Student Name

Mathematics Stage 5 Core

TRIGONOMETRY A

Book 1 Demonstrate and explain the constancy of trigonometric ratios for a given angle in a right-angled triangle

Version: 260207

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CONTENTS

OVERVIEW

SYLLABUS CONTENT

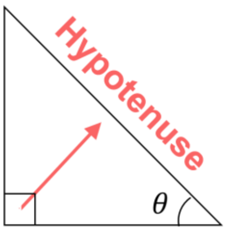
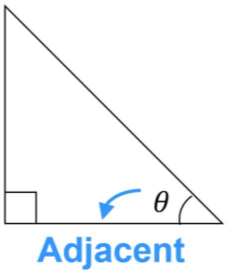
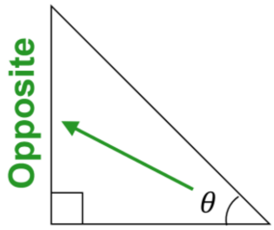
MA5-TRG-C-01 applies trigonometric ratios to solve right-angled triangle problems

Demonstrate and explain the constancy of trigonometric ratios for a given angle in a right-angled triangle

- Identify and label the hypotenuse, adjacent and opposite sides with respect to a given angle in a right-angled triangle in any orientation
- Define the sine, cosine and tangent ratios for angles in right-angled triangles and use trigonometric notation $\sin\theta$, $\cos\theta$, $\tan\theta$
- Identify the sine, cosine and tangent ratios in a right-angled triangle
- Verify the constancy of the sine, cosine and tangent ratios for a given angle by applying knowledge of similar right-angled triangles
- Find approximations of the trigonometric ratios for a given angle
- Find the size of an angle given one of the trigonometric ratios for the angle using digital tools

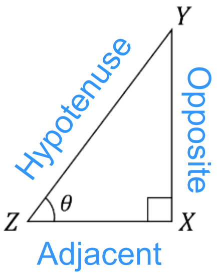
SIDES OF A RIGHT-ANGLED TRIANGLE

- The three sides of a right-angled triangle are named based on an angle θ:

Hypotenuse	Adjacent	Opposite
Longest side Opposite the right-angle	Next to the angle, but not the hypotenuse	Furthest side from the angle
		

Example Identify hypotenuse, adjacent, and opposite sides of a triangle.

For angle θ, identify the:



Hypotenuse: ZY

Adjacent: ZX

Opposite: YX

How do we know which side is the hypotenuse?

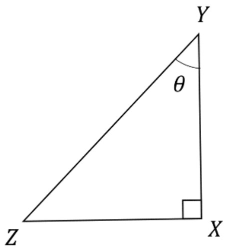
The hypotenuse is the ……………… side opposite the ……………… ………………

How do we know which side is adjacent to the angle?

The adjacent side is …………… …… the angle, but not the hypotenuse.

Identify the hypotenuse, opposite, and adjacent sides of these right-angled triangles.

a

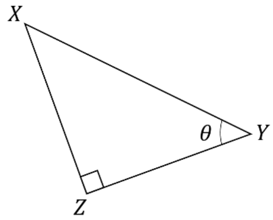


Hypotenuse: ZY

Adjacent: YX

Opposite: ZX

b

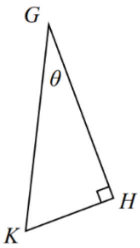


Hypotenuse: XY

Adjacent: ZY

Opposite: XZ

c

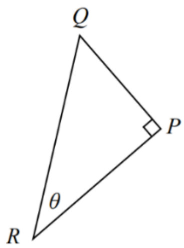


Hypotenuse: GK

Adjacent: GH

Opposite: KH

d



Hypotenuse: QR

Adjacent: PR

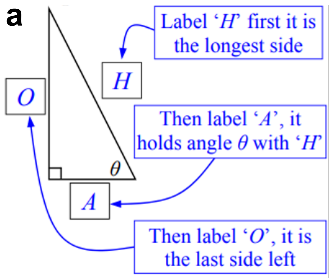
Opposite: QP

Key ideas

1. The ………………… is the longest side of a right-angled triangle and always ………………… the right-angle.
2. The ………………… side is opposite the angle.
3. The ………………… side is next to the angle.

1 Label the sides of these right-angled triangles.
Remember that the hypotenuse is always opposite the right-angle.

a



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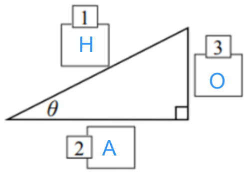

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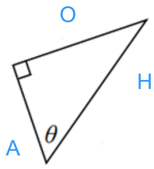

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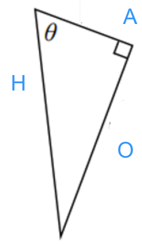

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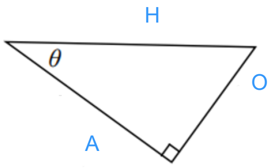

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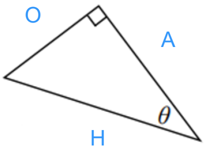

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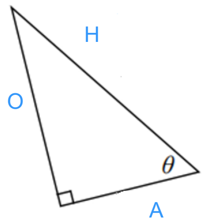

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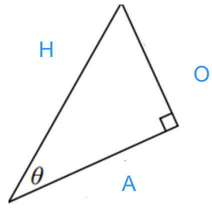

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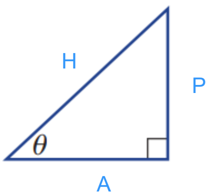

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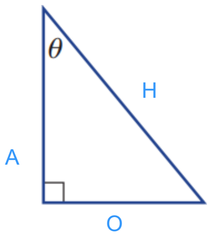

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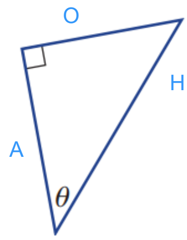

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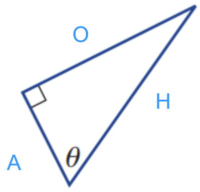

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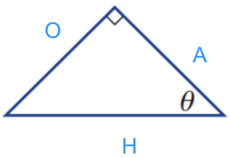

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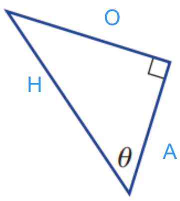

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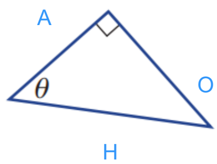

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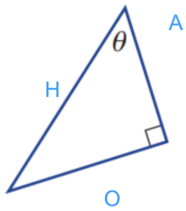
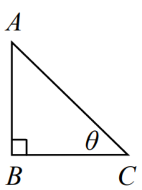


2 Identify the hypotenuse, adjacent and opposite.

a

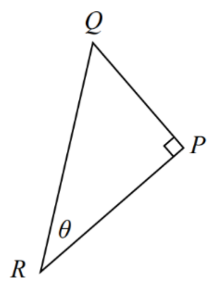


Hypotenuse: ……… AC

Adjacent: ……… BC

Opposite: ……… AB

b



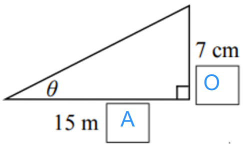
Hypotenuse: ……… QR

Adjacent: ……… RP

Opposite: ……… QP

3 Label the side lengths H, A, or O

a



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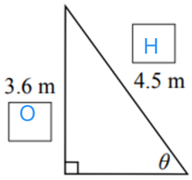

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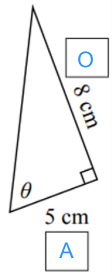

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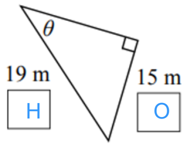

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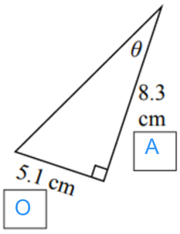

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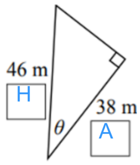

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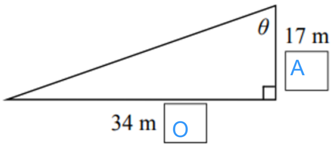

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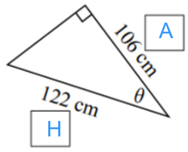

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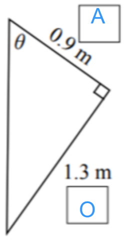

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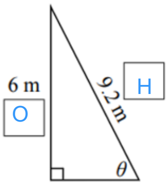

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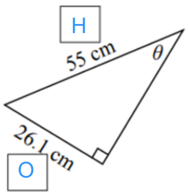

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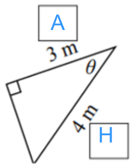

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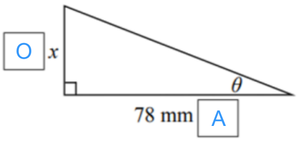

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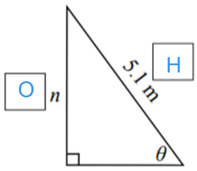

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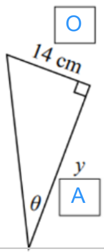

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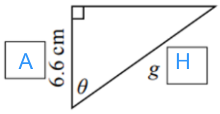

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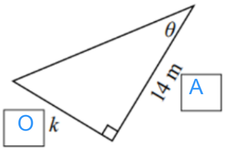

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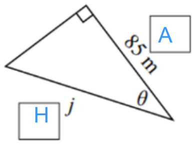

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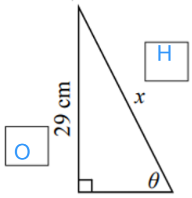

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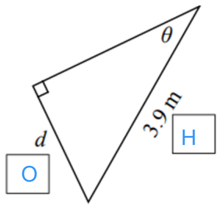
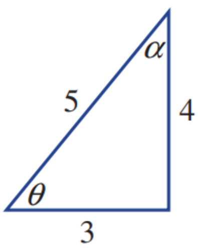


4 For the triangle shown, state the length of the:



a hypotenuse 5

b side adjacent to angle θ 3

c side adjacent to angle α 4

d side opposite angle θ 4

e side opposite angle α 3

THE TRIGONOMETRIC RATIOS

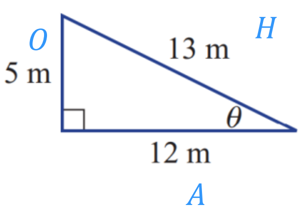
- There are three **trigonometric ratios: sine, cosine, and tangent,** which compare the lengths of two sides of a triangle.
- The ratios specify an angle, as the opposite and adjacent sides depend on the angle.

The Trigonometric Ratios		
$\sin\theta = \dfrac{\textbf{O}\text{pposite}}{\textbf{H}\text{ypotenuse}}$	$\cos\theta = \dfrac{\textbf{A}\text{djacent}}{\textbf{H}\text{ypotenuse}}$	$\tan\theta = \dfrac{\textbf{O}\text{pposite}}{\textbf{A}\text{djacent}}$

1. Identify the sides of the right-angled triangle: H, A, O
2. Write the trig ratios.

Example Identify sin, cos, and tan.

For the triangle, determine:



$$\sin\theta = \frac{\text{Opp}}{\text{Hyp}} = \frac{5}{13}$$

$$\cos\theta = \frac{\text{Adj}}{\text{Hyp}} = \frac{12}{13}$$

$$\tan\theta = \frac{\text{Opp}}{\text{Adj}} = \frac{5}{12}$$

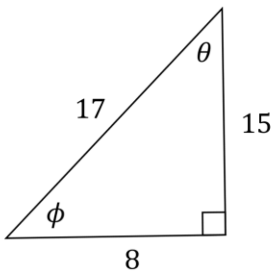
What is a ratio?

A ratio is a relationship between two …………………

Describe what $\sin\theta$ means.

$\sin\theta$ is the ratio of ……………… compared to ……………… for an angle θ in a right-angled triangle.

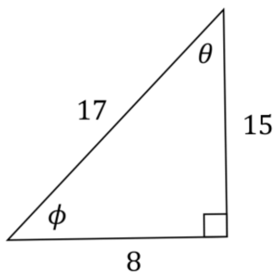
Identify the sine, cosine, and tangent ratios of the below triangles.



$$\sin\theta = \frac{\text{Opp}}{\text{Hyp}} = \frac{8}{17}$$

$$\cos\theta = \frac{\text{Adj}}{\text{Hyp}} = \frac{15}{17}$$

$$\tan\theta = \frac{\text{Opp}}{\text{Adj}} = \frac{8}{15}$$



$$\sin\phi = \frac{\text{Opp}}{\text{Hyp}} = \frac{15}{17}$$

$$\cos\phi = \frac{\text{Adj}}{\text{Hyp}} = \frac{8}{17}$$

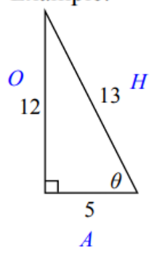
$$\tan\phi = \frac{\text{Opp}}{\text{Adj}} = \frac{15}{8}$$

Key ideas

1. The trigonometric ratios compare lengths of two ……………… of a right-angled triangle.
2. The sine ratio compares the ……………… and ………………
3. The cosine ratio compares the ……………… and ………………
4. The tangent ratio compares the ………………… and ………………
5. The trigonometric ratios must specify an …………………, as the opposite and adjacent sides depend on the angle.

1 Label the sides, then write the ratios $\sin\theta$, $\cos\theta$, $\tan\theta$

a Example:

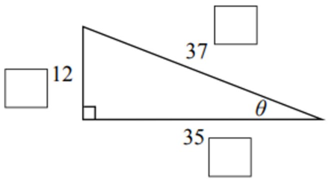


$sin\ \theta = \dfrac{O}{H} = \dfrac{12}{13}$

$cos\ \theta = \dfrac{A}{H} = \dfrac{5}{13}$

$tan\ \theta = \dfrac{O}{A} = \dfrac{12}{5}$

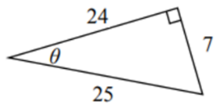
b



$sin\ \theta = \dfrac{\square}{\square}$ $cos\ \theta = \dfrac{\square}{\square}$ $tan\ \theta = \dfrac{\square}{\square}$

$\sin\theta = \frac{12}{37}$, $\cos\theta = \frac{35}{37}$, $\tan\theta = \frac{12}{35}$

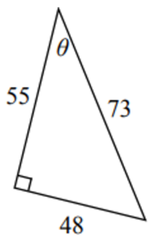
c



$sin\ \theta = \dfrac{\square}{\square}$ $cos\ \theta = \dfrac{\square}{\square}$ $tan\ \theta = \dfrac{\square}{\square}$

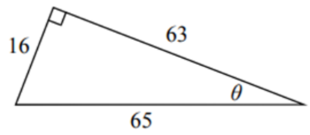
$\sin\theta = \frac{7}{25}$, $\cos\theta = \frac{24}{25}$, $\tan\theta = \frac{7}{24}$

d



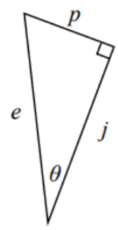
$\sin\theta = \frac{48}{73}$, $\cos\theta = \frac{55}{73}$, $\tan\theta = \frac{48}{55}$

e



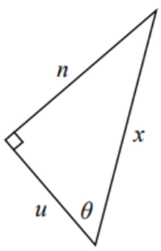
$\sin\theta = \frac{16}{65}$, $\cos\theta = \frac{63}{65}$, $\tan\theta = \frac{16}{63}$

f



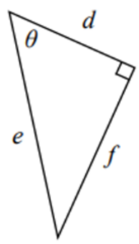
$\sin\theta = \frac{p}{e}$, $\cos\theta = \frac{j}{e}$, $\tan\theta = \frac{p}{j}$

g



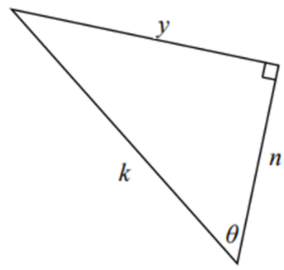
$\sin\theta = \frac{n}{x}$, $\cos\theta = \frac{u}{x}$, $\tan\theta = \frac{n}{u}$

h



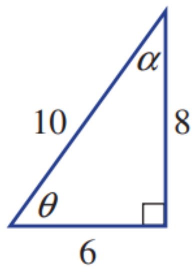
$\sin\theta = \frac{f}{e}$, $\cos\theta = \frac{d}{e}$, $\tan\theta = \frac{f}{d}$

i



$\sin\theta = \frac{y}{k}$, $\cos\theta = \frac{n}{k}$, $\tan\theta = \frac{y}{n}$

2 For the triangle shown, write the trigonometric ratio for:



a $\sin\theta =$ $\frac{8}{10} = \frac{4}{5}$

b $\cos\theta =$ $\frac{6}{10} = \frac{3}{5}$

c $\tan\theta =$ $\frac{8}{6} = \frac{4}{3}$

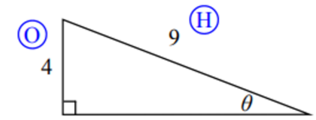
d $\sin\alpha =$ $\frac{6}{10} = \frac{3}{5}$

e $\cos\alpha =$ $\frac{8}{10} = \frac{4}{5}$

f $\tan\alpha =$ $\frac{6}{8} = \frac{3}{4}$

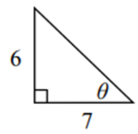
3 Label the given sides then decide the appropriate ratio that relates the two sides.

a



● sin ○ cos ○ tan

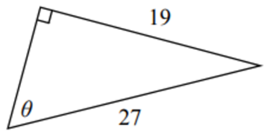
b



○ sin ○ cos ○ tan

tan

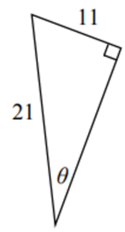
c



○ sin ○ cos ○ tan

sin

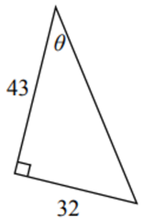
d



○ sin ○ cos ○ tan

sin

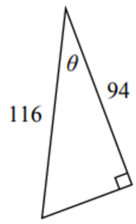
e



○ sin ○ cos ○ tan

tan

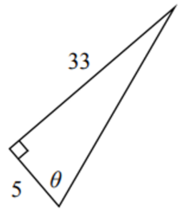
f



○ sin ○ cos ○ tan

cos

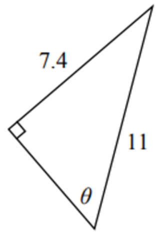
g



○ sin ○ cos ○ tan

tan

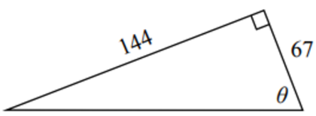
h



○ sin ○ cos ○ tan

sin

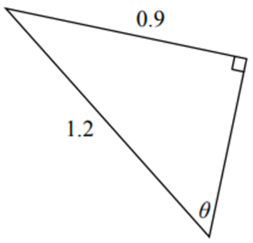
i



○ sin ○ cos ○ tan

tan

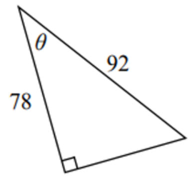
j



○ sin ○ cos ○ tan

sin

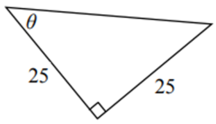
k



○ sin ○ cos ○ tan

cos

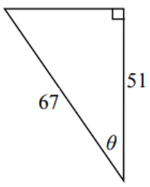
l



○ sin ○ cos ○ tan

tan

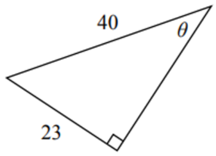
m



○ sin ○ cos ○ tan

cos

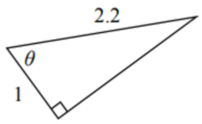
n



○ sin ○ cos ○ tan

sin

o



○ sin ○ cos ○ tan

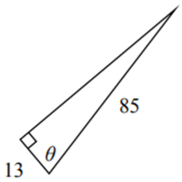
cos

p

○ sin ○ cos ○ tan

tan

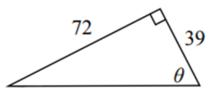
q



○ sin ○ cos ○ tan

cos

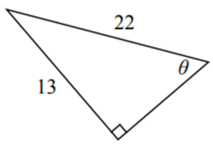
r



○ sin ○ cos ○ tan

tan

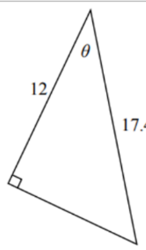
s



○ sin ○ cos ○ tan

sin

t

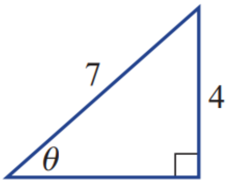


○ sin ○ cos ○ tan

cos

4 Use the given sides to write a trigonometric ratio for each triangle.

a

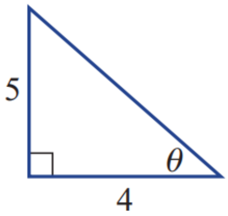


Given sides: O, H

Appropriate ratio: sine

$\sin\theta = \frac{4}{7}$

b



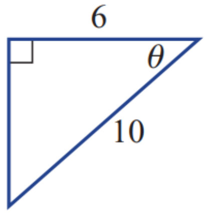
Given sides: …… , ……

Appropriate ratio: …………

…… θ = …………

$\tan\theta = \frac{5}{4}$

c



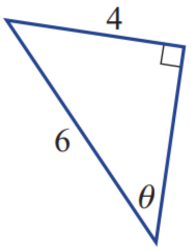
Given sides: …… , ……

Appropriate ratio: …………

………………………

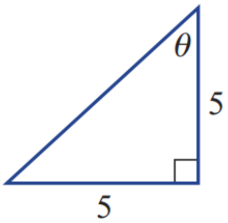
$\cos\theta = \frac{6}{10} = \frac{3}{5}$

d



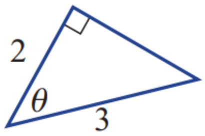
$\sin\theta = \frac{4}{6} = \frac{2}{3}$

e



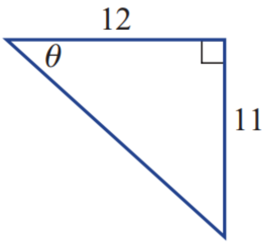
$\tan\theta = \frac{5}{5} = 1$

f



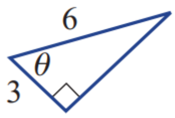
$\cos\theta = \frac{2}{3}$

g



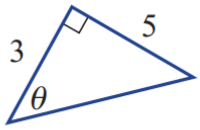
$\tan\theta = \frac{11}{12}$

h



$\cos\theta = \frac{3}{6} = \frac{1}{2}$

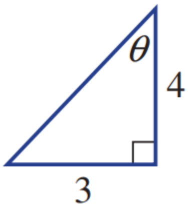
i



$\tan\theta = \frac{5}{3}$

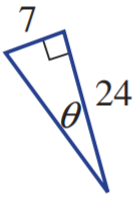
5 Use Pythagoras' Theorem to find the unknown side and then find the ratios for $\sin\theta$, $\cos\theta$, and $\tan\theta$.

a



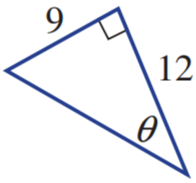
$\sin\theta = \frac{3}{5}$, $\cos\theta = \frac{4}{5}$, $\tan\theta = \frac{3}{4}$

b



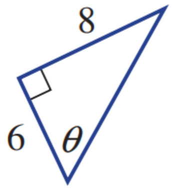
$\sin\theta = \frac{7}{25}$, $\cos\theta = \frac{24}{25}$, $\tan\theta = \frac{7}{24}$

c



$\sin\theta = \frac{9}{15} = \frac{3}{5}$, $\cos\theta = \frac{12}{15} = \frac{4}{5}$, $\tan\theta = \frac{9}{12} = \frac{3}{4}$

d



$\sin\theta = \frac{8}{10} = \frac{4}{5}$, $\cos\theta = \frac{6}{10} = \frac{3}{5}$, $\tan\theta = \frac{8}{6} = \frac{4}{3}$

CONSTANCY OF THE TRIGONOMETRIC RATIOS

Investigation Constancy of the Trigonometric Ratios.

Trigonometric Ratios: https://www.geogebra.org/m/k8qwer8j

For a triangle with a $30°$ interior angle, what is the ratio of:

a $\sin 30° = \frac{\text{Opposite}}{\text{Hypotenuse}}$

b $\cos 30° = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

c $\tan 30° = \frac{\text{Opposite}}{\text{Adjacent}}$

Do these values change if you make the triangle larger or smaller?

....

Type $\sin 30°$, $\cos 30°$, and $\tan 30°$ into your calculator.

a $\sin 30° =$

b $\cos 30° =$

c $\tan 30° =$

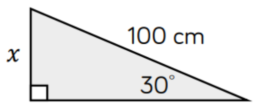
What do you notice?

....

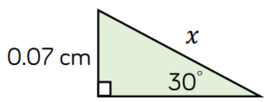
Complete the sentence:

The trigonometric ratios are always .... for a given angle, no matter the size of the triangle.

Hence, find x for these triangles:



....



....

Now we'll change the angle of the triangle. What changes, and what stays the same?

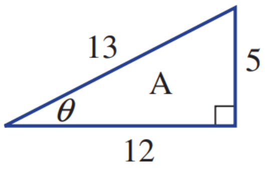
....

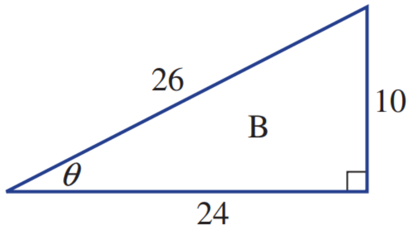
....

Key ideas

1. The .... ratios remain .... for a given angle.

1 Here are two similar triangles A and B





a Explain what is meant when two figures are similar.

All angles equal.

Corresponding sides are in the same ratio.

b Write the ratio $\sin\theta$ for triangle A.

$\sin\theta = \frac{5}{13}$

c Write the ratio $\sin\theta$ for triangle B.

$\sin\theta = \frac{10}{26} = \frac{5}{13}$

d Write the ratio $\cos\theta$ for triangle A.

$\cos\theta = \frac{12}{13}$

e Write the ratio $\cos\theta$ for triangle B.

$\cos\theta = \frac{24}{26} = \frac{12}{13}$

f Write the ratio $\tan\theta$ for triangle A.

$\tan\theta = \frac{5}{12}$

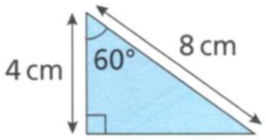
g Write the ratio $\tan\theta$ for triangle B.

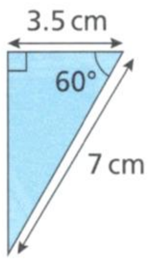
$\tan\theta = \frac{10}{26} = \frac{5}{12}$

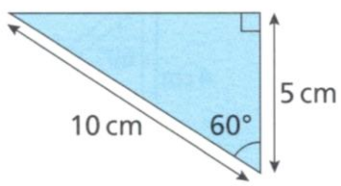
h What do you notice about your answers? (hint: fully simplify them).

The trigonometric ratios are the same for similar triangles.

2 Consider these triangles.







a Explain why these three triangles are similar.

They have the same angles: 90°, 60°, and 30° (using angle sum of a triangle)

b Calculate the ratio of $\frac{\text{Adjacent}}{\text{Hypotenuse}}$ for each of the triangles.

$\frac{4}{8} = \frac{1}{2}, \quad \frac{3.5}{7} = \frac{1}{2}, \quad \frac{5}{10} = \frac{1}{2}$

c What do you notice?

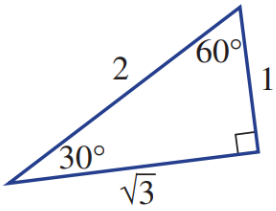
Cos ratio for all three triangles are equal.

d Type $\cos 60°$ in your calculator. What does this tell you about $\frac{\text{Adjacent}}{\text{Hypotenuse}}$ for any right-triangle with $60°$?

$\cos 60 = \frac{1}{2}$ for any right-angled triangle.

3 For the triangle shown, write the trigonometric ratio for:

a $\sin 30° =$ $\frac{1}{2}$	**b** $\cos 30° =$ $\frac{\sqrt{3}}{2}$	**c** $\tan 30° =$ $\frac{1}{\sqrt{3}}$
d $\sin 60° =$ $\frac{\sqrt{3}}{2}$	**e** $\cos 60° =$ $\frac{1}{2}$	**f** $\tan 60° =$ $\sqrt{3}$



What do you notice about cos 30° and sin 60°?

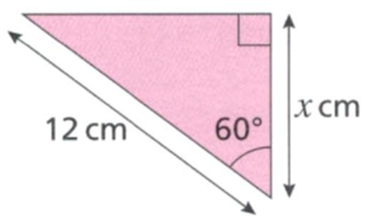
They're equal.

What do you notice about cos 60° and sin 30°?

They're equal.

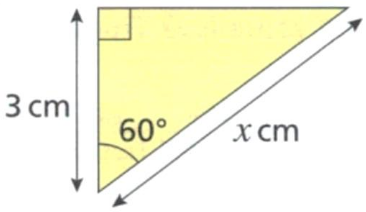
4 Use the fact that $\cos 60° = \frac{1}{2}$ to find the value of x in each of these triangles.

a



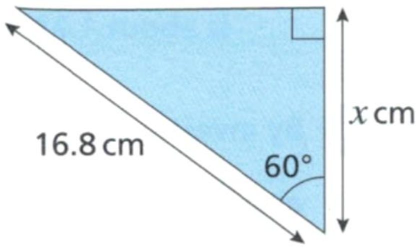
$x = 6$ cm

b



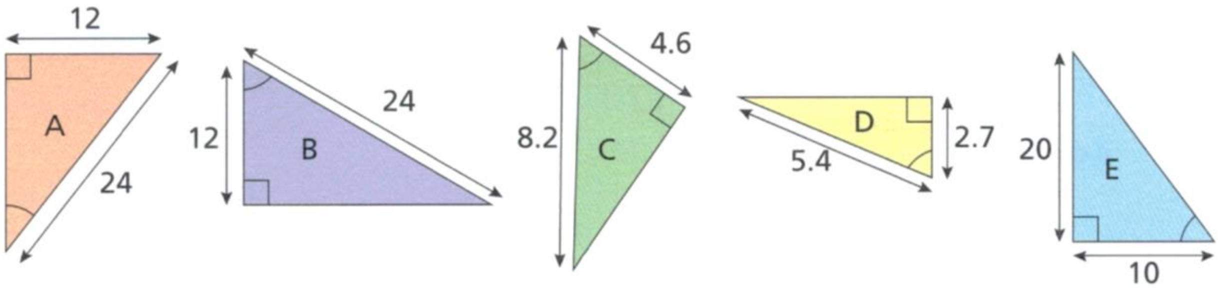
$x = 6$ cm

c



$x = 8.4$ cm

5 Use the fact that $\cos 60° = \frac{1}{2}$ to determine in which of these triangles the angle is 60°.



Triangle B and D.

6 A right-angled triangle has cosine ratio of $\frac{1}{2}$. Every side of the triangle is made 3 times longer. What is the new cosine ratio? Explain your answer using a diagram if necessary.

It is still $\frac{1}{2}$, as the triangles are similar, the ratios are equal.

7 A right-angled triangle has an interior angle of $45°$. Is it always isosceles? Explain by using the tangent ratio.

$\tan 45° = \frac{O}{A} = 1$

Since $\frac{O}{A} = 1$, $O = A$

Two sides of a triangle are equal, so it is isosceles.

8 Explain why it is impossible to have a right-angled triangle with these properties.

a $\tan\theta = -1$

$\frac{O}{A} = -1$, this implies either O or A is negative, but a length can't be negative.

b $\sin\theta = 1$

$\frac{O}{H} = 1$, so $O = H$, impossible the hypotenuse is always the longest side.

c $\cos\theta = 0$

$\frac{A}{H} = 0$, so $A = 0$, but length can't be zero.

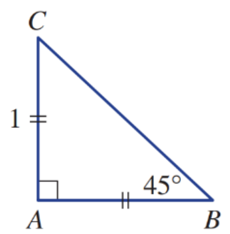
d $\sin\theta > 1$ or $\cos\theta > 1$

$\frac{O}{H} > 1,\ O > H$ or $\frac{A}{H} > 1, A > H$

Impossible as hypotenuse is always the longest side.

9 For the triangle shown,

a use Pythagoras' theorem to find the exact length BC.



$\sqrt{2}$

b use your result from part **a** to write down the exact values of:

a $\sin 45°$

$\frac{1}{\sqrt{2}}$

b $\cos 45°$

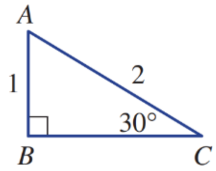
$\frac{1}{\sqrt{2}}$

c $\tan 45°$

1

10 For the triangle shown,

a use Pythagoras' theorem to find the exact length BC.



$\sqrt{3}$

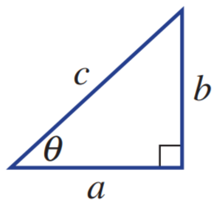
b use your result from part **a** to write down the exact values of:

a $\sin 30°$ $\frac{1}{2}$	**b** $\cos 30°$ $\frac{\sqrt{3}}{2}$	**c** $\tan 30°$ $\frac{1}{\sqrt{3}}$
d $\sin 60°$ $\frac{\sqrt{3}}{2}$	**e** $\cos 60°$ $\frac{1}{2}$	**f** $\tan 60°$ $\sqrt{3}$

11 Evaluate $\frac{\sin 20°}{\cos 20°}$. How does this compare to $\tan 20°$?

They are equal.

For this triangle with side lengths a, b and c , find an expression for:



a $\sin\theta$ $\frac{b}{c}$	**b** $\cos\theta$ $\frac{a}{c}$	**c** $\tan\theta$ $\frac{b}{a}$	**d** $\frac{\sin\theta}{\cos\theta}$ $\frac{\left(\frac{b}{c}\right)}{\left(\frac{a}{c}\right)}$ $=\frac{b}{c}\div\frac{a}{c}$ $=\frac{b}{c}\times\frac{c}{a}$ $=\frac{b}{a}$

CALCULATING THE VALUE OF A TRIGONOMETRIC RATIO

- Trigonometric ratios for a given angle are constant in all right-angled triangles.
- Calculators store these ratios.
- Knowing an angle lets you find the ratio between two sides.

Example Calculate the value of a trigonometric ratio.

$\cos 84°$ $\boxed{\texttt{cos(84)}}$ ≈ 0.1045	$\tan 15°$ $\boxed{\texttt{tan(15)}}$ ≈ 0.2679

What does $\cos 84°$ mean?

Answer using these words: *right-angled triangle, adjacent, hypotenuse, ratio*.

$\cos 84°$ *refers to the ………… of ………………… divided by ………………… in*

a ……………-…………… ………………… with an angle of …………

Calculate the value of these trigonometric ratios. Round to 4 decimal places.

a $\sin 12°$ 0.2079	**b** $\cos 12°$ 0.9781	**c** $\tan 42°$ 0.9004

Example Calculate the value of a trigonometric ratio.

$6\cos 27°$ $\boxed{\texttt{6cos(27)}}$ ≈ 5.3460	$\frac{\sin 84°}{7}$ $\frac{\texttt{sin(84)}}{\texttt{7}}$ ≈ 0.1421

Calculate the value of these trigonometric ratios. Round to 4 decimal places.

a $7\cos 29°$ 6.1223	**b** $3\tan 56°$ 4.4477	**c** $14\cos 12°$ 13.6941
d $12\sin 19.3°$ 3.9662	**e** $\frac{\tan 56°}{3}$ 0.4942	**f** $\frac{4\cos 16°}{5}$ 0.7690

Key ideas

1. Given an angle, you can determine the ……………… between two sides of a right-angled triangle.
2. Every trigonometric ratio is stored in your ………………………

1 Use a calculator to evaluate the following correct to 4 decimal places.

a $\sin 20° =$ 0.3420	**b** $\cos 37° =$ 0.7986	**c** $\tan 64° =$ 2.0503
d $\sin 47° =$ 0.7314	**e** $\cos 84° =$ 0.1045	**f** $\tan 14° =$ 0.2493
g $\cos 13° =$ 0.9744	**h** $\tan 47° =$ 1.0724	**i** $\sin 36° =$ 0.5878
j $12 \sin 13° =$ 2.6994	**k** $6 \tan 82.3° =$ 44.3770	**l** $9 \sin 31.3° =$ 4.6757
m $13. \sin 31° =$ 6.6955	**n** $150 \cos 18.5° =$ 142.2485	**o** $0.5 \tan 51.63° =$ 0.6315
p $\frac{9}{\sin 57°} =$ 10.7313	**q** $\frac{28}{\cos 74°} =$ 101.5827	**r** $\frac{53.2}{\tan 42°} =$ 59.0846
s $\frac{4.2}{\tan 31°} =$ 6.9900	**t** $\frac{0.64}{\sin 18.2°} =$ 2.0491	**u** $\frac{291}{\cos 3.45°} =$ 291.5283

CALCULATING THE VALUE OF AN ANGLE

- Given an angle, you can use trigonometry to find the ratio of two sides of a triangle.
- The reverse is also true: given a trigonometric ratio, you can find the angle.
- To do so, use the **inverse** trigonometric function:

Inverse Sine	Inverse Cosine	Inverse Tangent
$\sin\theta = \frac{O}{H}$ $\theta = \sin^{-1}\left(\frac{O}{H}\right)$	$\cos\theta = \frac{A}{H}$ $\theta = \cos^{-1}\left(\frac{A}{H}\right)$	$\tan\theta = \frac{O}{A}$ $\theta = \tan^{-1}\left(\frac{O}{A}\right)$

- $\sin^{-1}(0.4369)$ is read "sine inverse 0.4369" and means "the angle with a sine ratio of 0.4369"

Example Calculate the value of an angle.

$\sin\theta = 0.6314$

$\theta = \sin^{-1}(0.6314)$ SHIFT sin

$\approx 39°$

$\cos\theta = \frac{8}{10}$

$\theta = \cos^{-1}\left(\frac{8}{10}\right)$ SHIFT cos

$\approx 37°$

What does $\sin^{-1}(0.6314)$ mean?

Answer using these words: *right-angled triangle, opposite, hypotenuse, ratio, angle, inverse*

$\sin^{-1}(0.6314)$, *which is read as "sine .... 0.6314", is used to find the .... in a ....-.............. .... where the .... of ....*

to .... is 0.6314.

How do you know when to apply the inverse trigonometric ratio?

We apply the inverse trigonometric ratio when trying to find an ....

How do you input $\sin^{-1}(0.6314)$ in a calculator?

First press the .... button, then press the .... button.

Calculate the value of θ in these equations. Round your answer to 4 decimal places.

a $\sin\theta = 0.4371$

$\theta = \sin^{-1}(\quad\quad)$

$\approx$

25.9190°

b $\cos\theta = 0.1445$

$\theta = \cos^{-1}(\quad\quad)$

$\approx$

81.6917°

c $\tan\theta = \frac{5}{4}$

$\theta =$

$\approx$

51.3402°

d $\cos\theta = \frac{7}{12}$

$\theta =$

$\approx$

54.3147°

e $\tan\theta = 1$

$\theta =$

$\approx$

45°

f $\sin\theta = \frac{1}{2}$

$\theta =$

$\approx$

30°

Key ideas

1. Given a .... ratio, you can determine the angle.
2. To do so, use the .... trigonometric functions $\sin^{-1}(\quad), \cos^{-1}(\quad), \tan^{-1}(\quad)$.

1 Use a calculator to solve for θ. Answer to the nearest whole.

a $\sin\theta = 0.5$ $\theta = \sin^{-1}(0.5)$ $\theta = \ldots\ldots\ldots$ 30°	**b** $\cos\theta = 0.5$ $\theta = \cos^{-1}(\quad)$ $\theta = \ldots\ldots\ldots$ 60°	**c** $\tan\theta = 1$ $\theta = \ldots\ldots\ldots\ldots\ldots$ $\theta = \ldots\ldots\ldots$ 45°
d $\cos\theta = 0.8660$ 30°	**e** $\sin\theta = 0.7071$ 45°	**f** $\tan\theta = 0.5774$ 30°
g $\sin\theta = 1$ 90°	**h** $\tan\theta = 1.192$ 50°	**i** $\cos\theta = 0$ 90°

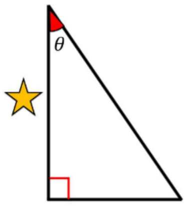
2 Use a calculator to solve for θ. Answer to 4 decimal places.

a $\sin\theta = \frac{4}{7}$ $\theta = \sin^{-1}\left(\frac{4}{7}\right)$ $\theta = \ldots\ldots\ldots$ 34.8499°	**b** $\cos\theta = \frac{1}{4}$ 75.5225°	**c** $\tan\theta = \frac{3}{5}$ 30.9638°
d $\cos\theta = \frac{4}{5}$ 36.8699°	**e** $\sin\theta = \frac{1}{3}$ 19.4712°°	**f** $\tan\theta = \frac{8}{5}$ 57.9946
g $\tan\theta = \frac{7}{3}$ 66.8014°	**h** $\cos\theta = \frac{9}{13}$ 46.1869°	**i** $\sin\theta = \frac{15}{42}$ 20.9248°

CHECK YOUR UNDERSTANDING

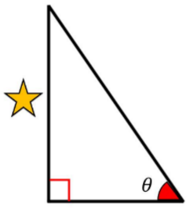
Identify sides of a right-angled triangle

1 What is the correct label for the side marked with the star?



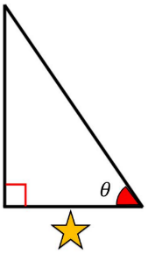
a Hypotenuse **b** Opposite **c** Adjacent **d** None of these

2 What is the correct label for the side marked with the star?



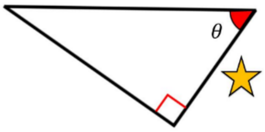
a Hypotenuse **b** Opposite **c** Adjacent **d** None of these

3 What is the correct label for the side marked with the star?



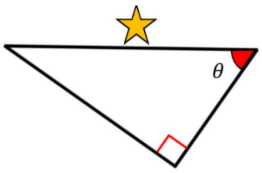
a Hypotenuse **b** Opposite **c** Adjacent **d** None of these

4 What is the correct label for the side marked with the star?



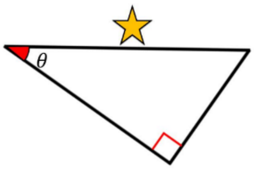
a Hypotenuse **b** Opposite **c** Adjacent **d** None of these

5 What is the correct label for the side marked with the star?



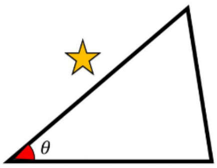
a Hypotenuse **b** Opposite **c** Adjacent **d** None of these

6 What is the correct label for the side marked with the star?



a Hypotenuse **b** Opposite **c** Adjacent **d** None of these

7 What is the correct label for the side marked with the star?



a Hypotenuse **b** Opposite **c** Adjacent **d** None of these

The trigonometric ratios

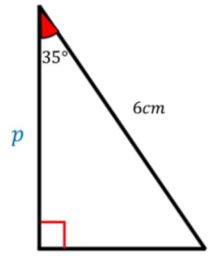
1 $\sin\theta =$

a $\dfrac{\text{Adjacent}}{\text{Hypotenuse}}$ **b** $\dfrac{\textit{Opposite}}{\text{Hypotenuse}}$ **c** $\dfrac{\text{Opposite}}{\text{Adjacent}}$ **d** $\dfrac{\text{Adjacent}}{\text{Opposite}}$

2 $? = \dfrac{\text{Adjacent}}{\text{Opposite}}$

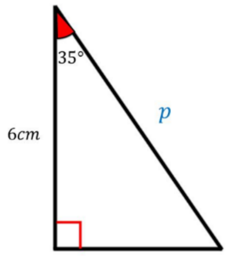
a $\sin\theta$ **b** $\cos\theta$ **c** $\tan\theta$ **d** None of these.

3 Which ratio relates p and 6?



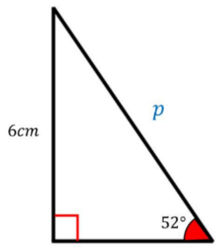
a $\sin 35°$ **b** $\cos 35°$ **c** $\tan 35°$ **d** None of these.

4 Which ratio relates p and 6?



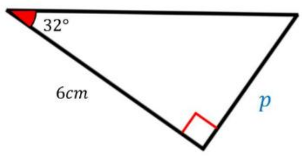
a $\sin 35°$ **b** $\cos 35°$ **c** $\tan 35°$ **d** None of these.

5 Which ratio relates p and 6?



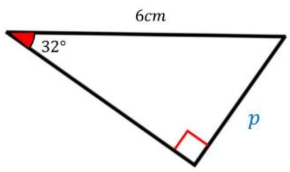
a $\sin 52°$ **b** $\cos 52°$ **c** $\tan 52°$ **d** None of these.

6 Which ratio relates p and 6?



a $\sin 32°$ **b** $\cos 32°$ **c** $\tan 32°$ **d** None of these.

7 Which ratio relates p and 6?



a $\sin 32°$ **b** $\cos 32°$ **c** $\tan 32°$ **d** None of these.