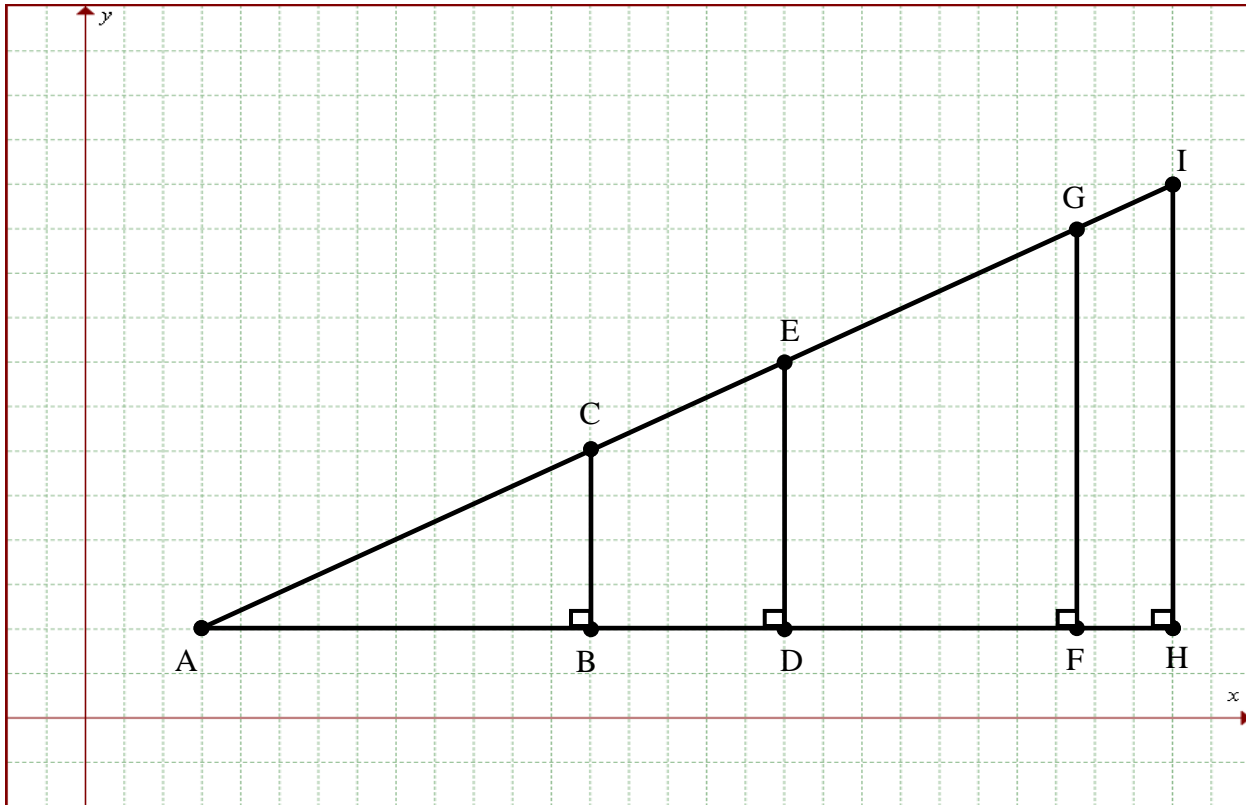


Trigonometry is a branch of mathematics that studies the relationship between the measures of the angles and the lengths of the sides in triangles.

INVESTIGATION

Given the right triangle $\triangle AHI$ shown below. A series of points B, D, F are selected along the base AH . Line segments BC, DE, FG are **parallel to side** HI with the points C, E, G on side AI .

Fill in the table below.

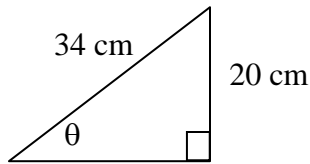


Triangles	Side opposite to $\angle A$	Side adjacent to $\angle A$	Hypotenuse	Trigonometric Ratios		
				$\frac{\text{Opposite}}{\text{Hypotenuse}}$	$\frac{\text{Adjacent}}{\text{Hypotenuse}}$	$\frac{\text{Opposite}}{\text{Adjacent}}$
$\triangle ABC$	$BC = 4$	$AB = 10$	$AC = \sqrt{4^2 + 10^2}$ $= \sqrt{116}$	$\frac{4}{\sqrt{116}} \approx 0.37$	$\frac{10}{\sqrt{116}} \approx 0.93$	$\frac{4}{10} = \frac{2}{5} = 0.40$
$\triangle ADE$	$DE =$	$AD =$				
$\triangle AFG$						
$\triangle AHI$						

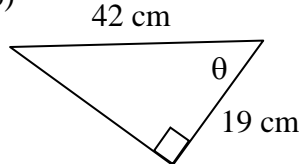
Example 4

Find the value of $\sin \theta$, $\cos \theta$ or $\tan \theta$ and then calculate the measure of $\angle \theta$ to the nearest tenth degree

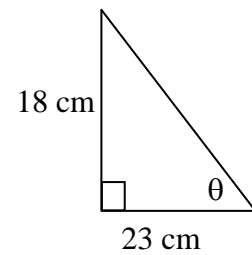
a)



b)

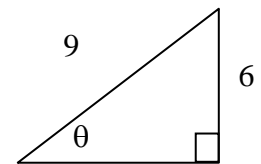


c)



Example 5

- Use the Pythagorean Theorem to calculate the unknown side.
- For the angle marked ' θ ' and state the three primary trigonometric ratios.
- Find the value of θ to the nearest-tenth degree.
(leave your answers in fractional form)



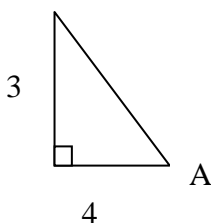
Example 6

Now go back to the investigation on Page 1 and determine the value for angle A.

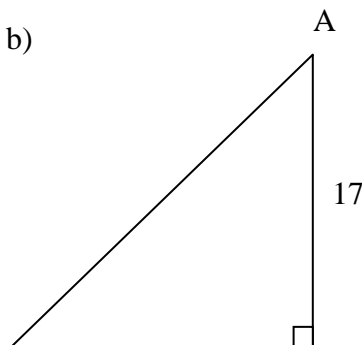
Exercise

1) For each of the following right triangles determine the value of the three primary trig ratios in terms of $\angle A$. Express your answers as fractions in lowest terms. Unless asked otherwise, this is the generally accepted form. **Do Not Approximate the value of any square roots. Leave in square root (radical) form.**

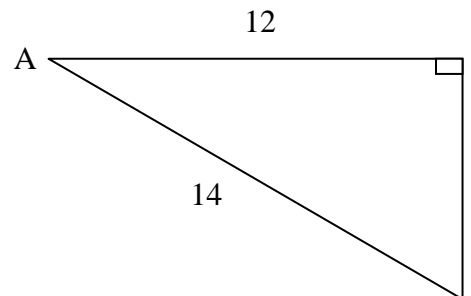
a)



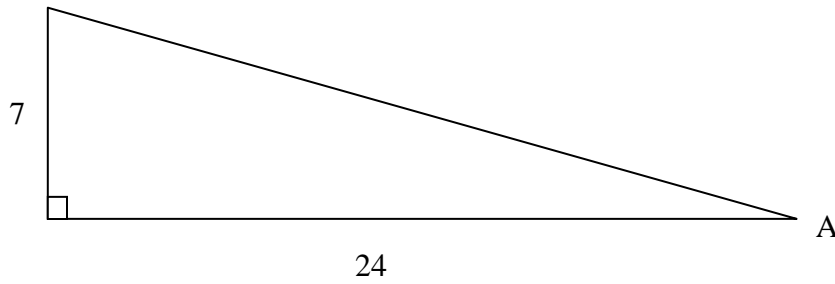
b)



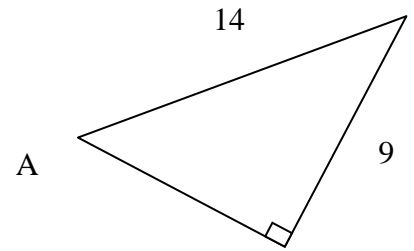
c)



d)



e)

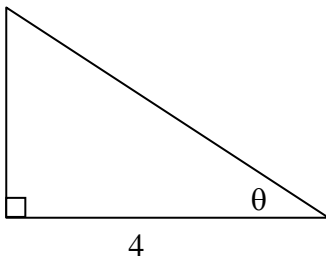


2. In each of the following questions:

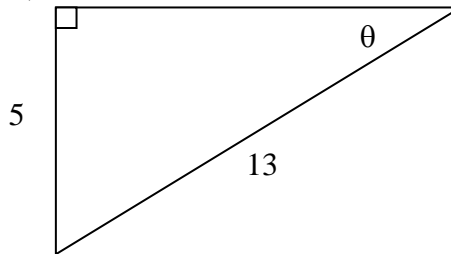
i) Use the Pythagorean Theorem to calculate the unknown side.

ii) For the angle marked ' θ ', state the three primary trig ratios. (*leave your answers in fractional form*)

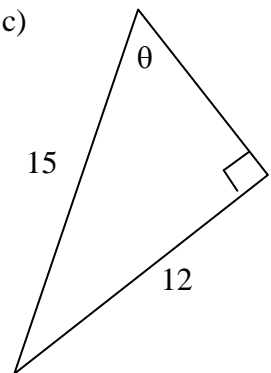
a)



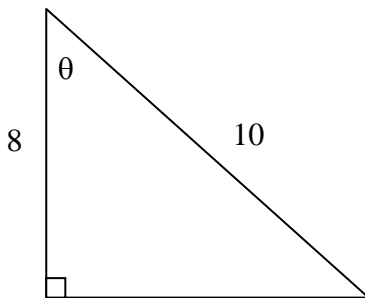
b)



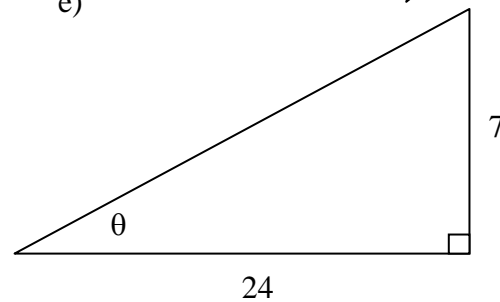
c)



d)



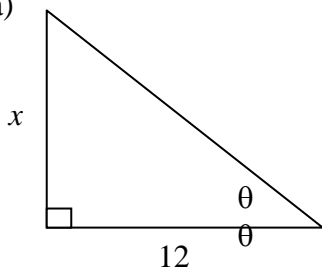
e)



3. For each of the following questions, state an expression for the given trig ratio.

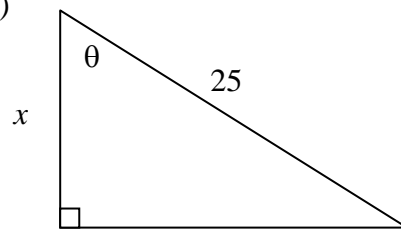
(*leave your answer in fractional form*)

a)



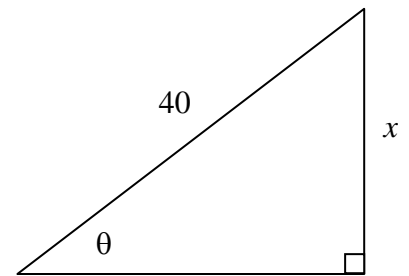
$\tan \theta =$

b)



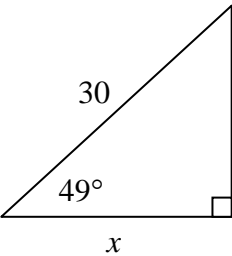
$\cos \theta =$

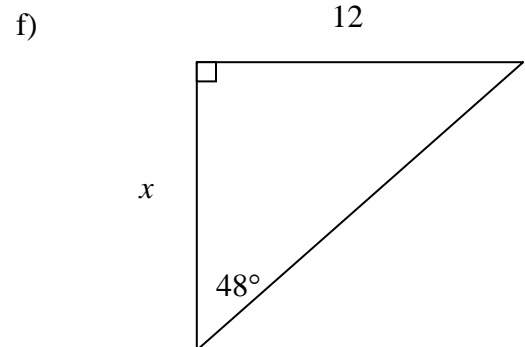
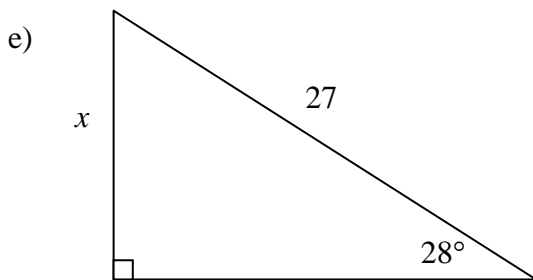
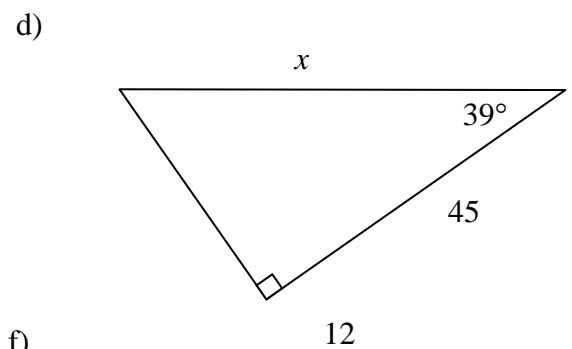
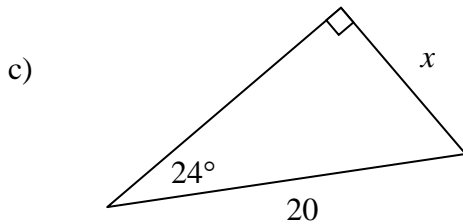
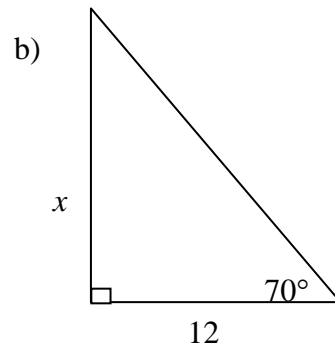
c)



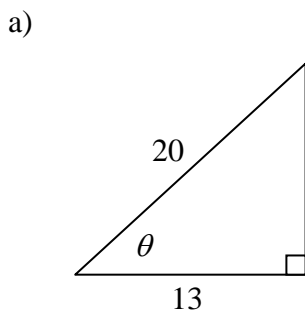
$\sin \theta =$

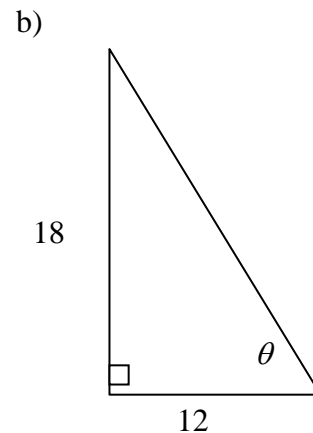
4) Determine the value of x in each of the following. Express your answer accurate to two decimal places. Use the first example as a guide for proper steps.

a)  $\frac{x}{30} = \left(\frac{A}{H}\right) = \cos 49^\circ$
 $x = 30 \cos 49^\circ$
 $x \doteq 19.68$

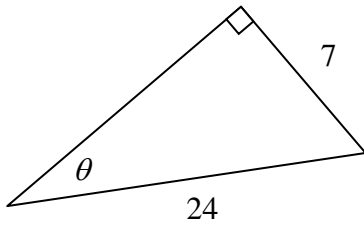


5) Determine the value of θ in each of the following. Express your answer accurate to one decimal place. Use the first example as a guide for proper steps.

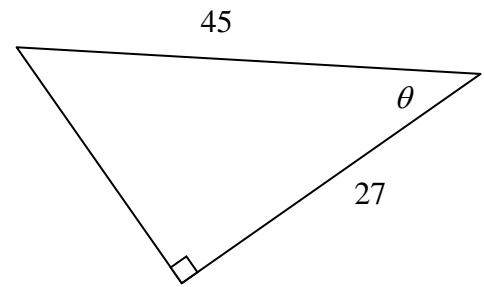
a)  $\cos \theta = \left(\frac{A}{H}\right) = \frac{13}{20}$
 $\cos \theta = 0.65$
 $\theta \doteq 49.5^\circ$



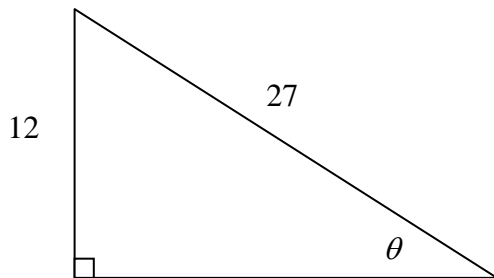
c)



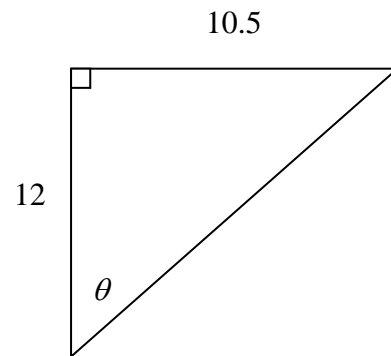
d)



e)



f)



Answers:

1a) $\sin A = \frac{3}{5}; \cos A = \frac{4}{5}; \tan A = \frac{3}{4}$

b) $\sin A = \frac{12}{\sqrt{433}}; \cos A = \frac{17}{\sqrt{433}}; \tan A = \frac{12}{17}$

c) $\sin A = \frac{\sqrt{52}}{14}; \cos A = \frac{6}{7}; \tan A = \frac{\sqrt{52}}{12}$

d) $\sin A = \frac{7}{25}; \cos A = \frac{24}{25}; \tan A = \frac{7}{24}$

e) $\sin A = \frac{9}{14}; \cos A = \frac{\sqrt{115}}{14}; \tan A = \frac{9}{\sqrt{115}}$

2a) i) 5; ii) $\sin \theta = \frac{3}{5}; \cos \theta = \frac{4}{5}; \tan \theta = \frac{3}{4}$

b) i) 12; ii) $\sin \theta = \frac{5}{13}; \cos \theta = \frac{12}{13}; \tan \theta = \frac{5}{12}$

c) i) 9; ii) $\sin \theta = \frac{4}{5}; \cos \theta = \frac{3}{5}; \tan \theta = \frac{4}{3}$

d) i) 6; ii) $\sin \theta = \frac{3}{5}; \cos \theta = \frac{4}{5}; \tan \theta = \frac{3}{4}$

e) i) 25; ii) $\sin \theta = \frac{7}{25}; \cos \theta = \frac{24}{25}; \tan \theta = \frac{7}{24}$

3a) $\tan \theta = \frac{x}{12}$ b) $\cos \theta = \frac{x}{25}$ c) $\sin \theta = \frac{x}{40}$

4a) 19.68 b) 32.97 c) 8.13 d) 57.90 e) 12.68 f) 10.80

5a) 49.5° b) 56.3° c) 17.0° d) 53.1° e) 26.4° f) 41.2°