Title: Discovering Different Types of Functions

Brief Overview:

This lesson was designed for students who are already familiar with linear equations and is to be used as an introduction to quadratic and exponential functions. In the lesson, students will be graphing experimental data on a coordinate plane. They will then analyze and describe the graphs as linear, exponential or quadratic.

NCTM Content Standard/National Science Education Standard:

- Students will understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions.

- Students will identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships.

- Students will draw reasonable conclusions about a situation being modeled.

- Students will approximate and interpret rates of change from graphical and numerical data.

- Students will make decisions about units and scales that are appropriate for problem situations involving measurement.

- Students will judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitudes of quantities.

Grade/Level:

High School Algebra I.

Duration/Length:

Five 45-minute lessons.

Student Outcomes:

Students will be able to:

- Graph experimental data.
- Recognize graphs of linear, exponential and quadratic functions.
- Describe the behavior of linear, exponential and quadratic functions.
- Classify functions as linear, exponential or quadratic.

Materials and Resources:

- Scale
- Bowl of jellybeans
- TI Graphing calculator with EasyData software installed
- Tape measure
- Tape for marking distances on floor
- CBR motion detector
- Beach ball
- Scissors (two or three pairs)
- Red, Orange, Green and Blue markers or crayons
- Rulers (three or four)
- Overhead Projector
- Copies of Worksheets
    - Jelly Bean Trials
    - Matching Graphs
    - Sketching Functions
    - Station Instructions
    - Station Data Collection
    - Stations
    - Discovering Functions – Station Activities

Development/Procedures:

Lesson 1

Pre-assessment – In a "Think, Pair, Share" activity, students should list all the things they know about linear functions. In a class discussion, be sure that the following topics are included:

- Straight lines
- Slopes and intercepts
- Adding/subtracting a constant rate of change in a table of values
- $y = mx + b$

Launch/Teacher Facilitation – Distribute copies of "Jelly Bean Trials" to the students. Experiment One will produce data which follows a general linear pattern. At teacher's discretion, this demonstration can be completed either as a class or in several groups working simultaneously. Post or verbally explain the following steps for students to complete Experiment One.

- Weigh one jellybean on the scale. Have students record the weight on their worksheets.

- Add two more jellybeans to the scale. Have students note "+2" in the change column and record the resulting weight.
- Continue adding two jellybeans at a time and recording the resulting weights.
- Emphasize that our pattern was created by *adding the same amount* of jellybeans each time.

Continue with "Jelly Bean Trials" to complete Experiment Two, which will produce data which generally follows a quadratic pattern. Post or verbally explain the following steps for students to complete Experiment Two.

- Question: "Are all graphs straight lines? Let's see…"
- Weigh 10 jellybeans on the scale. Have students record the weight on their worksheets.
- *Remove* five jellybeans from the scale. Have students record weight.
- *Remove* three jellybeans from the scale. Have students record weight.
- Question: "Is there a pattern to how many jellybeans I am removing? How many jellybeans should I remove now?"
- *Remove* one jellybean from the scale. Have students record weight.
- Question: "What should I do next?"
- *Add* one jellybean to the scale. Have students record weight.
- *Add* three jellybeans to the scale. Have students record the weight.
- Emphasize that our pattern was created by *adding a changing amount* of jellybeans each time.

Continue with "Jelly Bean Trials" to complete Experiment Three, which will produce data which generally follows an exponential pattern. Post or verbally explain the following steps for students to complete Experiment Three.

- Weigh one jellybean on the scale. Have students record the weight on their worksheets.
- Now weigh 3 jellybeans. Have students record the weight.
- Now weigh 9 jellybeans. Have students record the weight.
- Question: "Is there a pattern to how many jellybeans I am weighing? How many jellybeans should I have now?"

- Place 27 jellybeans on the scale. Have students record the weight.
- Emphasize that our pattern was created by *multiplying* the amount of jellybeans *by the same number* each time.

Lesson 2

Launch – As a class, brainstorm the results noted from yesterday's experiments. Take time to discuss the results and any patterns noticed.

Teacher Facilitation – Instruct students to graph the data obtained from the previous day's activities. Note that the teacher may need to take time to remind students about the characteristics of scatterplots, and the parts of graphing (such as axis labels and units). It is important to note that the graphs relate *trial number* to weight, and not number of jelly beans to weight. (Graphs that relate weight to number of jelly beans will only produce linear correlations.)

Student Application – Students work in groups to answer discussion questions which follow the graphing portion of "Jelly Bean Trials."

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Embedded Assessment – The teacher circulates through the room, asking guided questions and addressing any problems that students may have.

Reteaching/Extension – The teacher utilizes classwork time to address any reteaching. If extra time allows, have a class discussion to examine the answers to the worksheet and summarize the conclusions that can be reached from the jelly bean experiments.

Lesson 3

Preassessment – Students complete the worksheet, "Matching Graphs." As a class, go over answers.

Teacher Facilitation – As a class, complete the guided notes from "Jelly Bean Trials." Suggest this memory aid to students:

- Linear – Straight Lines
- Quadratic – Mountains or Valleys
- Exponential – Always increases or decreases but at a different rate.

Student Application – Working in groups, students complete "Sketching Functions".

Embedded Assessment – The teacher circulates through the room, asking guided questions and addressing any problems that students may have. The teacher may, at his/her discretion, collect the worksheets.

Reteaching/Extension – The teacher utilizes classwork time to address any reteaching.

Lesson 4

Pre-assessment – Review answers to "Sketching Functions" from the previous day.

Launch – As a class, brainstorm the differences between linear, quadratic and exponential functions.

Teacher Facilitation – Before class, create six stations in the classroom. Post attached "Station Instructions" at each station. During class, give a brief overview of each station to students.

1. STATION ONE
   - Setup: Tape measure
   - Overview: Students will use the tape measure to record the heights and arm spans of each student in the group.
2. STATION TWO
   - Setup: Graphing calculator attached to a CBR motion detector; beach ball
   - Setting up CBR:
     - Connect the graphing calculator to the CBR
     - Under the APPS menu, select EasyData.
     - Select Setup and 2 to select Time Graph.
     - Make sure the default settings are selected:
       - Sample Interval – 0.05
       - Number of Samples – 100
       - Experiment Length – 5
     - Select OK.
   - Overview: Students will use the CBR to create the graph of a beach ball tossed up in the air and allowed to fall.
3. STATION THREE
   - Setup: Blank sheets of paper (one for each group); a few pairs of scissors; red, green, orange and blue markers or crayons

- Overview: Students will be cutting the paper into three pieces. They will subsequently cut each piece into three further pieces. They will continue this process and count the total number of pieces after each cutting.

4. STATION FOUR
   - Setup: Overhead projector; tape marking an X on the floor close to the wall; tape labeling various distances away from the X (2, 3, 4 and 5 feet); ruler or tape measure
   - Overview: One student will hold a pencil in front of the overhead projector so it casts a shadow on the wall. Students will measure the length of the shadow with the overhead projector at various distances from the student.
5. STATION FIVE
   - Setup: Copies of Rectangles; ruler
   - Overview: Students will measure and record the length of the base and area of various rectangles.
6. STATION SIX
   - Setup: Copies of Generations (one copy for each group)
   - Overview: Students will create a fictional family tree and record the number of people in each generation.

Student Application – Divide students into six groups. Distribute the Station Data Collection worksheet to each student. Each group is assigned a starting station. After five minutes, the teacher instructs groups to rotate stations. At each station, students are to complete the posted activity and write their answers in the corresponding section of their answer sheet. Note that at this time students are only gathering data. During Lesson 5, students will apply and analyze the data.

Embedded Assessment – The teacher circulates through the room, asking guided questions and addressing any problems that students may have. The teacher may, at his/her discretion, collect the worksheets or assign any incomplete worksheets as homework.

Reteaching/Extension – The teacher utilizes classwork time to address any reteaching. The teacher should encourage to review their notes in preparation for the quiz after the next day's lesson.

Lesson 5

Pre-assessment – Working in groups, students take a sheet of paper and fold it to create three columns. Students label each

column “Linear”, “Quadratic” and “Exponential”. Students work with their groups to brainstorm as much as they can think of about each type of graph. Encourage students to consider:

- The shape of the graph
- Which experiments might have yielded each type of graph
- Any vocabulary that is associated with each graph

Teacher Facilitation/Student Application – Working in groups, students answer the questions on “Discovering Functions – Station Activities.”

Embedded Assessment – Students complete the summative assessment.

Reteaching/Extension – The teacher utilizes classwork time to address any reteaching. If necessary, a brief review session may precede the quiz assessment.

Summative Assessment:

Following Lesson Five, students complete the summative assessment.

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Jelly Bean Trials
Lesson 1

Name:_____
Date: _____

Directions: Fill in each of the following tables with the data collected from class experiments.

Experiment One

Trial #	Number of jellybeans	Change in number of jellybeans	Weight
1	1	----------	
2			
3			
4			
5			
6			

Experiment Two

Trial #	Number of jellybeans	Change in number of jellybeans	Weight
1	10	----------	
2			
3			
4			
5			
6			

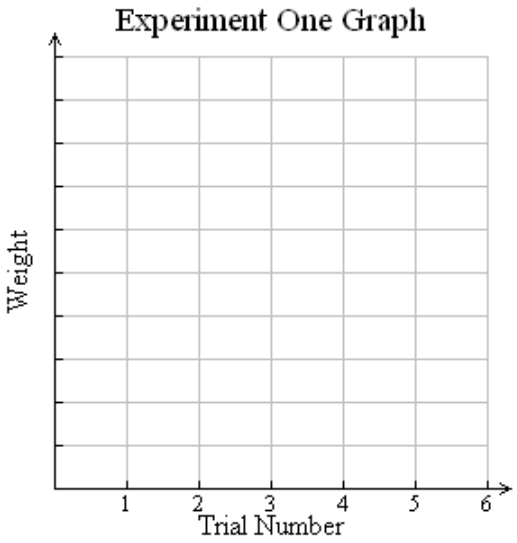
Experiment Three

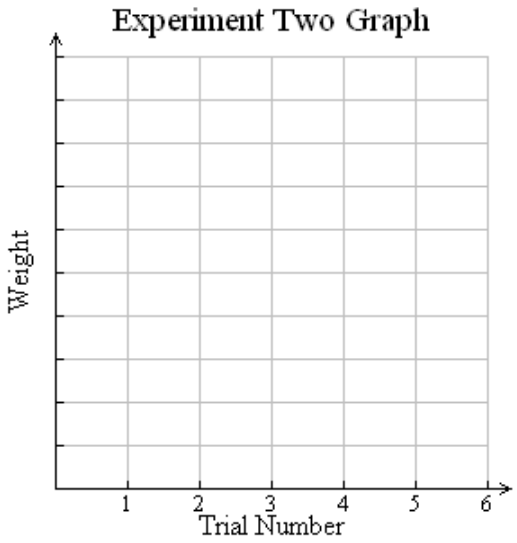
Trial #	Number of jellybeans	Change in number of jellybeans	Weight
1	1	----------	
2			
3			
4			

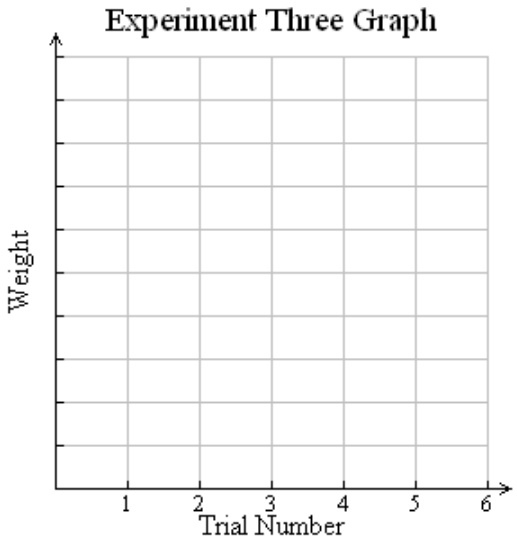
Jelly Bean Trials
Lesson 2

Name:_____
Date: _____

Directions: Graph the data from yesterday on the corresponding grids below. Answer the discussion questions that follow.







Discussion Questions

1) Describe the shape of the graph from Experiment One.

_____

_____

2) Describe the shape of the graph from Experiment Two.

_____

_____

3) Describe the shape of the graph from Experiment Three.

_____

_____

4) Do any of the graphs seem to “change direction”?

_____

_____

5) Which graph’s values seem to get the largest fastest? Why?

_____

_____

6) For Experiments two and three, compare the slope at trial 2 and trial 4?

_____

_____

Jelly Bean Trials
Lesson 1

Name:__**ANSWER KEY**__
Date: _____

Directions: Fill in each of the following tables with the data collected from class experiments.

Experiment One

Trial #	Number of jellybeans	Change in number of jellybeans	Weight
1	1	----------	*Answers vary*
2	3	+2	
3	5	+2	
4	7	+2	
5	9	+2	
6	11	+2	

Experiment Two

Trial #	Number of jellybeans	Change in number of jellybeans	Weight
1	10	----------	*Answers vary*
2	5	-5	
3	2	-3	
4	1	-1	
5	2	+1	
6	5	+3	

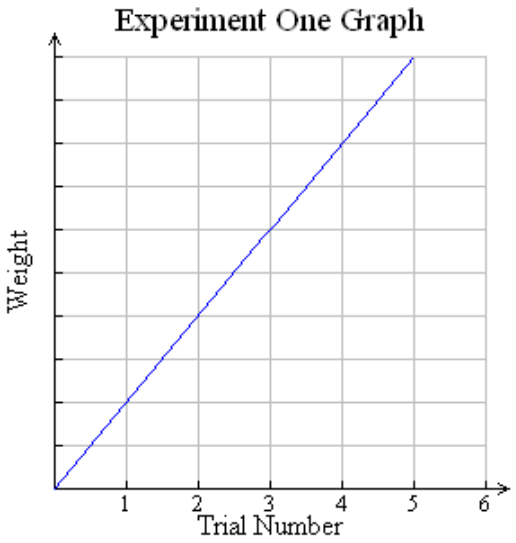
Experiment Three

Trial #	Number of jellybeans	Change in number of jellybeans	Weight
1	1	----------	*Answers vary*
2	3	+2	
3	9	+6	
4	27	+18	

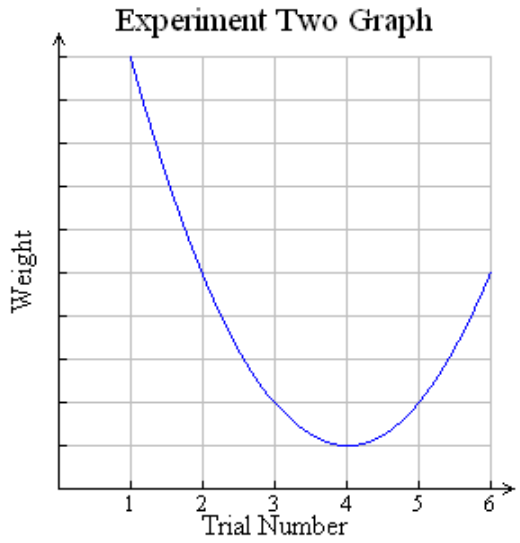
Jelly Bean Trials
Lesson 2

Name:_____
Date: _____

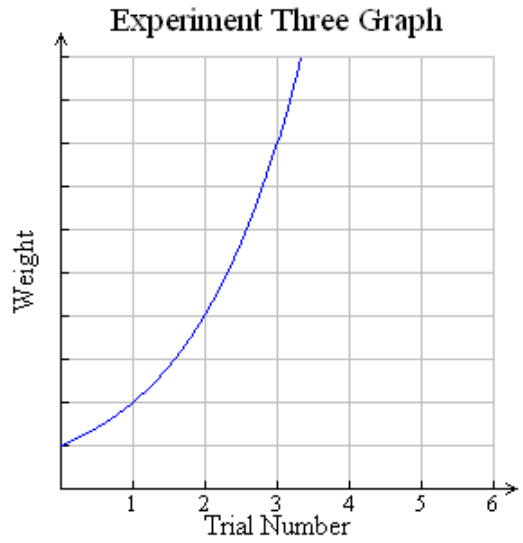
Directions: Graph the data from yesterday on the corresponding grids below. Answer the discussion questions that follow.



Graph will appear linear



Graph will appear quadratic



Graph will appear exponential

Discussion Questions

1) Describe the shape of the graph from Experiment One.

Graph will be a straight line. It has a constant rate of change. This is a linear function.

2) Describe the shape of the graph from Experiment Two.

The graph changes direction. It starts out going down, then ends up going up. The slope seems to change.

3) Describe the shape of the graph from Experiment Three.

It gets bigger and bigger. It grows very fast. The slope is positive.

4) Do any of the graphs seem to "change direction"?

The second graph seems to change direction. It starts going up after it went down

5) Which graph's values seem to get the largest fastest? Why?

Graph 3 got the biggest the fastest. It went from 1 to 27 by trial 4.

6) For Experiments two and three, compare the slope at trial 2 and trial 4?

The slope does not look the same. The slope is changing for both Experiment 2 and Experiment 3 between trial 2 and 4. It goes from negative to positive for Experiment 2. It gets steeper in Experiment 3.

Matching Graphs

Name: _____
Date: _____

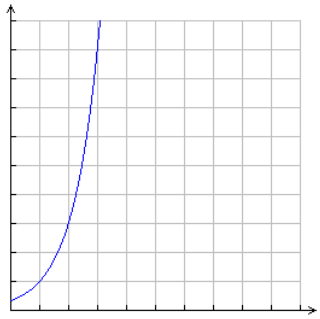
Directions: Match each of the following situations with one of the graphs (A. B. C.) displayed below.

Situation One:
You see 1 ant in your house on Monday. You see 4 ants in your house on Tuesday. You see 16 ants in your house on Wednesday. Each day there are 4 times the amount from the day before.

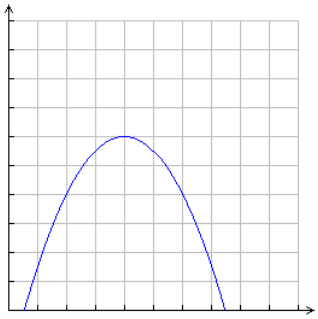
Situation Two:
Every week you save $10. After 1 week you have $20. After 2 weeks you have $30. After 3 weeks you have $40, and so on.

Situation Three:
You throw a ball straight up in the air and notice after 1 second the ball is 26 meters from the ground, after 2 seconds the ball is 41 meters from the ground, after 3 seconds 46 meters, after 4 seconds it is 41 meters, after 5 seconds it is 26 meters, and at 6 seconds it hits the ground.

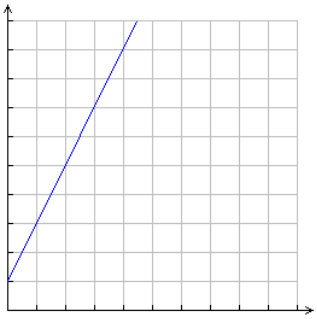
A



B



C



Matching Graphs

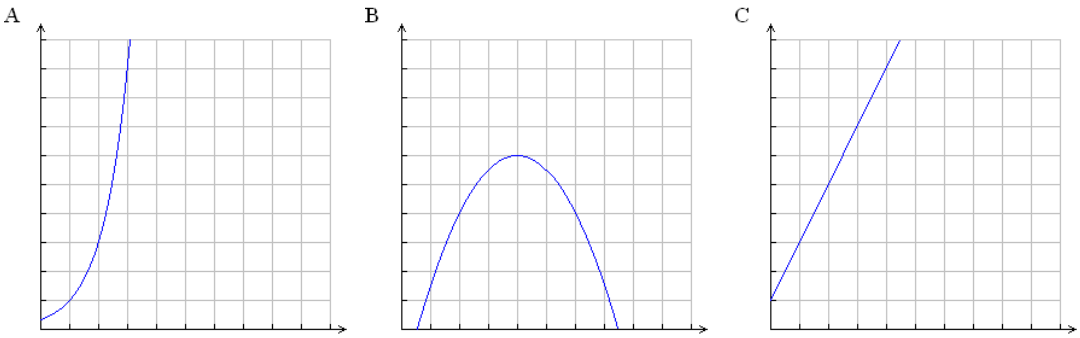
Name: __**ANSWER KEY**__
Date: _____

Directions: Match each of the following situations with one of the graphs (A. B. C.) displayed below.

Situation One:
You see 1 ant in your house on Monday. You see 4 ants in your house on Tuesday. You see 16 ants in your house on Wednesday. Each day there are 4 times the amount from the day before.

Situation Two:
Every week you save $10. After 1 week you have $20. After 2 weeks you have $30. After 3 weeks you have $40, and so on.

Situation Three:
You throw a ball straight up in the air and notice after 1 second the ball is 26 meters from the ground, after 2 seconds the ball is 41 meters from the ground, after 3 seconds 46 meters, after 4 seconds it is 41 meters, after 5 seconds it is 26 meters, and at 6 seconds it hits the ground.



Answers: 1) A
2) C
3) B

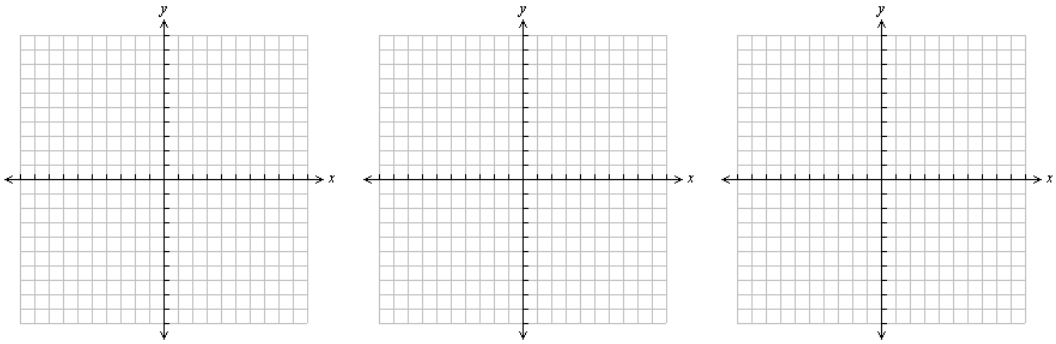
Different Types of Functions
Notes

Name: _____
Date: _____

Linear Functions:

- When graphed, linear functions look like _____.
- The rate of change is _____.
- What happens to *y* every time *x* increases by 1? _____

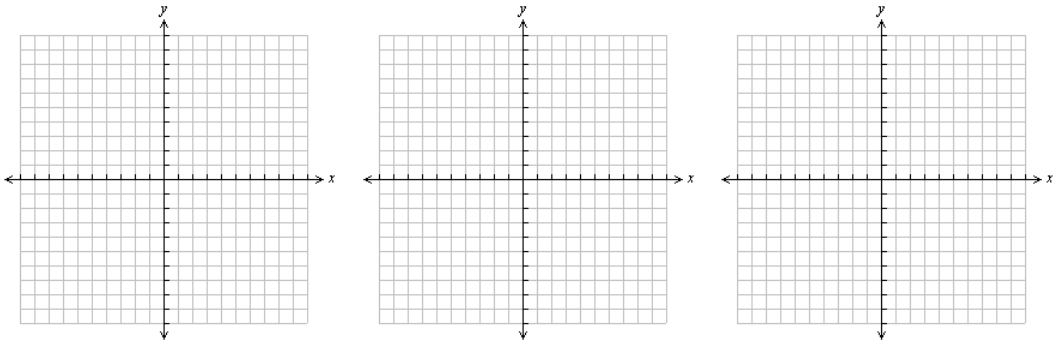
On the coordinate planes below, sketch three different linear functions:



Quadratic Functions

- When graphed, quadratic functions form a special curve called a _____. These shapes are _____ and can open _____.
- Quadratic functions are different from linear functions in that they _____.
- Every time *x* goes up by one, *y* is increased or decreased by _____.

On the coordinate planes below, draw three different quadratic functions.



Exponential Functions

- Exponential functions are similar to quadratic functions in that they are

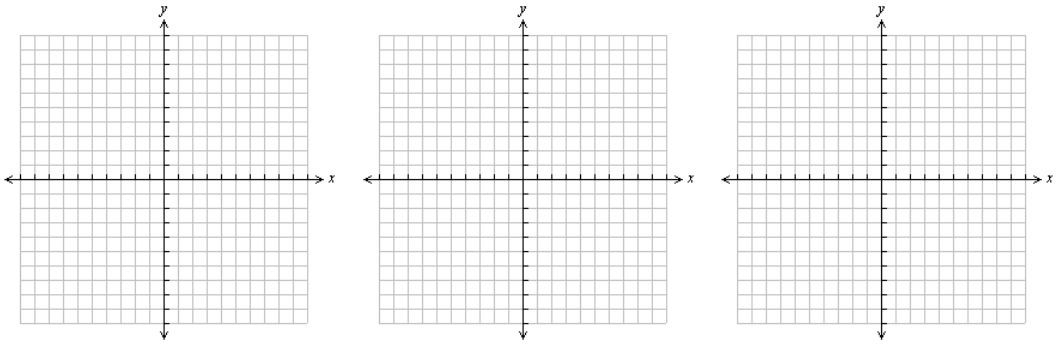
  _____, and not _____.

- Exponential functions are similar to linear functions in that they are always

  _____.

- Every time *x* increases by 1, *y* is _____.

On the coordinate planes below, draw three different exponential functions.



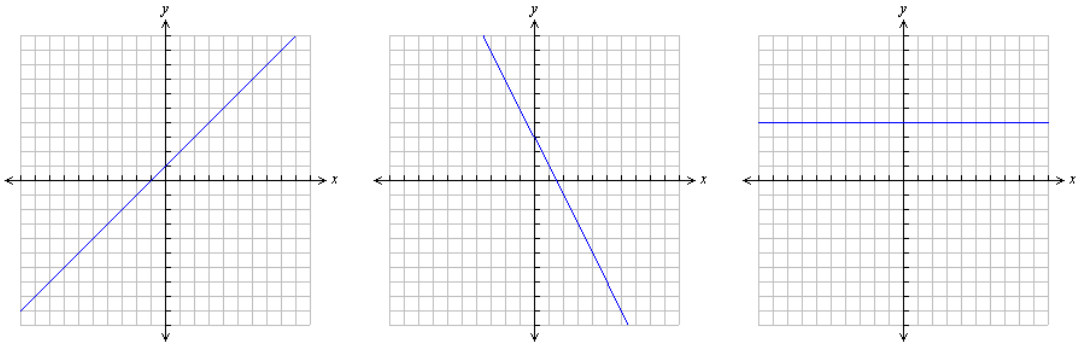
Different Types of Functions
Notes

Name: __**ANSWER KEY**__
Date: _____

Linear Functions:

- When graphed, linear functions look like _straight lines_____.
- The rate of change is _constant_____.
- What happens to *y* every time *x* increases by 1? *y* increases or decreases by the *same amount*

On the coordinate planes below, sketch any three linear functions:

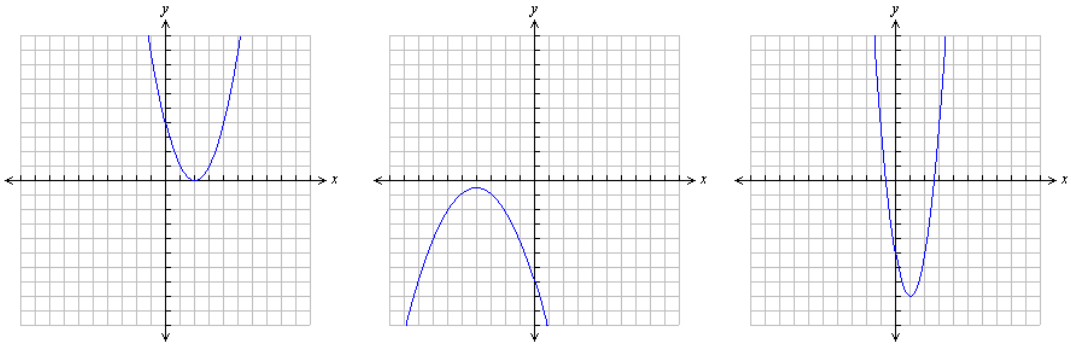


(Student answers will vary.)

Quadratic Functions

- When graphed, quadratic functions form a special curve called a _parabola_____. These shapes are __symmetric_____ and can open __up or down_____.
- Quadratic functions are different from linear functions in that they _____change directions_____.
- Every time *x* goes up by one, *y* is increased or decreased by ___a *changing* amount_____.

On the coordinate planes below, draw three different quadratic functions.

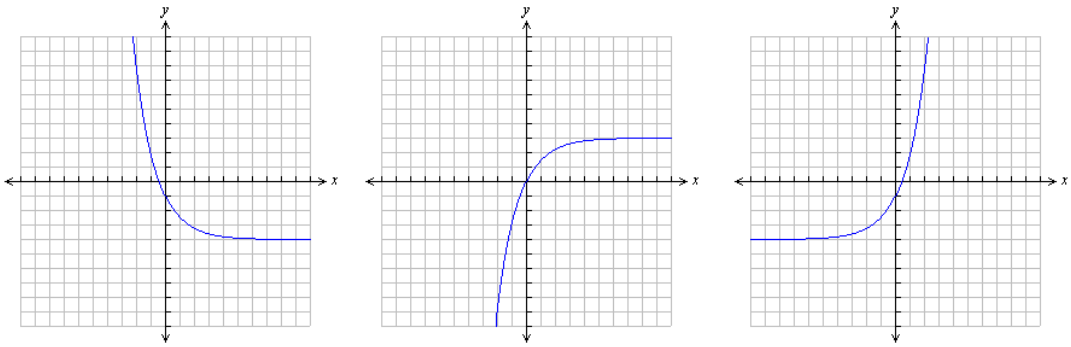


(Student answers will vary.)

Exponential Functions

- Exponential functions are similar to quadratic functions in that they are __curves_____, and not _straight lines_____.
- Exponential functions are similar to linear functions in that they are always __increasing or decreasing, they do not change direction_____.
- Every time *x* increases by 1, *y* is __being multiplied or divided by a number___.

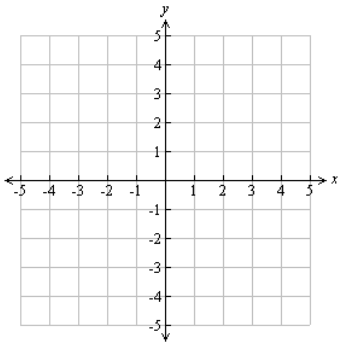
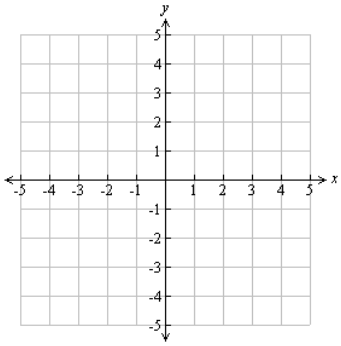
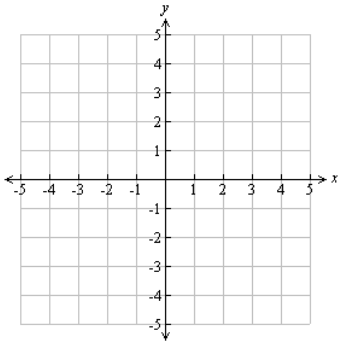
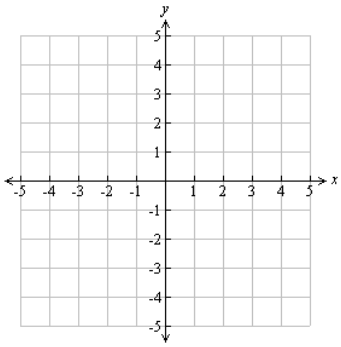
On the coordinate planes below, draw three different exponential functions.

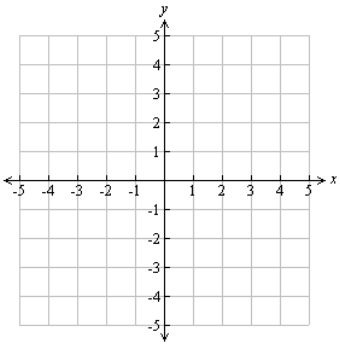
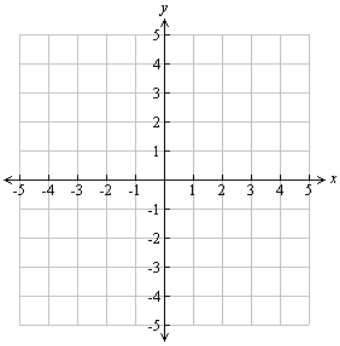
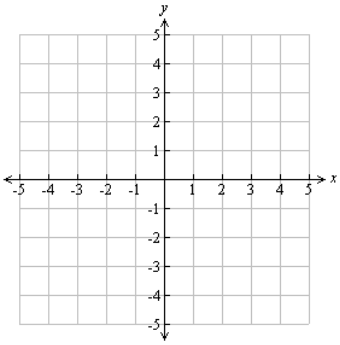
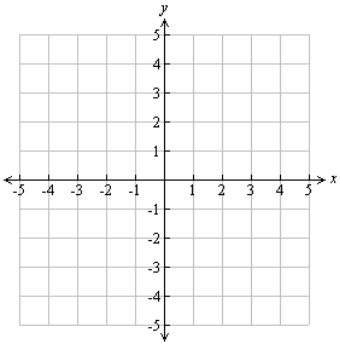


(Student answers will vary.)

Sketching Functions Name: _____

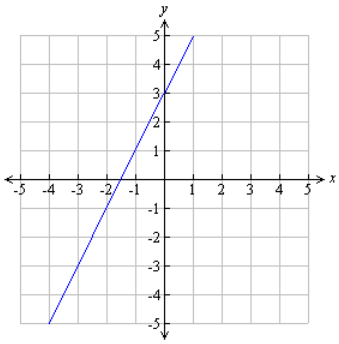
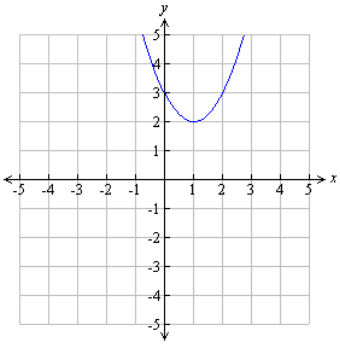
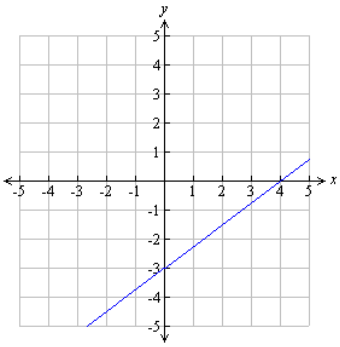
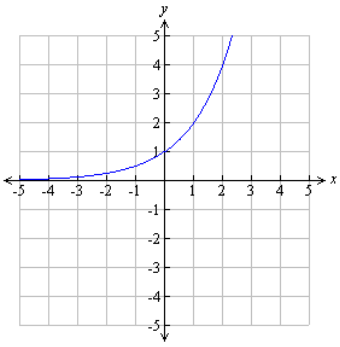
Directions: Use the graphing calculator to sketch each function on the grid provided. Identify each function as either linear, quadratic or exponential.

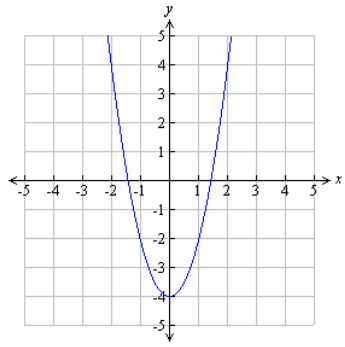
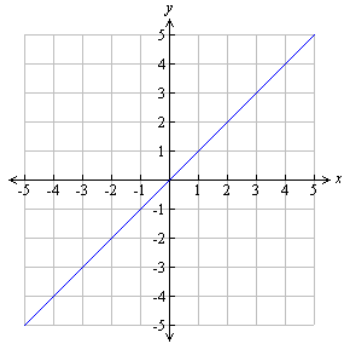
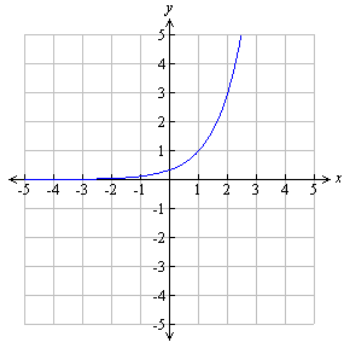
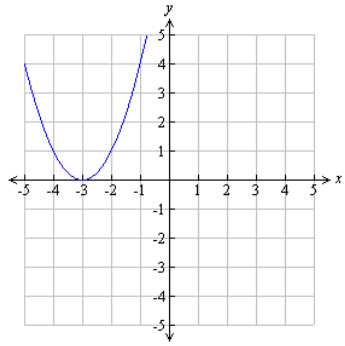
Equation	Graph	Type of Function
$y = 2x + 3$		
$y = x^2 - 2x + 3$		
$y = \frac{3}{4}x - 3$		
$y = 2^x$		

Equation	Graph	Type of Function
$y = 2x^2 - 4$		
$y = x$		
$y = 3^{(x-1)}$		
$y = x^2 + 6x + 9$		

Sketching Functions Name: __**ANSWER KEY**__

Directions: Use the graphing calculator to sketch each function on the grid provided. Identify each function as either linear, quadratic or exponential.

Equation	Graph	Type of Function
$y = 2x + 3$		Linear
$y = x^2 - 2x + 3$		Quadratic
$y = \frac{3}{4}x - 3$		Linear
$y = 2^x$		Exponential

Equation	Graph	Type of Function
$y = 2x^2 - 4$		Quadratic
$y = x$		Linear
$y = 3^{(x-1)}$		Exponential
$y = x^2 + 6x + 9$		Quadratic

Station One – Arm Span vs. Height

1. Take the measuring tape supplied and measure the height and arm span of each member of your group. (Arm span is the distance from the tip of your right middle finger to the tip of your left middle finger.)
2. Next to each row, write the name of a member of the group. In column 1 fill in this member's height, in column 2 fill in this member's arm span.
    - Be sure to record using inches only.
    - Make sure that all members of the group are measured.

Station Two – Beach Ball Toss

In this station you will record the path a beach ball makes as it is thrown in the air.

1. Practice gently tossing the ball upward a few feet. Keep these guidelines in mind:
    - Make sure the ball goes straight up and down (and not to either side).
    - Do not let the ball hit the ceiling.
    - Catch the ball before it hits the ground.

    Practice this step several times until you can be sure to toss the ball correctly.
2. Hold the beach ball at waist level, right above the motion detector.
3. Hit start on the calculator.
4. Wait one second, then gently toss the ball upward. *Catch the ball before it hits the motion detector*.
5. Record the resulting graph from the calculator onto your worksheet. Only record from when the ball left your hands to when the ball came back down and was caught.

Station Three – Cutting Paper

1. Take a single sheet of paper and mark it with an orange X. Record the number 1 (for one sheet of paper) next to “Trial One” on your worksheet.
2. Cut your paper into three pieces. Put a green X on each piece. How many total pieces do you have now? Record this amount next to “Trial Two” on your worksheet.
3. Cut each green piece into three more pieces. Put a red X on each resulting piece. How many total “Red X” pieces do you have now? Record this amount next to “Trial Three” on your worksheet.
4. Cut each red piece into three more pieces. Put a blue X on each resulting piece. How many total “Blue X” pieces do you have now? Record this amount next to “Trial Four” on your worksheet.

Station Four – Shadows

1. Look at the different marks on the floor. Place the overhead projector at the 5 feet mark on the floor facing the wall.
2. Have a student stand on the X and hold a pencil so that you can see its shadow on the wall.
3. Use a ruler and measure the length of the shadow of the pencil on the wall. Record this information on the worksheet provided next to “5 ft. away”.
4. Place the overhead projector at the 4 feet mark on the floor facing the wall. *Do not adjust the focus of the projector!*
5. Have a student stand on the marked area on the floor and record the shadow of the pencil on the worksheet provided next to “4 ft. away”.
6. Place the overhead projector at the 3 feet mark on the floor facing the wall.
7. Have a student stand on the marked area on the floor and record the shadow of the pencil on the worksheet provided next to “3 ft. away”.
8. Place the overhead projector at the 2 feet mark on the floor facing the wall.
9. Have a student stand on the marked area on the floor and record the shadow of the pencil on the worksheet provided next to “2 ft. away”.
10. Fill in the chart provided and find the first differences of the data.

Station Five – Length and Area

1. In front of you are 5 rectangles. Each of these rectangles has the same perimeter. You are going to compare the base of each rectangle with the area of each rectangle.

2. For each Rectangle, use a ruler and measure the length of the base. Record this length (in inches) in the space provided.

3. Now find the area of each rectangle and record this information (in in^2) in the space provided.

4. Fill in the chart provided. Find the first and second differences for the information

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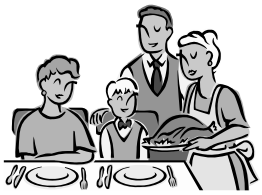


Station Six – Ancestry

1. Take a copy of “Henry’s Family Tree”

2. Record the number of parents that Henry has in the column next to “parents”.

3. Record the number of grandparents that Henry has in the column next to “grandparents”.

4. Draw in great grandparents for Henry and record the number of great grandparents in column next to “great grandparents”.

5. How many great-great grandparents will Henry have? Record this in the space provided.

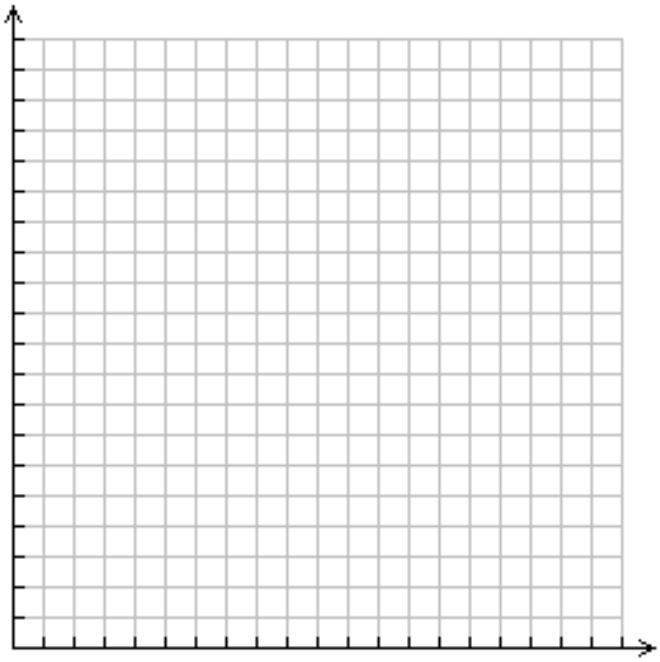
6. How many great-great-great grandparents will Henry have? Record this in the space provided.

7. Fill in the chart provided. Find the first and second differences for this data.

Station One

Student Name	Height (inches)	Arm Span (inches)

Station Two



Station Three

Trial	Colored X	Total Pieces of Paper Remaining
1	Orange	
2	Green	
3	Red	
4	Blue	

Station Four

Projector Distance	Length of Shadow
5 feet	
4 feet	
3 feet	
2 feet	

Station Data Collection

Projector Distance	5 ft	4 ft	3 ft	2 ft
Shadow Length				

First Difference:

Station Five

Rectangle	Length of Base (inches)	Area of Rectangle (square inches)
A		
B		
C		
D		
E		

Table	Rectangle A	Rectangle B	Rectangle C	Rectangle D	Rectangle E
Area					

First Difference:

Second Difference:

Station Six

Station Data Collection

Generation		How Many?
1	Parents	
2	Grandparents	
3	Great-Grandparents	
4	Great-Great-Grandparents	
5	Great-Great-Great-Grandparents	

Generation	Generation 1	Generation 1	Generation 1	Generation 1	Generation 1
How Many					

First Difference:

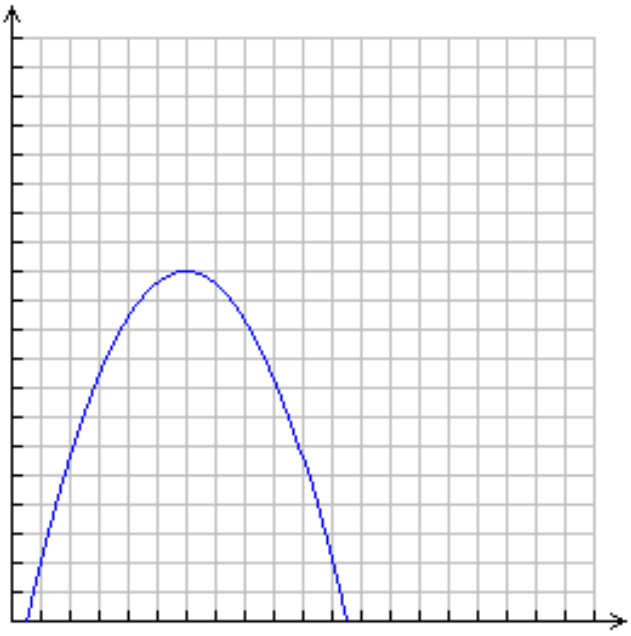
Second Difference:

Station One

Student Name	Height (inches)	Arm Span (inches)
Student answers will vary.		

Station Two

(*Sample graph. Student answers will vary.*)



Station Three

Trial	Colored X	Total Pieces of Paper Remaining
1	Orange	1
2	Green	3
3	Red	9
4	Blue	27

Station Four

Projector Distance	Length of Shadow
5 feet	*Student answers will vary.*
4 feet	
3 feet	
2 feet	

Projector Distance	5 ft	4 ft	3 ft	2 ft
Shadow Length				

Difference:

Answers will vary but will show a linear relationship

Station Five

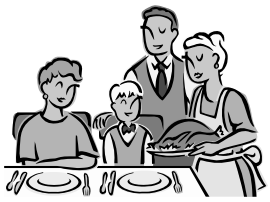
Rectangle	Length of Base (inches)	Area of Rectangle (square inches)
A	*1*	*5*
B	*2*	*8*
C	*3*	*9*
D	*4*	*8*
E	*5*	*5*

	Rectangle A	Rectangle B	Rectangle C	Rectangle D	Rectangle E
Area	5	8	9	8	5

First Difference: 3, 1, -1, -3

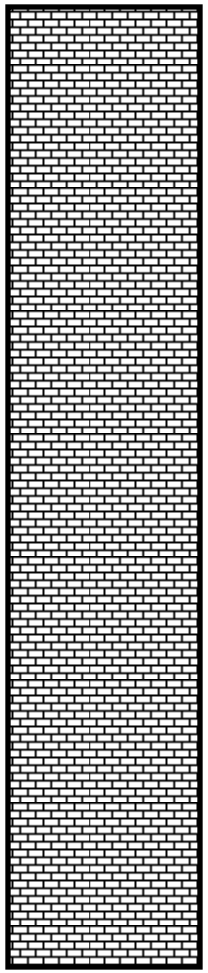
Second Difference: -2, -2, -2

Station Six

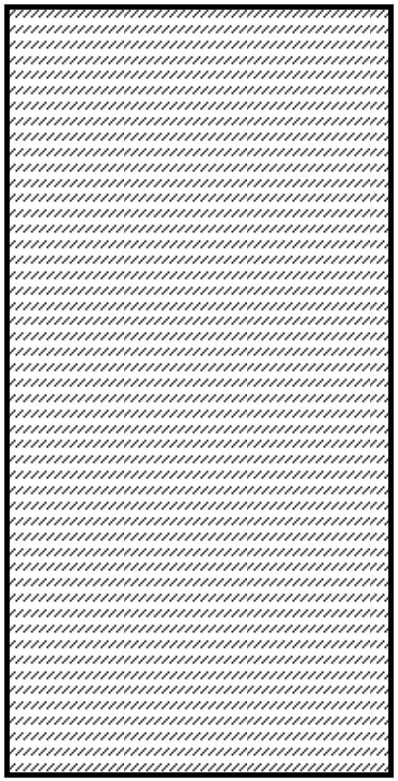


Generation		How Many?
1	Parents	*2*
2	Grandparents	*4*
3	Great-Grandparents	*8*
4	Great-Great-Grandparents	*16*
5	Great-Great-Great-Grandparents	*32*

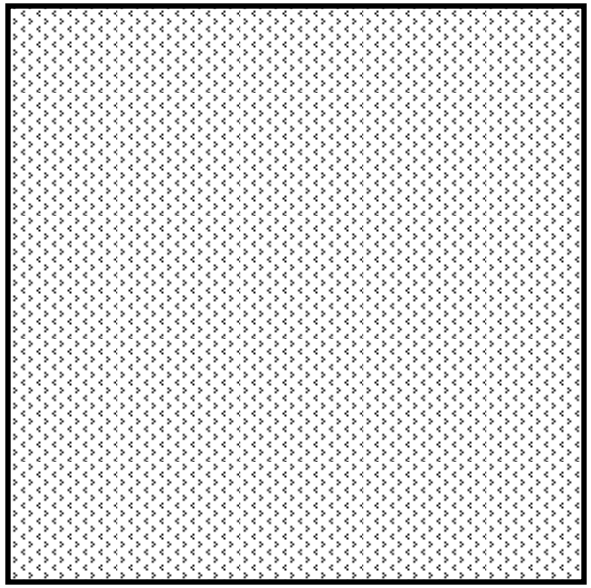
	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5
How many:	2	4	8	16	32
First Difference	2	4	8	16	
Second Difference		2	4	8	



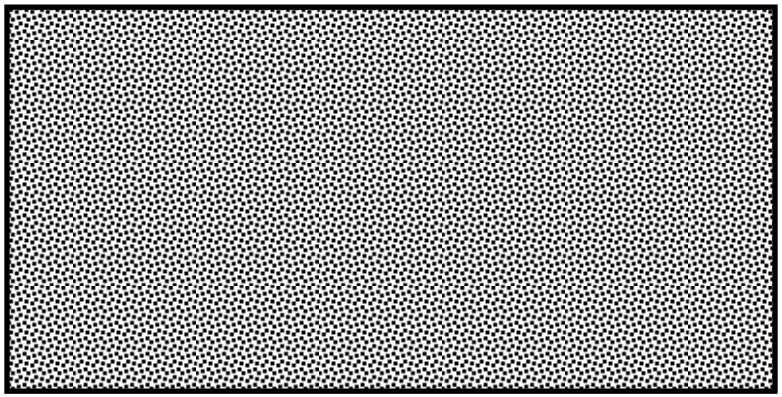
Rectangle A



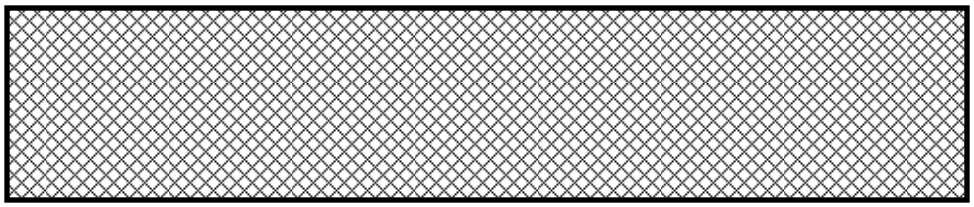
Rectangle B



Rectangle C



Rectangle D



Rectangle E

Ancestry

How many parents does Henry have? How many grandparents does he have? Now draw great-grandparents for Henry. How many does he have? Do you see a pattern? Record the number of great-great grandparents and great-great-great grandparents.

Henry's Family

Generation One — Mom — Dad

Generation Two _____ _____ _____ _____

Generation Three

Generation Four

Generation Five

Generation One _____

Generation Two _____

Generation Three _____

Generation Four _____

Generation Five _____

Ancestry

How many parents does Henry have? Record this in the first column, next to generation one. Now draw grandparents for Henry. How many does he have? Record this number next to generation two. Now draw great-grandparents for Henry. How many does he have? Do you see a pattern? Record the number of great-great grandparents and great-great-great grandparents.

Henry's Family

Generation One — Mom — Dad

Generation Two _____ _____ _____ _____

Generation Three

Generation Four

Generation Five

Generation One ___2___

Generation Two ___4___

Generation Three ___8___

Generation Four ___16___

Generation Five ___32___

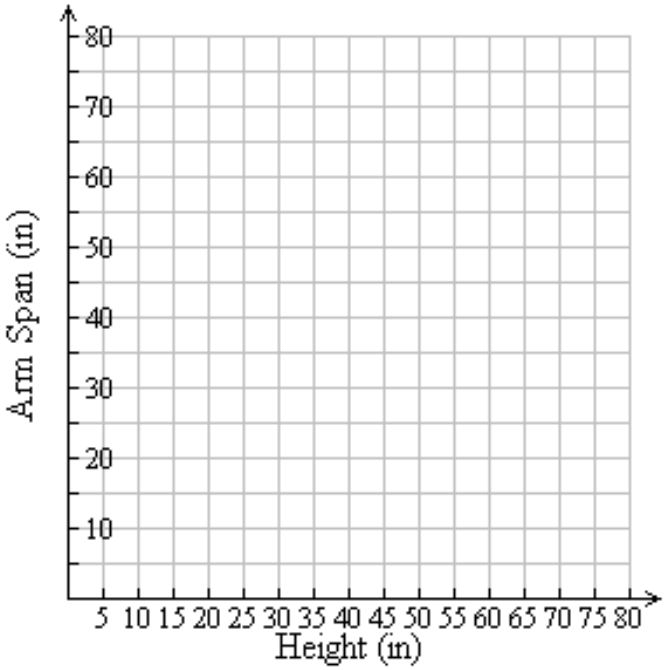
Discovering Functions – Station Activities

Name: _____
Date: _____

Directions: Using the data collected from each of the 6 Experiments, complete the following activities dealing with the relationships explored.

STATION ONE

1) Using the data from Station 1. Graph the relationship between Height (*x* axis) and arm span (*y* axis).



2) What type of relationship does this resemble? Why?

_____

_____

STATION TWO

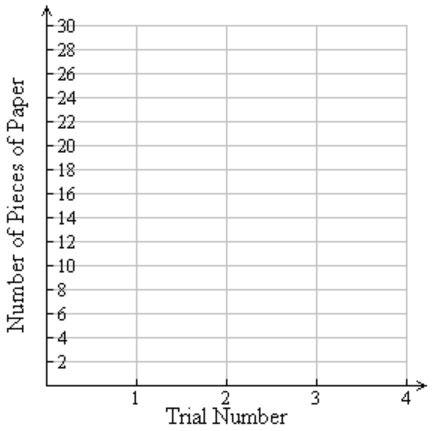
3) What type of function does the graph from Station 2 seem to show? Why?

_____

_____

STATION THREE

4) In the graph provided below, plot the information gathered from Station 3.



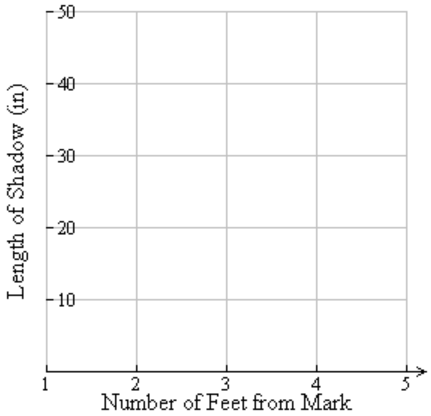
5) What type of relationship (liner, quadratic, exponential) is represented by this graph? What are the reasons it fits this type of function?

_____

_____

STATION FOUR

6) Plot the relationship between distance and shadow length from Station 4 on the axes below:



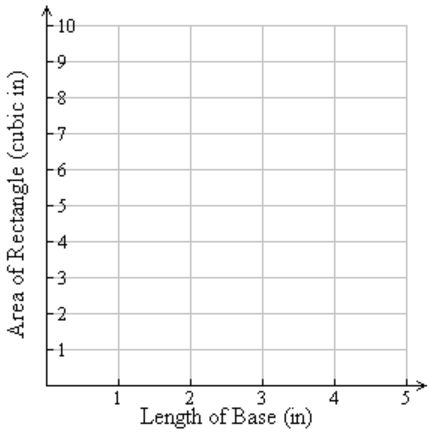
7) What type of function best describes the relationship seen in this graph? How can you tell?

_____

_____

STATION FIVE

8) Plot the relationship from Station 5 between length and area of a rectangle with a constant perimeter.



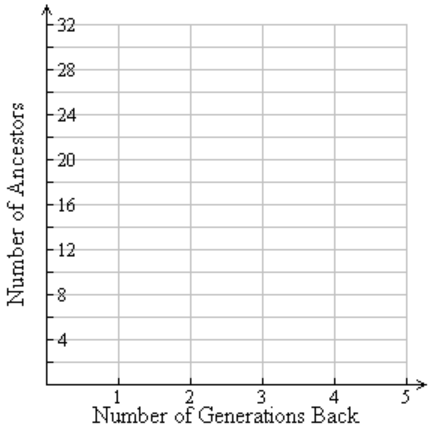
9) What type of function does this data seem to represent? Why?

_____

_____

STATION SIX

10) Use the information collected from Station 6 to plot points representing the relationship between number of generations passed, and number of direct ancestors.



11) What type of function does this relationship seem to represent? How can you tell?

_____

_____

Assessment

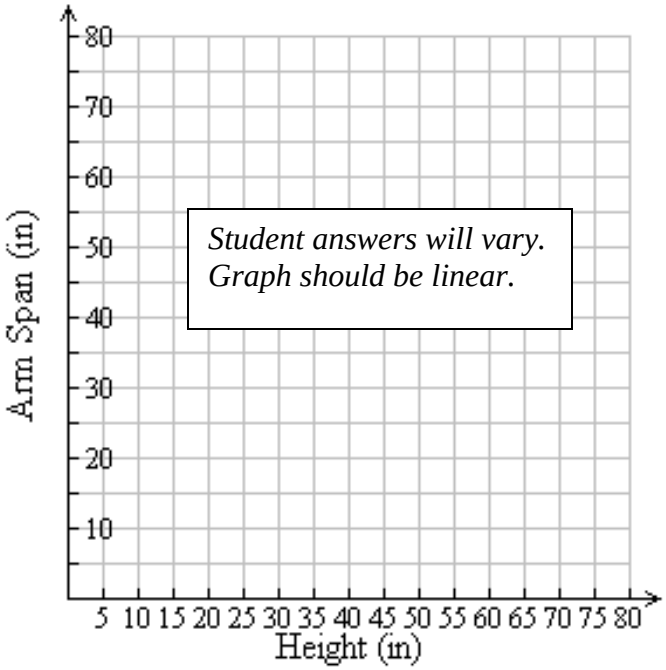
Discovering Functions – Station Activities

Name: __**ANSWER KEY**__
Date: _____

Directions: Using the data collected from each of the 6 Experiments, complete the following activities dealing with the relationships explored.

STATION ONE

1) Using the data from Station 1. Graph the relationship between Height (*x* axis) and arm span (*y* axis).



2) What type of relationship does this resemble? Why?

This relationship represents a linear function. The graph is a straight line and there is a constant slope.

STATION TWO

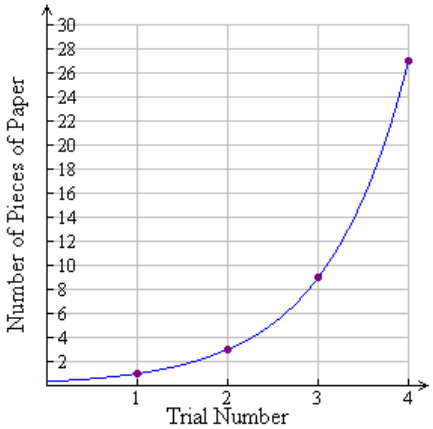
3) What type of function does the graph from Station 2 seem to show? Why?

This graph represents a quadratic function. It changes direction and is symmetric.

Assessment

STATION THREE

4) In the graph provided below, plot the information gathered from Station 3.



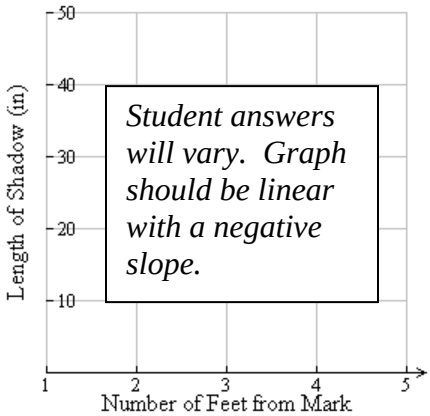
5) What type of relationship (liner, quadratic, exponential) is represented by this graph? What are the reasons it fits this type of function?

This is an exponential function because it always goes up, and is increasing very quickly.

Every time the numbers are being multiplied by 3.

STATION FOUR

6) Plot the relationship between distance and shadow length from Station 4 on the axes below:



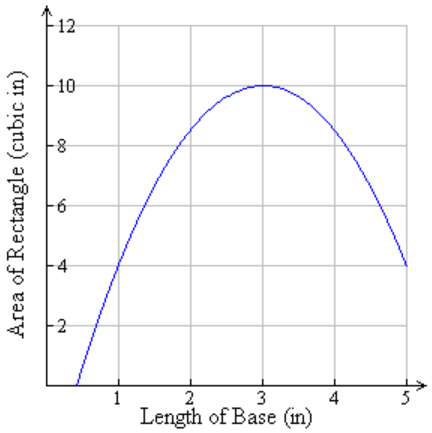
7) What type of function best describes the relationship seen in this graph? How can you tell?

This is a linear relationship. As one variable goes up, the other goes up by a constant rate. The data follows a straight line

Assessment

STATION FIVE

8) Plot the relationship from Station 5 between length and area of a rectangle with a constant perimeter.

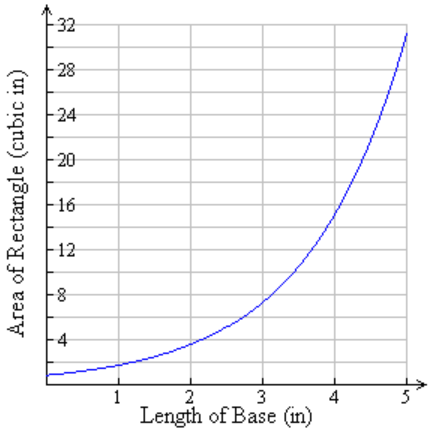


9) What type of function does this data seem to represent? Why?

This is a quadratic function. It changes direction and it is also symmetric.

STATION SIX

10) Use the information collected from Station 6 to plot points representing the relationship between number of generations passed, and number of direct ancestors.



11) What type of function does this relationship seem to represent? How can you tell?

This looks like an exponential function. It is increasing very quickly and the graph is always going in the same direction.

Assessment

Discovering Different Types of Functions
Summative Assessment

Name: _____
Date: _____

For questions 1-8 circle the answer. For 9 & 10, fill in the blank with the correct answer.

1. When graphed, a liner functions looks like a:

A Straight Line B Curved Lines C Segment D Parabola

2. Which experiment best describes an exponential function?

A Shadow B Ancestry C Beach Balls D Arm Length

3. Which equation can change directions?

A Linear B Quadratic C Exponential D None

4. The shape of a parabola is always:

A Straight B Constant C Symmetric D Decreasing

5. Which equation when graphed, will graph as an exponential function?

A $y = 2x^2 + 8$ B $y = 2x - 4$ C $y = 2x^2 + 6x + 9$ D $y = 2^x$

6. The rate of change for linear functions is:

A Changing B Constant C Multiplying D Positive

7. Which experiment best describes a quadratic function?

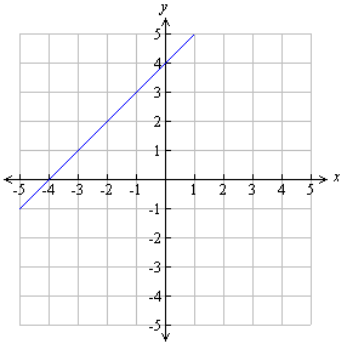
A Shadows B Ancestry C Beach Ball D Cutting Paper

8. The graphs of exponential functions and quadratic functions are:

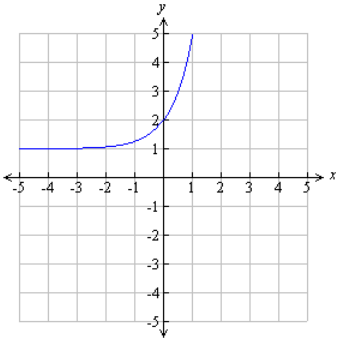
A Identical B Straight Lines C Curved Lines D Constant

9. Which graph best shows a quadratic function? _____

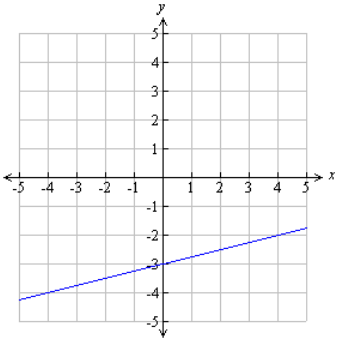
A



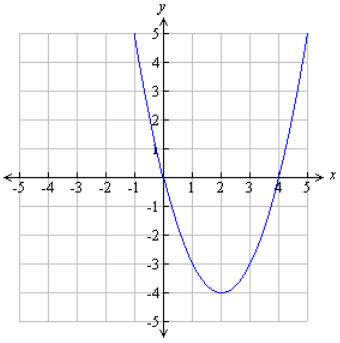
B



C

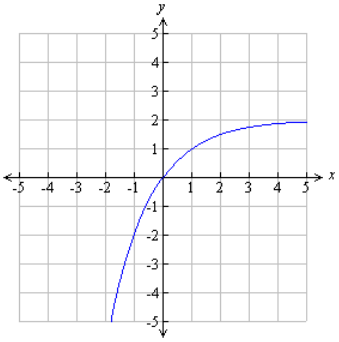


D

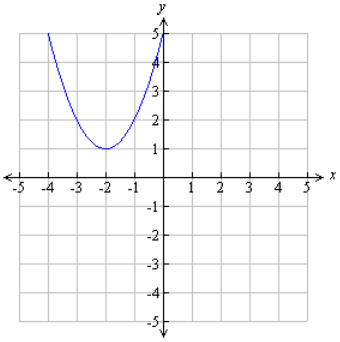


10. Which graph best shows a exponential function? _____

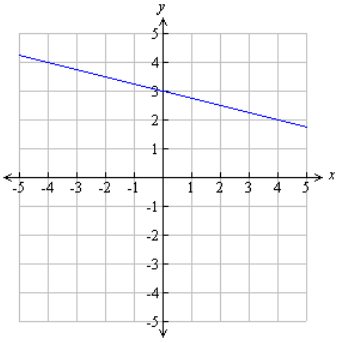
A



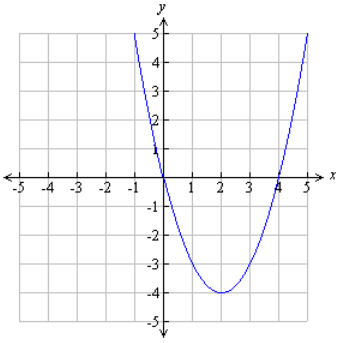
B



C



D



Assessment

11) Determine if the following relation id Linear, Quadratic or Exponential:

x	1	2	3	4	5
y	5	9	15	23	33

A Linear B Quadratic C Exponential D None

12) Determine if the following relation id Linear, Quadratic or Exponential:

x	1	2	3	4	5
y	5	3	1	-1	-3

A Linear B Quadratic C Exponential D None

13) Determine if the following relation id Linear, Quadratic or Exponential:

x	1	2	3	4	5
y	1	3	9	27	81

A Linear B Quadratic C Exponential D None

Summative Assessment Answer Key:

1. A	2. B	3. B	4. C	5. D
6. B	7. C	8. C	9. D	10. A
11. B	12. A	13. C		