

Questions to Enhance Student Viewing of



Module 1 – Video Game Designer

1. The owner of the company explains that the language of physics is expressed using _____.
2. To design a video game, the designer starts with something in the real world and writes a model for it. These models are written as _____ that the computer can process, since the computer doesn't understand sentences like humans do.
3. The designer explains that the reflections of sun on ocean waves are modeled using a concept called the dot product, which involves two simple mathematical operations: _____ and _____.
4. _____ problems make the essential connection between math and the real world.
5. In your own words, explain the key message communicated by this Frogan's Hero.

Module 2 – Zookeepers

1. The zookeeper uses _____ to calculate the quantities of _____ and _____ needed to keep animals healthy.
2. The calculations factor in several variables, including: _____, _____, _____.
3. The mathematical models (equations) are used to determine how much food must be _____.
4. Food quantities must be calculated carefully since, in some cases, orders for food are placed only once or twice each _____.
5. In your own words, explain how the zookeeper uses algebra in her job.

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Module 3 – Firefighter

1. Name two of the variables mentioned as being important in the work of firefighting.

2. Give an example of a formula mentioned by the firefighter.

3. The further the water is pumped through a hose, the more _____ there must be to push the water through.

4. More pressure must be added to the water hose when the _____ of the hose increases.

5. In your own words, explain the key message communicated by this Frogan's Hero.

Module 3 – Astronomer

1. One variable that is important to these astronomers is the _____ of an object in space that may collide with Earth. An object with only a 20- or 30-meter diameter can produce a great deal of damage to the Earth. An object that measures one kilometer across can produce an event that affects the entire planet.

2. The astronomers take three _____ of the sky at night at intervals of 30-minutes so that they can determine if the object in space has _____ in the course of sixty to ninety minutes.

3. The astronomers use _____ to compute how far an object should have moved in one day. This process is called extrapolation.

4. The formula $q = a(1 - e)$ can be rearranged to solve for any of its three _____. These variables represent the closest approach to the sun, the semi-major axis of the orbit, and the eccentricity of the orbit.

5. In your own words, explain what these scientists do.

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Module 4 – Forestry Service

1. In your own words, explain what the scientist who works with deer does.

2. To obtain a correct _____ for the number of deer in a region, the scientist must know the number of male deer, female deer and the number of fawns born each year.
3. The technique used by this scientist to determine the number of deer that pass by the feeder is called, "mark-recapture". It involves using the _____ of deer caught that have tags and that do not have tags to calculate the number of deer on a particular property.
4. To maintain a particular population of deer, the birth rate and mortality rate of the deer must be kept _____.
5. The scientist who works with trees measures the diameter of each tree and its growth on a periodic basis so that he determines the tree's _____ rate.
6. It would be too expensive and time-consuming to measure the growth of every tree in the forest, so the scientist uses a technique called sampling, along with algebra, to expand the projection to a larger number of trees. The scientist is able to use _____ to prove that the tree growth had improved by more than fifty percent.
7. Explain what the scientist who works with trees does in his job.

Module 5 – Skateboard Park Designer

1. This designer translates algebraic formulas and concepts into shapes for skateboard parks.
2. Skateboard parks are largely re-creations of elements found in the public, such as ramps, stairs, planters, seats, and benches. _____ and _____ of these are replicated in the skateboard park.
3. The concrete ramp on the blueprint is marked with a 3:1 _____. This means that for each three feet in the _____ direction, the ramp goes up one foot in the _____ direction.
4. The 3:1 ratio is used to determine that if the concrete ramp is ten feet long, then it must go up 3 feet, 4 inches. This mathematical process is an example of a _____.
5. The designer believes that "knowledge is _____". So having more knowledge *must* be cool!
6. What other things do you think could be designed using some of the same mathematical principals as are used to design skateboard parks?

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Module 6 – Pyrotechnician

1. According to the pyrotechnician in this segment, many people involved in pyrotechnics have an _____ background.
2. Two of the variables the pyrotechnician controls are _____
3. Sounds travels at a rate of 700 feet per _____. This is an important number because it is used to calculate the _____ it takes for the sound of a firework to travel to the audience.
4. The _____ of a firework is a variable factored into the calculation of how much lift is required to shoot the firework from the mortar tube into the sky.
5. In your own words, explain the key message communicated by this Frogan's Hero.

Module 7 – Music Amplifier Designer

1. Music on CDs and music played in the radio is _____. The designer points out this word "digitize" comes from the word "digit", which just means "numbers".
2. Sound is shown as a waveform on a _____. The height of the waveform at different points in time is then represented with numbers.
3. In the past, guitar amplifiers have relied on _____ technology. The designer can create new products that create new _____ by changing the numbers involved in the designs of the amplifiers.
4. The designer is using the problem solving techniques he learned in his high school _____ class.

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Module 7 – Stockbroker

1. What does this professional do in job?

2. When dealing with other peoples' money, there is no room for errors or mistakes. The stockbroker must get the calculations right. If she were not accurate in her calculations, she would probably be _____.

3. The stockbroker's graph shows that, in general, stock _____increase over time. So the broker suggests investing in stocks for the long-term.

4. The stockbroker demonstrated the use of a _____when she calculated the price at which she should sell the stock that was originally purchased for \$80 per share.

5. Explain why you think it might be interesting to be a stockbroker.

Module 8 – Thrill Ride Engineer

1. The designer uses algebra to design the _____and curves that get the vehicle from the top to the bottom of the track and to determine the spacing between ties on the tracks.

2. The more math is used in the design, the _____and _____the designer can make the rides.

3. What other things do you think could be designed using some of the same mathematical principals that are used to design rides?

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Module 9 – Performance Car Designer

1. Describe what this Frogan's Hero does with the cars.

2. What are some of the variables involved in the modification of the vehicles?

3. The computer is used to assist the designer in changing parameters that will affect how the car runs. The engineer changes numbers in the equations to make the _____do different things.

Module 9 – JPL Scientist

1. Briefly describe what this Frogan's Hero does in her job.

2. The scientist estimates that 80% of the 5000 people who work at the jet propulsion laboratory use _____regularly in their work.
3. A radio signal is sent to the spacecraft and then returned by the spacecraft to the earth. Based on the change in the signal caused by a "Doppler Effect", the scientists can determine how fast the _____is moving.
4. According to the scientist, it is difficult to determine the location of the spacecraft because so many variables are involved, including the rotation of the _____, and motion of the spacecraft. These variables impact the frequency of the radio signal received from the spacecraft.
5. This scientist began to understand the power of _____when her teacher was explaining the concept of ratios.
6. According to this Frogan's Hero, doing algebra at the jet propulsion laboratory is as essential as _____.

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Module 10 – Jet Fighter Pilot

1. The F-16 airplane can fly about 50,000 feet above the ground at a speed that is twice the speed of sound. This is called Mach 2, which is roughly _____ miles per hour.
2. Before the pilot takes off, he spends 2-3 hours doing calculations. Name two of the variables the variables involved in the pilot's pre-flight calculations.

3. According to the pilot, _____ is not hard, but it is disciplined. He says, "If you can follow the rules in algebra, you can follow the rules for anything in life."
4. The pilot explains that the calculations related to fuel consumption and the ability of the pilot to reach the enemy with his weapons, he must be able to do the algebra in his head, while he is _____.

Module 11 – Civil/Structural Engineer

1. What profession is described in this Frogan's Heroes segment? _____
2. This Frogan's Hero explained that although _____ was difficult for her in the beginning, it got easy after practicing it more and more.
3. Sometimes in the field you have to draw the problem and solve it right there and then. She says that there is no substitute for being in the field, since a _____ will not tell you what is out in the field!
4. Mathematics is part of the job. You *must* to be able to use math and algebra to be an _____.
5. Give some reasons why this Frogan's Hero enjoys her job so much.

_____.

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Module 11 – Signs of the Times Square Designer

1. Those in the industry call these special signs in Times Square, “Spectaculars”. The “Hershey’s Spectacular” is 215 feet tall and 100 feet wide. The designer used algebra to determine what it would take to hold the enormous 20-foot wide Hershey’s cocoa cup using small _____.
2. The designer used a formula to determine the size and thickness of the steel beams. The formula is *moment equals force times* _____.
3. This Frogan’s Hero did a bit of quick multiplication to determine how many panels of LED lights were being used on one side of a sign. 20×80 panels = _____panels.
4. Normal video is set up with a 4:3 aspect ratio, which is a ratio of the width to height of the picture. The aspect ratio for wide screen videos is 16:9. The aspect ratio for one sign described in the video is 4:1, which means that it is very _____and very short.
5. One of the designers explained that _____seemed boring at first; but once he started realizing the applications, it became exciting.

Module 12 – Brookhaven National Lab Scientist

1. The laboratory houses a complex of particle accelerators to do research in particle physics. A particle accelerator speeds up the movement of atomic or subatomic particles. These particles can then be smashed into targets or into _____to see the effects.
2. The scientists at the lab are studying the _____, what may have happened at the beginning of the existence of the universe.
3. How much current is in the machine at one time is determined using a tool called an oscilloscope. The scientist showed how to calculate an unknown quantity of current using a basic mathematical concept called a _____.

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Module 13 – Rose Parade Float Designer

1. Describe why this Frogan's Hero must use equations in his job as a float designer.

_____.
2. _____ weigh a great deal when large quantities are used as decorations on the floats.
3. Creating spectacular parade floats requires hard work and lots of algebra, as this segment illustrates. The large number of flowers needed is calculated based on many variables. Name one of these variables.

_____.

Module 14 – Layout/Surveyor

1. This Frogan's Hero's job is to troubleshoot and to set up a construction job before it gets built. He says he coordinates the use of building materials like a _____ (or conductor) coordinates the use of instruments in an orchestra.
2. Using the measurements of length, width, and height, he calculated the volume of dirt to be removed to put in a retaining wall. Based on this quantity, he could then use _____ to determine how long it would take, how many people would have to work, and how much it would cost to do the job.
3. The project manager used the equation $x^2 + y^2 = d^2$, where d is the _____ between the control point and the point where some other work on the project must be completed.
4. What other types of jobs might involve some of the same applications of algebra?

_____.
5. **BONUS:** Look at the formula $x^2 + y^2 = d^2$ carefully. What famous theorem does this look like to you? Can you guess what the variables x and y what represent in the project manager's formula?

_____.

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Module 15 – Bronx Zoo Electrical Engineer

1. This Frogan's Hero's main job function is to maintain the zoo for the health and safety of the animals and the guests. Originally, he trained as an electrical engineer and was hired at the zoo to develop a _____.

2. Describe the problem he used algebra to solve.

3. What does this Frogan's Hero enjoy about his job?

Module 16 – Water Quality Chemist

4. Name one of this Frogan's Hero's primary job functions. Possible answers include:

1. The chemist adds a chemical reagent to the water. The more chlorine is present in the water, the _____ the color.

2. Calcium and magnesium are measure in units of "parts per million". Other trace minerals are present in such small quantities that they are measured in units of parts per _____.

3. What example calculation did the chemist discuss to explain how she uses algebra in her job?

4. In her equation, x represents the percent of local groundwater contained in her blended sample. Using _____, she determined that $x = 0.39$, or 39 percent.

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Module 17 – New York Film Maker

1. To edit the films, the filmmaker loads the footage into a computer. Name two of the variables involved in loading the footage onto a computer.

2. Describe the calculation the filmmaker used as an example of how he uses algebra in his job.

Module 18 – Criminologist

1. What does this Frogan's Hero do in his job?

2. This scientist measures the length of the droplet along its long axis and the width of the elliptical shape at its widest point. He then calculates the quotient of the _____ divided by _____. The arcsine of that number gives an angle measurement in degrees.
3. The angle between each droplet and the place where it hit a surface is modeled using string. The place where the strings meet is the _____, that is, the location the pattern originated.

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Module 19 – G.E. Wind Engineer

1. Wind energy has only recently become _____, but it is now cost-competitive with other types of energy.
2. New wind turbines are as tall as a 32-story building. They have three blades that work independently. The blades have a wingspan that is the size of a 747-jet! The swept area is equal to the area of a _____.
3. According to this Frogan's Hero, wind can produce enough power to meet the electrical needs of _____.
4. This Frogan's Hero says that every business situation is translated into numbers and that the easiest way to do translate any situation into numbers is to create an algebraic equation. Some examples of questions she might answer using _____include: How many wind turbines can be produced on what shift schedule? What level of productivity is she achieving over a year? What is the power output of the wind turbine?
5. She explained that the power output of a wind turbine is a _____of cube of the wind speed and the square of the radius of the rotor diameter.
6. Why does she feel good about her job?

_____.

Module 20 – U.S. Coast Guard Cadet

1. What profession is described in this Frogan's Heroes segment? _____
2. Three values of the Coast Guard are _____.
3. Nautical science course is taken each year at the Academy. Algebra, trigonometry, and calculus are used to determine where the boat will be, given the variable of _____.
4. One of the cadets points out that in the military, one must be prepared for what happens when the electricity goes out and, hence, the _____cannot be used. The cadets must know how to do the calculations by hand.
5. Another cadet points out that _____is a cumulative subject. She explained that if you get lost in the subject early on, it might be quite difficult to catch up. She urges students to ask questions in class as soon as they don't understand a concept! "Don't be afraid, ask those questions!"