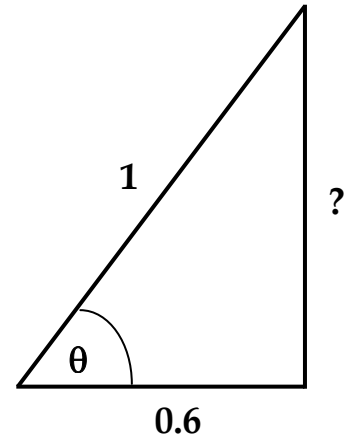


**For each question (except multiple choice questions), your solution must show work/calculations and display/explain your reasoning.**

1. The right triangle shown has an unknown side length and an unknown angle  $\theta$  (labeled).

a) Determine the unknown side length.

b) Determine  $\cos \theta$  and  $\sin \theta$ .



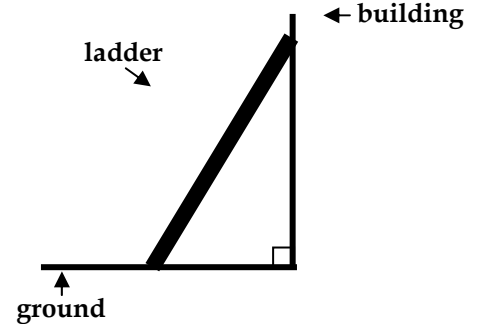
2. A 32 foot ladder leans against a building so that the angle between the ladder and the building is  $15^\circ$ .

a) What is  $15^\circ$  in radians? (circle one; all are in radians)

b) The figure (not to scale) shows the situation. Label all given distances and angles.

15	$2\pi$	360	$1/24$	24	5400
$2\pi/15$	$15/2\pi$	$30\pi$	$\pi/12$	$12/\pi$	$2700/\pi$

c) How far away is the base of the ladder from the building?



3. A velocipede travels at a constant angular speed around a circular track at a radius of 2.0 km. The velocipede completes 4 revolutions in 10 hours.

a) How long did it take to complete 3 revolutions? (circle one; all are in hours)

$4/10$	$10/4$	$10/12$	$12/10$	$4/30$	$30/4$	none of these
--------	--------	---------	---------	--------	--------	---------------

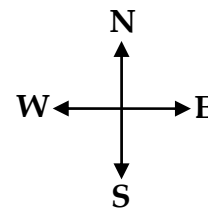
b) How many revolutions did it complete in 3 hours? (circle one; all are in revolutions)

$4/10$	$10/4$	$10/12$	$12/10$	$4/30$	$30/4$	none of these
--------	--------	---------	---------	--------	--------	---------------

c) continues on other side

3c) (continued from previous side) A velocipede travels at a constant angular speed around a circular track at a radius of 2.0 km. The velocipede completes 4 revolutions in 10 hours. Determine the velocipede's linear (tangential) speed.

4. Pizza Pan leaves Pizzaland to deliver a pizza to the Darlings. He travels due East for 0.5 km, then 30° North of West for 1.0 km, and then due South for 2.0 km, ending up at the Darlings. Pan wants to know how far and in what direction he would have needed to travel in order to go directly from Pizzaland to the Darlings.



a) Draw a vector diagram that includes all the individual displacement vectors as well as the resultant displacement vector.

b) Fill out the following table with the sign of the components for each part of Pan's trip. Use a standard coordinate system, so that  $+x$  is E and  $+y$  is N. For each entry, clearly put a **+**, **0**, or **-**.

	$x$ component	$y$ component
0.5 km, due E		
1.0 km, 30° N of W		
2.0 km, due S		

c) Determine the **distance** that Pan would have needed to travel in order to go directly from Pizzaland to the Darlings.

d) Determine the **direction** that Pan would have needed to travel in order to go directly from Pizzaland to the Darlings. Give your answer as a clear to understand angle.