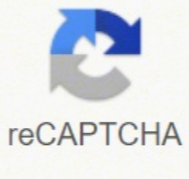


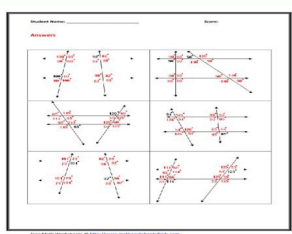


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# Cosine law worksheet answers with work



## Circular and Satellite Motion

Name: \_\_\_\_\_

### Universal Gravitation

Read from Lesson 3 of the Circular and Satellite Motion chapter at The Physics Classroom:

<http://www.physicsclassroom.com/Class/circles/ut13a.cfm>  
<http://www.physicsclassroom.com/Class/circles/ut13b.cfm>  
<http://www.physicsclassroom.com/Class/circles/ut13c.cfm>

MOP Connection: Circular Motion and Gravitation: sublevels 6 and 7

- The evidence that stimulated Newton to propose the law of universal gravitation emerged from a study of \_\_\_\_\_. Answer: **A**  
 a. the motion of the moon and other celestial or heavenly bodies  
 b. the fall of an apple to the Earth  
 c. the gravitational interaction of smaller objects upon the Earth  
 d. ...nonsense! There was no evidence; it was just proposed as a theory.
- The universal of Newton's law of universal gravitation is a common source of confusion. The universal means that \_\_\_\_\_.  
 a. the amount of gravitational forces is the same for all objects.  
 b. the acceleration caused by gravity is the same for all objects.  
 c. the force of gravity acts between all objects - not just between the Earth and an object, but also between two people. All objects with mass attract.  
 d. the force of gravity acts between all objects - not just between the Earth and an object, but also between two people. All objects with mass attract.
- According to Newton's gravitation law, the force of gravitational attraction between a planet and an object located upon the planet's surface depends upon \_\_\_\_\_. Choose all that apply. Answers: **ABC**  
 a. the radius of the planet  
 b. the mass of the planet  
 c. the mass of the object  
 d. the volume of the object  
 e. ... nonsense! None of these variables affect the force of gravity.
- The more massive that an object is, the more, (more, less) that the object will be attracted to Earth.
- The more massive the Earth is, the more, (more, less) that another object will be attracted to Earth.
- The greater that Earth's radius is, the less, (more, less) that another object will be attracted to Earth.
- In the mathematical form of Newton's law of universal gravitation (see equation at right), the symbol G stands for \_\_\_\_\_ Answer: **C**  

$$F_{\text{grav}} = \frac{G \cdot m_1 \cdot m_2}{d^2}$$
 a. gravity  
 b. the acceleration of gravity  
 c. the gravitational constant
- TRUE or FALSE:**  
 The value of G (in the equation above) is an enormously large number; that explains why (at least in part) the force of gravitational attraction between the Sun and the very distant Earth is such a large number.  
 Answer: **FALSE**. G is very small ( $\sim 10^{-11}$ ) ... but the masses are very large.
- TRUE or FALSE:**  
 Two lab partners attract each other with a gravitational force. However, it is impossible to calculate such a force since it is only an unproven theory.  
 Answer: **FALSE**. Knowing their masses and separation distances, the force of attraction can be calculated using the equation in question 7.
- TRUE or FALSE:**  
 The notion that any two objects attract each other gravitationally is a theory. There is no empirical evidence for such a notion.  
 Answer: **FALSE**. Cavendish has tested the theory using people-sized masses (actually, smaller than people-masses).
- Orbiting astronauts on the space shuttle do not have weight in space because \_\_\_\_\_. Answer: **E**  
 a. there is no gravity in space  
 b. there is no air resistance in space  
 c. there are no scales in space  
 d. the food is terrible and they work all the time  
 e. ... nonsense! The astronauts do have weight in space.



and plug in the numbers to solve for the unknown.

- 234 kPa of Argon is at a temp of 255 K. If the temp changes to 100 K, what is the new pressure?  

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\frac{234 \text{ kPa}}{255 \text{ K}} = \frac{P_2}{100 \text{ K}}$$

$$P_2 = 91.765 \text{ kPa}$$
- A 6.5 liter tank of methane gas has compressed gas in it so the pressure is 2500 kPa. What will the pressure of the gas be if the gas is put into a 3.25 liter tank?  

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{2500 \text{ kPa} (6.5 \text{ L})}{T_1} = \frac{P_2 (3.25 \text{ L})}{T_2}$$

$$P_2 = 5000 \text{ kPa}$$
- Neon gas at a pressure of 25 kPa occupies 444 liters at 333 K. What is the pressure of the gas at 200 K in a volume of 30 liters?

Force on m2 by m1 = 0.000 003 493 867 N

Force on m1 by m2 = 0.000 003 493 867 N

Mass 1: 881 kg  
 Mass 2: 1000 kg

Force Values:  
 Decimal Notation  
 Fraction  
 Custom Box

PHET

### Distributive Property (A)

Use the distributive property to simplify each expression.

- |                 |                |
|-----------------|----------------|
| $2(4 + 9w)$     | $-8(6x + 3)$   |
| $-4(-4d - 5)$   | $-6(8p + 3)$   |
| $2(3v - 8)$     | $(2 - 5m)(-5)$ |
| $4(-6z + 4)$    | $-9(n - 4)$    |
| $(-5d + 1)(-2)$ | $-4(9k + 9)$   |
| $2(-5 - 7)$     | $(3b - 2)(-3)$ |
| $-3(3 - 8)$     | $-(-5 - 3v)$   |
| $-8(2 + 9v)$    | $-9(8 - 2h)$   |
| $(-5f + 8)4$    | $(7x - 8)(-1)$ |
| $(-6 - 4p)$     | $9(8 + 5)$     |

### Sine law and cosine law worksheet answers with work.

A lawyer can help you do research on the area of your patent, helping you figure out whether someone else has patented the thing already. If you're seeing this message, it means we're having trouble loading external resources on our website. The USPTO says you can't patent something if: It already exists or has been sold. A patent lawyer may also be a registered patent agent. As a matter of fact, a better name for this new patent law might be the "Full employment for patent attorneys act." Filing a patent application is not a DIY thing and lawsuits continue to define the possibilities, like the internet patents mentioned above. The invention you are claiming a patent for something, if there is a previous patent application that was filed by another inventor before you, you're out of luck. This may sound like a simple question, but it's more complicated than it might appear. An example of a design patent might be a new computer design. A composition of matter, for example, a chemical mixture or ingredients, like a new drug. A plant, that is, a natural growing thing discovered or invented through asexual reproduction; for example, a new hybrid lily. An internet algorithm or an app. An article of manufacture can be something sold to consumers (a new kind of soap, for example) or to businesses (a new type of copier). Yes, you can go on to the USPTO website and get detailed information and even file your patent application online. Now, it's the first person to file the patent. Let's say two people are working on the same thing independently. In this article, we'll look at what can be patented and what you can't patent. Lawsuits — expensive and lengthy — are sometimes the only way to sort out who was first to invent. So, the law was changed to give the patent to the first person who applies. Since the "first to file" part of the law was made effective in 2013, there has been disagreement about whether it favors big corporations over small businesses. The criteria are the same - the thing must be new and useful. Don't get ahead of yourself; patent first, then talk about it. It was already patented. A big corporation has a big legal department and can file a patent and get it accepted quickly. We'll also look at the most recent changes to patent laws in the U.S., where the question about what can be patented has been revised dramatically. A patent is simply a way to claim ownership of something you have invented, and to have a process for keeping others from stealing that invention. If you're behind a web filter, please make sure that the domains \*.kastatic.org and \*.kasandbox.org are unblocked. A design, according to the USPTO, is a "new and nonobvious ornamental design for an article of manufacture." The inventor of the design can then grant licenses to others who will make the new mouse. A registered patent agent is someone with a scientific background who is registered with the USPTO, with knowledge on how to file patents in their area of expertise. You might invent a new wozzle, but if this wozzle can't be used for anything, it can't be patented. You can't patent an idea unless you can show its practical use and that it's obviously different from anything else anyone has ever seen or used. Here are the kinds of inventions that you can patent, with examples: A process or a method, like a new way to do something. For example, a patent was granted to a company who invented a new way to clean gun bores. In another example, Amazon patented its "one-click" ordering process. The most recent change has been the America Invents Act (2011), and especially the parts of the Act that were put into play in 2013. The 2013 portion of the new patent law has new standards for who gets to file a patent. But first, get the help of a registered patent agent or a patent attorney. Notice that there are two general overriding qualifications for something to be able to be patented. It must be new. There is some controversy about whether business methods, like a new accounting procedure, can be patented. An "article of manufacture" — a thing made by machine or by hand. It can also mean a component of a product. A design, like the design of a new kind of computer mouse, can also be patented. It can be a variation of something else, but it has to be distinct from the original thing. If you want to patent something, don't make it and sell it to the public before you file the patent application. And since the 15th century, people have been claiming ownership of their inventions by the process of patenting. You have a great idea, but can you patent it? In this age of the internet, you can also file a patent for something you create for the internet, like an application or program. For example, if someone has already invented a small green wozzle, you can't invent a big red one. These are typically called "business method patents" because they are about how to do things. Patents are only as good as the laws that protect them because it's usually the case that you must take someone to court to get them to stop using your invention to make money for themselves. In the U.S., patent laws are administered by the federal government, under the U.S. Patent and Trademark Office (USPTO). The USPTO has designated three general types of patents: 1. Utility patents may be granted to someone who invents or discovers any new and useful process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof; 2) Design patents may be granted to anyone who invents a new, original, and ornamental design for an article of manufacture; and 3) Plant patents may be granted to anyone who invents or discovers and asexually reproduces any distinct and new variety of plant. There may be some leeway on this if the product is disclosed "a year or less before the effective filing date," but don't count on it. It was "otherwise available to the public," which includes showing it in a presentation or demonstration or talking about it on a talk show, a video, or a website. It's difficult to know which person "invented" the thing and when the thing was actually invented. The best person for finding someone to help you file your patent would be a patent attorney who is also a registered patent agent. A small business owner seems to be at a disadvantage in the filing process. The America Invents Act is very complicated and full of loopholes and complex language. Over the history of the U.S., patent laws have been changing to keep up with the changing times. Ever since someone invented fire, and someone else invented a way to use that fire to cook, people have been inventing crazy things. That's not different and not new enough to be patentable. It must be useful. In the past, it was the first person to invent a new and useful thing. Yes, you can still file your own patent application, but you may want to hire a patent attorney to help you.

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