

Unit 3 Exponentials

MAP 4C Foundations for College Mathematics

BIG PICTURE

Students will:

Solve exponential equations

Investigate the effects of changing parameters when investing in an annuity or a mortgage

Day	Lesson Title	Math Learning Goals	Expectations
1	Exploring Exponentials <i>Lesson Included</i>	<ul style="list-style-type: none"> Graph exponential functions to look at key features of the graph including rate of change Compare exponential functions with linear and quadratic functions in real-world context Explore rates of change using finite differences 	MM 2.1, MM1.6, MM2.3, MM2.4, MM3.3
2		<ul style="list-style-type: none"> Determine, through investigation, the exponents laws for multiplying, dividing and power of a power Simplify and evaluate algebraic expressions containing integer exponents 	MM1.1 MM1.2
3		<ul style="list-style-type: none"> Determine through investigation using a variety of tools and strategies the value of a power with a rational exponent Evaluate numerical expressions involving rational exponents and rational bases Play a game involving powers 	MM1.3, MM1.4
4		<ul style="list-style-type: none"> Solve exponential equations, graphically and numerically Solve problems involving exponential equations 	MM1.5, MM1.7, MM1.6
5	Problem Solving with Exponentials <i>Lesson Included</i>	<ul style="list-style-type: none"> Solve equations of the form $x^n = a$ using rational exponents using inverse operations Using a real world formula, determine the value of a variable of degree no higher than three by substituting known values and then solving for the unknown variable Solve problems involving exponential equations 	MM3.1, MM3.2, MM2.6, MM1.6, MM3.4
6		<ul style="list-style-type: none"> Summative task on solving exponential equations and exponent laws and real world applications 	
7	Saving Your Money <i>Lesson Included</i> <i>*New Jan/08*</i>	<ul style="list-style-type: none"> Gather and interpret possible investments involving annuities Gather and interpret information about mortgages 	PF1.1, PF1.5
8		<ul style="list-style-type: none"> Solve problems that involve amount, the present value, and the regular payment of an ordinary annuity in situations where the compounding period and the payment period are the same Demonstrate through investigation using technology the advantage of investing early on 	PF1.3, PF1.4
9-10		<ul style="list-style-type: none"> Determine through investigation using technology the effect of changing the conditions (payment, frequency, interest rate, compounding period) keeping the compound period and payment period the same 	PF1.2, MM2.5

11		<ul style="list-style-type: none"> • Read and interpret an amortization table for a mortgage • Generate and amortization schedule 	PF1.6, PF1.7
12		<ul style="list-style-type: none"> • Determine, through investigation using technology the effects of varying payment periods, regular payments and interest rates on the length of time needed to pay off a mortgage. 	PF1.8
13	<p>Understanding Annuities</p> <p><i>Summative Included</i> <i>*New Jan/08*</i> <i>m.o.*</i></p>	<ul style="list-style-type: none"> • Summative Task • Establish the criteria for level 3 of the rubric for the personal finance expectation as a class 	

Unit 3: Day 7: Saving Your Money		
Minds On: 15	Math Learning Goals: <ul style="list-style-type: none"> gather and interpret information about annuities describe key features of annuities gather and interpret information about mortgages describe features associated with mortgages 	Materials <ul style="list-style-type: none"> BLM 3.7.1 BLM 3.7.2 BLM 3.7.3 computers with Internet access
Action: 50		
Consolidate: 10		
Total=75 min		
Assessment Opportunities		
Minds On...	Small Groups → Graffiti Prepare pieces of chart paper with stages of life as titles (Stages could include Infancy, Childhood, Adolescence, Early Adulthood, Middle Adulthood, Nearing Retirement, Senior Citizen). Each group carries a different coloured marker as they rotate through the chart paper stations. At each station, the group considers financial goals and needs during a particular stage in life and brainstorms reasons for saving money at that stage. Groups rotate after 1 – 2 minutes. At the last station, the group summarizes the information on that chart. Whole Class → Discussion Each group presents the information from their last station and the class has a brief discussion about the numerous reasons for saving money.	Prepare enough charts so that groups will contain four to five students.
Action!	Whole Class → Discussion Outline the features of an annuity as a possible method of saving money. These features include: regular payments, compound interest, fixed term (length of time). Repayment of a loan is also an example of an annuity. Individual → Summarizing Have students complete BLM 3.7.1 to summarize their understanding of annuities. Pairs → Internet Research Students work in pairs to complete BLM 3.7.2 and prepare to contribute to a class discussion at the end of the activity. Students continue to work in pairs to complete BLM 3.7.3 to learn some basic features of mortgages. Learning Skills/Observation/Anecdotal feedback: Circulate and give students feedback on their work. Mathematical Process Focus: Reflecting– students will reflect on their understanding of annuities and some applications.	Students will need access to the Internet. Websites are given in BLM 3.7.2.
Consolidate Debrief	Whole Class → Discussion Discuss advantages and disadvantages of saving in a registered plan (RESP, RRSP) versus saving in a non-registered plan (Savings Bonds, Bank Accounts, etc.)	
<i>Exploration</i>	Home Activity or Further Classroom Consolidation Investigate and describe other types of savings plans including Canada Savings Bonds, Automatic Savings Plans (at a bank), RRIF's, and GIC's.	

3.7.1: Annuities

In your own words, summarize the key features of an annuity.

Indicate, by placing a check mark in the appropriate column, whether each type of financial arrangement is an example of an annuity or not. Explain your choice in the last column.

Description	Is this an annuity?		Why or why not?
	Yes	No	
Every year on his birthday Nathan's grandparents deposit \$100 into his RESP.			
Michelle's father pays \$450 each month for child support, which Michelle's mother uses to buy clothing and groceries.			
Katsuyuki borrowed \$75 from a friend and agreed to pay it back with interest at the end of the month.			
Marcel set up an RRSP with an initial deposit of \$1200 when he started working. Every year in January, he adds whatever he can afford to the RRSP.			
Punitha deposits \$125 every month into her savings account at the bank.			
LeTrahn borrowed money from the bank and will be paying back \$257.37 each month for the next three years.			

3.7.2: RESP's and RRSP's

Although there are many different ways to save money, two popular plans in Canada are RESP's and RRSP's. Both of these plans can be set up as a single payment that grows over time, or as an annuity. Investigate some of the features of each plan and complete the following chart. The websites given may be helpful, but you may also find the information elsewhere.

RESP		
http://www.hrsdc.gc.ca/en/hip/lld/cesg/publicsection/CESP/RESPs_General.shtml		
What is it?		
What are some advantages of an RESP?	What are some rules about RESP's?	Who might be interested in this plan?
RRSP		
http://www.cra-arc.gc.ca/tx/ndvdl/tpcs/rrsp-reer/rrsps-eng.html		
What is it?		
What are some advantages of an RRSP?	What are some rules about RRSP's?	Who might be interested in this plan?

3.7.3: Mortgages

Access a bank website, locate the information about mortgages and answer the following questions.

1. What is a *conventional mortgage*?
2. How is a conventional mortgage different from a *high-ratio* or *low down payment* mortgage?
3. Why would a first-time homebuyer choose to open a high-ratio mortgage?
4. How does the bank protect itself when a client opens a high-ratio mortgage?
5. What is the difference between an *open (flexible)* mortgage and a *closed (fixed)* mortgage?
6. What are some of the advantages and disadvantages for open and closed mortgages?
7. Once you open a mortgage and purchase a home, you must begin to pay back the loan. Describe some of the repayment options and the advantages of each option.

3.7.3: Mortgages (Continued)

8. What is the difference between the *term* and the *amortization period* of a mortgage?

9. Suggest reasons why you might choose a short-term mortgage and reasons why you might choose a longer-term mortgage.

10. Some homeowners will choose a fixed interest rate while others will choose a variable rate. Briefly explain the difference between these two rates and suggest reasons why you might choose one or the other.

Investigate the current interest rates charged by several different banks.

11. Do most banks seem to charge similar rates or are they widely different?

12. Why do you think this is the case?

13. What is the current range of mortgage interest rates?

14. Why is a mortgage classified as an annuity?