

# Frames Project Ideas—Secondary Math

Creating illustrated animations, movies, and digital stories engages students in the curriculum, encourages problem solving, promotes creativity, and helps students develop 21st-century skills. Students can use Frames to animate formula solutions, demonstrate processes such as plotting coordinates, and more to explore the math curriculum.

## Graphing

### Slope

You are an engineer bidding on the foundation design for a house that will be built on the side of a hill. Working with coordinates provided by the surveying team, create a graph of the hill. Once you have the hill graphed, create an animated presentation to describe the type of foundation you would need to use. Explain why your foundation would be the best design.

### Density

The archaeology team you work with is using ground penetrating radar to determine what lies under the surface of a site suspected to contain Greek Ruins. Using the layer density data (provided), graph the results. Given accepted density values, determine what you think might be under the soil and how might your team go about excavating it. Create an animated graph to describe your findings to your team.

### Change Over Time

The US Census Bureau is looking for specific trends in your state over the last 50 years. Given population data for a specific county in your state, use the slope formula to determine how the population changed over time. Create an animation of your findings that describes any common trends that you observed. Perform additional research and provide explanations for the changes in population.

## Pre-Algebra

### Ratios

The local produce distributor has just delivered a shipment of apples and oranges to the grocery store where you work. Your manager wants to display the fruit with 3 oranges for every 2 apples. If you have 30 apples, how many oranges do you need to complete your display? Create an animation that demonstrates the best way to display the fruit for sale and explains your reasons.

### Integers

Your science teacher put a vial of protein powder in the -25 degree C freezer. Later, it was accidentally left out on the lab bench by one of your classmates. It had been there for most of the day, where the temperature in the lab is held at 19 degrees C. Once in the freezer, the temperature of the powder began to drop at a rate of 4 degree C every 5 minutes. Assuming the temperature change rate was constant, how long will it take for the protein powder to reach the temperature of the freezer? Create an animated explanation of your results.

### Calculations

As controller for Bigtown Transit District, you have been tasked with creating the schedule for the new daily bus service to Megacity. A single bus will make the 132-mile round trip at an average speed of 60 miles per hour. The bus will wait in the Megacity terminal for 27 minutes before starting the return trip to Bigtown. The bus will depart from Bigtown at 7AM every morning, and the final trip from Megacity must depart by 9PM. Determine the optimal amount of time for the bus to spend in Bigtown between trips, and then create a daily schedule showing departure and arrival times.

## Geometry

### Surface Area

You work for a large citrus grower and need to design a package to fit 27 oranges. Each orange is X inches in diameter. Design a package to fit 27 oranges with the least amount of wasted space. If the surface area of the package is tied directly to the cost, design the most economical package. **What type of package would be easiest to load?** Create an animated sequence that shows how your packaging solves the problem.

### Flow

As a member of the Oceanography Center, you are analyzing the rate of flow of the Gulf Stream using data collected from an array of instruments anchored at 22 moorings, nine of which are positioned east of the Bahamas, four in the mid-Atlantic, and nine across the continental slope of east Africa. The rate of ocean flow is measured in Sverdrups (Sv); a flow rate of 1 Sv = one million cubic meters per second. Using the data provided by your team generate a topographical map of the Gulf Stream flow rate over time using color to indicate different flow rates. Create an animation to describe your findings to your team at the Oceanography Center.

### Vocabulary

Your school's Academic Advisory Council is looking to create a series of instructional videos for students to use as extra support in their math tutoring program. Create an animation identifying the following vocabulary words: Volume, prism, cylinder, pyramid, and cone. Show formulas relating to each of these terms and a sample problem showing step-by-step solutions.



3 4 5 6 7 8 9 10

$$\begin{array}{r} 267 \\ + 48 \\ \hline 315 \end{array}$$

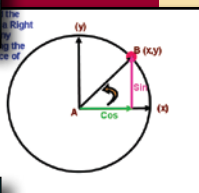


$$x \div = / \times y$$



Adding a Number Line:  
Adding Negatives

$$3 + -4 = -1$$

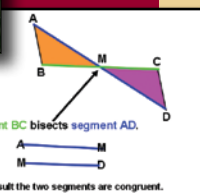
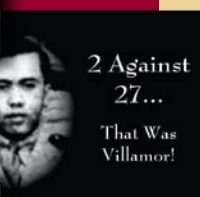
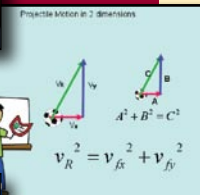
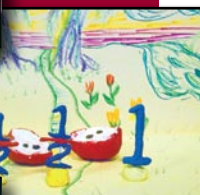
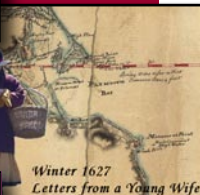
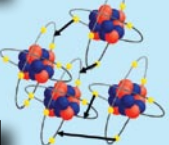


Congruent  
or Similar?





Covalent Carbon Bonds



## Algebra

### Formulas

You have just purchased a new house with a 30 year loan. Your significant other is having trouble understanding the principal and interest. Create an animated amortization schedule showing the principal and interest on a 5% annual loan. Visually show on a year by year basis what percent of the home you actually own. At what year do you own half the home? How does that date change when the interest rate you pay varies by integer amounts, both positive and negative?

### Calculating Percentage

The owners of the pizza shop you manage have asked you to create an animated presentation showing the profit made on each pizza sold. For each pizza, it costs \$2.21 for ingredients, \$1.24 for overhead, and \$0.47 for mailing flyers. You are currently charging \$5.84 per pizza. As a percentage of your costs, how much profit is the shop earning for each pizza sold?

### Patterns and Sequences

The concert hall in your city has hired you to create an animation for a kiosk outside the venue that describes the the number of seats in the venue and the seating arrangement. Develop your diagram from the following: 40 rows of seats with 200 seats in the first row, 250 seats in the second row, and the succeeding rows following this arithmetic sequence. Develop an animation demonstrating this sequence visually.

## Trigonometry

### Pitch and Load

You are an architect designing a roof for a client's house in the mountains. Because of excessive snowfall, the pitch of the roof needs to be at least 30 degrees on both sides of the truss. Building code says that each truss must contain at least 3 internal structural supports and each external board in the truss must be supported by at least one perpendicular member. Design a truss system that will support a roof 30 feet wide. Show your client an animation of your design and explain why your design would be the best for the job.

### Pythagorean Theorem

In fields such as surveying, construction, engineering, and aviation, a length or distance must often be calculated rather than directly measured, using concepts from trigonometry. Create an animation showing the angle of elevation of the sun on the surface of the earth using the shadow of a friend. Then, use this information to determine the height of an object that you are unable to measure directly. Create an animation of your results and the process you used to solve this puzzle.

### Sines and Cosines

The tutoring group you volunteer with is looking to create a series of instructional animations for SAT test preparation. You have been assigned to illustrate and animate the proofs for both the Law of Sines and the Law of Cosines. Be sure your animations include both terminology and graphical representations of all underlying concepts.

## Calculus

### Parameters

The engineering firm you are working with is looking to build a hydro-electric power dam. You **need to limit the flow** of water to a rate of 5 gallons per second for your generator to function properly. If the reservoir has a natural water pressure of 10lbs per square inch, what diameter of a 30 foot long pipe leading to the generator would you need to achieve the desired flow rate? What if the pipe was 20 ft long? What are some of the other parameters you should consider when solving this problem? Create an animated presentation to demonstrate your findings your colleagues.

### Velocity and Time

You are the engine tuner on a Top Fuel drag racing team. You have just downloaded your position versus time data from your car's first run down the track. You know that the velocity and acceleration of the car are both derivatives of its position versus time function. Generate the position, velocity and acceleration versus time functions from your data. How might you use this function to improve the car's performance in a quarter mile drag race? In order to convey the results to your driver, create an animation that demonstrates your modifications to the car's velocity and acceleration functions.

### Law of Reflection

The geometry of reflection and refraction explains the apparent position of a rainbow relative to the sun, and calculus shows why light is concentrated in the rainbow. Using Snell's Law and the Law of Reflection, create an animation explaining the different colors in the rainbow, and an exploration of secondary and tertiary rainbows.

## Resources That Can Help



[connect.tech4learning.com](http://connect.tech4learning.com)

Join like-minded educators from around the world to explore how a blend of technology, creativity, and curriculum can inspire 21st-century students!



[www.recipes4success.com/lessons](http://www.recipes4success.com/lessons)

The lessons at Recipes4Success include a step-by-step process for teachers and students, downloadable templates and examples, links to tutorials and references, and correlations to standards.