Grade 9 Math - Financial Strand Unit

This is a LIVE DOCUMENT...changes & additions will continue

This financial unit with lessons is designed to provide a rough guideline for teachers working through the Financial Literacy Strands. Lessons include connections to other strands, accommodations, lesson outline, and black line masters. The table of contents provides links to the corresponding section in the document. The majority of the tables are 'google drawings', so if you double click on them, you can open and edit them (or have students with accommodations use the digital version). Any material may be copied and used to help prepare lessons.

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9. APPENDIX A - Social-Emotional - Learning Checklist

Curriculum Expectations

MTH1W De-streamed Mathematics, Grade 9 Read online

F. Financial Literacy

Students will:

- build their financial literacy by learning to manage finances, such as working with budgets and understanding appreciation and depreciation of assets
- analyse various financial situations and learn how math can be applied to make informed decisions (for example, understanding shifts in the stock market)
- examine how interest rates, down payments, and other factors impact purchasing decisions

F1. Financial Decisions	
F1.1 identify a past or current financial situation and explain how it can inform financial decisions, by applying an understanding of the context of the situation and related mathematical knowledge	Use idea of regular savings or spending → connection to linear relations, algebra (solving) Use the OAME idea lesson 1, how much does it really cost. Given different representations, make a decision. Pick an installment plan from Easy home. -Table of value, equation, predict() -BLM -Summary
F1.2 identify financial situations that involve appreciation and depreciation, and use associated graphs to answer related questions	Look at depreciation of PS5's cell phones, Linear depreciation? Gather data, make a TOV, make graphs, calculate FD. Look at percent going down. Keep as a constant % increase or decrease.
F1.3 compare the effects that different interest rates, lengths of borrowing time, ways in which interest is calculated, and amounts of down payments have on the overall costs associated with purchasing	Using some coding, google sheets for these cases. Are we only going to look at linear (ie simple interest)

goods or services, using appropriate tools.	
F1.4 modify budgets displayed in various ways to reflect specific changes in circumstances, and provide a rationale for the modifications (Incorporated throughout all of the lessons in the strand)	Keep within certain percentages? Changing length of time to reach certain goals in specific times. Ie saving $50 each week, then how does time change if we save $75 per week? Financial statement or budget? Spending daily at the caf and how does it change if we go once per week, etc.

Financial Math Strand Outline

Lesson	Title	Main Strand	Topics
1	LESSON 1: Looking to the future. How much will it really cost?	**F1.1** identify a past or current financial situation and explain how it can inform financial decisions, by applying an understanding of the context of the situation and related mathematical knowledge	Bank balances with words, tables, graphs and solving Connect to installment plans
2	LESSON 2: Financial Situations - Appreciation	**F1.2** identify financial situations that involve appreciation and depreciation, and use associated graphs to answer related questions	Appreciation (% increase) -Minds on with percents (Sales tax and discounts) -Models in appreciations: -How can you identify the changing rates?? -Look at linear & nonlinear
3	LESSON 3: Financial Situations - Depreciation	**F1.2** identify financial situations that involve appreciation and depreciation, and use associated graphs to answer related questions	Depreciation (% decrease) -Minds on with saving & taxes -Look at linear & nonlinear
4	LESSON 4: Changing Interest Rates, Time, etc.	**F1.3** compare the effects that different interest rates, lengths of borrowing time, ways in which interest is calculated, and amounts of down payments have on the overall costs associated with purchasing goods or services, using appropriate tools.	Comparing Simple (Linear) vs Compound (Nonlinear) Interest
5	LESSON 5: Coding - Simple Interest	**F1.4** modify budgets displayed in various ways to reflect specific changes in circumstances, and provide a rationale for the modifications **C2. Coding** - apply coding skills to represent mathematical concepts and relationships dynamically, and to solve problems, in algebra and across the other strands	Simple interest -tables -graphs -Possible to find equation
6	LESSON 6: Coding - Compound Interest	**F1.4** modify budgets displayed in various ways to reflect specific changes in circumstances, and provide a rationale for the modifications **C2. Coding** - apply coding skills to represent mathematical concepts and relationships dynamically, and to solve problems, in algebra and across the other strands	Compound interest -tables -graphs -Possible to find equation Coding Activity

LESSON 1: Looking to the future...How much will it really cost?

Financial Literacy Lesson Plan

Connections to Financial Literacy

- F1.1 identify a past or current financial situation and explain how it can inform financial decisions, by applying an understanding of the context of the situation and related mathematical knowledge
- **F1.4 modify budgets displayed in various ways to reflect specific changes in circumstances, and provide a rationale for the modifications**

Lesson 1	**Subject/Course** MTH1W
Connections to Other Strands	**Learning Goals**
Application of Linear and Non-Linear Relations **C3.1** compare shapes of linear/non-linear graphs, rates of change **C3.2** represent linear relations using concrete materials, table of values, graphs, equations; rate of change, initial value **Specific Expectations:** *Understanding Characteristics of Linear Relations* - construct tables of values, graphs, and equations, using a variety of tools (e.g. graphing calculators, spreadsheets, graphing software, paper and pencil), to represent linear relations derived from descriptions of realistic situations. - compare the properties of direct variation and partial variation in applications, and identify the initial value (e.g., for a relation described in words, or represented as a graph or an equation) - determine other representations of a linear relation, given one representation (e.g., given a numeric model, determine a graphical model and an algebraic model; given a graph, determine some points on the graph and determine an algebraic model); **Mathematical Process Focus - *Connecting*:** students will make connections between the mathematical concepts they have been learning and applications to financial situations.	At the end of this lesson, students will be able to: 1) Determine or estimate the time required to reach their goal. 2) To investigate installment purchase compared to initial cost 3) To understanding the real cost savings and make financial decisions

L1: Accessibility (Accommodations and Universal Design)

- To support students struggling with literacy: Ensure all materials provided to students are accessible to *Read and Write*. Materials in this document are accessible to *Read and Write.*
- To support students with memory: Consider using voice recordings at key points in electronically shared documents
- To remove a barrier, points on graphs embedded in this document can be moved by right clicking on the image and selecting edit (so students using a digital copy can just move the points onto the graph into the correct position)

Student profiles will vary from class to class. In addition to other sources of information, including classroom assessments, helpful information about student profiles can be found in the IEPs and in psych-educational assessments. The school's Learning Support Teacher can provide support. For more ideas for accommodations for specific assessed areas of strength and/or need: (Click the link) Understanding Learning Disabilities: How Processing Affects Mathematics Learning

Some teachers find it helpful to organize student accommodations on a master sheet for quick reference. Here is a sample Classroom Accommodations Master Sheet that can be used to record individual accommodations after consulting with students and parents. In addition, some teachers find it helpful to track accommodations provided for assessments. Here is a sample Accommodations Tracking Sheet (just insert the student-specific accommodations under *Accommodations Used*.

L1: Instructional Components and Context

Students can
- create a table of values and a graph of this data from a description of a situation involving linearly-related data
- communicate the meaning of the terminology below either before or after the *Action* activity

Terminology

- linear relation
- direct variation
- partial variation
- initial value
- installment purchase

The lesson times listed in this lesson are suggestions. Times will vary depending on the prior knowledge of your students with the concepts and/or ideas presented.

- Pencil, paper, calculator, graph pencil
- Chart paper and markers OR Whiteboards
- Shared Google doc BLM1.1

L1: Minds On

Bank balance
-BLM 1.1 -Words, tables, equations
(Use vertical white board in pairs or trios)

Connections

Review :

Algebraic Expressions and Equations
- C3.2 represent linear relations using concrete materials, tables of values, graphs, and equations, and make connections between the various representations to demonstrate an understanding of rates of change and initial values
- C4.4 determine the equations of lines from graphs, tables of values, and concrete representations of linear relations by making connections between rates of change and slopes, and between initial values and y-intercepts, and use these equations to solve problems

L1: Action!

Groups of 2 or 3: Think, Pair, Share (use heterogeneous groupings)

Groups respond to the questions:

- What are some things you would like to purchase in the near future?
- Look up each item on the internet and find cost with sales tax
- Suggest plans to achieve your goal to purchase the item or items
- Brainstorm: What are some strategies to save for your future purchase? **Hint:** Suggest how much you can make per week. Are you starting at zero or with an initial amount?
- Each member picks a method or strategy. Next, determine how many weeks it takes to achieve your goal. Make use of words.

Low floor → determine the time to buy the item with one earning method.

High ceiling → determine how much faster it is to buy the item if your earning method changes. Earn more per week?

BLM 1. 2 Assessment Rubric (Checkbric): How Much Does It Cost REALLY

Next, use tables, graphs and finally an equation to show your understanding.

Some suggestions:

1) You earn $7.50 every week delivering paper. Your goal is to purchase a gaming system that will cost you $2550. You start with $50. How many weeks does it take?
2) Babysitting for $15 per hour with 5 hours per week.
3) Represent the situation with a table.

Week #	Money
0	0
1	
2	
3	

4) Represent the situation graphically with a scatter plot.
5) Create an equation to represent the situation.
6) Answer the questions.

Investigate: Who wants to wait that long? **How Much Will It Really Cost?** Go to https://www.easyhome.ca/ Next, select "**Shop**" and look for an item you would like to have:

- What is the weekly payment (installment plan)? How many weeks?
- Make a table of values. Next, develop an equation. N # of weeks, P= Total payment ($)
- Use the internet, find the cost (in Canadian dollars) with sales tax of 13%
- Provide justification on selected purchase plan (Installment plan) or wait and save plan you would choose.

Low floor → determine the time to buy the item with one earning method.
High ceiling → determine how much faster it is to buy the time if your earning method changes. Earn more per week?

Think pair share
Person A - one saving method, Person B different saving method. Determine as a pair which one would be able to purchase the item first.
Person A - savings method, Person B installment plan, what is the better buy?

L1: Consolidation (15 minutes)	
Groups ⇒ Presentation: How Much Did It REALLY Cost? While students are working through the Action, select at least 1 pair for each scenario to prepare their solution for presentation to the class. Provide chart paper, document camera (ELMO) or overhead transparency for presentation purposes. Students will show and explain their answers to questions from Action. Also ask open questions such as: 1. Does the total cost of the purchase surprise you? Why/why not? 2. Can you afford this purchase? Explain. 3. Why is the total cost when purchased over time different from the cash cost? Purchasing items with regular payment is called buying using an installment plan. **HW-Individual ⇒ Reflection:** Students answer individually in their journals (home) or on an exit card: 1. How many hours would you have to work part-time to earn enough to make the payments? Specify the hourly wage on this calculation. 2. What other purchase options might you consider rather than an installment purchase plan? Discuss the pros and cons of each. 3. What ways could you reduce the length of time to purchase an item?	 Students will reflect on the conclusions made from this activity and how this might affect their future purchasing decisions.  Teachers could collect student work including data tables, graphs and conclusions and assess their work based on a rubric BLM1.2 HW. BLM1.3

BLM 1.1- Minds on: Words, Tables, Graphs & Equations

Review: Words, tables, graphs and equations

Words	Complete the table of values. Next, plot the points. Finally, connect the points and draw the line. Use the draw feature in google doc to activate the graph.	Equation
You start with $50 in your bank. You predict that you can earn $25 each week from babysitting.	N = # of weeks B =Balance($) N \| B Balance($) # of weeks	Find the equation: Using the equation, how much will you have in 6 weeks?
You try,		
Make up a story to match the table of values.	N = # of weeks B =Balance($) N \| B 0 \| 200 3 \| 180 6 \| 160 9 \| 140 Balance($) # of weeks	Find the equation: Using the equation, how much will you have in 15 weeks?
Make up a story to match the graph.	N = # of weeks B =Balance($) N \| B Balance($) # of weeks	Find the equation: Using the equation, how long will it take to reach $1000?
Make up a story to match the equation. B = 40N	N = # of weeks B =Balance($) N \| B Balance($) # of weeks	Find the equation: B = 40N Using the equation, how long will it take to reach $1250? Remember to round up when estimating.

BLM 1.2 Assessment Rubric (Checkbric): How Much Does It Cost REALLY

Name: _____

Internet Websites or Project Card Used: _____

Check appropriate level of Achievement

Component	Getting Started	On Your Way	Reaching High	Over the Top
Table of Values				
Graph				
Total Cost and Calculation of extra cost				
Characteristics of the Relation				
Calculations for predicting how long it will take to purchase an item...				
Conclusions and personal reflections				

Name: _____

Exit Card

1) How many hours would you have to work part-time to earn enough to make the payments? Specify the hourly wage in this calculation.

2) What other purchase options might you consider rather than an installment purchase plan?

Strategy	Pro	Con

3) What ways could you reduce the length of time to purchase an item?

Name: _____

Exit Card

1) How many hours would you have to work part-time to earn enough to make the payments? Specify the hourly wage in this calculation.

2) What other purchase options might you consider rather than an installment purchase plan?

Strategy	Pro	Con

3) What ways could you reduce the length of time to purchase an item?

BLM 1.4 - HW

Students answer individually in their journals (home) or on an exit card:

4. How many hours would you have to work part-time to earn enough to make the payments? Specify the hourly wage on this calculation.

5. What other purchase options might you consider rather than an installment purchase plan? Discuss the pros and cons of each.

6. What ways could you reduce the length of time to purchase an item?

More examples needed here

LESSON 2: Financial Situations - Appreciation

Connections to Financial Literacy

- F1.2 identify financial situations that involve **appreciation, and use associated graphs to answer related questions.**
- **F1.4 modify budgets displayed in various ways to reflect specific changes in circumstances, and provide a rationale for the modifications**

Lesson 2: Appreciation in financial situations	**Subject/Course** MTH1W
L2: Connections to Other Strands	**Learning Goals**
Application of Linear and Non-Linear Relations **C3.1** compare shapes of linear/non-linear graphs, rates of change **C3.2** represent linear relations using concrete materials, table of values, graphs, equations; rate of change, initial value **Powers** **B2.2** power rules with operations (Ex. repeatedly mult) **Rational Numbers** **B3.2** fractions, measuring tools **B3.3** ratios, rates, fractions, decimals **Specific Expectations:** Appreciation in a linear and non-linear context using simple interest and compound contexts. **Mathematical Process Focus: Connecting**: reasoning and proving, problem solving.	At the end of this lesson, students will be able to: ● Predict if an appreciation model is linear or nonlinear from a table of values using first differences ● Determine equation if model is repeatedly adding the constant first differences ● Predict output if the model is repeatedly multiplying by the “common” ratio

L2: Accessibility (Accommodations and Universal Design)

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L2: Instructional Components and Context

Readiness: **Terminology** First differences Common ratio	-Review ratios and percentage -Look at BLM 2.1

Linear versus nonlinear Initial value/Rate	**Materials** • Paper/Pencil • White board

L2: Minds On	Connections
1) Convert the following percents to decimals 2) Convert the following decimals to percents 3) Calculate a) 10% x 62.85 b) 30% x 75.25 c) sales tax 113% of 853.26 d) mark up 145% of 62.55 How do you calculate total cost with sales tax of 13% or markup of 45%? How do you show repeated addition of 10? How do you show repeated multiplication of 10?	• BLM 2.1

L2: Action!	
Scenario 1: Simple Bank Consider saving $500 in a high interest bank account that pays 10% interest per year on the initial investment. a) How much money would you earn in interest and how much would you have after 1 year? b) How much interest would you earn the second year? How much money would you have after 2 years? c) *Predict how much money you would have after 10 years. Verify with your graph?* d) *What type of relationship do you notice in the graph?* e) *How can you determine the type of relationship using the table of values?* f) *What pattern do you notice in the amount?* g) *Determine the equation* h) *Using your equation after 10 years, was your prediction correct?.* Repeat with 6% simple interest Students on their own → whiteboard? Pairs at desks.one person does 12% and the other does 8%. Compare the percent on slope of the line. Which would you rather have? How much more do you make? **Scenario 2:** The Great Northern Compound Bank offers to reinvest your money at the end of each year. You believe that reinvesting	**BLM 2.2 -Scenario 1** **Action plan using google doc for editing.** **A = P + PRT same as y = b + mx** **BLM 2.3- Scenario 2** **Compound interest .** **They can use tables and graphs to support work.** **Level 4 =Use equations, tables and graphs to model work** 100% + 45%

year	Amount
0	500
1	
2	
3	

The math:
Do some calculations here

your money at the end of the year is a great way to live for today *and* save for tomorrow.

a) How much interest have you earned at the end of the first year? How much money do you have in total?
b) Your total from the end of year 1 is now reinvested for the start of year 2. How much interest have you earned after the second year? How much money do you have?

year	amount
0	500
1	
2	
3	
4	

The math:

500*1.10
500*1.10*1.10
500*1.10*1.10*1.10
500*1.10*1.10*1.10*1.10

Insert a graph here.

c) Predict how much money you would have after 10 years?
d) What do you notice about your graph?
e) Prove using your table of values. Find your first differences. What do you notice about your prediction?
f) Find the ratio between consecutive terms.
g) What do you notice?
h) How do you use the ratio to predict from 500 to 550?
i) How do you use the ratio to predict from 550 to 605?
j) How do you predict the amount from the 4th to 5th year?
k) Determine an equation.
l) Using your equation, was your prediction after 10 years correct?
m) In 10 years, which bank will pay more.

Given a table, predict the relationship. Prove using FD or ratio. Answer some questions. Creating some equations for each model. What is the initial amount invested given a table or graph. What is your interest rate?

Original amount + increase amount

→ teach the ratio colum here
→ predict the 5th, 6th years using the ratios.

BLM 2.4
$Y = 500(1.10)^x$
Initial value of $500 and repeatedly multiply by 1.10

Recall: 1.10 is 110% where 10% is the annual interest rate….

L2: Consolidation (15 minutes)	
Consolidation: When the amount of money you invest is increasing, the amount is appreciating. When the value is increasing linearly, you are repeatedly adding. This can be modeled using y=mx+b. The interest portion is called simple interest. You only earn interest on the initial value invested. When the value is increasing non-linearly, you are repeatedly multiplying. This can be modelled using powers. This is called compound interest. You repeatedly earn interest upon interest. In financial terms, when the value of an investment or item increases, it is appreciating.	BLM2.5 Add appreciation wording to the BLM

BLM 2.1: Appreciation of money and items in a linear and non-linear model.

Minds On: Activating prior knowledge on percents

1) Convert the following percents into decimals.

   a) 30% b) 45% c) 8% d) 118% e) 100% + 4%

2) Convert the following decimals into percentages.

   a) 0.25 b) 0.65 c) 0.035 d) 1.45 f) 1 + 0.15

3) Calculate the following

   a) 10% x 25
   b) 30% of 75
   c) sales tax of 13% on $64.99
   d) Mark up of 35% on $650

4) Write 5+5+5+5 another way mathematically.

5) Write 5x5x5x5 another way mathematically.

Teacher lead with the first three years

BLM 2.2. Action

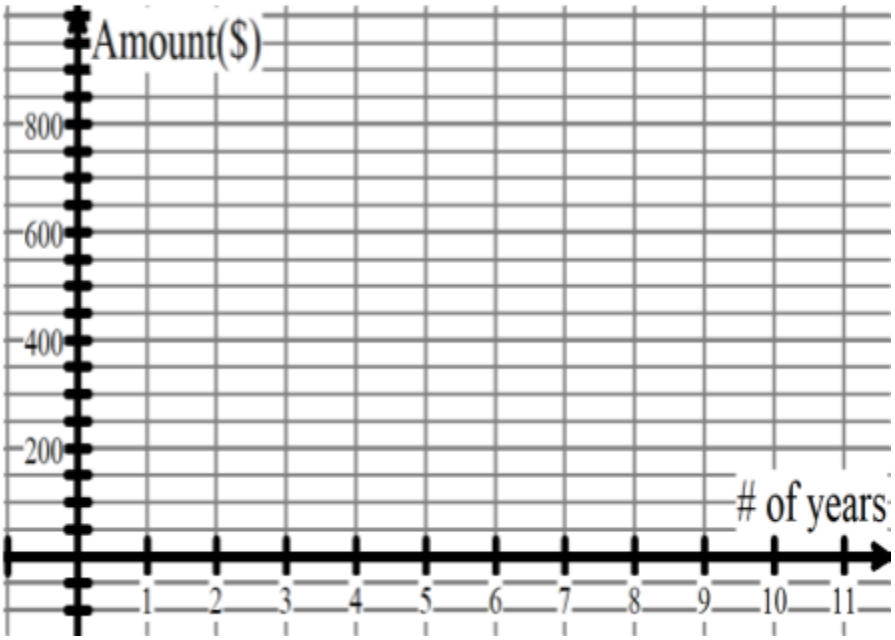
Scenario 1: Simple Bank
Consider saving $500 in a high interest account that pays 10% interest per year on the initial value only.

i) How much interest **do you earn after 1 year?** What is the total amount after 1 year?	
j) Assume that you earn only interest on $800, how much interest would you earn in the second year only?	

Use the above answers to complete the table. Next, plot the points.

rate=10% per year

N = # of years	Calculations	A = Amount
0		500
1		
2		
3		
4		



k) Predict how much money you would have after 10 years. Verify with your graph? (Note: Extend your graph)	
l) What type (linear or nonlinear) of relationship do you notice in the graph? Is this a positive or negative correlation?	
m) How can you determine the type (linear or nonlinear) of a relationship using only the table of values? Show the work in your table	
Circle the best answer: n) You repeatedly (add or multiply) the first differences (interest) to the principal to determine the new amount	.
o) Determine the equation.	
p) Find the amount after 10 years. Was your prediction correct?.	

Repeat with 6% simple interest.

Students on their own → whiteboard? Pairs at desks one person does 12% and the other does 8%. Compare the percent on slope of the line. Which would you rather have? How much more do you make?

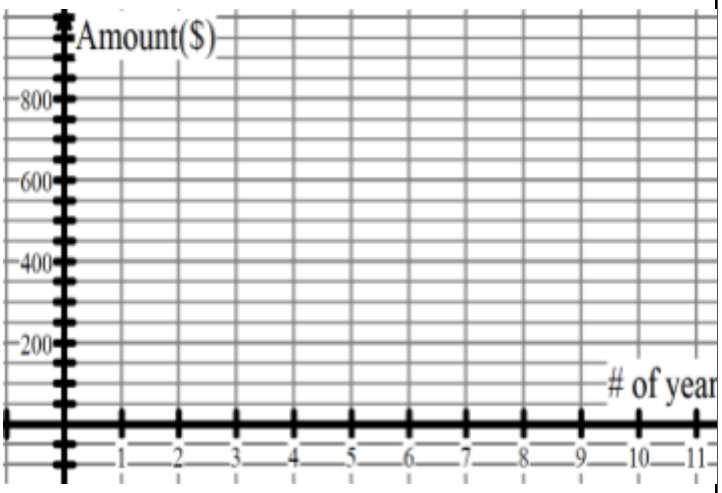
BLM 2.3 In pairs,

Student A:
Consider saving $500 in a high interest account that pays 8% interest per year.

a) Complete the table and plot the points.

rate=8% per year

N = # of years	Calculations	A = Amount
0		500
1		
2		
3		
4		



b) Predict how much money you would have after 10 years. Verify with your graph? (extend graph if needed)

c) Find the first differences from the table of values to verify that the model is linear.

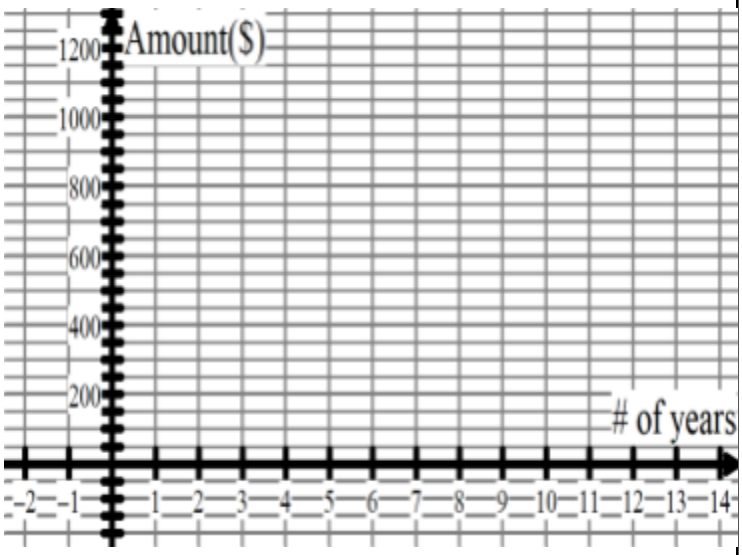
d) Use the initial value and first differences to find the equation.

Student B:
Consider saving $500 in a high interest account that pays 12% interest per year.

a) Complete the table and plot the points.
Note: If you use Google Doc, the red dots can represent points on the graph from your table of values.

rate=12% per year

N = # of years	Calculations	A = Amount
0		500
1		
2		
3		
4		



b) Predict how much money you would have after 10 years. Verify with your graph? (extend graph if needed)

c) Find the first differences from the table of values to verify that the model is linear.

d) Use the initial value and first differences to find the equation.

e) Find the amount after 10 years using the equation. Next, verify your answer with the graph.	e) Find the amount after 10 years using the equation. Next, verify your answer with the graph.
Summary: Circle the best answer To predict the amount in 20 years, you repeatedly (add or multiply) the interest (first differences) to the initial amount. This model is an example of simple interest.	Summary: Circle the best answer To predict the amount in 20 years, you repeatedly (add or multiply) the interest (first differences) to the initial amount. This model is an example of compound interest.
Signature from partner B:	Signature from partner A:

Teacher lead

BLM 2.4. Action

Scenario 2: Compound Bank

Consider saving $500. The Great Northern Compound Bank will reinvest your money at the end of each year at 10% per year. You believe that reinvesting your money at the end of the year is a great way to live for today *and* save for tomorrow. You decide to do some math first to figure out whether to take the bank up on this offer.

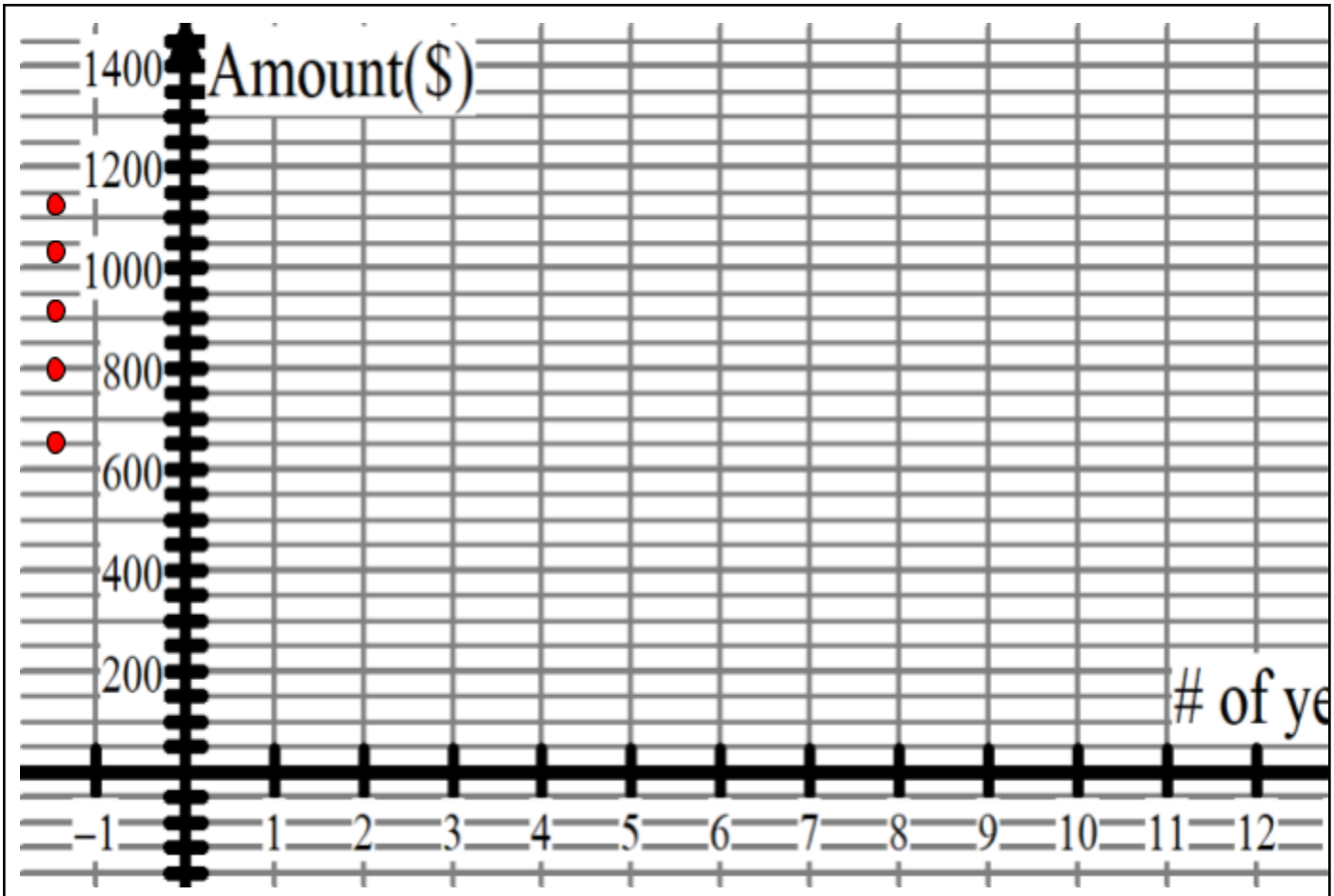
a) How much money would earn in **interest after 1 year?** **What is the new total amount after 1 year?**	
b) Now find the interest of 10% on the new amount for the 2nd year. What is the new total amount after 2 years?	
c) Now find the interest of 10% on the new amount for the 3rd year. What is the new total amount after 3 years?	

Use the above answers to complete the table. Next, plot the points.

rate=10% per year on the previous amount each year

N = # of years	Calculations	A = Amount
0		500
1		
2		
3		
4		

FD	Ratio



d) Predict how much money you would have after 10 years using the graph. (Note: extend your graph)	
e) Is the model linear or nonlinear using your graph?	
f) Find first differences using the above table. Is your prediction (linear or nonlinear) correct? How do you know?	
g) Find the ratio between consecutive terms. What do you notice? h) What does the ratio represent?	.
i) How do you use the ratio to predict how the amount changed $500 to $550 from your table of values?	
j) How do you use the ratio to predict how the amount changed $550 to $605 from your table of values?	
k) Now use the above pattern to determine the new amount after $605 (previous amount). Compare your answer in the table	
Circle the best answer l) You (add or multiply) the ratio with the previous amount to determine the new amount	
m) Determine the equation. Using your equation after 10 years, was your prediction correct?	

n) In 10 years, how much more will Great Northern Compound Bank pay you in interest compared to Simple Bank?.	
o) When the value of an item increases over time, it is called **appreciation.**	

BLM - 2.5

In pairs,

Student A: Use first differences to show that the account is nonlinear?	Student B: Use first differences to show that the account is nonlinear?
N # of years / A Amount($) 0 / 400 1 / 420 2 / 441 3 / 463.05 4 / 486.2025	N # of years / A Amount($) 0 / 100 1 / 102 2 / 104.04 3 / 106.1208 4 / 108.243216
For this nonlinear account, find the ratio between consecutive terms.	For this nonlinear account, find the ratio between consecutive terms.
Circle You repeatedly (add or multiply) the ratio to the initial value to determine the new amount.	Circle You repeatedly (add or multiply) the ratio to the initial value to determine the new amount.
Use the initial value and ratio to find the equation.	Use the initial value and ratio to find the equation.
Find the amount in 10 years using the equation.	Find the amount in 10 years using the equation.
Signature from partner B:	Signature from partner A:

BLM 2.6. HW - Simple & Compound Interest

1. a) Calculate the first differences for each model.
   b) Next, identify if the model is linear or nonlinear
   c) If nonlinear, find the ratio between consecutive terms.

i) Account A

N= #of years	A= Amount($)		
0	800		
1	960		
2	1152		
3	1382.40		
4	1658.88		

ii) Account B

N= #of years	A= Amount($)		
0	800		
1	826.5		
2	853		
3	879.5		
4	906		

d) Find the equation for bank account A.

e) Find the equation for bank account B.

f) Find the balance in 20 years for bank account A.

g) Find the balance in 20 years for bank account B.

h) Is the bank account A a positive or negative correlation? How do you know?

i) Is the bank account A a positive or negative correlation? How do you know?

j) What does the ratio represent for this model?

k) What does the first differences represent in this model?

l) Whose bank account (A or B) would you like to have in 30 years? Why?

LESSON 3: Financial Situations - Depreciation

Connections to Financial Literacy

- F1.2 identify financial situations that involve **depreciation**, **and use associated graphs to answer related questions**
- **F1.4 modify budgets displayed in various ways to reflect specific changes in circumstances, and provide a rationale for the modifications**

Lesson 3	**Subject/Course** MTH1W
L3: Connections to Other Strands	**Learning Goals**
Application of Linear and Non-Linear Relations **C3.1** compare shapes of linear/non-linear graphs, rates of change **C3.2** represent linear relations using concrete materials, table of values, graphs, equations; rate of change, initial value **Powers** **B2.2** power rules with operations (Ex. repeatedly mult) **Rational Numbers** **B3.2** fractions, measuring tools **B3.3** ratios, rates, fractions, decimals **Specific Expectations:** Depreciation in a linear and non-linear context using simple interest and compound interest contexts. **Mathematical Process Focus: Connecting**	At the end of this lesson, students will be able to: -Predict if a depreciation model is linear or nonlinear from a table of values using first differences -Determine equation if model is repeatedly subtracting the constant first differences -Predict output if the model is repeatedly multiplied by the common ratio

L3: Accessibility (Accommodations and Universal Design)

- To support students struggling with literacy: Ensure all materials provided to students are accessible to *Read and Write*. Materials in this document are accessible to *Read and Write.*
- To support students with memory: Consider using voice recordings at key points in electronically shared documents
- To remove a barrier, points on graphs embedded in this document can be moved by right clicking on the image and selecting edit (so students using a digital copy can just move the points onto the graph into the correct position)

Student profiles will vary from class to class. In addition to other sources of information, including classroom assessments, helpful information about student profiles can be found in the IEPs and in psych-educational assessments. The school's Learning Support Teacher can provide support. For more ideas for accommodations for specific assessed areas of strength and/or need: (Click the link) Understanding Learning Disabilities: How Processing Affects Mathematics Learning

L3: Instructional Components and Context

Terminology -FD -Ratio -Linear and nonlinear -Initial value and rates	-Review yesterday's HW -Look at BLM3.1

L3: Minds On

Minds on to recall savings amount and remaining amount.

1) How much money would you save in the following situations?
   a) Save 25% of $100 b) Save 6% of $52

2) If you have the following discount, what amount would you pay?
   a) Item of $100, save $25, sale price ___?
   b) Item cost of $52, save $3.12

3) Determine the percent of each item you would pay.
   a) Save 25%, pay ____%
   b) Save 10%, pay ____%

Connections

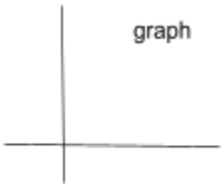
- **BLM 3.1**

L3: Action!

WOW. I was given a PS5! What is the value of a PS5 over time?

The original value of the PS5 is $1000. The PS5 loses 15% of its value each year.

year	Value $	FD	Ratio
0			
1			
2			
3			



a) What amount of money does the PS5 lose in the first year?
b) What is the value of the PS5 at the end of the first year?
c) What is the value of the PS5 over the remaining years?
d) Graph the table of values.
e) What do you notice about the graph? Type of correlation?
f) Prove the relationship using the table of values.
g) What do you notice about the first differences and the given percent?
h) How long will it take for the PS5 to be worth less than $100?

BLM 3.2

When the value of an item decreases over time, it is called _____.

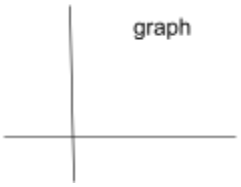
Will the value of the PS5 ever be zero? Why or Why not?

BLM3.3

It's time to replace my flip phone. A brand new iPhone 12 costs $1200. The iPhone loses 15% oof its value each year.

year	Value $
0	
1	
2	
3	

FD	Ratio



a) How much money does the phone lose the first year?
b) How much money does it lose the second year?
c) Graph the table of values.
d) What do you notice about the graph? Type of correlation?
e) Prove the relationship using the table of values.
f) What do you notice about the first differences?
g) What do you notice about the ratios?
h) Where did the 15% given in the question go?
i) What does the 85% represent? What does the 15% represent?
j) How long will it take for the PS5 to be worth less than $100?
k) What is the connection between the ratio and given percent?
l) How much will the phone be worth in 7 years?
m) Will the iPhone ever be worth zero dollars? Why or why not?

Does this situation represent appreciation or depreciation? How do you know?

Consolidation:

When an investment or item increases in value it is appreciating in value.
When an investment or item decreases in value, it is a depreciation in value. Often when you purchase an item, ie car, it loses value after you purchase it.

Remaining percent (ratio) = 100% - given %

Need some practice and HW.

BLM 3.1: Minds on - Simple interest

Minds on to recall savings amount and remaining amount.

1. How much money would you save in the following situations?

a) Save 25% of $100 b) Save 6% of $52

2. If you have the following discount, what amount would you pay?
   Item of $100, save $25, sale price ___?
   Item cost of $52, save $3.12?

3. Determine the percent of each item you would pay.
   c) Save 25%, pay ____%
   d) Save 10%, pay ____%

BLM 3.2. Action - Learning about Depreciation

Scenario 1: WOW. I was given a PS 5 system! What is the value of a PS5 system over time?

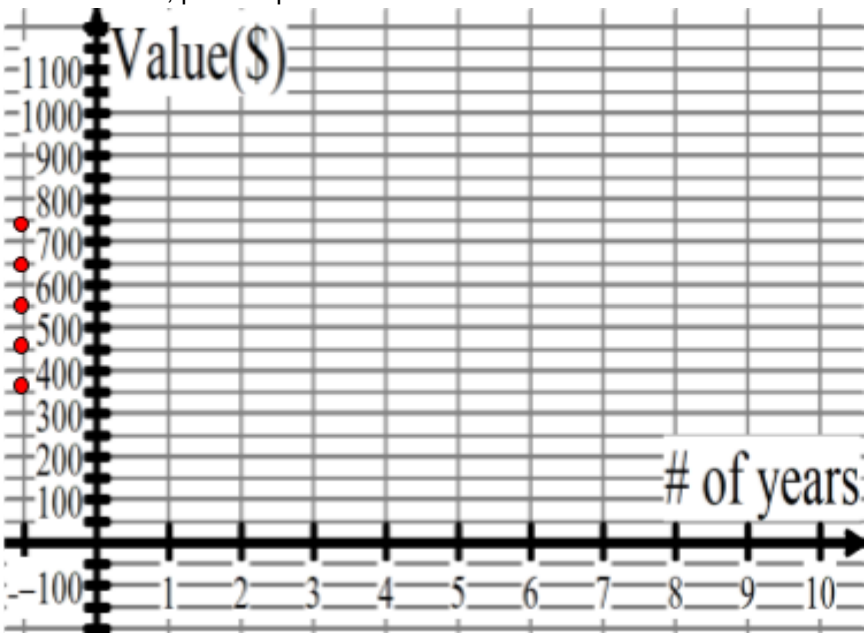
The original value of the PS5 system is $1000. The PS5 loses 15% of its value each year.

q) How much does it lose in the first year? What is the value of the PS% system after 1 year?	
r) Assume that you lose only 15% on $1000 each year, how much do you lose in the second year only?	

Use the above answers to complete the table. Next, plot the points.

rate=15% per year

N = # of years	Calculations	Value ($)
0		1000
1		
2		
3		
4		

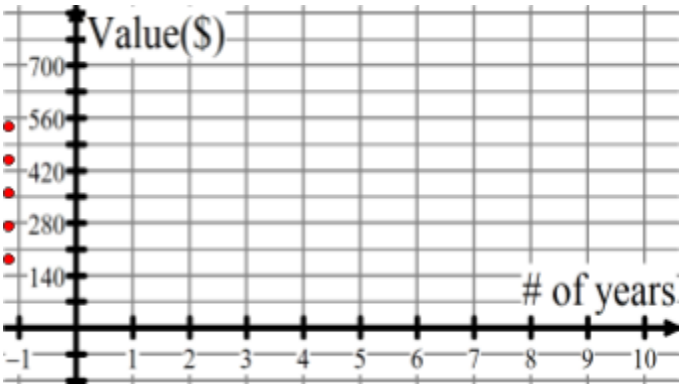


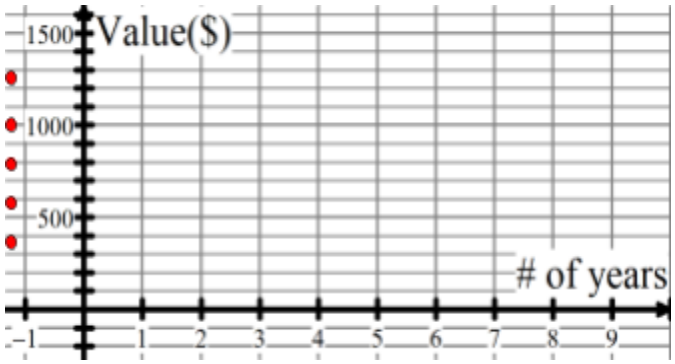
s) Predict the value of the PS5 system after 5 years. Verify with your graph? (Note: Extend your graph)	
t) What type (linear or nonlinear) of relationship do you notice in the graph? Is this a positive or negative correlation?	
u) How can you determine the type (linear or nonlinear) of a relationship using only the table of values? Show the work in your table.	
Circle the best answer: v) You repeatedly (add or multiply) the first differences to the initial value determine the new value of the PS5 system.	.
w) Determine the equation.	
x) How long will it take for the PS5 to be worth less than $100 using the equation? Verify with your graph.	
When the value of an item decreases over time, it is called **depreciation.** Will the value of the PS5 ever be zero? Why or Why not?	

Students on their own → whiteboard? Pairs at desks. One person does 12% and the other does 8%. Compare the percent on slope of the line. Which would you rather have? How much more do you make?

BLM 3.3: Practise simple depreciation In pairs,

<table>
<tr>
<td>Student A:
This time you get an Xbox One system for $700.

The original value of the Xbox One system is $700. The Xbox One system loses 10% of its value each year.</td>
<td>Student B:
This time you get a Gaming System one system for $1500. The original value of the Gaming System is $1500. The Gaming System loses 12% of its value each year.</td>
</tr>
<tr>
<td>b) Complete the table and plot the points.</td>
<td>b) Complete the table and plot the points.</td>
</tr>
<tr>
<td>rate=10% per year
<table>
<tr><th>N = # of years</th><th>Calculations</th><th>A = Amount</th></tr>
<tr><td>0</td><td></td><td>700</td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
</table>


</td>
<td>rate=12% per year
<table>
<tr><th>N = # of years</th><th>Calculations</th><th>A = Amount</th></tr>
<tr><td>0</td><td></td><td>1500</td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
</table>


</td>
</tr>
<tr>
<td>b) Predict the value of the system after 7 years. Verify with your graph. (extend graph if needed)</td>
<td>b) Predict the value of the system after 7 years. Verify with your graph. (extend graph if needed)</td>
</tr>
<tr>
<td>c) Find the first differences from the table of values to verify that the model is linear.</td>
<td>c) Find the first differences from the table of values to verify that the model is linear.</td>
</tr>
<tr>
<td>d) Use initial value and first differences to find the equation.</td>
<td>d) Use initial value and first differences to find the equation.</td>
</tr>
<tr>
<td>e) Find the value of the system after 7 years using the equation. Next, verify your answer with the graph.</td>
<td>e) Find the value of the system after 7 years using the equation. Next, verify your answer with the graph.</td>
</tr>
<tr>
<td>Summary: Circle the best answer
To predict the value of the system in 7 years, you repeatedly (add or multiply) the first differences to the initial amount.</td>
<td>Summary: Circle the best answer
To predict the value of the system in 7 years, you repeatedly (add or multiply) the first differences to the initial amount.</td>
</tr>
<tr>
<td>Signature from partner B:</td>
<td>Signature from partner A:</td>
</tr>
</table>

BLM 3.4. Action - Compound Depreciation

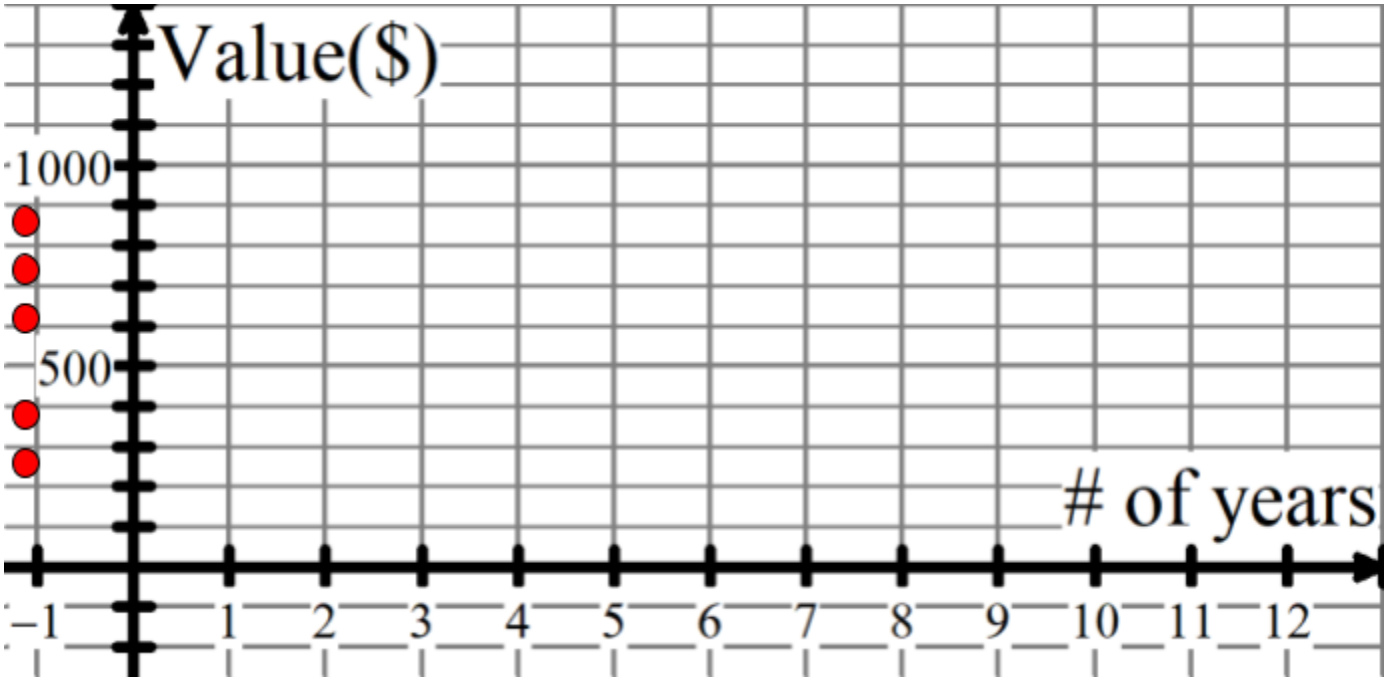
Scenario B
It's time to replace my old iPhone. A brand new iPhone 12 cost $1200. The iPhone loses 15% each year from the previous year.

n) How much value does the iPhone lose **after 1 year?** **What is the new value of the iPhone after 1 year?**	
o) Now find 15% of the value of the iPhone after the first year. Next, find the new value of the iPhone after 2 years?	
p) Now find 15% of the value of the iPhone after the 2nd year. Next, find the new value of the iPhone after 3 years.	

Use the above answers to complete the table. Next, plot the points.

rate=15% per year on the previous value

N = # of years	Calculations	A = Amount
0		1200
1		
2		
3		
4		



q) Predict how much money you would have after 7 years using the graph. (Note: extend your graph)	
r) Use your graph to determine whether the model is linear or nonlinear?	
s) Find first differences using the above table. Is your prediction (linear or nonlinear) correct?	
t) Find the ratio between consecutive terms. Why are the ratios not all equal but close in value?	.
u) How can you use the ratio and $1200 to get to $1020?	
v) How do you use the ratio and $1020 to get $867?	
w) Now use the above pattern to predict the new value from $867. Compare your answer in the table.	
Circle the best answer x) You (add or multiply) the ratio with the previous amount to determine the new value of your iPhone.	
y) Create an equation for this situation.	
z) Using your equation, was your prediction for the value of the iPhone at 7 years correct?	
p) Which type of depreciation do you want (Scenario A or Scenario B) for your latest new computer? Why?	

BLM 3.5 - Compound depreciation in pairs

<table>
<tr><td>Student A:
Use first differences to show that the account is nonlinear.</td><td>Student B:
Use first differences to show that the account is nonlinear.</td></tr>
<tr><td>

N # of years	A Amount($)
0	1000
1	900
2	810
3	729
4	656.10

</td><td>

N # of years	A Amount($)
0	100
1	102
2	104.04
3	106.1208
4	108.243216

</td></tr>
<tr><td>For this nonlinear account, find the ratio between consecutive terms.</td><td>For this nonlinear account, find the ratio between consecutive terms.</td></tr>
<tr><td>Circle
You repeatedly (add or multiply) the ratio to the initial value to determine the new value.</td><td>Circle
You repeatedly (add or multiply) the ratio to the initial value to determine the new value.</td></tr>
<tr><td>Use the initial value and ratio to find the equation.</td><td>Use the initial value and ratio to find the equation.</td></tr>
<tr><td>Use the equation to find the new value at 10 years.</td><td>Use the equation to find the new value at 10 years.</td></tr>
<tr><td>Does this situation represent appreciation or depreciation? How do you know?</td><td>Does this situation represent appreciation or depreciation? How do you know?</td></tr>
<tr><td>Signature from partner B:</td><td>Signature from partner A:</td></tr>
</table>

BLM 3.5. HW

LESSON 4: Changing Interest Rates, Time, etc.

Connections to Financial Literacy

- **F1.3 compare the effects that different interest rates, lengths of borrowing time, ways in which interest is calculated, and amounts of down payments have on the overall costs associated with purchasing goods or services, using appropriate tools**
- **F1.4 modify budgets displayed in various ways to reflect specific changes in circumstances, and provide a rationale for the modifications**

Lesson 4: Decisions for purchasing	**Subject/Course** MTH1W
L4: Connections to Other Strands	**Learning Goals**
Linear Relations **Linear/Non-linear Relations** **Overall Expectations** By the end of this course, students will: Compare interest rates, time, and amount using tables, graphs, and equations. Compare different methods of payments and make the best choice. **Mathematical Process Focus - *Connecting*:** students will make connections between the mathematical concepts they have been learning and applications to financial situations. ***Understanding Characteristics of Linear Relations*** - construct tables of values, graphs, and equations, using a variety of tools (e.g. graphing calculators, spreadsheets, graphing software, paper and pencil), to represent linear relations derived from descriptions of realistic situations. **Mathematical Process Focus - *Connecting*:** students will make connections between the mathematical concepts they have been learning and applications to financial situations.	At the end of this lesson, students will be able to: 1) Decide which interest, time, or amount is "best" in each scenario. 2) Use appropriate tool to support their choice.

L4: Accessibility (Accommodations and Universal Design)

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L4: Instructional Components and Context

-Create tables, graphs, and equations for both simple and compound interest -Recall A = P + PRT same as y = b + mx -Recall $A = P(1+r)^t$ -simple and compound interest	-Opportunity to represent nonlinear equations but not necessary. Students can use patterns(tables) to represent the model. **Materials** ● Paper and pencil ● Google doc

L4: Minds On

1) Calculate the following interest amounts?
a) 20% of $60 b) 5% of 50

2) If you have $800 in your account, started with $500, and earned $50 per week, for how long did you invest your money?

3) Evaluate $750(1.25)^4$

4) Which TOV represents simple interest?

year	amount
0	75
1	105
2	135
3	165
4	195

year	amount
0	75
1	86.25
2	99.19
3	114.07
4	131.18

Connections

BLM 4.1

L4: Action!

Simple interest:

In pairs, discuss: Whiteboards?
Case I: Time and interest rates:

Idea 1: → Would you rather have simple interest $1000 at 2% per year for four years or $800 at 4% invested for 4 years? What about the same scenario but for 8 years?
(Use different methods for level 4)

Idea 2: → Would you rather have simple interest $1000 at 2% per year for 5 years or $1000 at 5% per year for 2 years?
(Use different methods for level 4)

Goal: F1.3 compare the effects that different interest rates, lengths of borrowing time, ways in which interest is calculated,

BLM4.2

m→ slope, "interest per year" (Pr)
FD in a table

Case II: Making choices

Idea: → Want to purchase _____ item. Multiple purchase plans.

a) Start with and save
b) Borrow $ and pay interest
c) Payment plan

Case III:

Idea: → Given this situation, how long would it take to get to this amount?

Your family member has a truck sitting in their driveway for you to buy when you get your license. They will charge you $3000 for the truck, and you have $1750 now. How long would it take you to have $3000 if the simple interest is 2% per year?

Extension:
They deposit 50% of their bi-weekly $200 earnings.

Getting more yucky → dollars and cents with half percents.

Idea: → given different representations, make a decision.
TOV → compound
Words → simple

Idea → Which investment has a higher interest rate?

Consolidation:

1) **Solve with TOV and patterning**
2) **Solve A=P+PRT**

BLM 4.3

BLM 4.1 Minds on: Are you ready?

1) Calculate the following interest amounts.
   a) 20% of $60
   b) 105% of 50

2) You start with $500 and earn $50 at the end of each week. How long will it take to reach $800?
3) Bob starts with $400 and takes out $25 every 2 weeks. How long will it take to reach $$100?

4) Complete

Equation	Y = 900 - 10x	$Y = 750(1.25)^4$
How much did you start with?		
Identify if the model is linear or nonlinear.		
Identify if this model is repeatedly adding or multiply.		
Is the model an appreciation or depreciation model? Why?		

5) a) Find first differences and identify the model as linear or nonlinear.
   b) Which table of values represents a simple interest model?
   c) For the nonlinear model, show that it is a compound interest model by finding the ratio between consecutive terms.
   b) Find the equation of each model.

year	amount
0	75
1	105
2	135
3	165
4	195

year	amount
0	75
1	86.25
2	99.19
3	114.07
4	131.18

BLM 4.2 - Different Scenarios

Case I: Which account would you pick?

1. You have the choice of two bank accounts paying different interest. You plan on keeping the money in the account for four years. Would you rather have account A that pays 2% per year simple interest on $1000 or account B with $800 at 4% simple interest?

Which account would you pick?	
Why? Use tables, graphs, and equations to support your choice.	

2. Would you rather have an account with $1000 at 2% per year simple interest for 5 years or an account with $1000 at 5% per year simple interest for 2 years?

Which account would you pick?	
Why? Use tables, graphs, and equations to support your choice.	

Case II: Which is the better option?

Use the following link and look for an item you would like to have in the near future: https://www.easyhome.ca/	
You have several options to reach your goal:	
Option 1	You start with $100 and hope to make $20 per week from babysitting.
Option 2	Consider the installment plan on Easy homes.
Option 3	Borrow the money at 2.5% per year simple interest for 3 years.

Case III: How long will it take?

3. Your family member has a truck sitting in their driveway for you to buy when you get your license. They will charge you $3000 for the truck and you have $1750 now.	
a) How long would it take you to have $3000 if the rate is 2% per year simple interest?	b) How long would it take you to have $3000 if the rate is 2% per year compound interest?

LINK to BLM 4.3 in Google Doc (below) for accessibility

BLM 4.3: Home Activity

You have a choice of two different savings accounts to invest $100:

1. 10% simple interest

or

2. 8.5% interest compounded annually

If you were going to leave the money in the account for 5 years, which investment should you choose? Justify your answer.

Years	Principal	Interest Rate	Interest	Total Amount
0				
1				
2				
3				
4				
5				

In a lot of cases, we invest money early so we have money for retirement. How much money would you have in 35 years?

Years	Principal	Interest Rate	Interest	Total Amount
0				
1				
2				
3				
4				
5				

In a lot of cases, we invest money early so we have money for retirement. How much money would you have in 35 years?

LESSON 5: Coding - Simple Interest

Connections to Financial Literacy

- **F1.3 compare the effects that different interest rates, lengths of borrowing time, ways in which interest is calculated, and amounts of down payments have on the overall costs associated with purchasing goods or services, using appropriate tools**

Lesson 5: Coding - Simple Interest	Subject/Course MTH1W
L5: Connections to Other Strands	**Learning Goals**
Linear Relations **Linear/Non-linear Relations** **Overall Expectations** By the end of this course, students will: -Reg -use coding or spreadsheet to consolidate understanding of simple interest -to make decisions using coding or spreadsheet	At the end of this lesson, students will be able to: -use coding or technology to make decisions -apply simple interest

L5: Accessibility (Accommodations and Universal Design)

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L5: Instructional Components and Context

-Access to computer -Access to Scratch coding	**Teacher's Note** -Book computer lab **Materials** • Paper and pencil • Google doc • Spreadsheet and Scratch

L5: Minds On	Connections
Using the simple interest formula A=P(1+rt) = p + prt a) Determine the length of time for $500 to double when invested at 3% per year. b) Determine the principal or initial value if the total amount was $600 when the principal was invested at 2% per year simple interest for 5 years, c) Determine the rate or percent if the total value was $1000 and you invested $750 for 48 months.	BLM 5.1

L5: Action!

Simple interest:

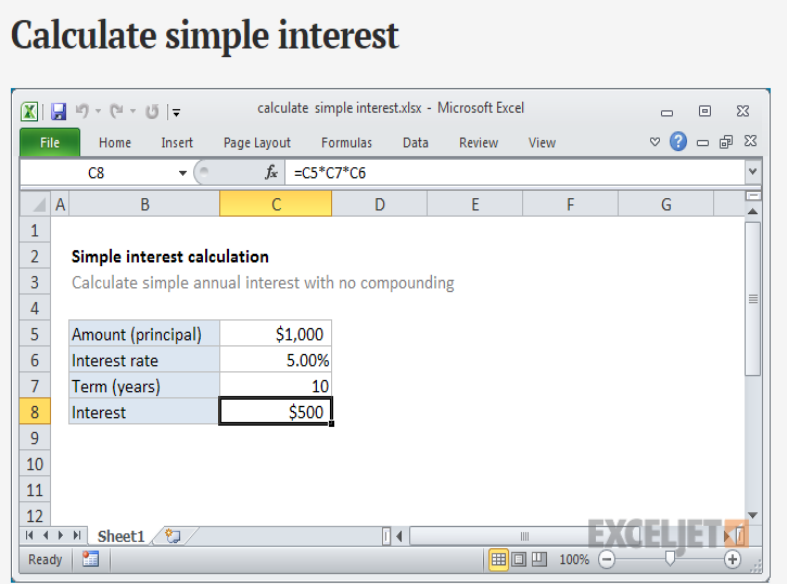
Teacher lead instructions for Scratch-
A = P(1 + rt)
Method 1: Scratch
Unplugged coding. Plan what you would like your program to do.
ie.

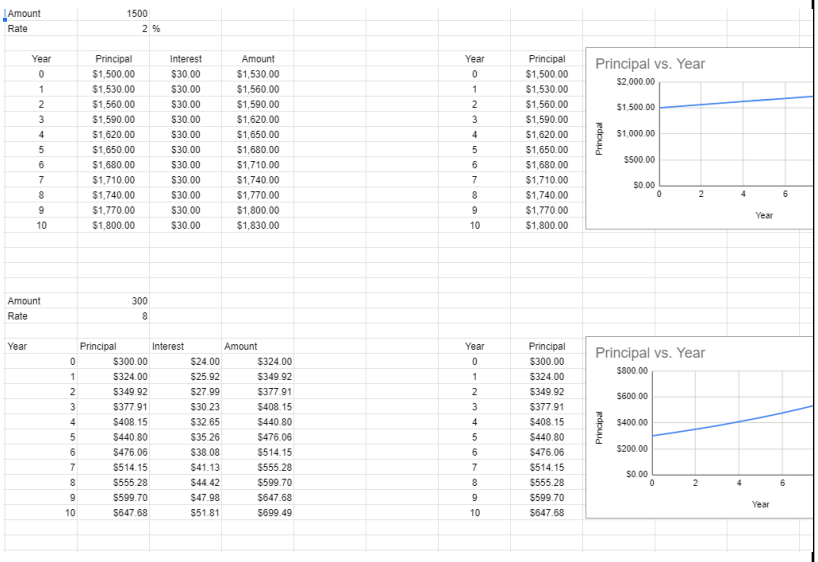
1) Click on the letter
2) Create the variables
3) Ask for the variables then store
4) Calculate
5) Get the sprite to say the answer.
6) Reset and ask again.

BLM 5.1

Code:

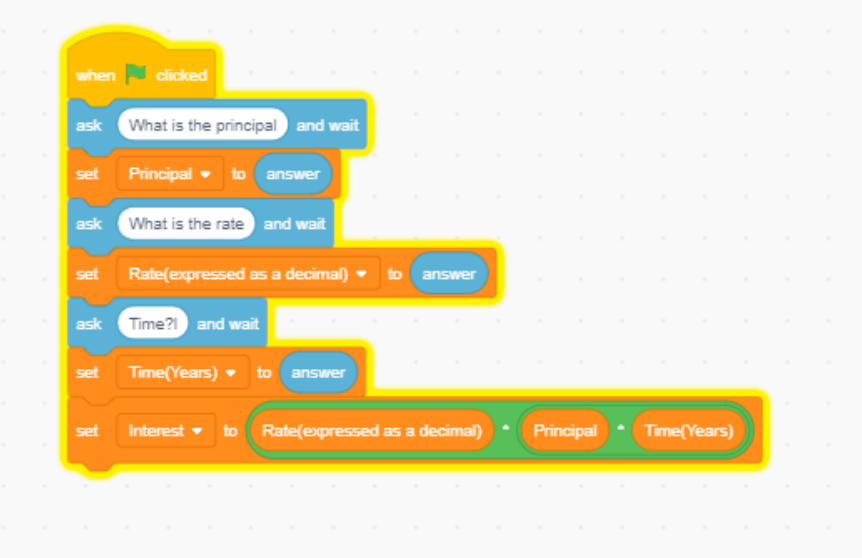
Test using decision making questions.
Method 2: Use google spreadsheet





Method 3 (Optional - Students may want to use other programming languages ex. Python, C++) Questions: You would like to have $16 000 saved when you graduate from ESS. You are going to buy A Raven Savings Certificate. This certificate can only be cashed out once you graduate. Include an interest rate. Create three scenarios that would allow you to meet this requirement. a) Invest now. b) Wait for your grade 12 year. c) If you invest $5000 today, how much would you need to invest two years from now to meet the goal. d) You save four installments of the same amount of money each year. Record your trials until you achieve your goal?	**Look up the interest rate as a class.** **This activity would be a lot of trial and error using the coding that was just made. This purpose is to look how time in years affects the amount.** **Low floor → parts a and b** **High ceiling → the multiple installments.** **Can also extend to changing rates.** **ie., does tripling an interest rate cause your amount to be one third?**

BLM 5.1- Scratch Sample Program



LESSON 6: Coding - Compound Interest

Connections to Financial Literacy

- **F1.3 compare the effects that different interest rates, lengths of borrowing time, ways in which interest is calculated, and amounts of down payments have on the overall costs associated with purchasing goods or services, using appropriate tools**

Lesson 6: Coding - Compound Interest	Subject/Course MTH1W
L6: Connections to Other Strands	**Learning Goals**
Linear Relations **Linear/Non-linear Relations** **Overall Expectations** By the end of this course, students will: -Reg -use coding or spreadsheet to consolidate understanding of compound interest -to make decisions using coding or spreadsheet	At the end of this lesson, students will be able to: -use coding or technology to make decisions -apply compound interest

L6: Accessibility (Accommodations and Universal Design)

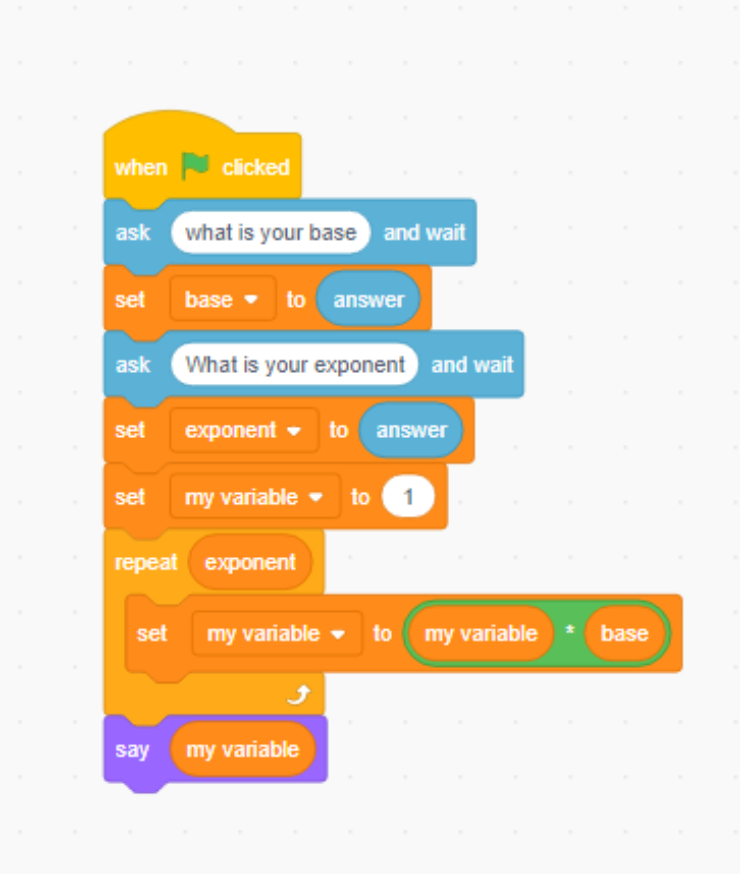
- To support students struggling with literacy: Ensure all materials provided to students are accessible to *Read and Write*. Materials in this document are accessible to *Read and Write.*
- To support students with memory: Consider using voice recordings at key points in electronically shared documents
- To remove a barrier, points on graphs embedded in this document can be moved by right clicking on the image and selecting edit (so students using a digital copy can just move the points onto the graph into the correct position)

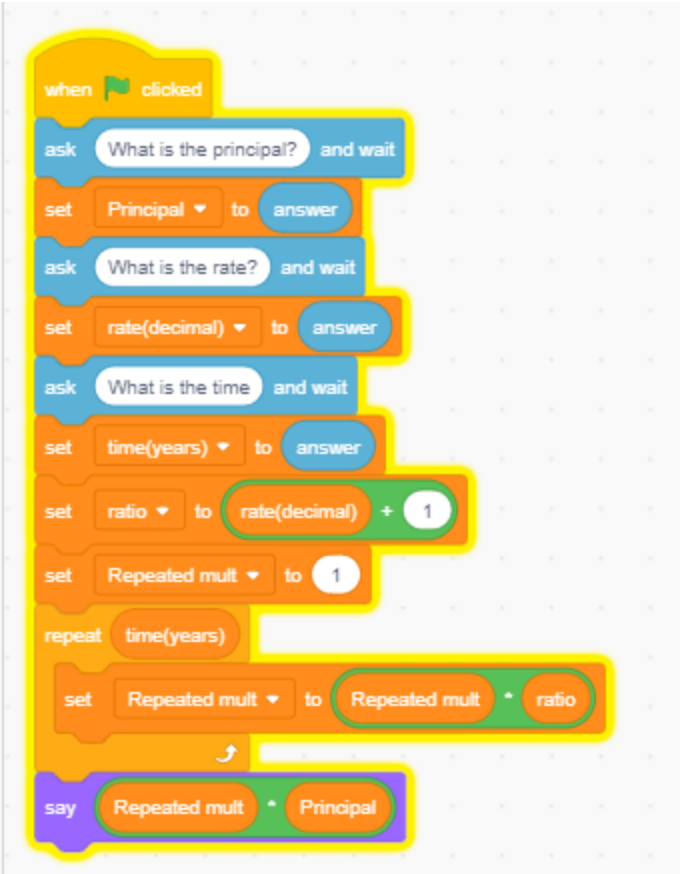
Student profiles will vary from class to class. In addition to other sources of information, including classroom assessments, helpful information about student profiles can be found in the IEPs and in psych-educational assessments. The school's Learning Support Teacher can provide support. For more ideas for accommodations for specific assessed areas of strength and/or need: (Click the link) Understanding Learning Disabilities: How Processing Affects Mathematics Learning

L6: Instructional Components and Context

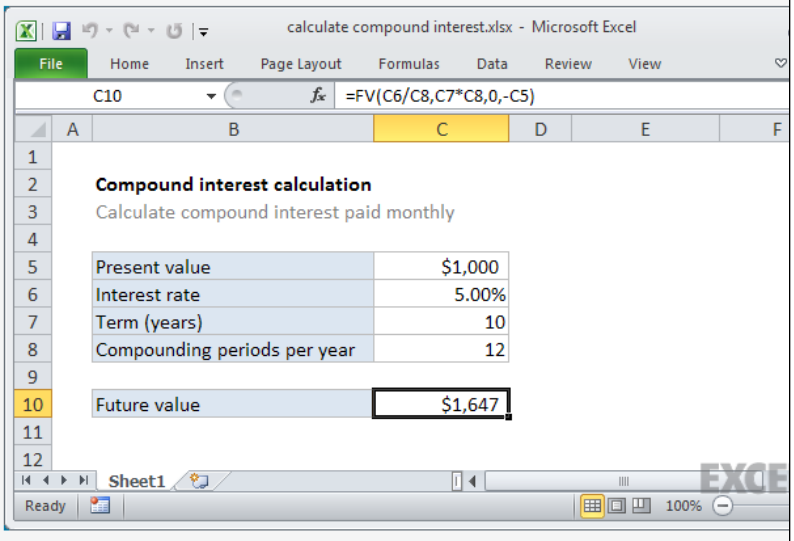
Terminology	**Teacher's Note**
-Access to computer	-Book computer lab • Paper and pencil • Google doc • Spreadsheet and Scratch

L6: Minds On	Connections
1) Create a tov to create a model and equation for starting with $250 and earning 2% simple and then compound interest. 2) If you borrowed some money from your parents/guardians what type of interest plan would you tell them to set up. a) 0% at paying $50/week for 24 weeks b) Borrow $1000 and pay simple interest of 0.5% per week for 24 weeks. Create option for simple interest	Base for appreciation and depreciation.

c) Borrow $1000 and pay compound interest of 0.5% per week for 24 weeks. Create option with repeated multiplication	Go back and check for compound interest practice in earlier lesson. 1000*1.005^24
L6: Action!	
Compound interest: *Unplugged coding: goal, solve for future amount* *1) Ask for investment $ and store* *2) Ask for interest rate % and store* *3) Ask for time in number of years* *4) Output amount using a calculation.* *Method 1: Scratch* *Method 2: Spreadsheet* *Method 3 (Optional - Students may want to use other programming languages ex. Python, C++)* *Code on how to calculate a power in scratch.*  	**Change FV to represent equation they created.** **Perhaps use this coding to verify with the minds on questions.**



Calculate compound interest



See

Amount	1500
Rate	2 %

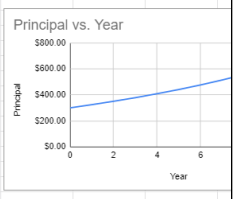
Year	Principal	Interest	Amount
0	$1,500.00	$30.00	$1,530.00
1	$1,530.00	$30.00	$1,560.00
2	$1,560.00	$30.00	$1,590.00
3	$1,590.00	$30.00	$1,620.00
4	$1,620.00	$30.00	$1,650.00
5	$1,650.00	$30.00	$1,680.00
6	$1,680.00	$30.00	$1,710.00
7	$1,710.00	$30.00	$1,740.00
8	$1,740.00	$30.00	$1,770.00
9	$1,770.00	$30.00	$1,800.00
10	$1,800.00	$30.00	$1,830.00

Year	Principal
0	$1,500.00
1	$1,530.00
2	$1,560.00
3	$1,590.00
4	$1,620.00
5	$1,650.00
6	$1,680.00
7	$1,710.00
8	$1,740.00
9	$1,770.00
10	$1,800.00

Amount	300
Rate	8

Year	Principal	Interest	Amount
0	$300.00	$24.00	$324.00
1	$324.00	$25.92	$349.92
2	$349.92	$27.99	$377.91
3	$377.91	$30.23	$408.15
4	$408.15	$32.65	$440.80
5	$440.80	$35.26	$476.06
6	$476.06	$38.08	$514.15
7	$514.15	$41.13	$555.28
8	$555.28	$44.42	$599.70
9	$599.70	$47.98	$647.68
10	$647.68	$51.81	$699.49

Year	Principal
0	$300.00
1	$324.00
2	$349.92
3	$377.91
4	$408.15
5	$440.80
6	$476.06
7	$514.15
8	$555.28
9	$599.70
10	$647.68



Add in some consolidation questions or budgeting questions.
Add in some depreciation work. What would change to make this a depreciation question.

Need to add more practice questions.
Google forms quiz and some homework (maybe terminology)

Low questions	*Medium questions*	*High questions*

Questions:

You would like to have $16 000 saved when you graduate from ESS. You are going to buy A Raven Saving Certificate. This certificate can only be cashed out once you graduate. Include an interest rate.

Create three scenarios that would allow you to meet this requirement.

e) Invest now
f) Wait for your grade 12 year
g) If you invest $5000 today, how much would you need to invest two years from now to meet the goal.
h) You save four installments of the same amount of money each year.

Record your trials until you achieve your goal?

BLM 6.1 - Teacher Instructions & Support for Coding with Compound Interest

Learning Goal

Minds on: The key to compound interest is the repeated multiplication of the growth/decay factor. Key reminder is for appreciation = 100%+ interest%, depreciation = 100% - given%.

1) Create a table of values to create a model and equation for starting with $250 and earning 2% simple and then compound interest.

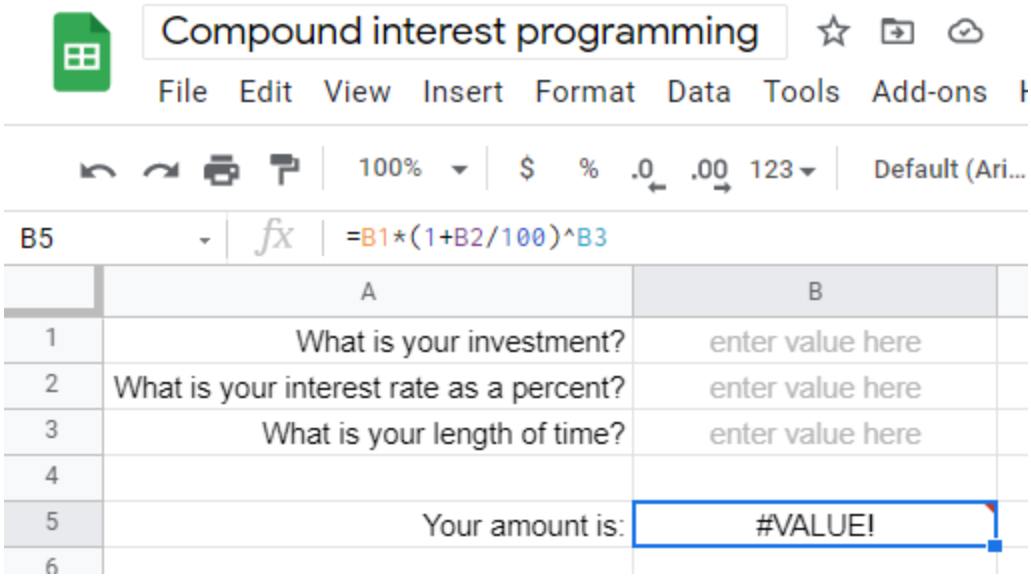
2) If you borrowed some money from your parents/guardians what type of interest plan would you tell them to set up.
    a) 0% at paying $50/week for 24 weeks
    b) Borrow $1000 and pay simple interest of 0.5% per week for 24 weeks. Create option for simple interest
    c) Borrow $1000 and pay compound interest of 0.5% per week for 24 weeks. Create option with repeated multiplication

3) Create the base of a power used in appreciation/depreciation for each case.
    a) Appreciate 4% each year.
    b) Compound interest $7\frac{3}{4}$%
    c) Depreciate 33% each year.

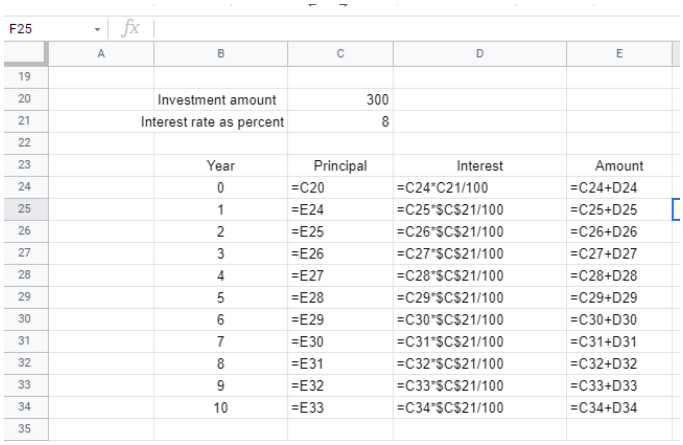
Action:
Coding lesson:
Topic 1: Coding compound interest / appreciation / depreciation on google sheets.

Unplugged coding:

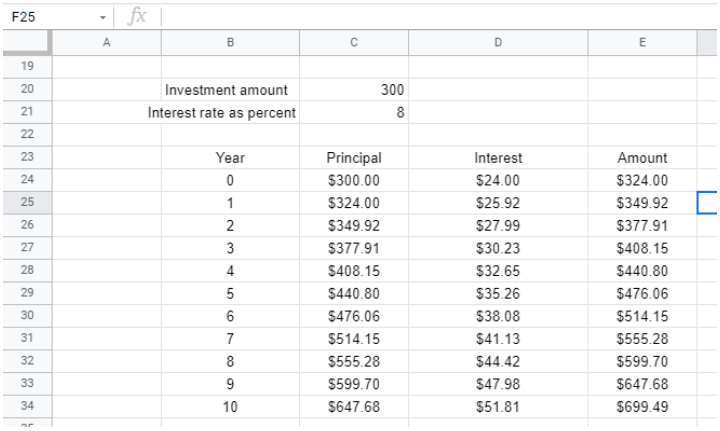
I want my program to:
1) Ask for investment (starting) amount and store variable.
2) Ask for % increase in the amount and store.
3) Ask for length of time in years and store.
4) Complete the calculation and output the answer.
    a) The math. Take investment and multiply by 100%+ increase % to the exponent in years.



To make a chart that shows the growth, use repeated multiplication using the simple interest formula.



	A	B	C	D	E
19					
20		Investment amount	300		
21		Interest rate as percent	8		
22					
23		Year	Principal	Interest	Amount
24		0	=C20	=C24*C21/100	=C24+D24
25		1	=E24	=C25*$C$21/100	=C25+D25
26		2	=E25	=C26*$C$21/100	=C26+D26
27		3	=E26	=C27*$C$21/100	=C27+D27
28		4	=E27	=C28*$C$21/100	=C28+D28
29		5	=E28	=C29*$C$21/100	=C29+D29
30		6	=E29	=C30*$C$21/100	=C30+D30
31		7	=E30	=C31*$C$21/100	=C31+D31
32		8	=E31	=C32*$C$21/100	=C32+D32
33		9	=E32	=C33*$C$21/100	=C33+D33
34		10	=E33	=C34*$C$21/100	=C34+D34
35					

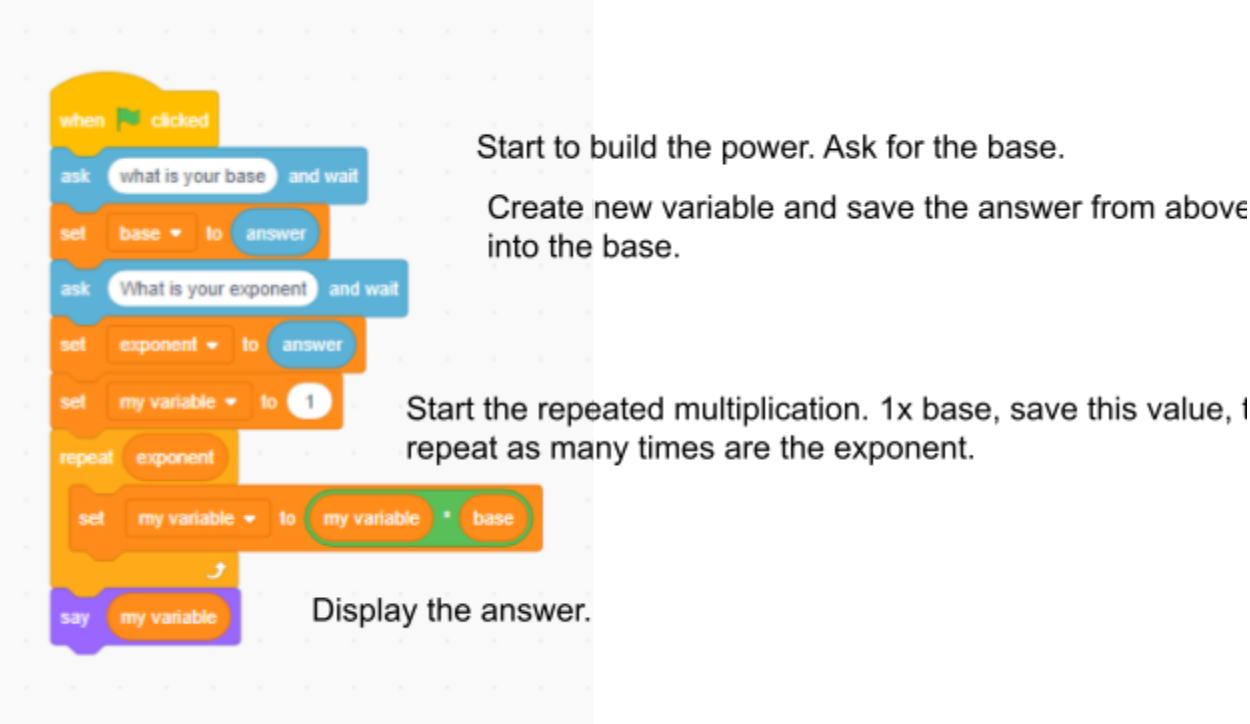


	A	B	C	D	E
19					
20		Investment amount	300		
21		Interest rate as percent	8		
22					
23		Year	Principal	Interest	Amount
24		0	$300.00	$24.00	$324.00
25		1	$324.00	$25.92	$349.92
26		2	$349.92	$27.99	$377.91
27		3	$377.91	$30.23	$408.15
28		4	$408.15	$32.65	$440.80
29		5	$440.80	$35.26	$476.06
30		6	$476.06	$38.08	$514.15
31		7	$514.15	$41.13	$555.28
32		8	$555.28	$44.42	$599.70
33		9	$599.70	$47.98	$647.68
34		10	$647.68	$51.81	$699.49

This idea of coding in spreadsheets can make it easier to see where a variable is stored. When you move to scratch, you need to create a name of the variable to store it under the name. Ie, in sheets investment amount is B1, in scratch, investment amount can actually be called investment amount.

Topic 2: Coding in scratch.
Scratch does not have a mathematical way to calculate exponents easily. A program using the idea of repeated multiplication needs to be written to complete the exponents.

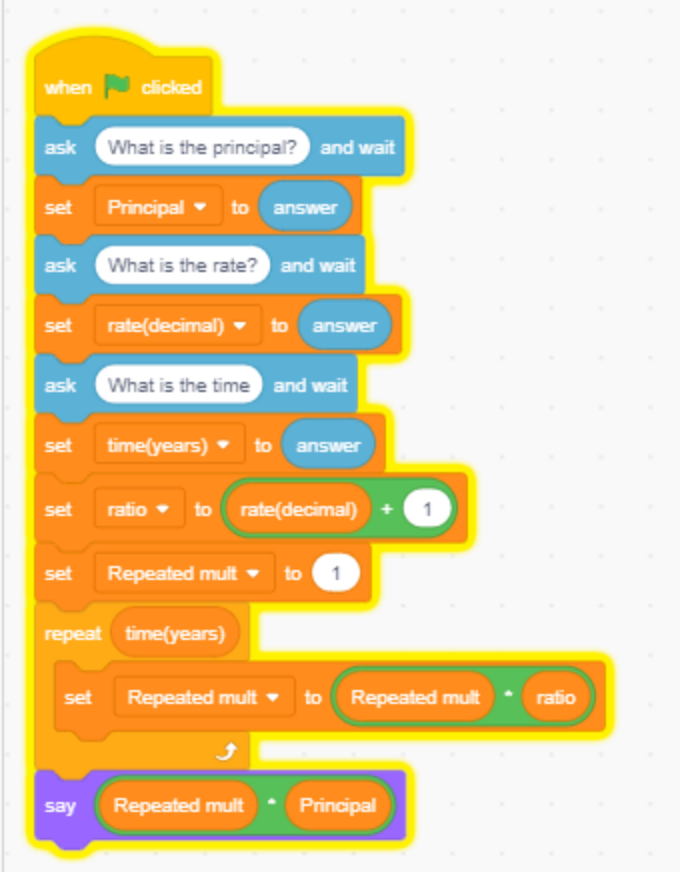
Action: Teach students how to create code to complete calculations with powers.



Students can then try to build their scratch program for compounding.
Unplugged coding:

1) Ask for investment amount and store answer as ____
2) Ask for interest rate and store answer as _____ variable
3) Ask for number of years and store answer as ____
4) Complete power calculation. Store answer as _____
5) Display answer as calculate investment amount time power calculation.

See below for sample calculation.



Question: Now change your code to calculate the depreciation of an item.

Appendix A - SEL Skills Checklist

SOCIAL-EMOTIONAL LEARNING (SEL) SKILLS Develop and explore a variety of social-emotional learning skills in a context that supports and reflects this learning in connection with the expectations across all other strands. **(AA1)**										
Specific Goals:	**Not Yet**	**Getting There**					**Got It!**			
I can recognize and identify emotions that support my mathematical learning. **(AA1)**	✔									
I can recognize sources of stress that present challenges to my mathematical learning. **(AA2)**	✔									
I can identify resources that will help me to persevere in my mathematical learning. **(AA3)**	✔									
I can build healthy relationships and communicate effectively in mathematics. **(AA4)**	✔									
I have developed a healthy mathematical identity through building self-awareness. **(AA5)**	✔									
I have developed my critical and creative mathematical thinking. **(AA6)**	✔									