

Baseline Professional Learning Handout

M201 Modeling with Exponential Functions

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High School - Functions

Understand the concept of a function and use function notation

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.
2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n + 1) = f(n) + f(n - 1)$ for $n \geq 1$.

Analyze functions using different representations

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
 - a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
 - b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
 - c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
 - d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
 - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
 - a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
 - b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as $y = (1.02)t$, $y = (0.97)t$, $y = (1.01)12t$, $y = (1.2)t/10$, and classify them as representing exponential growth or decay.*
9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Build a function that models a relationship between two quantities

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

M201 Content and Practice Expectations

201.a	Understand the concept of a function and use function notation.
201.b	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
201.c	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
201.d	Build new functions from existing functions.
201.e	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
201.f	Build a function that models a relationship between two quantities.

M201 Content and Practice Expectations and Indicators

Content and Practice Expectations	Indicators Choose an artifact where you...
201.a: Understand the concept of a function and use function notation.	i. demonstrate understanding of the following language of functions: If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.
	ii. recognize that sequences are functions, sometimes defined recursively, and their domain is a subset of the integers.
201.b: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.	i. graph linear and quadratic functions and show intercepts, maxima, and minima.
	ii. graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
	iii. graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
	iv. graph exponential functions showing intercepts and end behavior.
201.c: Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	i. rewrite expressions, using processes such as factoring and completing the square in a quadratic function, to show zeros, extreme values, and symmetry of graphs.
	ii. use the properties of exponents to interpret expressions for exponential functions.
201.d: Build new functions from existing functions.	i. identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.
201.e: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	i. compare properties of two functions that highlight two quantities or features of interest.
201.f: Build a function that models a relationship between two quantities.	i. identify and/or define the variables of interest in a given situation or data set that demonstrate a functional relationship.
	ii. build a function that models the relationship between two quantities in a situation.

Let's Investigate

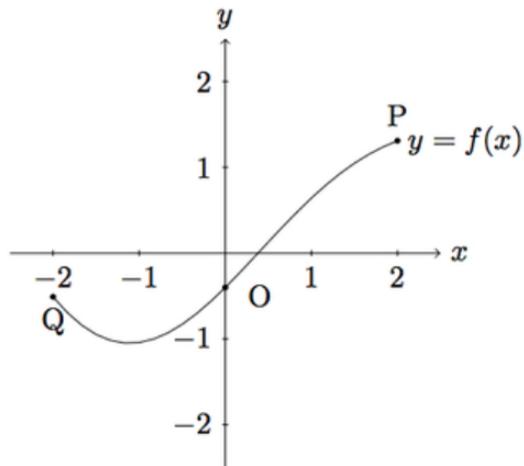
Graphs of Power Functions

- a. Sketch the graphs of the functions described by $f(x) = x^2$ and $g(x) = x^4$ on the same axes, being careful to label any points of intersection. Also, find and label $(\frac{1}{2}, f(\frac{1}{2}))$ and $(\frac{1}{2}, g(\frac{1}{2}))$.
- b. Sketch the graphs of the functions described by $f(x) = x^3$ and $g(x) = x^5$ on the same axes, being careful to label any points of intersection. Also, find and label $(\frac{1}{2}, f(\frac{1}{2}))$ and $(\frac{1}{2}, g(\frac{1}{2}))$.
- c. Sketch the graphs of the functions described by $f(x) = x^2$ and $g(x) = x^3$ on the same axes, being careful to label any points of intersection. Also, find and label $(\frac{1}{2}, f(\frac{1}{2}))$ and $(\frac{1}{2}, g(\frac{1}{2}))$.

Source: [Illustrative Mathematics](#)

Transforming the Graph of a Function

The figure shows the graph of a function f whose domain is the interval $-2 \leq x \leq 2$.



a. In (i)–(iii), sketch the graph of the given function and compare with the graph of f . Explain what you see.

i. $g(x) = f(x) + 2$

ii. $h(x) = -f(x)$

iii. $p(x) = f(x + 2)$

b. The points labelled Q , O , P on the graph of f have coordinates

$$Q = (-2, -0.509), O = (0, -0.4), P = (2, 1.309).$$

What are the coordinates of the points corresponding to P , O , Q on the graphs of g , h , and p ?

Source: [Illustrative Mathematics](#)

Let's do some math! Round 1

Task 1: Speeding Tickets Prompt

Students are presented with a scenario like this:

Part A: Speeding in Massachusetts

A speeding ticket fine in Massachusetts is \$100 for any speed up to 10 miles above the posted speed limit. The fine increases by \$10 for each additional mile an hour after the first 10.

[Source: [Speeding Ticket FAQs | Massachusetts Speeding Ticket Lawyer](#)]

1. Create a graph of this situation where the number of miles over the posted speed limit is on the horizontal axis and the cost of the ticket is on the vertical axis.
 - a. Does this graph represent a function?
 - b. What domain and range are reasonable for this function? How do you see these in the graph?
2. Suppose the posted speed limit is 65 miles per hour. Create a "formula" that takes the driver's speed at the time of incident in that zone and generates the cost of the driver's speeding ticket.
 - a. Explain how the formula you created works. What is the input? What is the output?
 - b. Define any variables you use and illustrate how the formula(s) work.

Part B: Speeding in New York

Fines for speeding vary from state to state. In New York, speeding penalties are determined as follows:

Penalties for Speeding

Speed	Minimum fine	Maximum fine	Possible prison time
up to 10 mph over	\$45	\$150	not more than 15 days
more than 10 mph over - less than 30 mph over	\$90	\$300	not more than 30 days
more than 30 mph over	\$180	\$600	not more than 30 days
inappropriate speed	\$45	\$150	not more than 15 days

Source: [Penalties for Speeding | Governor's Traffic Safety Committee](#)

1. Create a graph of this situation that illustrates the relationship between quantities.
 - a. What is interesting about your graph?
 - b. What do some of the interesting features of the graph mean relative to the context?
2. How does New York's Speeding Penalty system compare to Massachusetts' system?
 - a. What are your thoughts about this?

Part C: Extending the learning:

Learn about your state's or another state's or another state's system for determining speeding penalties.

- b. Is it possible to represent the system graphically? Using a formula of some sort? Why or why not?
- c. How does your state's system compare to the systems in New York and Massachusetts?
- d. What are your thoughts on this?

Sample Learning Experience

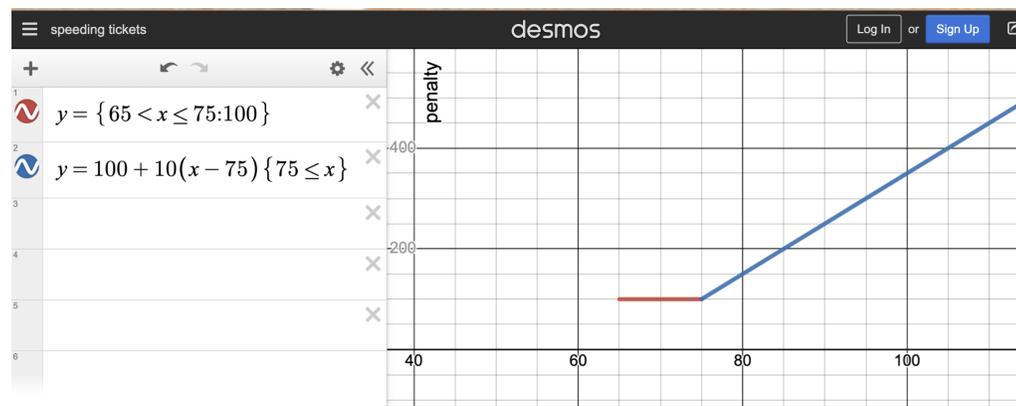
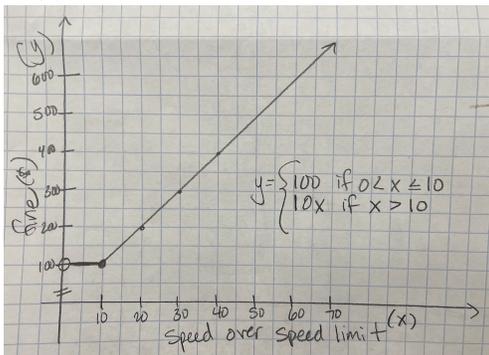
Launch this task by engaging students in a conversation to make sense of driving laws, speed limits, and penalties for going over the speed limit. Some questions you can pose are as follows:

- How does a driver determine how fast to go at any point in time?
- How does a driver know the maximum speed for any road they're on?
- What are some consequences for going over the speed limit?

Introduce the prompt and provide time for students to consider the questions posed. Give students time to work independently and develop a response. Ensure students have access to multiple tools they can use to develop a response.

Invite students to partner with classmates and share their responses. Provide time for students to revise their justifications using the information gained during these discussions.

Some possible approaches are as follows:



Monitor and select various solution methods to share with the class as students work with classmates. Have selected students present their responses—consider using a document camera for students to show actual work—and explain their justification. As discussion takes place, invite classmates to make sense of and build on each other's responses, allowing for students to clarify and defend their response as the conversation ensues. Ask:

- What about this reasoning makes sense?
- In what ways is using a function helpful to communicate speeding penalties?
- What questions surface for you?
- Is there anything you have as an alternate explanation or point of view?
- What can you take from this approach to apply to your own work?

Following the discussion, provide students an opportunity to reflect on and revise their work. Additionally, offer students tools to explore any of the questions that surface from examining the speeding penalty practices of these states. Follow a similar structure for Parts B and C.

Learning Principles

Engage with cognitively demanding tasks in heterogeneous settings (LP 1). Students should be given opportunities to grapple with multistep, non-routine tasks that promote mathematical rigor. These experiences should be differentiated so that all students engage in appropriate challenges—for example, through tasks with multiple entry points and solution pathways. These experiences should continue to integrate knowledge and skills developed in grades 6-8 at the level of sophistication of high school mathematics.

Engage in social activities (LP 2). Students should have opportunities to work independently and to communicate with one another about mathematics by engaging in collective and collaborative learning activities. Explaining and having opportunities to revise one’s thinking has excellent value in solidifying one’s knowledge.

Build conceptual understanding through reasoning (LP 3). Students should be given the opportunity to reason, justify, and problem solve with critical thinking, reading, writing, speaking, and listening. Through reasoning and work with multiple representations, students learn why procedures work and build a conceptual understanding of key mathematical ideas.

Have agency in their learning (LP 4). Students should be able to choose tasks and learning experiences that align with their interests and aspirations. All students have rich and varied experiences and home lives. Learning mathematics should bring students’ identities and interests to the fore and build on the strengths that they bring to the learning space.

View mathematics as a human endeavor across centuries (LP 5). Students should understand that mathematical ideas emanated over time from civilizations around the world and have opportunities to explore these contributions to mathematics. Students should develop an appreciation of mathematics as a human endeavor: one in which they feel a sense of belonging, where they see themselves as mathematicians, and one that offers opportunities to broaden their ideas about what mathematics is, how it is used, and who it is for.

See mathematics as relevant (LP 6). Students should engage with mathematics in ways that authentically involve real-world situations. Problem-solving contexts should allow students to perceive mathematics as a tool for addressing the questions that arise in everyday life, as well as the ways it can model our world and address global economic, social, and environmental challenges. Students should also engage with mathematics in ways that connect to academic disciplines and future careers by doing the mathematics used by artists, designers, engineers, and other professionals.

Employ technology as a tool for problem-solving and understanding (LP 7). Research indicates that technology is a powerful tool for learning deeper mathematics by improving calculation efficiency and enabling more sophisticated analysis. Students should learn to use technology, with emphasis put on widely used tools and software, such as calculators and spreadsheets, to make sense of models. Technology use should not be limited to supporting “doing mathematics,” but should also be used as a tool for displaying and communicating results to appropriate audiences.

Task 1: Speeding Tickets Student Work

Example 1:

2023

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{20 - 10}{50 - 100} = \frac{10}{-50} = -\frac{1}{5}$$

1.) yes because it's a linear function

Domain: All possible x-values

Range: All possible y-values

2.)

x (amount of money)	y (miles over the posted speed limit (goes over every 10))
\$ 100	10 miles over
\$ 110	20 miles over
\$ 120	30 miles over
\$ 130	40 miles over
\$ 140	50 miles over
\$ 150	60 miles over

Formula:

$$y = mx + b$$

$$y = 10x + 10$$

↑

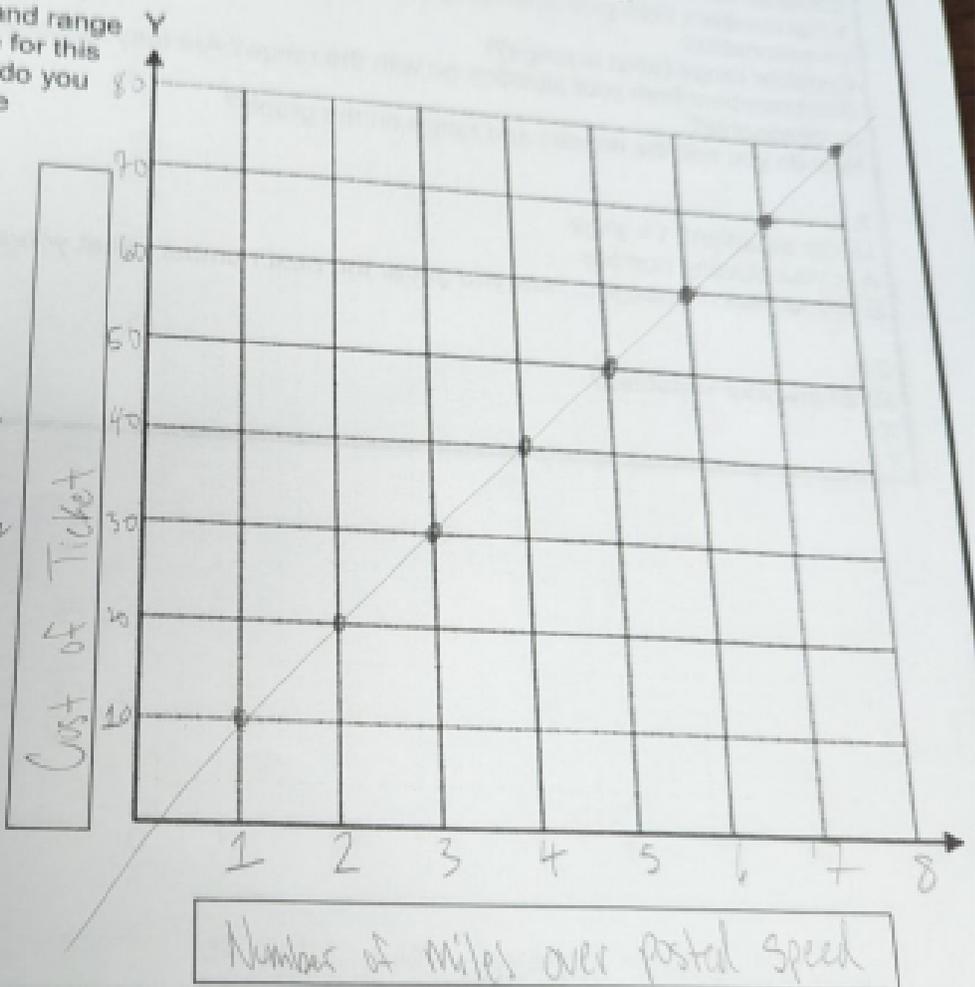
still don't know if this is correct + no answer to equation.

Example 2:

Part A: Speeding in Massachusetts

A speeding ticket fine in Massachusetts is \$100 for any speed up to 10 miles above the posted speed limit. The fine increases by \$10 for each additional mile an hour after the first 10.

- Create a graph of this situation where the number of miles over the posted speed limit is on the horizontal axis and the cost of the ticket is on the vertical axis.
 - Does this graph represent a function?
 - What domain and range are reasonable for this function? How do you see these in the graph?



Domain: $(0, 80]$
 Range: $(0, 800]$
 I believe it is reasonable because domain represents x which is amount of miles over and I really hope we don't have people going over 80 more miles above posted speed limits. The range is reasonable since I said the domain ends at 80 then the cost shouldn't exceed $80 \cdot 10 = 800$ dollars.

- Suppose the posted speed limit is 65 miles per hour. Create a "formula" that takes the driver's speed at the time of incident in that zone and generates the cost of the driver's speeding ticket.

My formula works because it has the \$100 extra speeding fee then it's adding $x \cdot 10$ with x being the amount of miles so it gets multiplied for the additional miles over.

$F = \text{Fine}$
 $F = X(10) + 100$

- Explain how the formula you created works. What is the input? What is the output?
- Define any variables you use and illustrate how the formula(s) work.

$X = \text{Number of miles over speed}$

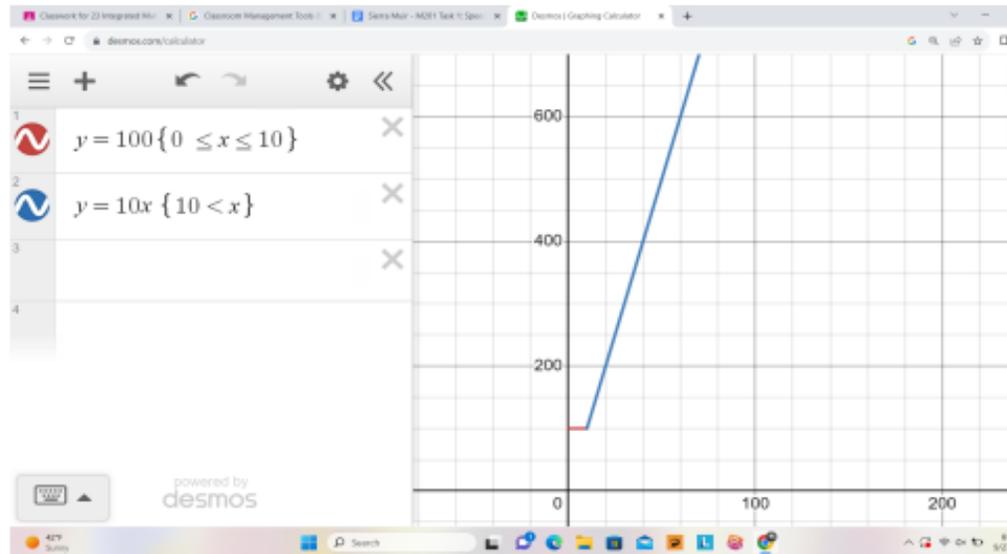
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[Source: [Speeding Ticket FAQs | Massachusetts Speeding Ticket Lawyer](#)]

1. Create a graph of this situation where the number of miles over the posted speed limit is on the horizontal axis and the cost of the ticket is on the vertical axis.
 - a. Does this graph represent a function?



Yes, this graph is a function because it doesn't repeat two numbers.

- b. What domain and range are reasonable for this function? How do you see these in the graph?

Domine is 0 to 200 mph over the speed limit, range is \$100 to \$2000

2. Suppose the posted speed limit is 65 miles per hour. Create a "formula" that takes the

driver's speed at the time of incident in that zone and generates the cost of the driver's speeding ticket.

Speed 0-65 the cost is zero

Speed is 75-65 the cost is 100

Speed is >75 the cost is 100+10s

- a. Explain how the formula you created works. What is the input? What is the output?

Input- the in number

output - the out number

- b. Define any variables you use and illustrate how the formula(s) work.

A variable is something that can be changed or adapted, or vary.

Part B: Speeding in New York

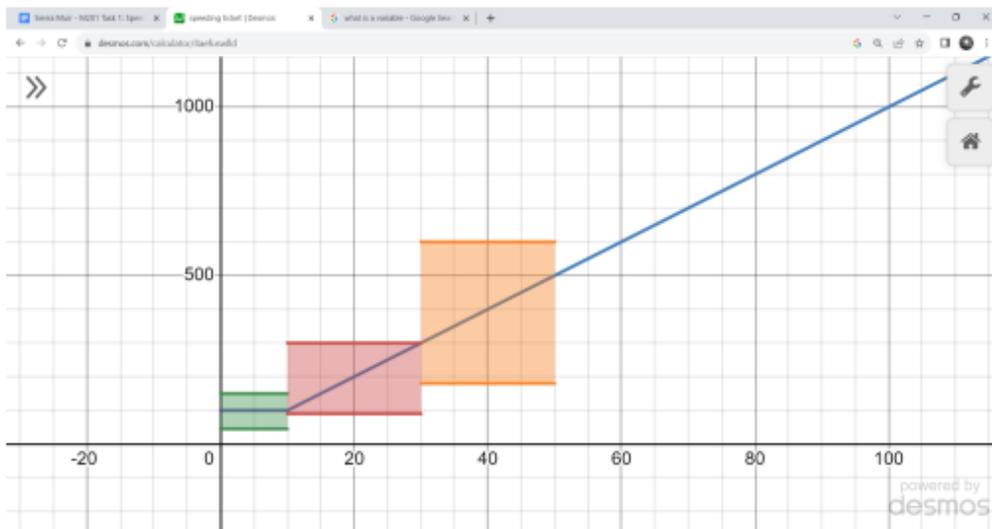
Fines for speeding vary from state to state. In New York, speeding penalties are determined as follows:

Penalties for Speeding

Speed	Minimum fine	Maximum fine	Possible prison time
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more than 30 mph over	\$180	\$600	not more than 30 days
inappropriate speed	\$45	\$150	not more than 15 days

Source: [Penalties for Speeding | Governor's Traffic Safety Committee](#)

1. Create a graph of this situation that illustrates the relationship between quantities.
 - a. What is interesting about your graph?



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- b. *What do some of the interesting features of the graph mean relative to the context?*

The ranges of the speeding tickets

2. *How does New York's Speeding Penalty system compare to Massachusetts' system?*
a. *What are your thoughts about this?*

There isn't as big of a fee as in New York, because it is harder to speed because of all the traffic.

Part C: Extending the learning

Learn about your state's or another state's or another state's system for determining speeding penalties.

- a. *Is it possible to represent the system graphically? Using a formula of some sort? Why or why not?*

Yes, you can go 15 over while passing but besides that it goes up.

- b. *How does your state's system compare to the systems in New York and Massachusetts?*

It doesn't really have a number of how much you pay for comparison

- c. *What are your thoughts on this?*
2. *I'm going to be honest I don't really know, because the state of Idaho isn't super clear on anything.*

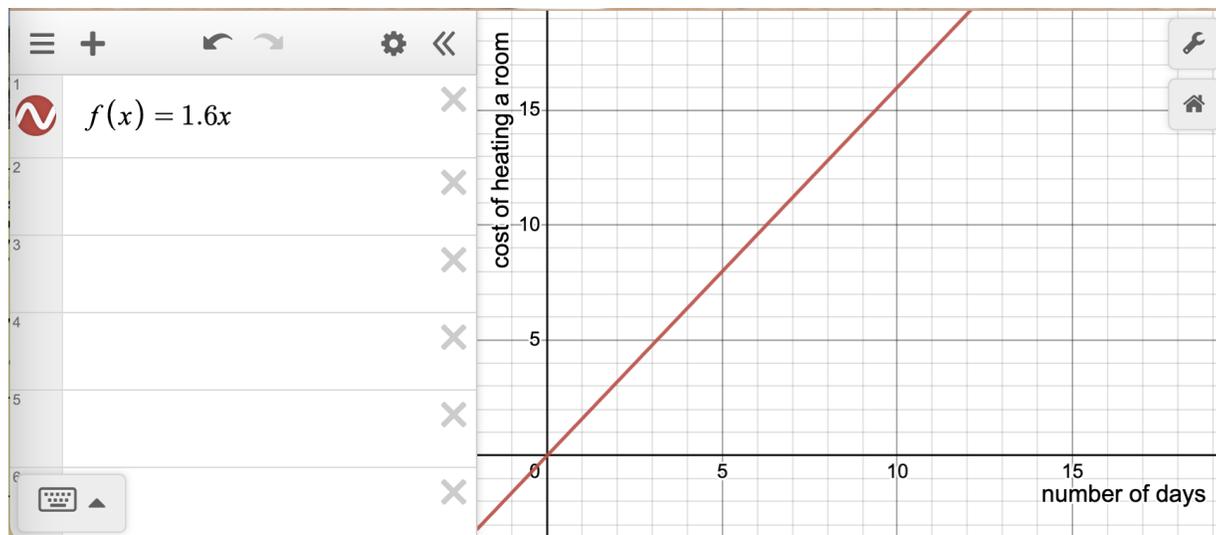
Let's do some math! Round 2

Task 2: School Heating Prompt

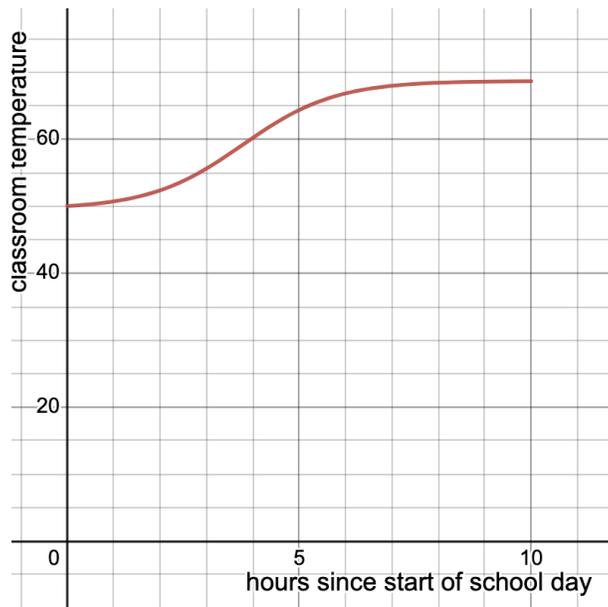
Students are given a problem like this:

During the winter months, some schools shut down due to extreme cold conditions and the schools' inability to adequately heat their buildings. According to the Capital Gazette and Bloomberg, the Baltimore City Public School System experienced this over the course of two winters in 2017 and 2018. In an effort to help, one college student started a [GoFundMe campaign](#) to purchase space heaters, raising about \$84,000. One high school student reported near freezing temperatures of 50°F at the start of the day. With the use of a space heater, the classroom temperatures increased to 65°F . In Maryland, the estimated cost to run a heater is about \$0.20 per hour.

- a. Examine the image below or explore the actual graph at <https://www.desmos.com/calculator/nts1vbqygf>
- How would you describe the relationship between the input and the output?
 - What does this relationship tell you about the costs of heating a room? How do the variables, slope of the line, and the equation of the function capture that relationship?
 - If a school has set up 40 classrooms each with a space heater, how would the function between the number of days and the cost of heating change? How does this impact the graph of the function? How does it impact the equation?



- b. Consider the following graph of $y = g(x)$.
- How would you describe the relationship between the input and the output?
 - What values of the input are part of the domain of this function? Why does that make sense?
 - What does the relationship represented below tell us about how a space heater works to warm a room?



- iv. Given the conditions, the school leadership team decides to have administrators who are already in the building two hours before the start time preheat all the classrooms and keep the heaters running until the end of the school day.
1. Sketch a graph of the new function h , which gives the temperature in the school as a function of time.
 2. Write an equation for h in terms of g . Explain why your equation makes sense.
 3. How will the school leadership team's decision to start heating rooms earlier impact their cost for heating the school?

Sample Learning Experience

Have students examine the following articles to set context to the situation. Lead a class discussion based on thoughts, reflections, surprises, etc. from the articles.

- Ericson Jr., E. (2018, January 7). How Baltimore Students Got Left in the Cold. Bloomberg. [How Baltimore's Public Schools Got Left In the Cold - Bloomberg](#)
- McNamara, J. (2017, January 10). Cold classrooms a hot issue in Bowie. Retrieved from Capital Gazette: [Cold classrooms a hot issue in Bowie – Capital Gazette](#)

Lead into the activity with some individual work time, where students develop an approach to the prompt, encouraging them to share and compare approaches. Monitor and select a couple of approaches to highlight and reflect on progress made at this point.

Questions that can be posed to student pairs as they work:

- What is this context about? What connections can you make to your own experience?
- What are the quantities, things that can be counted or measured, involved in this context?
- What do you anticipate is the relationship between these quantities? Why does that make sense?
- What connections can you make between these ideas you shared and the first graph?
- What connections can you make between these ideas you shared and the first equation?
- Press for details by asking *can you say more about...?*

Give selected pairs of students time to share responses and invite classmates to reflect on the following questions:

- *What makes sense about the ideas shared?*
- *What questions surface for you?*
- *What can you take from this discussion and apply to your own work?*

Provide time for students to revise their work. While they work, select additional pairs to share how they used the structure and relationship between the equations to determine which sets of equations have the same answer. Give students additional time to revise their work.

Additionally, offer students tools to explore any of the questions that surface from examining the case of Baltimore Public Schools.

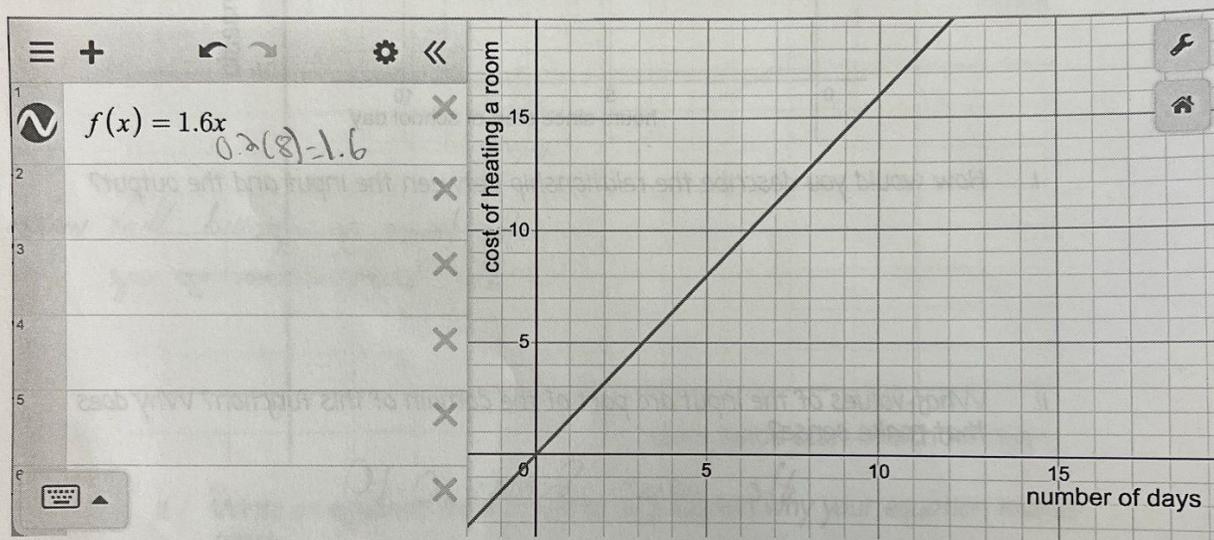
Task 2: School Heating Student Work

Example 1:

SCHOOL HEATING

During the winter months, some schools shut down due to extreme cold conditions and the schools' inability to adequately heat their buildings. According to the Capital Gazette and Bloomberg, the Baltimore City Public School System experienced this over the course of two winters in 2017 and 2018. In an effort to help, one college student started a GoFundMe campaign to purchase space heaters, raising about \$84,000. One high school student reported near freezing temperatures of $50^{\circ}F$ at the start of the day. With the use of a space heater, the classroom temperatures increased to $65^{\circ}F$. In Maryland, the estimated cost to run a heater is about \$0.20 per hour.

a. Examine the image below



i. How would you describe the relationship between the input and the output?

For each day it will cost 1.6.
 - days go up, cost goes up

ii. What does this relationship tell you about the costs of heating a room? How do the variables, slope of the line, and the equation of the function capture that relationship?

It cost 1.6 each day to heat the rooms
 slope = $y = 1.6x$

iii. If a school has set up 40 classrooms each with a space heater, how would the function between the number of days and the cost of heating change? How does this impact the graph of the function? How does it impact the equation?

I price will go up a lot.
 as days go up cost goes up.

Example 2:

questions within your group. After your group is done discussing, each group needs to share a quick summary of your discussion.

1. Would the temperature of the school effect your learning?

yes, because: Considering students have a set schedule for each class (and when school starts and ends) a student shouldn't be sitting in a classroom where it's either too hot or too cold (also considering that students could get sick under either condition) which would cause under attendance

2. Would issues such as temperature effect other aspects of a school?

It would because: much like students, teachers can't really focus on teaching under such conditions (also much like students, teachers can get sick too. which would cause under attendance of teachers as well)

3. What should the main priorities of a school be?

The main priority of the school should be to fix the HVAC system (air conditioning, heating) in order to provide a healthy learning + working environment

4. List some of the costs discussed in the article.

• 2.8 billion in an entire upgrade on the system
• 1.4 million dollar study to produce a long term plan

5. Are ~~there~~ ^{there} costs that are not listed that would have to be considered?

Yes and that would be the millions of dollars in boiler repairs, window upgrades and other critical work on the school would have to be considered

6. What is the difference between a long-term and a short-term solution? Are space heaters a long-term or short-term solution? Explain.

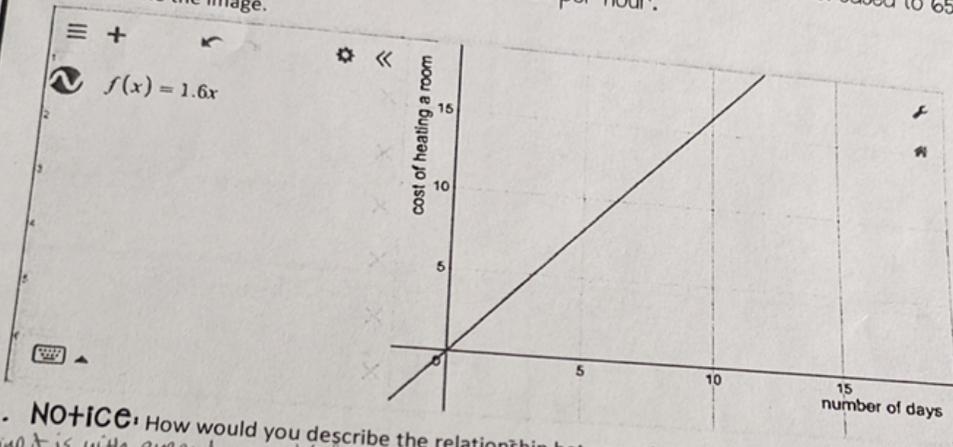
They are a short term because: Some are required to be plugged into a wall and if the electricity goes out then it's not going to be able power them. And even if some weren't required to be plugged in, there's only so much that they can do that they can only be used for a short term amount of time (short term solutions can fix situations for a little bit but not permanently) whereas long term solutions are more likely to be permanent

- a1. Linear
- a2. The costs grow slowly but increasingly more expensive. This is shown with the line only going up linearly and taking account of the input and output's values.
- a3. The line would be aligned different and the equation would be bigger because of the number of classrooms.
- b1. The line starts at 50° rises beginning at one hour and stopping when it reaches 7 hours and 65° and ends right before it crosses 10 hours.
- b2. The values would be 50, 55, 60, and 65 because the line only stays in those values.
- b3. The longer the space heater is on, the more the heat it gives off rises.

Example 3:

in an effort to help... experienced this over the course of two winters in 2017 and 2018. raising about \$84,000. One high school student started a GoFundMe campaign to purchase space heaters, of the day. With the use of space heaters, the classroom temperatures increased to 65°F. In Maryland, the estimated cost to run a heater is about \$0.20 per hour.

a. Examine the image.



b. **NOTICE:** How would you describe the relationship between the input and the output?
 The input is with every hour added the output is .20 times the input (i.e. .20(d))

c. **DESCRIBE:** What does this relationship tell you about the costs of heating a room?
 The cost of heating rooms varies depending how long they are heated

d. **MAKING CONNECTIONS:** How do the variables, slope of the line, and the equation of the function capture the relationship? The slope represents the changes of the variables that is written in the equation

e. **APPLYING:** If a school has set up 40 classrooms with a space heater, how would the function between the number of days and the cost of heating change?
 It would multiply the cost by 40 because with 40 classrooms there would be 40 space heaters

f. **MAKING CONNECTIONS:** How does this impact the graph of the function?
 The graph will increase

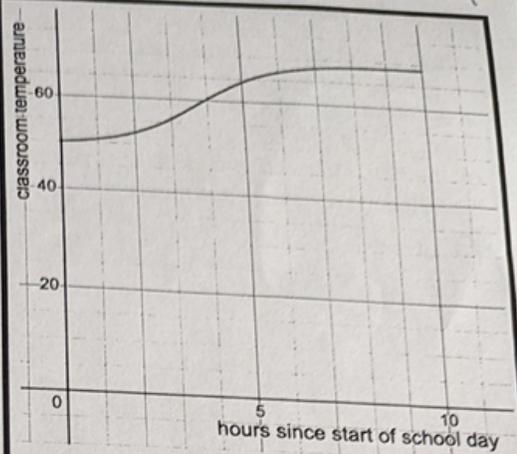
g. **MAKING CONNECTIONS:** How does this impact the equation?
 The equation will turn into $1.6x(40)$ to make it add up to the 40 space heaters

Consider the following graph of $y=g(x)$.

NOTICE: How would you describe the relationship between the input and the output? The relationship between the input & output vary depending on how the input values are changed for corresponding output.

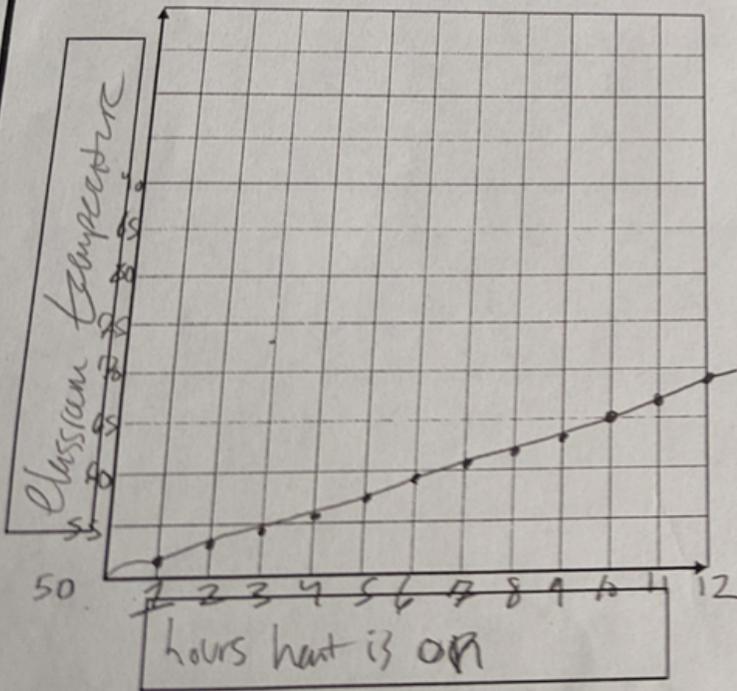
DESCRIBE: What values of the input are part of the domain of this function? Why does that make sense? The domain of this specific function would be 10 since the graph cuts off at 10 hrs since the start of school. It makes sense since the cost per day is 1.60 and there are 8 hrs in a school day and teachers usually stay two hours after

MAKING CONNECTIONS: What does the relationship represented below tell us about how a space heater works to warm a room? The space heater takes 10 hrs to make the room about 15° more warmer, giving an average 1.5° rise per hour.



Given the conditions, the school leadership team decides to have administrators who are already in the building two hours before the start time preheat all the classrooms and keep the heaters running until the end of the school day.

VISUALIZE: Sketch a graph of the new function h , which gives the temperature in the school as a function of time.



Different Representation: Write an equation for h in terms of g .

$$h = g(t + 2)$$

YOUR WORDS: Explain why your equation makes sense. My equation makes sense because g represents the hours that will make the temperature rise at an average 1.5° warmer an hour.

DECISION TIME: How will the school leadership team's decision to start heating rooms earlier impact their cost for heating the school?

It will add \$128 dollars to the bill to heat the classrooms for 10 hours

1.60 per day

$$1.60 \cdot 2 = 3.4 \cdot 40 = 128$$

Criteria for Success

Conference and Provide Revision Support	Accept with Revision	Accept
The student's artifact shows an emerging understanding of the expectations of the indicator(s). After conferencing and additional instruction/learning, the student may provide a revised or different artifact as evidence of the indicator(s).	The student's artifact is approaching a full understanding of the expectations of the indicator(s). The artifact may contain execution errors that should be corrected in revision. The student may revise the selected artifact or submit a different artifact.	The student's artifact demonstrates evidence that they have met the expectations of the indicator(s).

References

Illustrative Mathematics. (2016, May 4). *Graphs of Power Functions*. Illustrative Mathematics High School Functions. <http://tasks.illustrativemathematics.org/content-standards/HSF/IF/C/7/tasks/627>

Illustrative Mathematics. (2016, May 4). *Interesting Interest Rates*. Illustrative Mathematics. <https://tasks.illustrativemathematics.org/content-standards/tasks/302>