triangle ABC$, $\angle C = 90^\circ$, $\angle B = 38^\circ 40'$ and $AB = 14.6$ cm, Find BC correct to one decimal place.

QUESTION 5 James is flying a kite on a 65 metre string that makes an angle of 49° with the horizontal.
Calculate the height of the kite to the nearest metre.

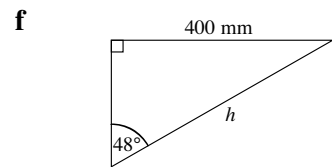
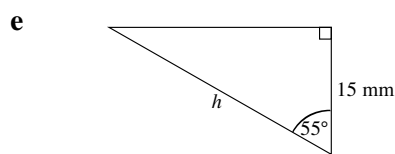
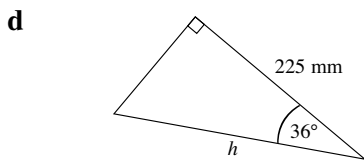
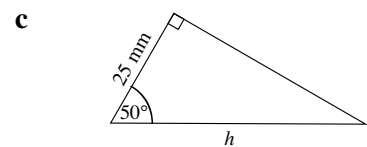
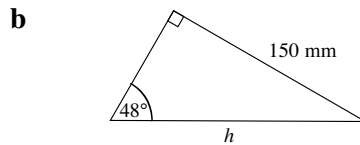
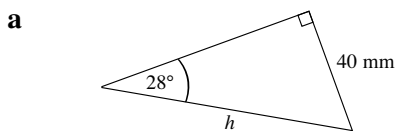
Trigonometry

Topic 7: Finding the hypotenuse

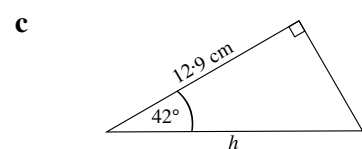
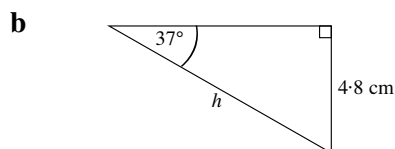
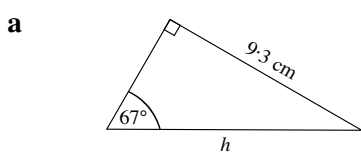
QUESTION 1 Find the length of the hypotenuse correct to two decimal places.



QUESTION 2 Find the length of the hypotenuse correct to one decimal place.



QUESTION 3 Find the length of the hypotenuse correct to two decimal places.



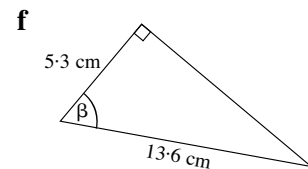
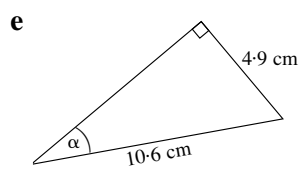
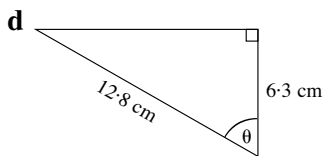
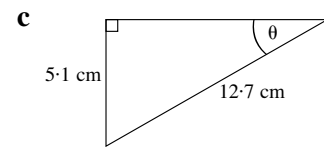
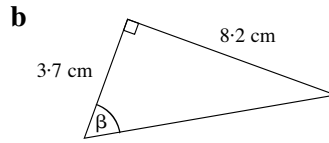
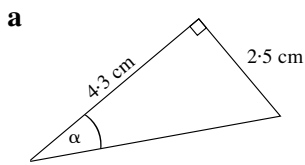
QUESTION 4 The height of a ramp is 4.2 m. Given that the ramp is inclined at 30° to the ground, find the length of the ramp to the nearest centimetre. _____

QUESTION 5 A tree casts a shadow 20.7 m long. If the Sun's rays meet the ground at $29^\circ 36'$, what is the height of the tree to the nearest metre? _____

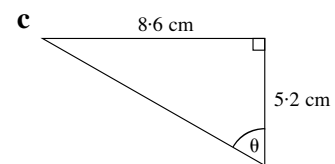
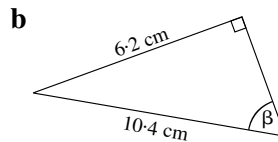
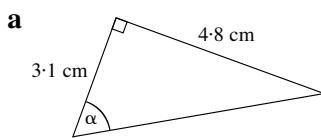
Trigonometry

Topic 8: Finding an unknown angle

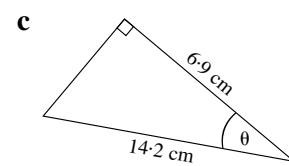
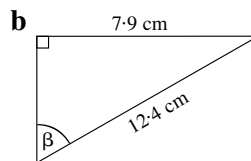
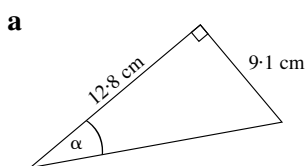
QUESTION 1 Find the size of the angle marked in degrees and minutes.



QUESTION 2 Find the value of the angle marked in degrees and minutes.



QUESTION 3 Find the size of the angle marked in degrees and minutes.



QUESTION 4 A tree 18 metres tall casts a shadow 19.5 metres long. What angle do the rays of the Sun make with the ground? _____

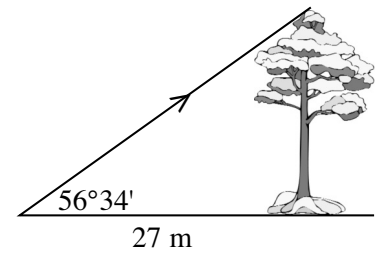
QUESTION 5 A ladder leans against a vertical wall with its foot 1.5 metres from the wall making an angle of $45^{\circ}36'$ with the ground. How long is the ladder? Give your answer to the nearest centimetre.

Trigonometry

Topic 9: Angles of elevation and depression

QUESTION 1

- a From a point on the ground 27 m from the base of a tree, the angle of elevation of the top of the tree is $56^{\circ}34'$. Find the height of the tree to the nearest metre. _____



- b A railway track rises uniformly 5.4 m for every 250 m along the track. Find the angle of elevation of this track to the nearest minute. _____

- c Find the angle of depression from the top of a vertical cliff 80 m high to a boat 388 m from the foot of the cliff. Give your answer correct to the nearest minute. _____

QUESTION 2

- a Ryan is sitting in a Park and looks towards the top of a 120 m tall tower at an angle of elevation of $31^{\circ}28'$. How far is he sitting from the base of the tower, to the nearest metre? _____

- b A statue is 25 m tall and casts a horizontal shadow 26.3 m long. Find the angle of elevation of the Sun to the nearest degree. _____

- c From a point on top of a building that is 98 m tall, the angle of depression of a car is $39^{\circ}27'$. How far is the car from the foot of the building? Give your answer correct to the nearest metre. _____

Trigonometry

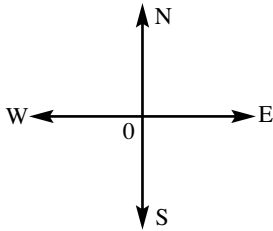
Topic 10: Bearings

QUESTION 1 What is the size of the angle between each pair of directions?

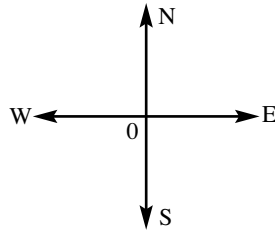
- a N and E _____ b N and S _____ c S and SW _____
 d S and ESE _____ e N and NE _____ f N and ENE _____

QUESTION 2 Show each bearing:

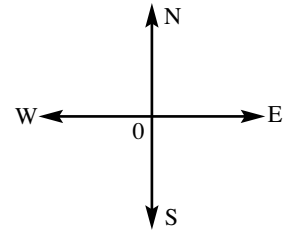
a 035°



b $N 64^\circ E$

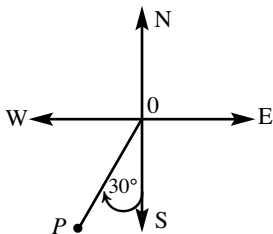


c 260°

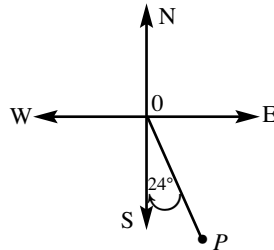


QUESTION 3 Write the true bearing and the compass bearing of P from O :

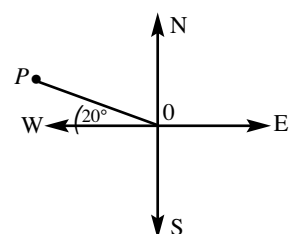
a



b



c



QUESTION 4 A ship sailed 12 nautical miles north and then 20 nautical miles west. Find its bearing (to the nearest degree) from the starting point. _____

QUESTION 5 A man walked due south and then turned and walked due east. He was then 3 km $S 50^\circ E$ from his starting point. How far (to the nearest metre) was he south of his initial position? _____

QUESTION 6 A lighthouse is 10 nautical miles north-east of a ship. How far is the ship west of the lighthouse (correct to two decimal places). _____

Trigonometry

Topic Test

PART A

Time allowed: 15 minutes

Total marks = 15

				Marks		
1	The hypotenuse of a right-angled triangle is 25 cm. If one side is 7 cm, the third side is	(A) 25.96	(B) 24	(C) 26	(D) 26.52	1
2	Evaluate $15 \cos 70^\circ$ correct to two decimal places.	(A) 0.34	(B) 0.02	(C) 5.13	(D) 43.86	1
3	If $\sin \theta = \frac{3}{5}$, calculate the size of θ to the nearest degree.	(A) 53°	(B) 37°	(C) 31°	(D) 59°	1
4	In relation to the diagram, which statement is correct?	(A) $\cos \theta = \frac{6}{10}$	(B) $\tan \theta = \frac{8}{6}$	(C) $\sin \theta = \frac{6}{10}$	(D) $\sin \theta = \frac{8}{10}$	1
5	If $\cos \theta = \frac{1}{2}$, find the size of angle θ .	(A) 30°	(B) 45°	(C) 55°	(D) 60°	1
6	The value of $\sin 49^\circ 28'$ is closest to:	(A) 0.650	(B) 0.760	(C) 1.169	(D) 0.482	1
7	64.65° equals:	(A) $64^\circ 6' 5''$	(B) $64^\circ 35'$	(C) $64^\circ 39'$	(D) $64^\circ 1' 5''$	1
8	The three sides of a right-angled triangle measure 40 m, 41 m and 9 m. The length of the hypotenuse is:	(A) 9 m	(B) 40 m	(C) 41 m	(D) none of these	1
9	If $\tan \theta = 1$, calculate the size of angle θ .	(A) 30°	(B) 45°	(C) 60°	(D) 72°	1
10	The value of x in the diagram is given by:	(A) $36 \times \cos 18^\circ$	(B) $36 \times \sin 18^\circ$	(C) $\frac{36}{\cos 18^\circ}$	(D) $\frac{36}{\sin 18^\circ}$	1
11	From the diagram the correct expression for h is:	(A) $h = 30 \tan 25^\circ$	(B) $h = 25 \tan 30^\circ$	(C) $h = \frac{\tan 25^\circ}{30}$	(D) $h = \frac{30}{\tan 25^\circ}$	1
12	If $\triangle ABC$, the angle B is 90° , AB is 6 m and AC is 10 m. Find the size of angle A correct to the nearest degree.	(A) 27°	(B) 30°	(C) 37°	(D) 53°	1
13	If $\sin \theta = \frac{1}{2}$, find the size of angle θ .	(A) 30°	(B) 45°	(C) 60°	(D) 72°	1
14	The diagonal of a rectangle makes an angle of 56° with one of the shorter sides. If the length of the rectangle is 15 cm, find the length of the diagonal correct to one decimal place.	(A) 12.4 cm	(B) 18.1 cm	(C) 26.8 cm	(D) 37.7 cm	1
15	From the top of a tower the angle of depression of a boat is 60° . If the tower is 50 metres high, how far is the boat from the foot of the tower (to the nearest metre).	(A) 29 m	(B) 87 m	(C) 58 m	(D) 100 m	1

Total marks achieved for PART A

15

Trigonometry

Topic Test

PART B

Time allowed: 15 minutes

Total marks = 15

	Answers	Marks
<p>Question 1 Find correct to three significant figures.</p>		
<p>a $\frac{\sin 86^{\circ}20'15''}{0.43}$</p>	<hr/>	1
<p>b $\frac{83.56}{\sin 68^{\circ}36'56''}$</p>	<hr/>	1
<p>c $18.63 \cos 38^{\circ}52'$</p>	<hr/>	1
<p>d $\frac{19.3 \times \sin 73^{\circ}54'}{\tan 68^{\circ}15'30''}$</p>	<hr/>	1
<p>e $\frac{45.683 \cos 59^{\circ}39'}{4.3 \sin 63^{\circ}}$</p>	<hr/>	1
<p>Question 2 $ABCD$ is a rectangle with dimensions</p>		
<p>9 cm by 40 cm:</p>		
<p>a Use Pythagoras' theorem to find 9 cm the length of the diagonal AC.</p>		
<p>Find the following ratios in fraction form.</p>	<hr/>	1
<p>b $\sin \theta$</p>	<hr/>	1
<p>c $\cos \theta$</p>	<hr/>	1
<p>d $\tan \theta$</p>	<hr/>	1
<p>e Show that $\tan \theta = \frac{\sin \theta}{\cos \theta}$</p>	<hr/>	1
<p>Question 3 For the triangle PQR given below:</p>		
<p>a Find the value of h correct to one decimal place.</p>		
<p>b Find the size of $\angle P$</p>	<hr/>	1
<p>c Find the length QR correct to one decimal place.</p>	<hr/>	1
<p>d Find $\sin 28^{\circ}$ correct to four decimal places.</p>	<hr/>	1
<p>e Show that $\sin^2 28^{\circ} + \cos^2 28^{\circ} = 1$.</p>	<hr/>	1

Total marks achieved for PART B

15
