MATH IN ACTION

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UNIT ASSESSMENT

PROJECT TIME!

LESSON 1 OVERVIEW

WORLD RECORD SPEEDS

GOALS OF THE LESSON

This lesson is designed to get you familiar with linear functions that have a proportional relationship between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 1, the focus will be on the idea of slope. You will use the different contexts as a way of learning what slope is and how to calculate it.

By the end of the lesson, you should be able to explain how to find slope, what it is, what it represents, and what is unique about slope relating to linear functions.

All of these real world contexts given to help you learn by using around world records for speed in a variety of sports. This topics make the tasks and lesson very interesting. The following are the contexts that are used to help students learn about slope:

Lesson 1.1 – On Your Mark, Get Set, Go!
Usain Bolt: The fastest man on the planet

Lesson 1.2 – The Fast and the Furious
The world record for land speed

Lesson 1.3 – "Safety is in the Speed"
Pavel's speed skating world record

After completing all three of these components to the lesson in lesson 1.4. You will be asked to look at and explore the similarities and differences between the 3 different examples of linear functions. This will be wear conclusions will be made about linear functions and their slopes.

Lesson 1.4 – Teamwork Makes the Dream Work
Pulling it All Together

1.1 ON YOUR MARK… GET SET… GO!

THE FASTEST MAN ON THE EARTH

The fastest human footspeed on record was seen during the final **100 meters** sprint of the World Championships in Berlin on 16 August 2009 by Usain Bolt. He won the race in **9.58 seconds**.

TASK 1

We normally don't think about speed per 100 meters. When you think of speed what do you think of?

Convert his speed into units that are more commonly used.

Calculate the distance that Usain could travel in .5 hours, 1 hour, 2 hours, 4 hours, 6 hours, and 9 hours.

TASK 2

Explore the table for Usain's speed. (*if he could continue to hold this pace forever*)

Time (hrs)	Distance (miles)
.5	
1	
2	
3	
4	
6	
9	

What do you notice about this table?

Calculate $\dfrac{\textit{the change in y-values}}{\textit{the change in x-values}}$ **for the follow pairs of points:**

(.5, 11.675) and (1, 23.35)

(6, 140.1) and (9, 210.15)

(1, 23.35) and (2, 46.7)

(2, 46.7) and (3, 70.05)

(1, 23.35) and (4, 93.4)

(4, 93.4) and (6, 140.1)

(2, 46.7) and (4, 93.4)

What do you notice with these different pairs of points?

SLOPE

We define SLOPE as $\frac{\Delta Y}{\Delta X} = \frac{Change\ in\ y-values}{Change\ in\ x-values}$

for corresponding x and y values

TASK 3

On your TI-Nspire, open up a list and spredsheets page and enter the information from the previous table.

Then plot these points on a data and statistics page. What variable goes on the bottom and what variable goes on the side up and down?

TASK 4: BUILDING AN EQUATION

How far would Usain travel if he ran his speed for 1 hour?

For 2 hours?

For 10 hours?

Supposed Usain runs for “n” hours, how far would he have traveled?

TASK 5: CHECK YOUR HYPOTHESIS

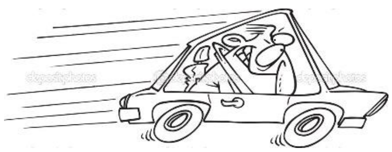
On your TI-Nspire, plot your hypothesis function on your graph page.
If your graph doesn’t match the data change it so that it fits.

What did you notice about your hypothesis and your collected data?

1.2 THE FAST AND THE FURIOUS

THE LAND SPEED RECORD

Land speed refers to the fastest speed of a person in a car on land. On October 15th, 1997, Andy Green broke the world record for land speed in Black Rock Desert Nevada, USA. At this time it was recorded that he hit an amazing speed being the first driver of a car to break the sound barrier. During this drive he drove **1 mile** in a mere **4.718 seconds**!



TASK 1

Convert his speed into units that are more commonly used.

Calculate the distance that Andy's car could travel in 2 hours, 7 hours, and 11 hours.

TASK 2

Explore the table for Andy's car's speed (*if this could be maintained for 11 hours)*

Fill in the blanks in the table below.

Time (hrs)	Distance (miles)
0	
1	
2	
	2289
7	
	6867
11	

How can you find the missing X values?

What do you notice about the values in this table?

Remember, in the last lesson we mentioned the idea of slope as $\frac{Change\ in\ y-values}{Change\ in\ x-values}$

Calculate the slopes for the flowing:

From 0 hours to 1 hour

From 2 hours to 3 hours

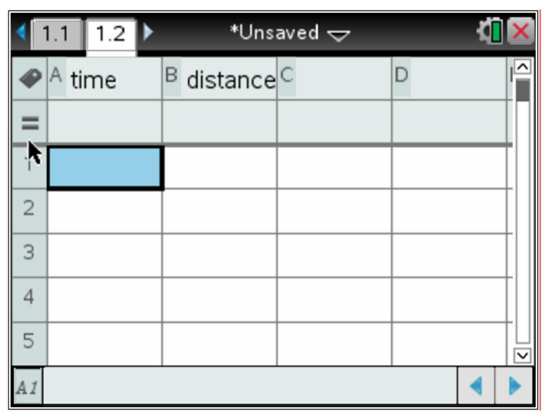
From 1 hour to 7 hours

From 3 hours to 9 hours

What do you notice with these different slopes?

TASK 3

On your TI-Nspire, open up a list and spredsheets page and enter the information from the previous table.



Then plot these points on a data and statistics page. What variable goes on the bottom and what variable goes on the side up and down?

TASK 4

How far could Andy and his car travel in 1 hour?

In 7 hours?

In 4 hours?

Suppose Andy drives his crazy fast car for "h" hours, how far would he travel?

TASK 5

On your TI-Nspire, plot your hypothesis function on your graph page.
If your graph doesn't match the data change it so that it fits.

What did you notice about your hypothesis and your collected data?

1.3 “SAFTEY IS IN THE SPEED”

WORLD RECORD 500 METER SPEED SKATING

As Ralph Waldo Emerson has said “In skating over thin ice, our safety is our speed”, this is also the mindset for many speed skaters. Pavel Kulizhnikov is a Russian speed skater. In 2015, he became the first speed skater to finish the **500 meter** in under 34 seconds with a world record of **33.98 seconds.**

TASK 1

Convert his speed into units that are more commonly used.

Calculate the distance that Pavel could travel in 3 hours, 4 hours, 6 hours, and 9 hours.

TASK 2

Explore the table for Pavel's speed (*if this could be maintained for nine hours)*

Fill in the blanks.

Time (hrs)	Distance (miles)
	0
3	
4	
6	
	231
9	

What do you notice about this table?

Calculate the slopes for the following:

From 0 hours to 3 hours

From 3 hours to 6 hours

From 6 hours to 7 hours

From 3 hours to 4 hours

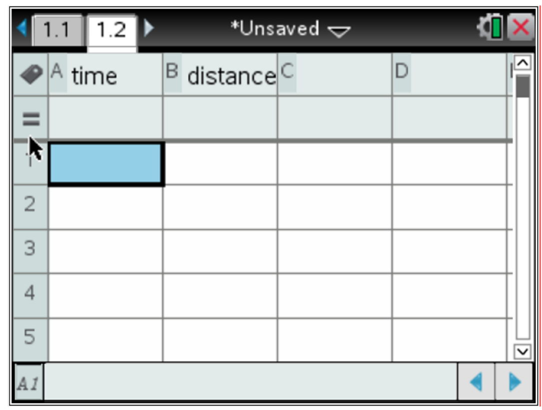
From 4 hours to 6 hours

From 7 hours to 9 hours

What do you notice about these different slopes?

TASK 3

On your TI-Nspire, open up a list and spredsheets page and enter the information from the previous table.



Then plot these points on a data and statistics page. What variable goes on the bottom and what variable goes on the side up and down?

TASK 4

How far could Andy and his car travel in 1 hour?

In 7 hours?

In 4 hours?

Suppose Andy drives his crazy fast car for "h" hours, how far would he travel?

TASK 5

On your TI-Nspire, plot your hypothesis function on your graph page.
If your graph doesn't match the data change it so that it fits.

What did you notice about your hypothesis and your collected data?

1.4 TEAM WORK MAKES THE DREAM WORK

BRINGING IT ALL TOGETHER

In the last 3 lessons we have talked about a few super speedy world records.

Review the tables and graphs for each of the 3 world records we studied earlier.

RUN

Time (hours)	Distance (miles)
.5	11.675
1	23.35
2	46.7
3	70.05
4	93.4
6	140.1
9	210.15

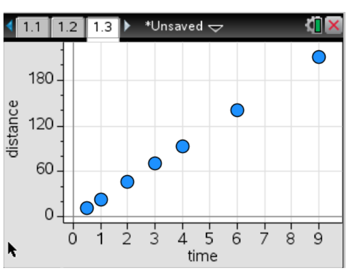
DRIVE

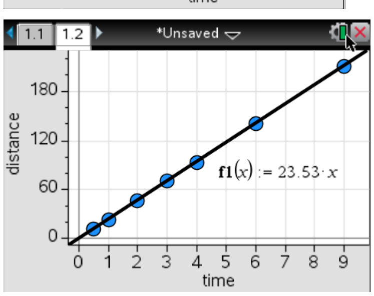
Time (hours)	Distance (miles)
0	0
1	763
2	1526
3	2289
7	5341
9	6867
11	8393

SKATE

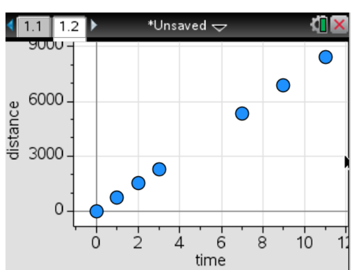
Time (hours)	Distance (miles)
0	0
3	99
4	132
6	198
7	231
9	297

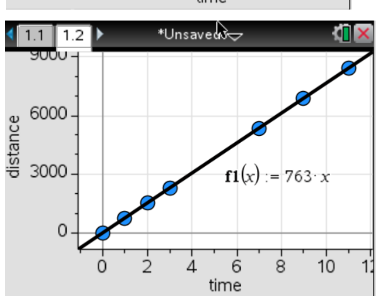
RUN



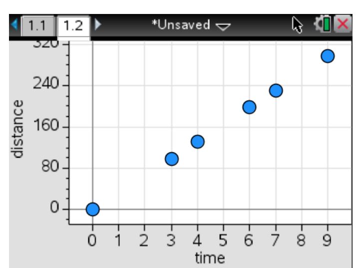


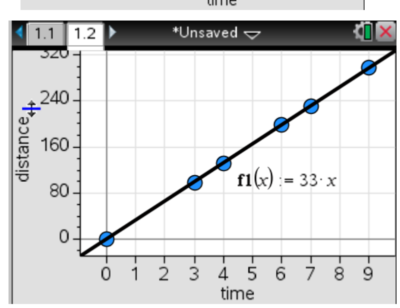
DRIVE





SKATE





What do you notice about all three of these situations?

What is similar?

What is different?

All of these are situations that can be represented my linear functions.

From this…

What can we say is true about ALL linear functions from our three examples?

LESSON 2 OVERVIEW

HIGH EXPECTATIONS

GOALS OF THE LESSON

This lesson is designed to get you familiar with linear functions that have a non-proportional relationship between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 2, the focus will be on the idea of the y-intercept of a linear function. You will use the different contexts as a way of learning what a y-intercept is and how to calculate it. You will also get a review from lesson 1, and continue to see slope.

By the end of the lesson, you will be able to explain how to find the y-intercept of a linear function, what it is, what it represents, and the how it relates to certain properties of linear functions.

All of these real world contexts given are to help you learn the material while revolving around a variety of sports. This topics make the tasks and lesson very interesting. The following are the contexts that are used to help you learn about y-intercepts:

Lesson 2.1 – You Go Girl!
The increase of high school female athletes since 1997

Lesson 2.2 – There's No Mountain Too High
Ski Lift to the Top

Lesson 2.3 – Those Who Don't Jump Will Never Fly
Sky Diving

After completing all three of these components to the lesson in lesson 2.4, you will be asked to look at and explore the similarities and differences between the 3 different examples of linear functions. This will be where conclusions will be made and you will understand the idea of a y-intercept, along with its properties for a linear function. You will also be introduced to the "Slope-Intercept" form of an equation for a linear function in this lesson.

Lesson 2.4 – There is no "I" in Team
Pulling it all together to make sense

2.1 YOU GO GIRL!

SPORTS PARTICIPATION

In **1997**, about **2.6 million** girls competed in high school sports. The number of girls competing in high school sports has increased by **an average of 0.06 million** per year in the years **1997 to 2008.**

TASK 1

How many girls competed in 2008?

How did you find that number?

Could you find the number of female athletes in the year 2004?

At what year will there be 3.38 million female student athletes in high school sports?

Do you think that there is a limit to this pattern? OR will this trend continue forever?

TASK 2

Explore the table for the number of female athletes in school sports.
Fill in the blank spaces.

Time (years since 1997)	Female Athletes (in millions)
0	
1	
4	
5	
7	
9	
13	

What do you notice about this table?

Is there anything that seems to be different from the tables and information from the last lesson on "World Record Speeds"?

Do you think that this situation has a constant slope?
If yes, how did you decide that and what is the slope?
If no, how did you decide that?

TASK 3

On your TI-Nspire, open up a list and spreadsheets page and enter the information from the previous table.

Then plot these points on a data and statistics page. What variable goes on the bottom and what variable goes on the side up and down? Justify your reasoning.

Looking at this graph, how does it differ from the ones from lesson 1? (Usain's run, fastest car, speed skating examples)

BUILDING AN EQUATION

On your TI-Nspire, plot your hypothesis function on your graph page.
If your graph doesn't match the data change it so that it fits.

What did you notice about your hypothesis and your collected data?

2.2 THERE'S NO MOUNTAIN TOO HIGH

SKIING

A ski lift raises the skiers up **130 feet every minute**. Even in the ski lodge, at the bottom of the ski lift, is **620ft above sea level**. The top of the mountain is 1420 ft about sea level.

TASK 1

How long would it take for you to reach the top of the mountain?

How did you find that number?

If you rode the ski lift for 5 mins, what altitude would you be at?

Do you think that there is a limit to this pattern? OR will this trend continue forever?

TASK 2

Explore the table for the different altitudes of the chair lift at different times.

Fill in the blank spaces.

Time (mins)	Altitude (in feet)
0	
1	
	520
5	
7	
9	
	1420

What do you notice about this table?

Is there anything that seems to be different from the tables and information from the last lesson on "World Record Speeds"?

Do you think that this situation has a constant slope?
If yes, how did you decide that and what is the slope?
If no, how did you decide that?

TASK 3

On your TI-Nspire, open up a list and spreadsheets page and enter the information from the previous table.

Then plot these points on a data and statistics page. What variable goes on the bottom and what variable goes on the side up and down? Justify your choices.

Looking at this graph, how does it differ from the ones from lesson 1? (Usain's run, fastest car, speed skating examples)

BUILDING AN EQUATION

On your TI-Nspire, plot your hypothesis function on your graph page.
If your graph doesn't match the data change it so that it fits.

What did you notice about your hypothesis and your collected data?

2.3 THOSE WHO DON'T JUMP WILL NEVER FLY

SKYDIVING

For a standard sport Skydiving experience, a person will jump from a plane that is flying at **12,500 feet** above the ground level. From there the person experiences "free fall" at, on average, **115 mph until they reach 2,500 feet** above the ground where they must pull their parachute cord.

TASK 1

Thinking about this rate, you probably won't be falling for hours out of the plane. Convert this rate to feet per second.

What altitude will you be at after 30 seconds into the fall?

What time will you need to pull the parachute cord?

What is the slope to represent this situation?

What makes this problem/situation different than the rest of the linear situations we have explored this unit?

Will this trend continue forever? Provide your reasoning.

TASK 2

Explore the table for the number of female athletes in school sports.
Fill in the blank spaces.

Time (secs)	Altitude (in feet)
	12500
10	
30	
	4895
50	
57	
	2500

What do you notice about this table?

What information about this linear situation can you find out from this given table?

TASK 3

On your TI-Nspire, open up a list and spreadsheets page and enter the information from the previous table.

Then plot these points on a data and statistics page. What variable goes on the bottom and what variable goes on the side up and down? Justify your answer.

Looking at this graph, how does it differ from the ones from previous situations in previous lessons?

BUILDING AN EQUATION

On your TI-Npsire, plot your hypothesis function on your graph page.
If your graph doesn't match the data, change it so it fits.

What did you notice about your hypothesis and your collected data?

2.4 THERE IS NO "I" IN TEAM

BRINGING IT ALL TOGETHER

In the last 3 lessons we have talked about a few different experiences with linear functions.

Review the tables and graphs for each of the situations we studied earlier.

Time (yrs since 1997)	Female athletes (in millions)
0	**2.6**
1	**2.66**
4	**2.84**
5	**2.9**
7	**3.02**
9	**3.14**
13	**3.38**

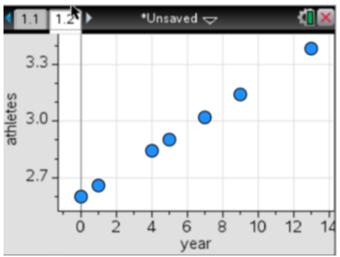
Time (hours)	Distance (miles)
0	**620**
1	**750**
4	**1140**
5	**1270**
6.158	**1420**

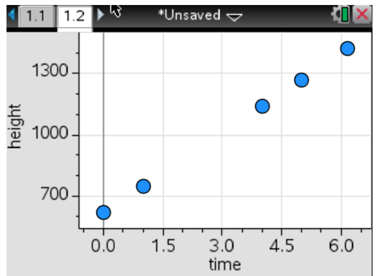
Time (hours)	Distance (miles)
0	**12500**
10	**10810**
30	**7430**
45	**4895**
50	**4050**
57	**2867**
59.17	**2500**

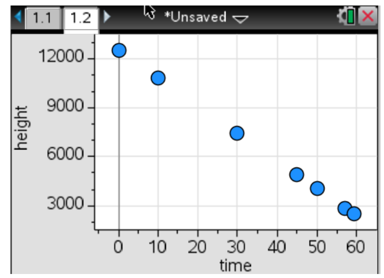
Girls in Sports

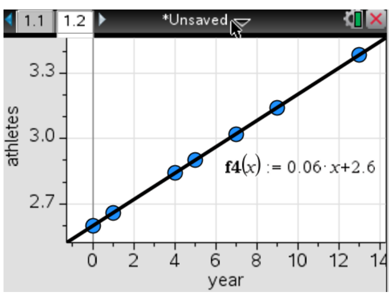
Ski lift

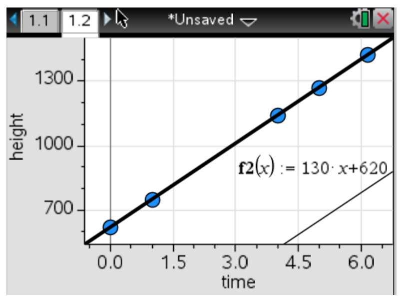
Skydiving

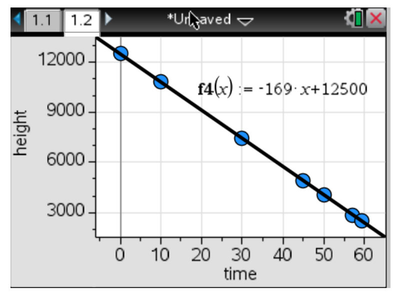












What do you notice about all three of these situations?

What is similar?

What is different?

Now let's compare the equations from each of these situations.

Girls in Sports	Ski lift	Sky Diving
Y= 0.06x + 2.6	**Y = 130x + 620**	**Y = -169x + 12500**

What do you notice about these equations?
What is similar?

What is different?

From this…

Y= m*x + b is called **Slope Intercept Form** for a linear equation. Where m represents the slope of the line and b represents the y-intercept, or initial value of the function.

LESSON 3 OVERVIEW

GETTING PRICY

GOALS OF THE LESSON

This lesson is designed to get you familiar with linear functions that have a proportional and non-proportional relationships between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 3, the focus will be on the representation of tables. You will use a table representation of a linear function to find out information about the linear situation and then construct a graphical representation and an equation to represent the situation.

By the end of the lesson, you should be able to explain how to find and calculate slope from a table, locate the y-intercept from a table, and show how to create another representation for the linear function when only given a table.

All of these real world contexts, given in the beginning, will not provide any information on the slope or y-intercept of the function. It will just give a story line to follow and help make sense of the table. These are used to help you learn revolving around situations that are more relevant to your lives than a traditional text. This topics make the tasks and lesson very interesting. The following are the contexts that are used to learn about linear function with only given table representations of the data.

Lesson 3.1 – Hey Hey Hockey Town
Ticket Prices for a Redwings Game

Lesson 3.2 – Let's Get Fit!
Purchasing a Gym Membership

3.1 HEY HEY HOCKEY TOWN!

DETROIT RED WINGS GAME

Tickets for hockey games between the Detroit Red Wings and the Chicago Blackhawks can get very pricy. For a game in the Joe Lois Arena in Detroit, you always want a good seat!

The following is a table that shows the relationship between the number of tickets bought and the price to pay. These tickets are in section 107, row 3 (right behind the opponent's team bench).

Fill in any blank spaces

Tickets	Price to Pay
0	0
1	
3	
6	2,163.66
8	2,884.88
11	
	5,409.15

What do you notice about this table?

What can you conclude about the price of tickets in terms of the number of tickets bought?

TASK 1

Create a now-next formula for how to find the price you would need to pay based on the price you would pay for one less ticket.

Remember: A now next formula uses the previous term to find the next term.

For example: *How much would you have to pay for 4 tickets, based on the price for 3 tickets?*

TASK 2

What would a graph for this function look like? Graph this situation by hand.

Would this be a continuous graph or a group of distinct points?

TASK 3

Write an equation to represent this data.

How did you come up with this equation?

Show that your equation works for this situation.

3.2 LET'S GET FIT!

GYM MEMBERSHIP

Let's Get Fit is a very successful gym, however due to the high quality there is also a high demand to get into the gym.

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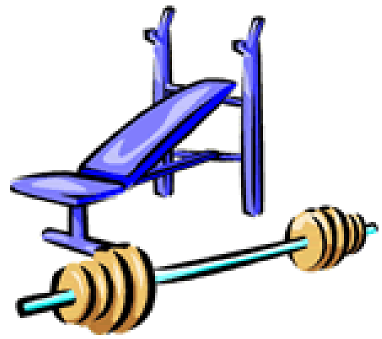


The following is a table that shows the relationship between the number of months that you want to be a member at the gym, and the price to pay.

Fill in any blank spaces

Months of Membership	Price to Pay
0	350
1	
3	
6	530
12	710
16	
	1070

What do you notice about this table?

What can you conclude about the price of tickets in terms of the number of tickets bought?

TASK 1

Create a now-next formula for how to find the price you would need to pay based on the price you would pay for one less ticket.

Remember: A now next formula uses the previous term to find the next term.

For example: *How much would you have to pay for 4 tickets, based on the price for 3 tickets?*

TASK 2

What would a graph for this function look like?
Graph this situation by hand.

What similarities do you notice with your graph and the table that you started with?

TASK 3

Write an equation to represent this data.

How did you come up with this equation?

Show that your equation works for this situation.

LESSON 4 OVERVIEW

WATCHING THE WEIGHT FALL RIGHT OFF

GOALS OF THE LESSON

This lesson is designed to get you familiar with linear functions that have a proportional and non-proportional relationships between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 4, the focus will be on the representation of graphs. You will use a graphical representation of a linear function to find out information about the linear situation and then construct a tabular representation and an equation to represent the situation.

By the end of the lesson, you should be able to explain how to find and calculate slope from a graph, locate the y-intercept from a graph, and show how to create another representation for the linear function when only given a graph.

All of these real world contexts, given in the beginning, will not provide any information on the slope or y-intercept of the function. It will just give a story line to follow and help make sense of the graph. These are used to help you learn revolving around situations that are more relevant to your lives. This topics make the tasks and lesson very interesting. The following are the contexts that are used to help you learn about linear function with only given graphical representations of the data.

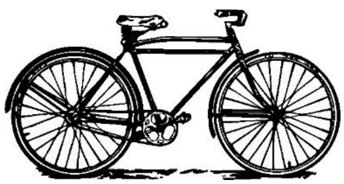
Lesson 4.1 – Cycling Through the Calories
Burning Calories While Biking

Lesson 4.2 – Burn Baby Burn
Burning Calories While Running

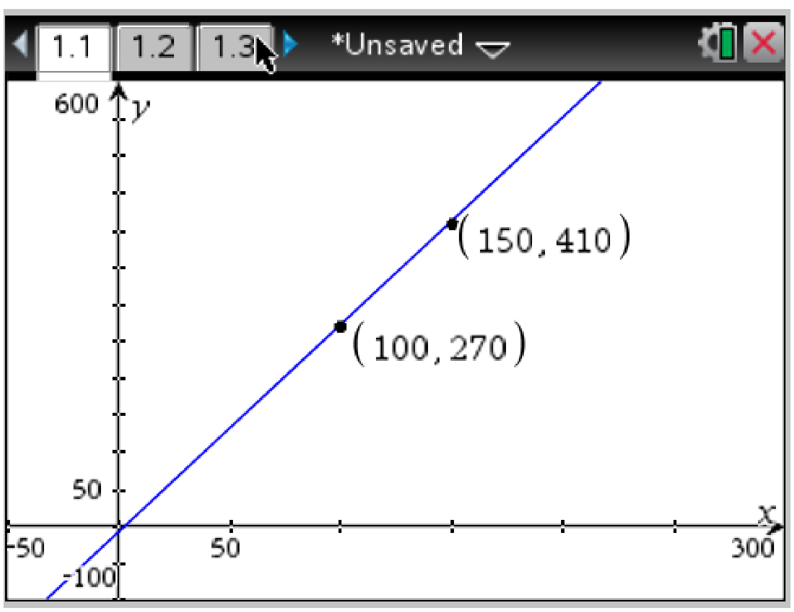
4.1 CYLCING THROUGH THE CALORIES

BURNING CALORIES WHILE BIKING

According to the American Heart Association, the number of calories a person can burn while biking at 12mph depends on the weight of that person (in pounds)



The following is a graph that shows the relationship between a person's weight (in pounds) and the number of calories that they will burn while biking at 12 mph.



What variable is along the bottom of the graph (x- axis) and what variable goes along the y-axis? Justify your answers.

What conclusions about this linear situation can you conclude from the graph?

Will the trend of this graph continue on forever in both directions? Explain your reasoning.

TASK 1

Based on this, create a table that represents the data from the graph.

What variable goes in the left column?

What variable goes in the right column?

Are there any restrictions for what you can put in for the x values?

TASK 2

Create a now-next formula for how to find the price you would need to pay based on the price you would pay for one less ticket.

TASK 3

Write a y= equation to represent this data.

How did you come up with this equation?

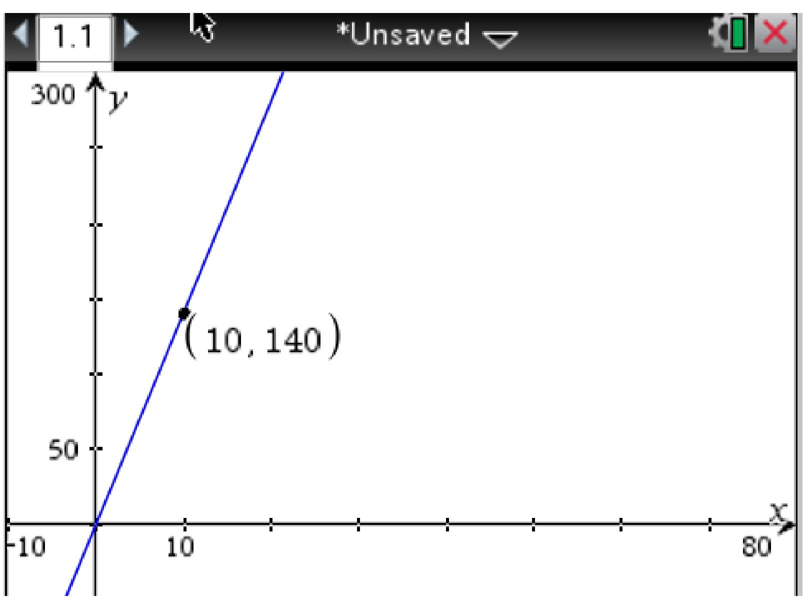
Show that your equation works for this situation. . Prove by graphing your equation and using the Trace function on your TI-nspire.

4.2 BURN BABY BURN

BURNING CALORIES WHILE RUNNING

According to calculations done by the USA Track and Field group, a jogger will burn a certain number of calories per minute while running at 9 miles per hour.

The following is a graph that shows the relationship between the length of time a person is running at 9mph and the number of calories that they burn.



What variable is along the bottom of the graph (x- axis) and what variable goes along the y-axis? Justify your answer.

What conclusions about this linear situation can you conclude from the graph?

Notice that only one point is labeled on the graph. How could we find the slope for this situation based on the graph?

Will the trend of this graph continue on forever? Explain your reasoning.

TASK 1

Based on this, create a table that represents the data from the graph.

What variable goes in the left column? Justify

What variable goes in the right column? Justify

TASK 2

Create a now-next formula for how to find the price you would need to pay based on the price you would pay for one less ticket.

TASK 3

Write an equation to represent this data.

How did you come up with this equation?

Show that your equation works for this situation. Prove by graphing your equation and using the Trace function on your TI-nspire.

LESSON 5 OVERVIEW

A PROFESSIONAL'S OPINION

GOALS OF THE LESSON

This lesson is designed to help you to become familiar with linear functions that have a proportional and non-proportional relationships between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 5, the focus will be on the representation of equations. You will use an equation representation of a linear function to find out information about the linear situation and then construct a tabular representation and a graphical representation the situation.

By the end of the lesson, you should be able to explain how to find and calculate slope from an equation, locate the y-intercept from an equation, and show how to create another representation for the linear function when only given an equation.

All of these real world contexts, given in the beginning, will not provide any information on the slope or y-intercept of the function. It will just give a story line to follow and help make sense of the equation. These are used to help you learn revolving around situations that are more relevant to your lives. This topics make the tasks and lesson very interesting. The following are the contexts that are used to help you learn about linear function when only provided with an equation representation of the data.

Lesson 5.1 – Serve it to them
  Paying for Tennis Lessons

Lesson 5.2 – Swing with Everything You've Got
  Paying for Baseball Lessons

5.1 SERVE IT TO THEM

TENNIS LESSONS WITH A PROFESSIONAL

Getting a professional's opinion can really help to increase your skill level in any sport. Due to this many professional athletes will be paid a lot to help train other players. A tennis pro is paid a certain amount of money per hour for a private lesson for members in a community club.

The following is an equation that describes the price a professional tennis player will receive (P(x)) based on the number of hours they work and train members from the community club.

$$P(x) = 40x$$

What conclusions about this linear situation can you conclude from the equation?

Can we plug in any number for x into the equation? Can we have any value of x for this situation? Justify your answers.

TASK 1

Based on this, create a table that represents the data from the graph.

What variable goes in the left column?

What variable goes in the right column?

What similarities do you notice with your graph and the equation that you started with?

TASK 2

Create a now-next formula for how to find the price you would need to pay for n lessons based on the price you would pay for one less lesson.

TASK 3

What would a graph for this function look like?
Graph this situation by hand.

What similarities do you notice with your graph and the equation that you started with?

5.2 SWING WITH EVERYTHING YOU'VE GOT

PAYING FOR BASEBALL LESSONS

GREAT LAKES BASEBALL ACADEMY

Getting a professional's opinion can really help to increase your skill level in any sport. Great Lake's Baseball offers but private and group lessons to help people work on and better their skills. A major private lesson includes a session with experienced and premier Major League Baseball coaches.

The following is an equation that describes the price to pay (P(x)) for a sessions with Major League Baseball coach based on the number of sessions that you want to attend.

$P(x) = 55x + 20$

What conclusions about this linear situation can you conclude from the equation?

Can we plug in any number for x into the equation? Can we have any value of x for this situation? Justify your answers.

TASK 1

Based on this, create a table that represents the data from the graph.

What variable goes in the left column?

What variable goes in the right column?

What similarities do you notice with your graph and the equation that you started with?

TASK 2

Create a now-next formula for how to find the price you would need to pay based on the price you would pay for one less lesson.

TASK 3

What would a graph for this function look like?
Graph this situation by hand.

What similarities do you notice with your graph and the equation that you started with?

LESSON 6 OVERVIEW

REACHING NEW HEIGHTS

GOALS OF THE LESSON

This lesson is designed to get you familiar with linear functions that have a proportional and non-proportional relationships between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 6, the focus will be on the representation of tables. You will be given a table with only one row filled in to represent the sports context that they were given at the beginning on the lesson. You will use this to create their own table that will represent the linear situation that was given. This lesson emphasizes the idea of moving within one representation.

By the end of the lesson, you should be able to explain how proportional and non-proportional linear relationships are shown in tables. You should also be able to identify multiple linear functions (in the form of tables) that could represent the given sports context.

All of these real world contexts, given in the beginning, will not provide any information on the slope or y-intercept of the function. It will just give a story line to follow and help make sense of the table. These are used to help you learn revolving around situations that are more relevant to your lives. These topics make the tasks and lesson very interesting. The following are the contexts that are used to help you learn about the concepts of a linear function with only given a table representation of the data.

Lesson 6.1 – Climbing to the Top
Temperature Changes with Elevation

Lesson 6.2 – Setting High Goals
World Records for Pole Vault

6.1 CLIMBING TO THE TOP

TEMPERATURE CHANGE WITH ELEVATION

A mountain climber feels that the air temperature decreases as his elevation above sea level increases.

Let the following table represent the drop in temperature, in degrees Fahrenheit, that the mountain climber is experiencing while climbing to a higher elevation.

Complete the table with 6 other possible points that could fulfil this situation.

Elevation	Temperature
2000	60

Is this a proportional or non-proportional linear relationship? Justify your answer.

How did you chose the values that you added to the table?

Is there a limit to this pattern?

Given the values that you filled in, what would you say would be the corresponding y value to this x value if it was added to your table?

6500	

A student claimed that this was another point represented in their table from the information given at the beginning on the lesson:

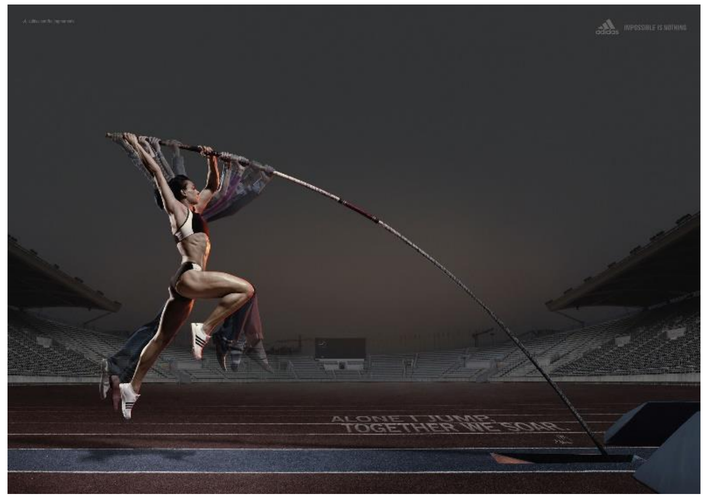
2000	**60**
3000	**75**

Does this point make sense to be a possible point on our table? Why or why not?

6.2 SETTING HIGH GOALS

POLE VAULT RECORDS

Over the years, the men's world record for pole vaulting has continued to increase.



Let the following table represent the men's world record for pole vault over the years since 1900.

Complete the table will 6 other possible points that could fulfil this situation.

Year	Height in meters
57	4.78

Is this a proportional or non-proportional linear relationship? Justify your answer.

How did you chose the values that you added to the table?

Is there a limit to this pattern? Justify your answer.

Given the values that you filled in, what would you say would be the corresponding y value to this x value if it was added to your table?

100	

A student claimed that this was another point represented in their table from the information given at the beginning on the lesson:

57	**4.78**
60	**4.5**

Does this point make sense to be a possible point on our table? Why or why not?

LESSON 7 OVERVIEW

BEND IT LIKE BECKHAM

GOALS OF THE LESSON

This lesson is designed to get you familiar with linear functions that have both a proportional and non-proportional relationships between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 7, the focus will be on the representation of graphs. You will be given a graph with only one point plotted to represent the sports context that they were given at the beginning on the lesson. You will use this to create their own graph that will represent the linear situation that they were given. This lesson emphasizes the idea of moving within one representation.

By the end of the lesson, you should be able to explain how proportional and non-proportional linear relationships are shown in graphs. You will also be able to identify multiple linear functions (in the form of graphs) that could represent the given sports context.

All of these real world contexts, given in the beginning, will not provide any information on the slope or y-intercept of the function. It will just give a story line to follow and help make sense of the graph. These are used to help you learn revolving around situations that are more relevant to your lives. This topics make the tasks and lesson very interesting. The following are the contexts that are used to help you learn about the concepts of a linear function when only provided with a graphical representation of the data.

Lesson 7.1 – Whoa, that's Hot!
 Temperature Increase While Playing on Artificial Turf

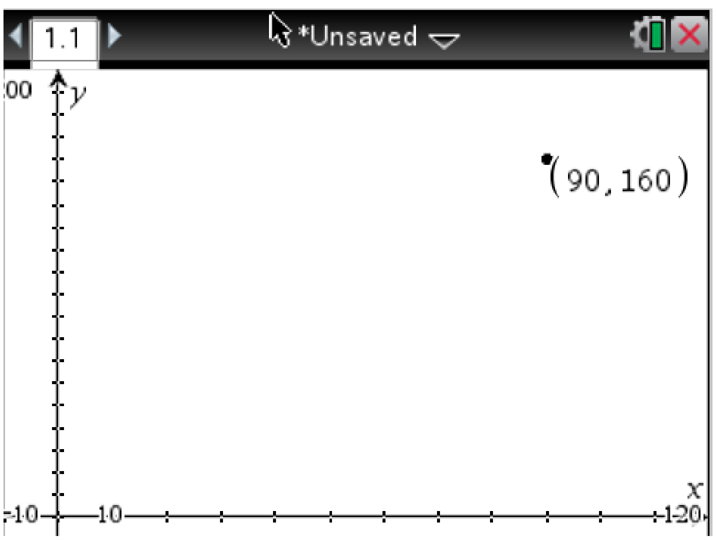
Lesson 7.2 – What a Pass!
 How Long Will it Take to Pass the Ball to Your Teammate?

7.1 WHOA, THAT'S HOT!

TEMPERATURE INCREASE WHILE PLAYING ON ARTIFICIAL TURF

A soccer player can always explain to you that playing on a turf field in the summer is way hotter than playing on a grass field. Turf can get so hot in the sun that you cannot walk on it barefoot.

The following is a graph that represents the increase of the temperature, in degrees Fahrenheit, that the soccer player can notice of the turf compared to the air temperature at that time.



What variable goes on the bottom? Justify.

What variable goes on the side (up and down)? Justify.

Draw a possible graph for this situation knowing that the point (90, 160) is on the graph and that this is a non-proportional linear relationship. (You can draw it on the graph provided)

From a graphical perspective what does it mean to be a non-proportional linear function? What does this look like on a graph?

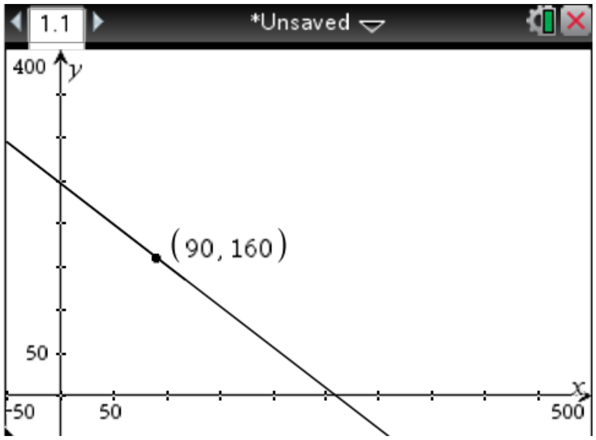
How did you create your graph?

Is there a limit to this pattern? Justify.

Given the graph you created for this situation, what would you say would be the corresponding y value to this x value if it was found on your graph?

(65, ?)

A student claimed that this was another graph that could represent the information given at the beginning on the lesson:



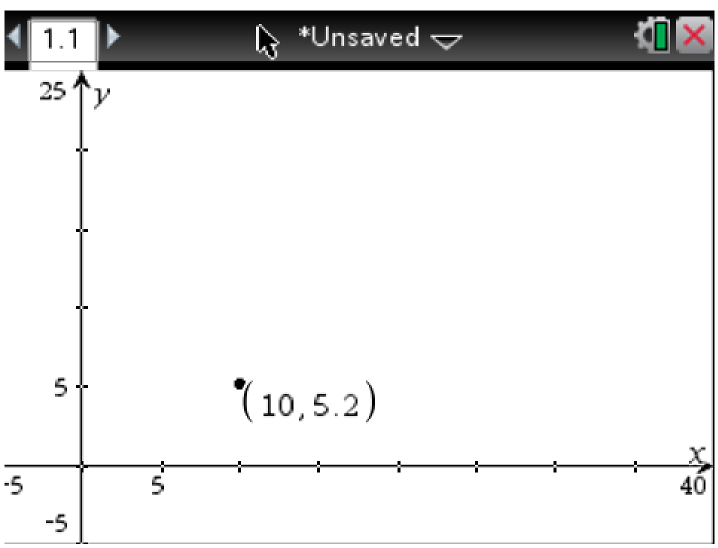
Does this make sense to be a possible graph for this situation? Why or why not?

7.2 WHAT A PASS!

HOW LONG WILL IT TAKE TO PASS THE BALL TO YOUR TEAMMATE?

It is important to make accurate passes to our teammates in a soccer game if you want your team to keep possession of the ball for the game. An accurate pass requires you to get the ball to your teammate.

The following is a graph that represents the distance the ball will travel in meters, based on the time it took to get there (in seconds), assuming the ball travels at a constant speed.



What variable goes on the horizontal axis? Justify your answer.

What variable goes on the vertical axis? Justify your answer.

Draw a possible graph for this situation knowing that the point (10, 5.2) is on the graph. You can draw it on the graph provided)

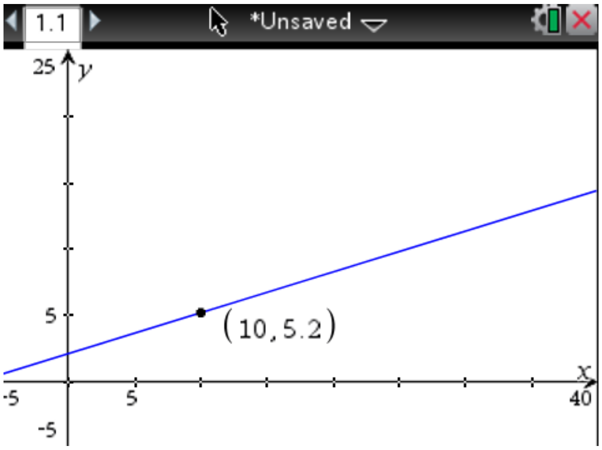
Is this situation proportional or non-proportional? Justify your answer.

Does your graph extend forever in both directions? Justify your answer.

Given the graph you created for this situation, what would you say would be the corresponding y value to this x value if it was found on your graph?

(15, ?)

A student claimed that this was another graph that could represent the information given at the beginning on the lesson:



Does this make sense to be a possible graph for this situation? Why or why not?

LESSON 8 OVERVIEW

FAMILY FUN TIME

GOALS OF THE LESSON

This lesson is designed to provide you with opportunities to become familiar with linear functions that have both proportional and non-proportional relationships between the input and output. The goal is to use real world contexts that fit this to help gather information on properties and characteristics of linear functions. In lesson 8, the focus will be on the representation of equations. You will be given an equation to represent the sports context that they were given at the beginning on the lesson. You will use this to create equivalent equations that will represent the linear situation that they were given. This lesson emphasizes the idea of moving within one representation.

By the end of the lesson, you should be able to explain how proportional and non-proportional linear relationships are shown in equations. You should also be able to identify multiple linear functions (in the form of equations) that could represent the given sports context.

All of these real world contexts, given in the beginning, will not provide any information on the slope or y-intercept of the function. It will just give a story line to follow and help make sense of the equation. These contexts are used to help you learn revolving around situations that are more relevant to your lives. These topics make the tasks and lesson more interesting and engaging. The following are the contexts that are used to help you learn about the concepts of a linear function when only given and an equation representation of the data.

Lesson 8.1 – Fore!

Putt Putt Golfing

Lesson 8.2 – Strike!

The Number of Bowling Alleys in the U.S.

8.1 FORE!

PUTT PUTT GOLFING

Craig's Cruisers is a great place to go to have some fun! One of their main attractions is the Putt Putt Golf course that they have. Who doesn't love a good game of Putt Putt?

CRAIG'S CRUISERS
FAMILY FUN CENTERS

The following is an equation that represents the price for a game of mini golf per hole that is played.

$$P(x) = \frac{1}{2}x$$

What is represented by the independent variable? Which variable is it? Justify.

What is represented by the dependent variable? Which variable is it? Justify.

Write one equation that is equivalent to this equation that could also represent this situation.

Is this situation proportional or non-proportional? Justify your answer.

Determine if the graph of this situation is a line? Justify your answer.

Does your graph extend forever in both directions? Justify your answer.

Given the equation you created for this situation, what would you say would be the corresponding y value to this x value?

(9, ?)

Given your equation, what will be the price to pay for a full game of Putt Putt Golf, assuming that there are 18 holes on the course?

Does this match the amount you must pay to play a full 18 holes of Putt Putt Golf from the intial given equation? Justify your answer.

A student claimed that this was another equation that could represent the information given at the beginning on the lesson:

$$Y=\frac{4}{2}x+7$$

Does this make sense to be a possible equation for this situation? Why or why not?

8.2 STRIKE!

THE NUMBER OF BOWLING ALLEYS IN THE US

Bowling has been a very popular sport throughout the world for many centuries. The sport was then brought to America when settlers began coming to the New World. But is it still as big of a sport now as back in the day?

The following is an equation that represents the number of bowling alleys in the United States since the year 1997.

$$B(x) = -215x + 7611$$

What is represented by the independent variable? Which variable is it? Justify.

What is represented by the dependent variable? Which variable is it? Justify.

Write one equation that is equivalent to this equation that could also represent this situation.

Is this situation proportional or non-proportional? Justify your answer.

Graph the equation. Justify the shape of your graph.

Given the equation you created for this situation, what would you say would be the corresponding y value to this x value?

(27, ?)

Given your equation, at what year is it predicted to have no more bowling alleys in the U.S.?

Does this match the year that there will be no more bowling alleys in the U.S. from using the initial given equation? Justify your answer.

A student claimed that this was another equation that could represent the information given at the beginning on the lesson:

$$Y = \frac{-645}{3}x + 7611$$

Does this make sense to be a possible equation for this situation? Why or why not?

ROLL IT ALL TOGETHER

FINAL PROJECT

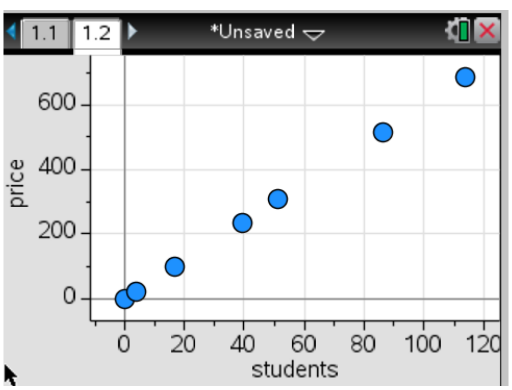
Congratulations!! You have been elected as the leader of the celebration committee for your class! This is a very exciting job, and you just got it at the perfect timing! Your teachers want to have a class skating party to celebrate the end of the year. They need your help to plan out this party. This will be your first job in your new position on the committee for the class.

Your job: You are in charge of finding a place to rent in-line roller-skates for your class at a reasonable price.

TASK 1

Use the data given to determine information about the different companies' rental rates. What do you notice about these companies?

Roll-Away Skates



Gary's Gliding Skates

# of students who attend	Total Price to Pay
0	50
5	75
19	145
25	175
55	325
56	330
120	650

Wheelie's Skates and Stuff

Charges $100 plus $4 per student

TASK 2 – COMPARING AND CONTRASTING EQUATIONS

1. For each company, write and equation for the relationship between the numbers of people renting skates and the cost.

Roll Away Skates: Gary's Gilding Skates: Wheelie's Stakes and Stuff:

How do they differ? Is anything similar between the 3 equations?

When looking at your equations what do the coefficients in front of the x represent? What do these coefficients mean in terms of cost to rent skates?

Are these linear functions proportional or non-proportional and why?

TASK 3: COMPARING AND CONTRASTING TABLES

1. Draw the different tables for the different companies.

Roll Away Skates:

Gary's Gilding Skates:

Wheelie's Stakes and Stuff:

What do you notice about all three of these tables? Are there similarities or differences? If so explain.

What are the y-intercepts are for each of the equations. What does this mean in terms of the cost to rent skates?

TASK 4: COMPARING AND CONTRASTING GRAPHS

1. Graph the equations for the three companies.

What do you notice about the different graphs? How are the similar? How are they different? Support your claims.

How would you compare the slopes of these three lines?

What do these slopes represent in terms of the different companies?

TASK 5: DECISION TIME

Which company would you choose to rent from if 100 students are planning to attend the party? Why?

Which company would you choose to rent from if 50 students are planning to attend the party? Why?

Which company would you choose to rent from if only 25 students are planning to attend the party? Why?

If your budget for skate rental is $250, how many pairs of skates can you rent from each company? How did you determine this?

TASK 6: FINAL PRESENTAITON

Last year 58 students came to the skating party, however your teacher's goal is to get more students to go. They are expecting that at there could be a max of anywhere from 80- 100 students at the party.

You need to decide which company you should choose to rent from in order to keep the cost at a minimum!

We don't know how many students will show up this year. But trusting your judgment, what is your final decision on which company to rent from for your class party? Why did you choose this company?

Create a poster to present to your teacher your final decision!
Please have the graph, table, equation, and written rule for your chosen company on your poster to back up your decision.