

Lab Framework

Text:Cord

Unit number and title: Unit 15 Using Formulas to Solve Problems

Short Description: Students are going to calculate compound interest for investments.

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Lab Title

Investments & Compounding Interest

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**

Students will use formulas to determine investment income with various compounding of interest methods (daily, quarterly, annually) and examine the affects of different investment strategies (invest now, gradually, etc.)

- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

Solving problems with powers and roots

Vocabulary list below

Problem solving techniques

- **Vocabulary**

Formulas

Rearrange & substitute values in formulas

Pythagorean formula

- **Materials List**

Lab Worksheet

Calculator

- **GLEs (State Standards) addressed**

Math:

1.1.6 Complete multi-step computations with combinations of rational numbers using order of operations and addition, subtraction, multiplication, division, powers, and square roots

2.2.3 Apply a variety of strategies and approaches to construct solutions.

2.2.4 Determine whether a solution is viable, is mathematically correct, and answers the question(s)

3.3.2 Evaluate reasonableness of results

Reading: (Reading)

1.2 Use vocabulary (word meaning) strategies to comprehend text

Writing:

3.3.1 Uses legible handwriting.

- **Leadership Skills**

Teamwork

Organizing a group

- **SCAN Skills/Workplace Skills**

- **Set-up information**

Lab organization(-Grouping/leadership opportunities/cooperative learning expectations)

Students are to be placed in groups of 3 to 4 students. At least two of the students should work each problem at a time, so they can compare their results and verify that they used the order of operations correctly to get an accurate result. Students should take turns answering the problems. One student may be chosen to lead the group, be sure that everyone is participating, to keep the group on track, and to monitor their time. Each of these jobs can also be given to each individual member of the team. This lab will take at least two 50 minute class hours – one to complete the lab problems and one to prepare & then present group ideas.

- **Teacher Assessment of student learning** (scoring guide, rubric)

Students will be assessed with teacher observation of teamwork (and individual participation), student group self-assessment of participation, and for thoroughness of problem explanations.

- **Summary of learning** (to be finished after student completes lab)

-discuss real world application of learning from lab

-opportunity for students to share/present learning

Each team will share their conclusion and supporting data with the class.

-The teacher will start a discussion of possible career applications for this lab and student goals/strategies for their own investing (matching it with budgets already created).

- **Optional activities**

1. Have students research current investment rates for CDs, bonds, or savings accounts.

2. Students could research other investment opportunities, fees, current rates of returns, etc.

3. Students could recreate a budget including money to be invested every month and have them choose a type of investment.

- **Career Applications/Objectives**

Financial planner, banker, accountant, homemaker, realtor, union rep, construction worker, boat builder, electrician, engineer, budget manager, insurance agent, entrepreneur with employees, human resource manager, etc.

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LAB TITLE: Investments & Compounding Interest

STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**

How can a young person start to invest for their future/retirement and why should they think about it now? What are some of the investment opportunities available to young people with very little to start investing with?
- **Grouping instructions and roles**

Students will work in small groups. Students should both calculate the answers and then compare their results with other members of their group. Each of the students will present part of the project to the class.
- **Procedures – steps to follow/instructions**
 1. Students are to complete the lab work sheet with members of their group.
 2. Using the formulas on the lab work sheet, students are to find various investment rates, amounts, and decide how to reach their investment goals.
 3. Students will research investment opportunities and strategies and think about what might work best for them.
 4. Groups will present their numbers and what they think is the best investment strategy for them to the entire class at the end of the project.
 5. Groups should graph their results to use with their presentations and this is also easier ‘to see’ for visual learners.
 6. Optional activities listed above would be good follow-ups for this worksheet.
- **Outcome instructions**

Students are going to use their skills on how to use formulas to solve several problems. Then, they will need to decide what investment strategy would work best for young people, like themselves, just starting in the work world.
- **Assessment instructions** (peer-teacher)

Students will be assessed on their correct usage of vocabulary (while speaking & writing), use of formulas, and the reasonableness/thoughtfulness of their explanations to their answers.

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Lab Data Collection

Student: _____ Date: _____

Unit: 15 Using Formulas to Solve Problems

Lab Title: Investments & Compounding Interest

Criteria: Write the problem/objective in statement form

Students are going to use formulas to find income for different investment strategies and then choose one that they think would work best for young people – to present to the class.

Data Collection: Record the collected/given data

1. Deposit \$5,000 @ 8% interest for 5 years, compound annually, quarterly, monthly, and then daily. Which one earns the most amount of money in 5 years? By how much? Why? Next, using the best compounding method, how much would the \$5,000 be worth in 10 years? 20 years?
2. Invest \$1000 per year for 5 years @8%, compounded daily. What is the investment worth in 5 years? Now, compare this amount with the result from problem 1, invest \$5000 @ 8% interest for 5 years, compounded daily. Which one has a higher value at the end of the first 5 years? Why (you invested \$5000 total for each)?
3. Finally, use your data from above and come up with a plan to invest for your retirement. How much should you invest annually to have what you want to retire with (\$1,000,000 or \$100,000,00???) Hint, rearrange the formulas as you need to. (How old will you be when you retire?)
4. Create graphs of your information for your class presentation.
5. Present to the class your idea for best investment strategy. All students must participate in the presentation.

Calculations: Complete the given calculations to solve for an answer(s)

P = principal

R = annual interest rate (decimal)

N = number of times compounded per year (daily, monthly, quarterly, annually)

T = number of years

A = amount after (T) time – final investment value

C = Annual Contributions

Compound Interest Formula;

$$A = P(1+R/N)^{NT}$$

Compound Interest with Annual Additions;

$$A = P(1+R)^N + C[((1+R)^{N+1} - (1+R))/R]$$

Summary Statement: (to be finished after student completes lab)

- discuss real world application of learning from lab
- opportunities for students to share learning

Other Assessment(s)

Teacher observation of individual participation within groups

Student group self-assessment of individual participation

Use of estimation processes learned in unit

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Unit 15 Lab (2 Class hours / 3-4 students per group) Using Formulas to Solve Problems

Saving for the Future (using compound interest)

How can you start to invest for your future/retirement and why should you think about it now?

Calculations: Complete the given calculations to solve for an answer(s)

P = principal

R = annual interest rate (decimal)

N = number of times compounded per year (daily, monthly, quarterly, annually)

T = number of years

A = amount after (T) time – final investment value

C = Annual Contributions

Compound Interest Formula;

$$A = P(1+R/N)^{NT}$$

Compound Interest with Annual Additions;

$$A = P(1+R)^N + C[(1+R)^{N+1} - (1+R)]/R$$

1. Deposit \$5,000 @ 8% interest for 5 years, compound annually, quarterly, monthly, and then daily. Which one earns the most amount of money in 5 years? By how much? Why?
2. Next, using the best compounding method from #1, how much would the \$5,000 be worth in 10 years? 20 years? 30 years?
3. Invest \$1000 per year for 5 years @ 8%, compounded daily. What is the investment worth in 5 years?
4. Now, compare this amount with the result from problem #1, (invest \$5000 @ 8% interest for 5 years, compounded daily). Which one has a higher value at the end of the first 5 years? Why (you invested \$5000 total for each)?

Group Project:

5. Finally, use your data from above and come up with a plan to invest for your retirement. How much should you invest annually to have what you want to retire with (\$1,000,000 or \$100,000,000)? Hints; rearrange the formulas as you need to. How old will you be when you retire?
6. Create graphs of your information for your class presentation.
7. Present to the class your idea for best investment strategy. All students must participate in the presentation.

Optional activities

1. Have students research current investment rates for CDs, bonds, or savings accounts.
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