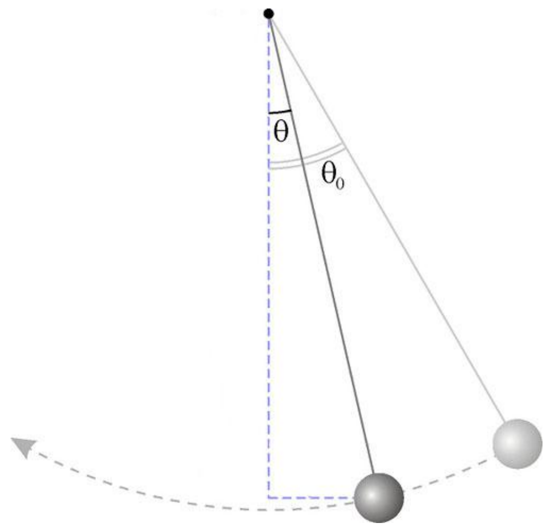
Algebra 2 Module 6 Lesson 8 Test Answer Explanations

1. The period of a pendulum is the time the pendulum takes to complete one back-and-forth swing. The period T (in seconds) can be modeled by $T = 1.11\sqrt{l}$, where l is the length (in feet) of the pendulum. If the length of a pendulum is halved, what happens to the period of the pendulum?



http://www.flickr.com/photos/ethanhein/2253992502/

A. The period is also halved.

Incorrect. If you start with a length of 1 meter, the period would be 1.11. If the length is shortened to ½ meter, the period would be $1.11\sqrt{0.5} = 0.78 \neq 0.555$.

B. The period is multiplied by a factor of $\sqrt{2}$.

Incorrect. If you start with a length of 1 meter, the period would be 1.11. If the length is shortened to ½ meter, the period would be $1.11\sqrt{0.5} = 0.78$. $1.11 \times \sqrt{2} \approx 1.57$. These obviously are not equal.

C. The period is multiplied by a factor of $\frac{\sqrt{2}}{2}$.

Correct. If the original length started at 1 m, the period would be:

$$T_{original} = 1.11\sqrt{1} = 1.11$$

If the length were halved, the new period would be: $T_{new} = 1.11\sqrt{\frac{1}{2}} = 1.11\frac{1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = 1.11\frac{\sqrt{2}}{2}$

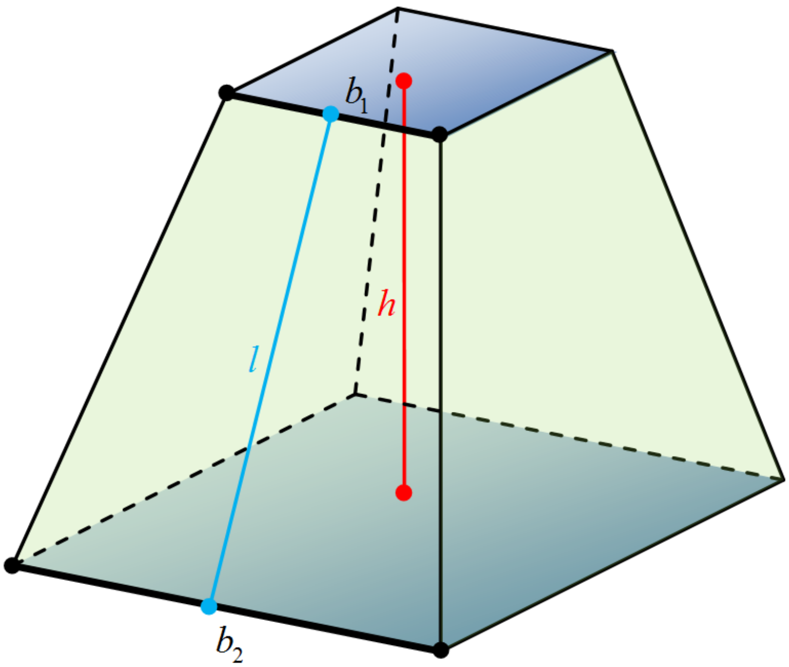
Since the original period was 1.11, the new period is the original period multiplied by a factor of $\frac{\sqrt{2}}{2}$.

D The period is

Incorrect. If you start with a

doubled.	length of 1 meter, the period would be 1.11. If the length is shortened to ½ meter, the period would be $1.11\sqrt{0.5} = 0.78$.

2.



A truncated pyramid's height, *h* and slant height *l* are related as shown in the formula:

$$l = \sqrt{h^2 + \frac{1}{4}(b_2 - b_1)^2}$$

b_1 and b_2 are the side lengths of the upper and lower bases of the pyramid, respectively.

If $l = 6$, $b_1 = 2$, and $b_2 = 4$, what is the height of the pyramid?

Author created image.

A. $h = \sqrt{35}$	Correct. Your solution should have looked like: $6 = \sqrt{h^2 + \frac{1}{4}(4-2)^2}$ $6 = \sqrt{h^2 + 1}$ $36 = h^2 + 1$ $h^2 = 35$ $h = \pm\sqrt{35}$ (*only the positive square root is sensical)
B. $h = \sqrt{37}$	Incorrect. You should have substituted the values $l = 6$, $b_1 = 2$, and $b_2 = 4$ into the formula and solved for *h*.

	$6=\sqrt{h^2+\frac{1}{4}(4-2)^2}$ $6=\sqrt{h^2+1}$ $36=h^2+1$ $h^2=35$ $h=\pm\sqrt{35}$ (*only the positive square root is sensical)
C. $h=35$	Incorrect. You should have substituted the values $l=6$, $b_1=2$, and $b_2=4$ into the formula and solved for *h*. $6=\sqrt{h^2+\frac{1}{4}(4-2)^2}$ $6=\sqrt{h^2+1}$ $36=h^2+1$ $h^2=35$ $h=\pm\sqrt{35}$ (*only the positive square root is sensical)
D. $h=\sqrt{\frac{71}{2}}$	Incorrect. Substitute in the values $l=6$, $b_1=2$, and $b_2=4$ into the formula and solve for *h*. $6=\sqrt{h^2+\frac{1}{4}(4-2)^2}$ $6=\sqrt{h^2+1}$ $36=h^2+1$ $h^2=35$ $h=\pm\sqrt{35}$ (*only the positive square root is sensical)

3. The speed *v* (in meters per second) of sound waves in air depends on the temperature *K* (in Kelvins) , modeled by the equation $v=331.5\sqrt{\frac{K}{273.15}}$, $K\geq 0$.

Kelvin temperature K is related to Celsius temperature C by the formula $K=273.15+C$.
Celsius temperature is related to Fahrenheit temperature by the formula $F=\frac{9}{5}C+32$.

If the sound waves are traveling 300 m/s, find the temperature in Fahrenheit.

A. 223.71° — Incorrect. This is the temperature in Kelvins.

B. -57°. — Correct! Nice job.

$$300 = 331.5\sqrt{\frac{K}{273.15}}$$
$$0.904977 = \sqrt{\frac{K}{273.15}}$$
$$0.818984 = \frac{K}{273.15}$$
$$K = 223.71$$

$$K = 273.15 + C$$
$$223.71 = 273.15 + C$$
$$C = -49.44$$

$$F = \frac{9}{5}C + 32$$
$$F = \frac{9}{5}(-49.44) + 32$$
$$F = -57^\circ$$

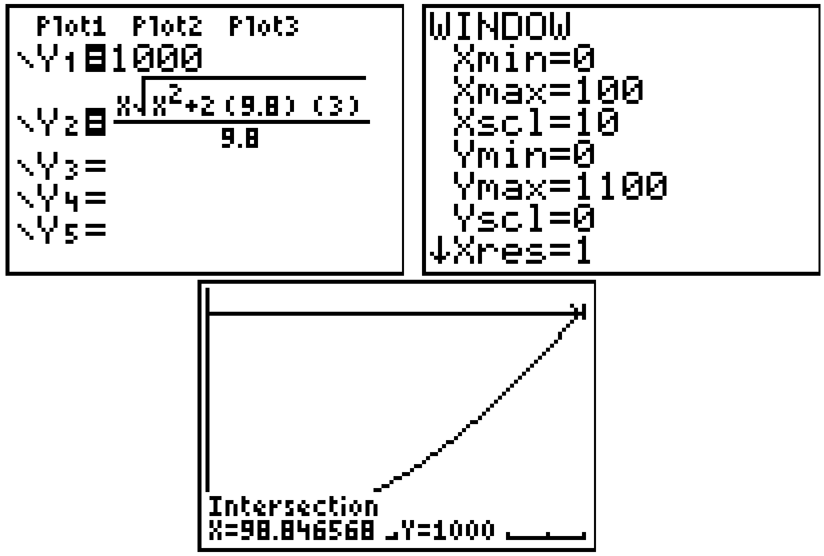
C. -49.44° — Incorrect. Convert from Celsius to Fahrenheit.

D. 165.67° — Incorrect. Check the speed substituted in.

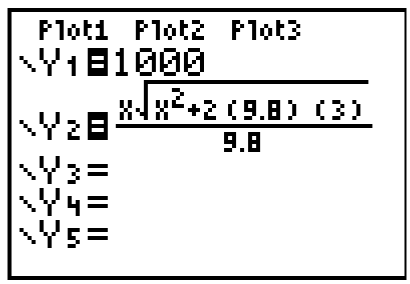
$$6 = \sqrt{h^2 + \frac{1}{4}(4-2)^2}$$
$$6 = \sqrt{h^2 + 1}$$
$$36 = h^2 + 1$$
$$h^2 = 35$$
$$h = \pm\sqrt{35}$$
(*only the positive square root is sensical)

4. The maximum horizontal distance d (in meters) that an object can travel when launched at an optimum angle of projection is given by $d = \dfrac{v_0\sqrt{(v_0)^2 + 2gh_0}}{g}$, where h_0 is the object's initial height, v_0 is the initial speed, and g is the acceleration due to gravity. If an object is launched with an initial height of 3 meters, what initial velocity would produce a distance of 1 km? (Remember, 1 km equals 1000 m.)

A. 98.8 m/s — Correct. Did you solve the equation graphically, with a table, or algebraically? Here is a graphical solution:



B. 439.2 m/s Incorrect. Check your formula with the following:



C 30.8 m/s Incorrect. You used 100 m instead of 1000 m.

D 1.26 m/s Incorrect. Did you try to solve the equation graphically, with a table, or algebraically? Here is a graphical solution: