WAMC Lab Template
Math Concept(s): Calculating discount points and breakeven
Source / Text: Financial Algebra – Advanced Algebra with Financial Applications, 2nd Edition
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Attach the following documents:
Lab Instructions
Student Handout(s)
Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):
This lab takes place after the instruction for Purchase and Mortgage of a house. The lab includes research into mortgage rates, creation of an electronic spreadsheet to determine the mortgage payments, and a determination of if paying discount points is a good decision for the purchase of the house. The students will also use the different in payments to determine the break-even point for the discount points and if they make sense based on different lengths of time for ownership of the house.

Lab Plan
Lab Title: Why would I want to use discount points?

Prerequisite skills: (i.e., vocabulary, measurement techniques, formulas, etc.)
- Vocabulary – mortgage, market value, down payment, closing cost, points, discount points, mortgage points, breakeven
- Formulas – monthly payment formula, cost of points formula, formula to determine savings each month for lower interest rate, formula to determine the length of time for points to be recovered
- Electronic spread sheets – How to create a loan payment schedule

Lab objective:
Students are not only able to determine monthly payments with discount points, but also if the breakeven point is the correct one for the length of time that a house will be owned. They will use technology to do research on interest rates and to determine if the budget will allow for making the house payment.

Standards: (*Note: SPECIFIC relationship to Science, Technology, and/or Engineering*)
Mathematics K-12 Mathematical Practices
- MP.1 – Makes sense of problems and persevere in solving them
- MP.2 – Reason abstractly and quantitatively
- MP.4 – Model with mathematics
- MP.5 – Use appropriate tools strategically
Standards for Mathematical Practice:

- N-RN.1 – Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- N-Q – Reason quantitatively and use units to solve problems.
- A-SSE1 – Interpret expressions that represent a quantity in terms of is context.
- A-CED3 – Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.
- A-APR6 – Rewrite simple rational expressions in different forms
- F-BF1 – Write a function that describes a relationship between two quantities.
- S-MD – Calculate expected values and use them to solve problems

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):
- RI.9-10.1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- RI.9-10.2 - Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.
- RI.9-10.4 - Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone
- W.9-10.1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- W.9-10.2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- W.9-10.3a - Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.
- SL.9-10.4 - Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
- L.9-10.1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- L.9-10.2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Technology
- ISTE 1d - Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.
- ISTE 3a - Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.
- ISTE 3b - Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources.

- ISTE 4b - Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

Engineering

- HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Leadership/21st Century Skills:

<table>
<tr><td colspan="3">21st Century Interdisciplinary themes (Check those that apply to the above activity.)</td></tr>
<tr><td>☐ Global Awareness</td><td>☒ Financial/Economic/Business/Entrepreneurial Literacy</td><td>☐ Civic Literacy</td></tr>
<tr><td>☐ Health/Safety Literacy</td><td>☐ Environmental Literacy</td><td></td></tr>
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21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS	Productivity and Accountability
Creativity and Innovation	Information Literacy	Flexibility and Adaptability	☐ Manage Projects
☒ Think Creatively	☒ Access and Evaluate Information	☐ Adapt to Change	☒ Produce Results
☐ Work Creatively with Others	☐ Use and manage Information	☐ Be Flexible	Leadership and Responsibility
☐ Implement Innovations	Media Literacy	Initiative and Self-Direction	☐ Guide and Lead Others
Critical Thinking and Problem Solving	☐ Analyze Media	☒ Manage Goals and Time	☐ Be Responsible to Others
☒ Reason Effectively	☐ Create Media Products	☐ Work Independently	
☐ Use Systems Thinking	Information, Communications and Technology (ICT Literacy)	☐ Be Self-Directed Learners	
☒ Make Judgments and Decisions	☒ Apply Technology Effectively	Social and Cross-Cultural	
☒ Solve Problems		☒ Interact Effectively with Others	
Communication and Collaboration		☐ Work Effectively in Diverse Teams	
☐ Communicate Clearly			
☒ Collaborate with Others			

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Computer
- Spreadsheet software
- Paper and either pencil or pen
- Presentation system

Set-Up Required:

- Student Hand-outs
- Students divided into 3-person groups

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Group will collaborate to solve problems

Cooperative Learning:

- Students will work effectively to arrive at information and presentation of solutions to problems

Expectations:

- Students will understand how discount points affect the cost of buying a house

Timeline:

- 2 – 3 class periods

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab

- Why would a person want to use discount points with a mortgage?

- Are discount points always a wise decision?

Career Applications

- Lenders
- Mortgage brokers
- Real estate agents
- Accountants
- Developers

Optional or Extension Activities

- Change of the income for the perspective buyer to see what the amount of the mortgage loan would be for different incomes.

Student Handout

Formulas:

Balance of Monthly Down Payments Made	$B = \dfrac{P\left((1 + \frac{r}{n})^{nt} - 1\right)}{\frac{r}{n}}$
Monthly Payment	$M = \dfrac{P(\frac{r}{12})(1 + \frac{r}{12})^{(12t)}}{(1 + \frac{r}{12})^{(12t)} - 1}$
Points Cost	1 Point = 1.5% of Loan Amount
Interest Rate Deduction	Number of Points Purchased x Rate Discount
Amount Saved Each Month	Original Interest Rate Monthly Payment – Discounted Interest Rate Monthly Payment
Break-even Point	Cost of Points ÷ Amount Saved Each Month

Should I or Not Purchase Discount Points?
Lab Instructions

Information about what is taking place:

You are in the market for buying a house that will be your first purchase. You have been saving money for your down payment for the past 5 years while you were renting an apartment. You have been able to save $450 per month for your down payment. The house that you are looking for will have 3-bedrooms and 2-baths. You are looking for a house that is in the $250,000 range. Discount rates are currently a 0.10% per discount point purchased. Discount points are 1.5% of the loan amount.

Items you need to research and answer:

What are interest rates for a 30-year mortgage from at least 3 lenders?

Which three houses am I interested in? (*These can be found on any real estate companies web site*)

Lab Work:

After you have answered he above two questions, you will complete the following task.

Step 1:

Create a spreadsheet to calculate the mortgage payment. This spreadsheet formula will be used for the original mortgage payment and to calculate the mortgage payments for the discount points. Print out a copy of the spreadsheet showing the calculations to turn in.

Step 2:

Create a table where you will put all of the mortgage payments and their interest rates for discount points of 1, 2, 3, and 4. (*Sample shown below.*)

Points	Interest Rate	Monthly Payment
0 *(Original rate)*	4.50%	$875.00
1	4.40%	$845.00
2		
3		
4		

You will turn in your completed table.

Step 3:

As a group of three, you will decide which table of rates and payments you will include for your group to turn in.

Step 4:

As a group, answer the following questions:

1. Based on the monthly payments for each discount point purchased, when is the break-even point for each situation? *(Show your work)*

2. If you were to keep the house for just 10 years would you purchase any discount points? At which level if any? Why or why not?

3. If you were to keep the house for 15 years would you purchase any discount points? At which level if any? Why or why not?

4. If you were to keep the house for 25 years would you purchase any discount points? At which level if any? Why or why not?

Step 5:

As a group present your findings and calculations to the class. Use presentaion technology to make your presentation.

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