Unit 1: Day 11: Summative Assessment: Expo-Experts

MCT 4C

Minds On: 20

Action: 50

Consolidate:5

Total=75 min

Math Learning Goals:

- Representing an exponential function with an equation, given its graph or properties
- Connect algebraic and graphical models of exponential functions for collected data
- Identifying properties of exponential functions, including those that arise from real-world applications and explain any restrictions that the context places on the domain and range
- Compare and contrast properties of exponential functions that arise from real-world applications

Materials

- 35 baggies of M&M's®
- Graphing calculators
- 35 paper plates
- 35 sheets of letter sized paper
- Scissors
- Glue sticks
- Rulers
- BLM 1.11.1-1.11.5

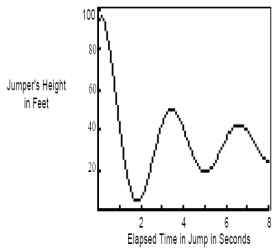
			Assessment Opportunities
	Minds On…	**Pairs → Activity** Distribute copies of BLM 1.11.1 per pair. Students will need scissors and glue sticks for the matching sheet. Collect their matching sheet and move onto individual investigations. Make sure students are aware of time constraints. **Learning Skills/Teamwork/Checkbric:** Observe teamwork as pairs work through investigation.	. The paired investigation may be completed individually and assessed as a part of the summative. Adjustment in timing can be made vby using only one of the investigations or completing the second investigation on the next day using one of the two jazz days in Unit 2.
	Action!	**Individual → Investigation** Students use graphing calculators as they work through the summative assessment on BLM 1.11.2 and BLM 1.11.3. **Mathematical Process Focus: Connecting** – Students **connect** different models of exponential data. **Mathematical Process Focus: Representing** – Students **represent** real-world applications that can be modelled by exponential functions.	For those students who need assistance with calculator skills, a brief review can be provided the day prior or a tip sheet (BLM 1.11.4) can be distributed to students.
	Consolidate Debrief	**Whole Class → Debrief** Collect all materials from each student. Discuss the nature of the two investigations and which ones were examples of exponential growth and decay. **Curriculum Expectations /Rubric: Use BLM 1.11.5 to evaluate student work from the investigations.**	
Concept Practice Application		**Home Activity or Further Classroom Consolidation** Prepare for pencil and paper test that addresses the expectations that were not covered in the final summative task.	

1.11.1: Sort this out

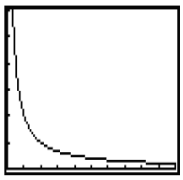
Instructions:

1. Cut along each of the solid lines and sort each function as either an exponential or non-exponential function.
2. With the group of exponential functions, sort them as either growth or decay functions. When you are satisfied with your sorted functions glue them to the recording sheet.
3. Based on your thinking, write a justification next to each function explaining why you have categorized the function in that way.

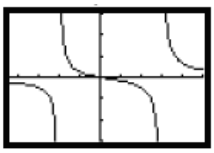
A



B



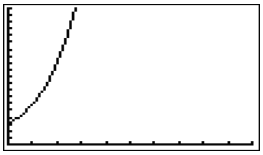
C



D



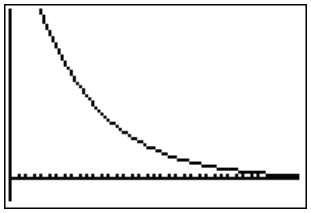
E



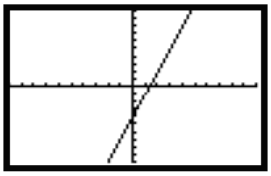
F



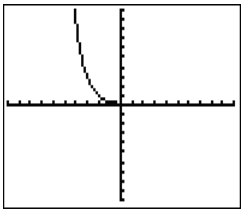
G



H



I



1.11.1: Sort this out (continued)

Instructions: Glue all of the functions onto this sorting sheet. Make sure to write a justification for each choice next to each function.

Your name: _____ Your partner: _____

Exponential Functions *Group exponential functions here and sort them into either **growth or decay** below.*		**Non-exponential functions**
Decay	**Growth**	

1.11.2: Melts in your mouth, not in your hands! ®

Your name: _____

Instructions:

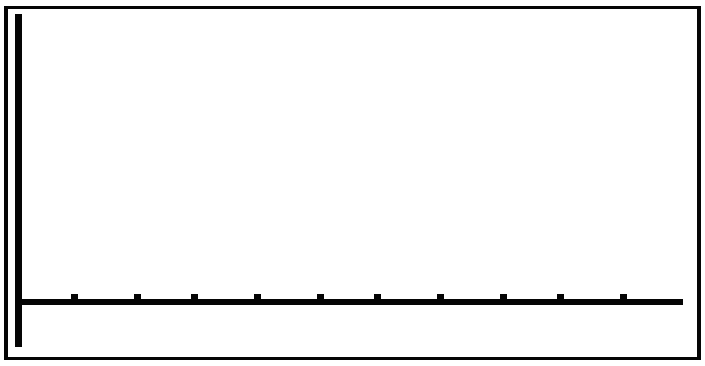
1. Empty your bag of M&M's® onto your paper plate and count the total. Record this initial value as trial number 0 in the table below.
2. Replace M&M's® into the bag and mix them well.
3. Pour the M&M's® back out onto the desk and count the number of M&M's® which have an "m" showing and place them back into the bag. Record this value in the table below. The others can be eaten or removed.
4. Continue to pour M&M's® onto the paper plate, count and record the number of "m's" removing the others until the number of M&M's® remaining is less than 5.

Part 1: Collecting Data

Trial number	Number of M&M's® remaining
0	
1	
2	
3	
4	
5	
6	

Add rows if

Part 2: Graphing



1. Using a graphing calculator, make a scatter plot of the data.
2. Copy your scatter plot onto the grid below.

1.11.2: Melts in your mouth, not in your hands! ® (continued)

Your name: _____



1. The scatter plot of the data is (check one): ❒ exponential OR ❒ quadratic
   Provide two reasons for your choice.

2. Determine the percentage decrease from one trial to the next. Record your answers in the chart.

Trial numbers	Percentage decrease in M&M's®
Trial 0 to Trial 1	
Trial 1 to Trial 2	
Trial 2 to Trial 3	
Trial 3 to Trial 4	
Trial 4 to Trial 5	
Trial 5 to Trial 6	
Trial 6 to Trial 7	

Add rows if

3. Find the average of the percentage decreases from one trial to the next.

4. Using your average, create a model that will predict the number of M&M's® after any trial.

5. Using the graphing calculator, find an equation that will model the data: _____

6. Compare your model with the one given by the graphing calculator. Explain any similarities or differences between the two.

1.11.2: Melts in your mouth, not in your hands! ® (continued)

Part 4: Interpreting the data

1. Using your mathematical model, when x = 3, what is the value of the function? Show your work below. Compare this to the value in the data table. Explain why there is a difference between the value from the model and value from the data.

2. Mr. Johnston's class decided to combine all their M&Ms® and came up with the following model for their data: $y = 2100(0.65)^x$, where x is the trial number and y is the number of M&Ms® remaining. Explain the significance of the values in the model by referring to the number of M&Ms® and the rate of change.

3. At some point during Mr. Johnston's investigation, the class had 100 M&Ms® left. Determine how many trials had taken place. Show your work.

1.11.3: Origami, it's not!

Instructions:

1. Fold a sheet of white paper in half.
2. Unfold the sheet of paper and count the number of sections.
3. Refold and add a new fold.
4. Continue to fold and count the sections after you make each new fold.
5. Record the data in the table below.

Peel District School ..., 11/26/07 9:03 AM
Formatted: Bullets and Numbering

Part 1: Collecting Data

Number of folds	Number of sections
0	
1	
2	
3	
4	
5	
6	

Add rows if

Part 2: Graphing

1. Using a graphing calculator, make a scatter plot of the data.
2. Copy your scatter plot onto the grid below.



1.11.3: Origami it's not! (continued)

Your name: _____

Part 3: The model

Using the graphing calculator, find an equation that will model the data:

_____

Part 4: Interpreting the data

1. Using your algebraic model, what is the value of the function when x = 6? Show your work below. Compare this to the value on your graphical model. Explain why there is or is not a difference between the values from the two models (algebraic and graphical).

2. Based on the general exponential function, $y = a(b)^x$, what is the value for *b* in your algebraic model? What does this value represent in the context of the problem?

3. Compare and contrast the M&M® mathematical models to the paper folding mathematical models.

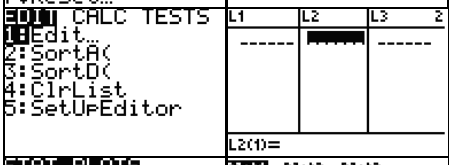
.

1.11.4: Graphing Calculator Tip Sheet

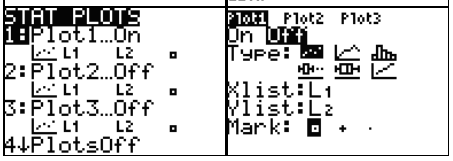
Clear lists of any data that may be in the calculator by pressing ` > + and selecting 4: ClrAllLists.
The command will be pasted into the home screen. Press e to execute the command.



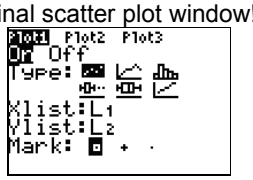
To enter data, press S and select the first menu option, 1: Edit.
You will now have an empty list editor. Enter your data into the lists. Make sure that the lists are the same length



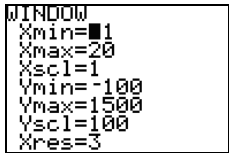
To create a scatter plot, press ` > ! . To create the scatter plot in the first plot, press e.
Turn on the plot by placing the cursor over the word "On" and pressing e.
The scatter plot is the first type and should be highlighted.
If your data is in Ω and æ, then the Xlist and Ylist should be set to Ω and æ respectively.
Select the mark you prefer.
The final window should look like the final screen capture at right.



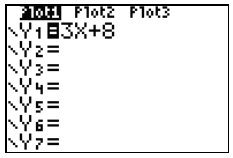
Final scatter plot window!



To change the axes and scale, press @.
Set the values on the screen here to capture a good view of all the data.



To see the scatter plot, press %. Adjust the window if needed.
If there is a function that is being graphed that you don't want, press ! and place the cursor on the line with the unwanted function and press C.



To perform a regression, press S and move over to the CALC menu. Select the regression you want and press e. The regression will be preformed on Ω and æ by default. Press e to execute the command.
If the regression doesn't fit your data well, try another one.

