

Spire Physics Summer Work:

These problems seek to sharpen relevant skills for your upcoming class in physics. Do your best, and if you are unsure you should explain your thought process!

Algebra

Solve the following equations for the indicated quantities in terms of the remaining variables.

$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$	$R_{eq} =$
$y = vt + \frac{1}{2}at^2$	$a =$
$y = vt + \frac{1}{2}at^2$	$t =$
$T = 2\pi\sqrt{\frac{L}{g}}$	$L =$
$mgh = \frac{1}{2}mv^2$	$v =$

Variables

Given the following equations and the following changes to certain variables, what will happen to the variables I ask about in the final column? Be as specific as you can (will they increase or decrease, and *how* will they increase or decrease). You should assume the variables on the right side of the equations are positive.

Equation	What changes	Result
$x = vt$	v increases, t constant	x?
$x = vt$	x increases, v constant	t?
$I = \frac{V}{R}$	V increases, I constant	R?
$I = \frac{V}{R}$	R increases, V constant	I?
$v = v_0 - at$	v_0 , a constant, t increases	v?
$F = \frac{k}{r^2}$	r increases, k constant	F?
$F = \frac{k}{r^2}$	F increases, k constant	r?

Scientific notation

Write the following quantities in standard notation (decimals and/or commas) or scientific notation, whichever is missing.

Standard	Scientific
.007	
	3.3×10^4
8,000	
	4.5×10^{-1}

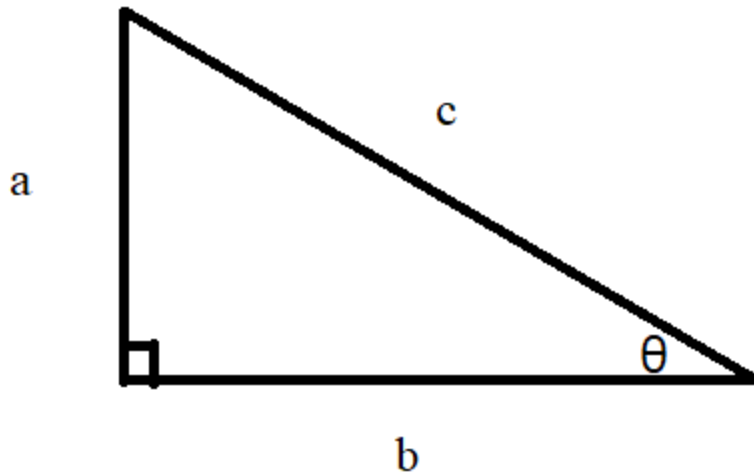
Unit conversion

Using your knowledge of metric prefixes (or you can learn more at <https://www.nist.gov/pml/owm/metric-si-prefixes>), convert the quantity to the unit in the middle column.

40cm	m	
550nm	m	
.03Hz	kHz	
.003kg	mg	
2 μ C	pC	

Trig

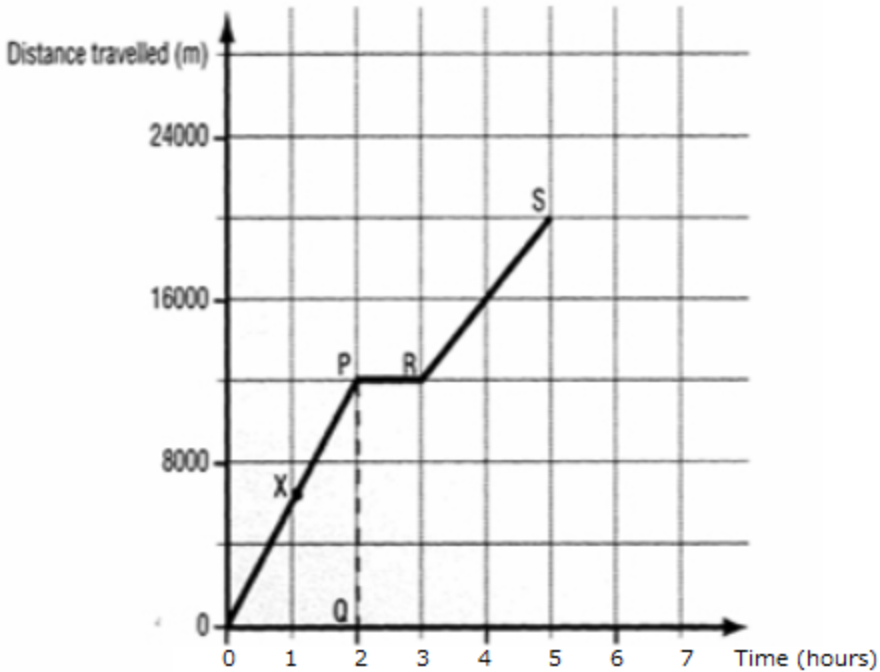
Use your knowledge of trigonometry (or reference Khan Academy at <https://www.khanacademy.org/math/trigonometry/unit-circle-trig-func>) to solve for the indicated side lengths or angles. You may solve numerically or algebraically.



a=	b=	c=	θ =
1	2		
		4	45
4			30

Graphs

Answer the following questions based on the graphs below. The first shows the position of a human walking over time. The second shows the velocity of an object over time.



1) What was the walker's (approximate) position at the following times?

Time	0	1.5hr	3hr	5hrs
Position				

2) Describe the motion between points P and R

3) What is the value of the slope (approximately) at point X? Include units. What physical meaning would you assign to this value?