CENTRAL FLORIDA ASSESSMENT COLLABORATIVE

Individual Test Item Specifications

for Advanced Algebra with Financial Applications
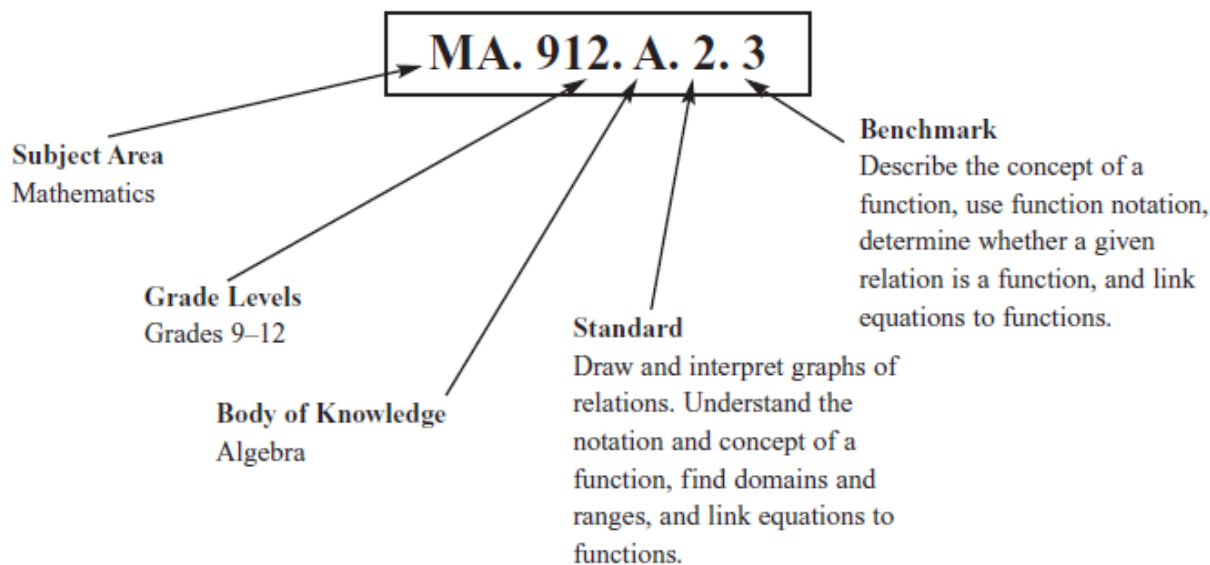
2013

Table of Contents

I. Guide to the Individual Benchmark Specifications

Content specific guidelines are given in the *Individual Benchmark Specifications* for each course. The *Specifications* contains specific information about the alignment of items with the NGSSS and CCSS. It identifies the manner in which each benchmark is assessed, provides content limits and stimulus attributes for each benchmark, and gives specific information about content, item types, and response attributes.

Benchmark Classification System

Each NGSSS benchmark is labeled with a system of letters and numbers.

- The two letters in the *first position* of the label identify the **Subject Area**.

- The number(s) in the *second position* represents the **Grade Level**.

- The letter in the *third position* represents the **Strand** or **Body of Knowledge.**

- The number in the *fourth position* represents the **Standard**.

- The number in the *last position* identifies the specific **Benchmark**.

MA. 912. A. 2. 3

Subject Area
Mathematics

Grade Levels
Grades 9–12

Body of Knowledge
Algebra

Standard
Draw and interpret graphs of relations. Understand the notation and concept of a function, find domains and ranges, and link equations to functions.

Benchmark
Describe the concept of a function, use function notation, determine whether a given relation is a function, and link equations to functions.
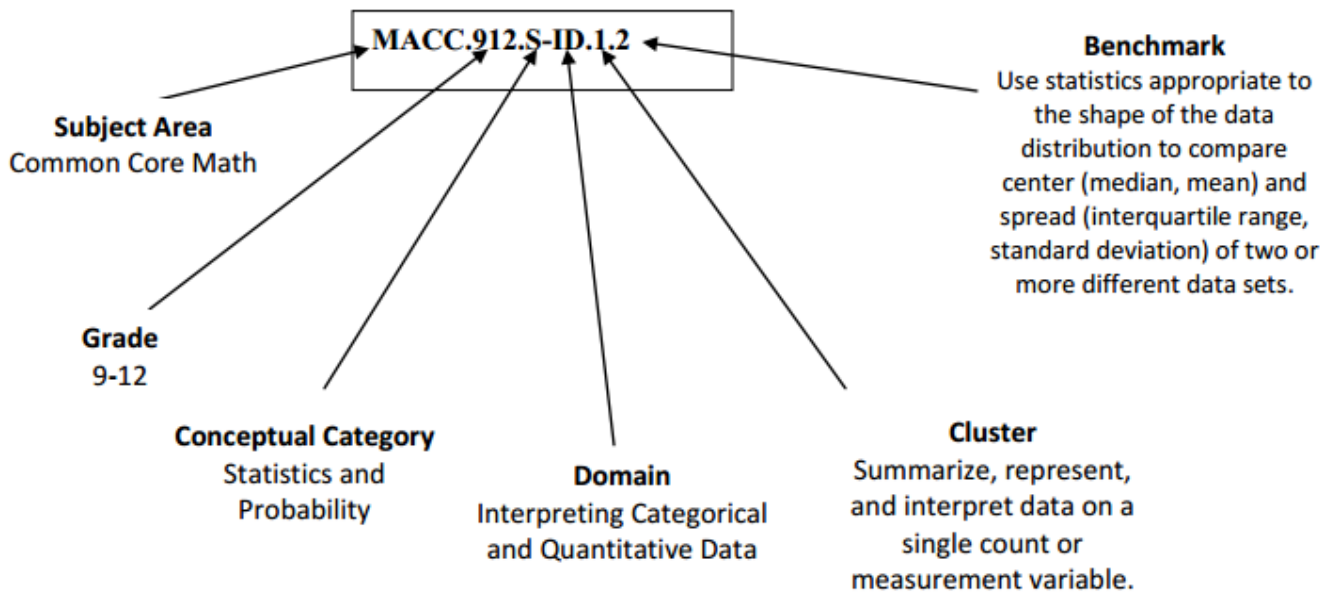
Each CCSS benchmark is labeled with a system of letters and numbers.

- The four letters in the *first position* of the label identify the **Subject**.
- The number(s) in the *second position* represents the **Grade Level**.
- The letter(s) in the *third position* represents the **Category**.
- The number in the fourth position shows the **Domain**.
- The number in the *fifth position* identifies the **Cluster**.
- The number in the last position identifies the specific **Benchmark.**

MACC.912.S-ID.1.2

Subject Area
Common Core Math

Grade
9-12

Conceptual Category
Statistics and
Probability

Domain
Interpreting Categorical
and Quantitative Data

Cluster
Summarize, represent,
and interpret data on a
single count or
measurement variable.

Benchmark
Use statistics appropriate to
the shape of the data
distribution to compare
center (median, mean) and
spread (interquartile range,
standard deviation) of two or
more different data sets.

Definitions of Benchmark Specifications

The *Individual Benchmark Specifications* provides standard-specific guidance for assessment item development for CFAC item banks. For each benchmark assessed, the following information is provided:

Reporting Category	is a grouping of related benchmarks that can be used to summarize and report achievement.
Standard	refers to the standard statement presented in the NGSSS or domain in the CCSS.
Benchmark	refers to the benchmark statement presented in the NGSSS or standard statement in the CCSS. In some cases, two or more related benchmarks are grouped together because the assessment of one benchmark addresses another benchmark. Such groupings are indicated in the Also Assesses statement.
Item Types	are used to assess the benchmark or group of benchmark.
Benchmark Clarifications	explain how achievement of the benchmark will be demonstrated by students. In other words, the clarification statements explain what the student will do when responding to questions.
Content Limits	define the range of content knowledge and that should be assessed in the items for the benchmark.
Stimulus Attributes	define the types of stimulus materials that should be used in the items, including the appropriate use of graphic materials and item context or content.
Response Attributes	define the characteristics of the answers that a student must choose or provide.
Sample Items	are provided for each type of question assessed. The correct answer for all sample items is provided.

II. Individual Benchmark Specifications for Advanced Algebra with Financial Applications
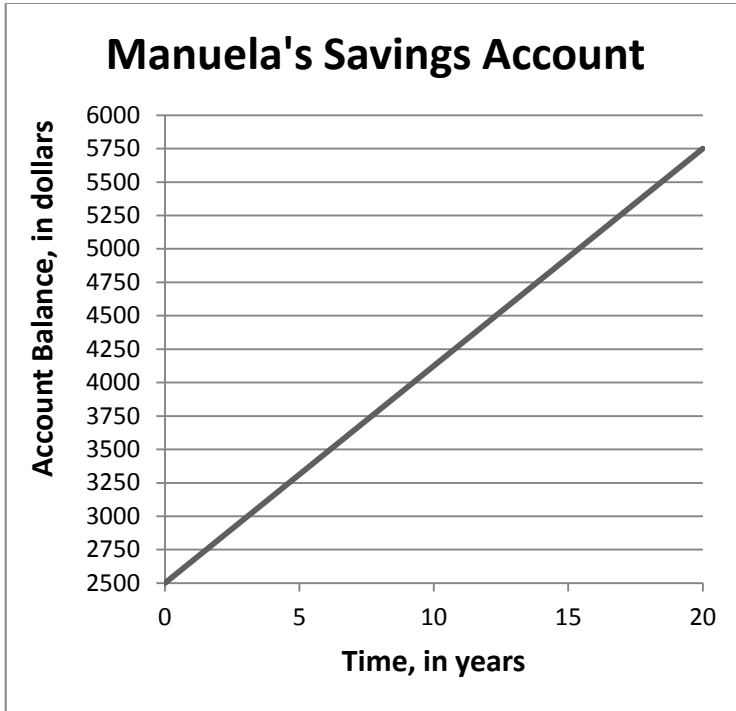
Course Number: 1200500

MA.912.F.1.1

Reporting Category	Financial Literacy
Standard	Simple and Compound Interest
Benchmark Number	MA.912.F.1.1
Benchmark	Explain the difference between simple and compound interest.
Also Assesses	MA.912.F.1.3, MA.912.F.1.4, MACC.912.A-CED.1.1, MACC.912.F-IF.3.7a, e
	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1,.7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will compare and contrast simple and compound interest.
	Students will understand the relationship between simple interest and linear growth.
	Students will understand the relationship between compound interest and exponential growth.
	Students will be able to graph simple and compound interest problems.
Content Limits	Students will be provided a reference sheet that includes the formulas for simple and compound interest.
	Continuous compounding will not be assessed under this benchmark.

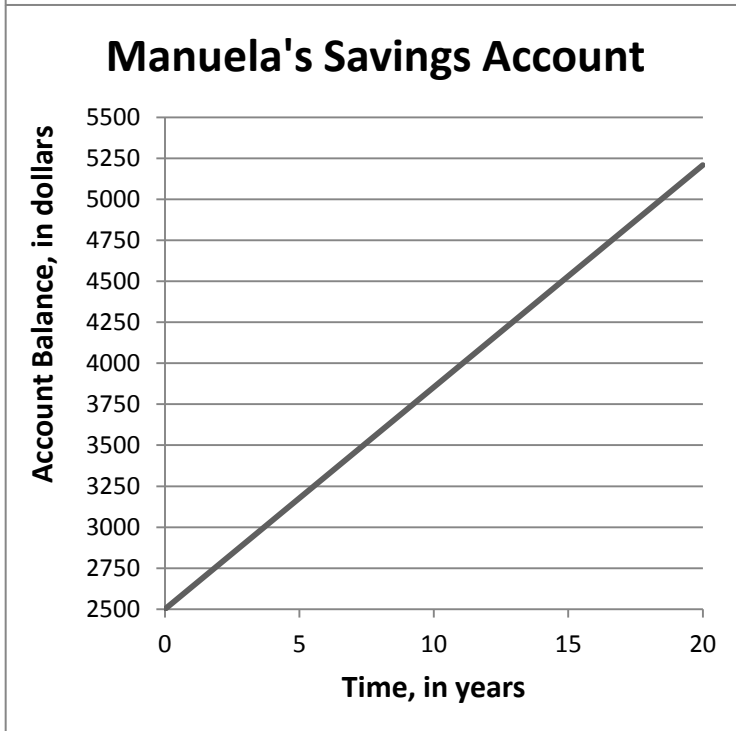|	
Stimulus Attributes	Principal, annual rate of interest, time, form of compounding (if applicable) must be provided.
	Items requiring students to create and/or solve an equation in one variable must involve simple interest.
	Students may be asked to identify the graph that models a given scenario.
	Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.
Sample Item 1	How much more, in dollars, would $1000 earn in 5 years in an account compounded daily than an account earning simple interest, if the interest rate on both accounts is 3%?
	Answer: 11.83
Sample Item 2	Which of the following statements about simple interest and compound interest is NOT true?
	A. Simple interest is only added to an account once a year, while compound interest may be added numerous times throughout the year.
	B. Both simple interest and compound interest are computed using the original principal balance. *
	C. Over time compound interest pays more than simple interest because compounding pays interest on the interest earned.
	D. The Simple Interest Formula is an example of a linear equation, while the Compound Interest Formula is an example of an exponential equation.

Sample Item 3

Manuela deposited $2,5000 into a saving account which pays 6.5% annual interest, compounded monthly. If she makes no additional deposits, which of the following graphs models the balance in Manuela's account over a 20-year period?
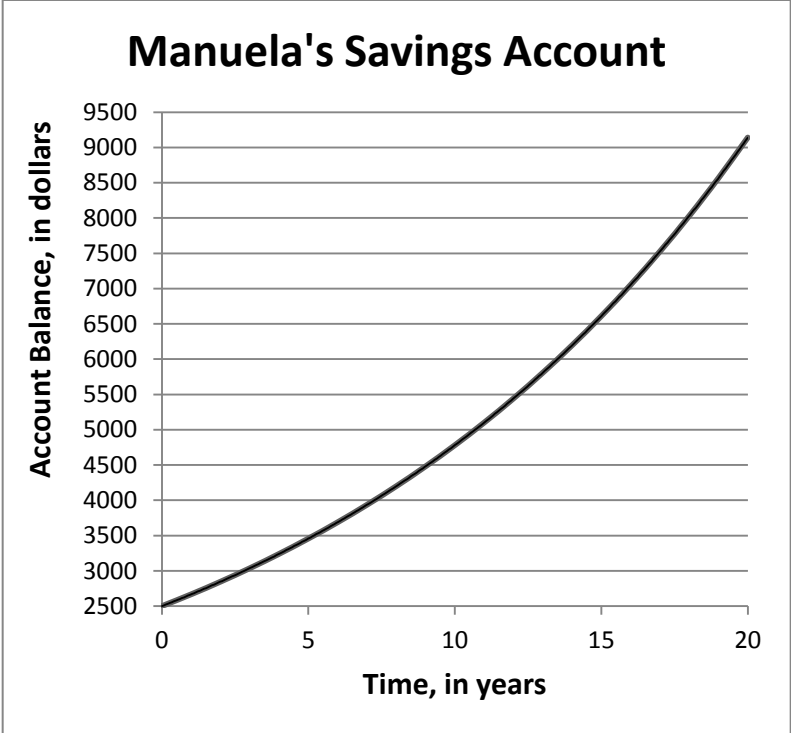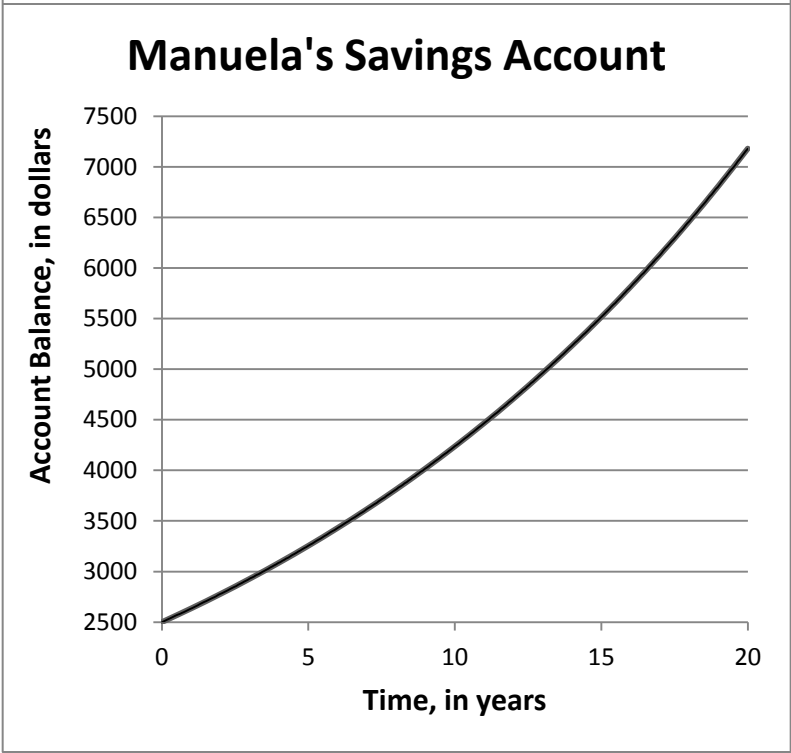
A.

Manuela's Savings Account

B.

Manuela's Savings Account

C.*

Manuela's Savings Account

D.

Manuela's Savings Account

MA.912.F.1.2

Reporting Category	Financial Literacy
Standard	Simple and Compound Interest
Benchmark Number	MA.912.F.1.2
Benchmark	Solve problems involving compound interest.
Also Assesses	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1,.7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will solve problems involving compound interest, to include continuous compounding.
Content Limits	Students will be provided a reference sheet that includes the formulas for compound interest. Items may require students to calculate the principal, amount of interest earned, or ending balance. Calculation of the interest rate, time, or number of compounding will not be assessed.
Stimulus Attributes	Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.
Sample Item 1	You invest $1000 in an account at an annual rate of 2.5%, compounded quarterly. You made no additional deposits. How much money, in dollars, is in your account at the end of 3 years? Answer: 1077.63
Sample Item 2	At the end of 10 years you have a total of $1500 in your savings account. The account paid an annual rate of 3%, compounded monthly. If no additional deposits were made, what was the amount, in dollars, of your original deposit? Answer: 1111.64

MA.912.F.2.1

Reporting Category	Financial Literacy
Standard	Net Present and Net Future Value (NPV and NFV)
Benchmark Number	MA.912.F.2.1
Benchmark	Calculate the future value of a given amount of money with and without technology.
Also Assesses	MACC.K12.MP.1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Student will be able to calculate the net future value of an investment.
Content Limits	Students will be provided a reference sheet that includes the formulas for future value for both single and periodic deposits. Items may require students to calculate the periodic investment, amount of interest earned, or ending balance. Calculation of the interest rate, time, or number of compounding will not be assessed.
Stimulus Attributes	Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.
Sample Item 1	Each month your parents deposit $50 into your college fund. The account pays an annual rate of 3.5%, compounded monthly. To the nearest whole dollar, how much will be in your college fund after 18 years? Answer: 31815

Sample Item 2   Taylor will be attending college in 3 years and would like to save $1000 to help with expenses. She will deposit money in a savings account that pays 1.75% interest annually, compounded monthly. How much should she deposit each month to meet her goal?

A. $21.74
B. $22.96
C. $26.37
D. $27.08*

MA.912.F.2.2

Reporting Category	Financial Literacy
Standard	Net Present and Net Future Value (NPV and NFV)
Benchmark Number	MA.912.F.2.2
Benchmark	Calculate the present value of a certain amount of money for a given length of time in the future with and without technology.
Also Assesses	MACC.K12.MP.1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Student will be able to calculate the present value and net present value of an investment.
Content Limits	Students will be provided a reference sheet that includes the formulas for present value for both single and periodic deposits. Items may require students to calculate the periodic investment, amount of interest earned, or initial investment. Calculation of the interest rate, time, or number of compounding will not be assessed.
Stimulus Attributes	Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.
Sample Item 1	Alyssa is opening a savings account with an annual interest rate of 3.5%, compounded monthly. At the end of 5 years, she would like to have $10,000 in her account. If she plans to make no additional deposits, how much should Alyssa deposit today, in dollars, in order to reach her goal? Answer: 8396.71
Sample Item 2	Alexander would like to buy a used car and needs a total of $5000. He is opening a savings account with an annual interest rate of 6%, compounded monthly. If Alexander plans to make equal monthly deposits for the next 3 years, how much will he need to deposit each month, in dollars, to reach his goal? Answer: 127.11

MA.912.F.3.2

Reporting Category	Financial Literacy
Standard	Loans and Financing
Benchmark Number	MA.912.F.3.2
Benchmark	Analyze credit scores and reports.
Also Assesses	MACC.K12.MP.1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1MACC.K12.MP.1.1, 5.1, 6.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Student will understand how past payment history, amount of debt, public records, length of credit history, and the number of recent credit inquires impact credit scores. Students will understand how credit scores affect the cost of making a loan.
Content Limits	Not applicable
Stimulus Attributes	Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.
Sample Item 1	Which of the following is NOT a way of improving your credit score? A. Pay all of your bills on time each month. B. Open several new accounts to show that you can get credit.* C. Check your credit report regularly and correct any inaccuracies. D. Keep accounts with long credit histories open when they have zero balance.

Sample Item 2   Delano and Omario plan to purchase an automobile. They both plan to take out a loan for $5,200 towards the vehicle cost financed over a period of 36 months.

Purchasers	Credit Score	Annual Interest Rate
Delano	700	4.784%
Omario	605	15.539%

Based on the chart, how much money, to the nearest whole dollar, will Delano save compared to Omario over the life of the loan?

 Answer: 946

MA.912.F.3.3

Reporting Category	Financial Literacy
Standard	Loans and Financing
Benchmark Number	MA.912.F.3.3
Benchmark	Calculate the finance charges and total amount due on a credit card bill.
Also Assesses	MA.912.F.3.1, MA.912.F.4.4
	MACC.K12.MP.1.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will calculate the monthly finance charges on a credit card bill.
	Students will calculate the minimum monthly payment required on a credit card bill.
	Students will calculate the minimum payment required to pay off a debt in a specified period of time.
	Students will compare paying for a purchase with cash versus with a credit card over time.
Content Limits	Interest rates will be given as annual percentage rate (APR).
Stimulus Attributes	Items required students to calculate the minimum payment required or time required to pay off a credit card balance must: - state that no additional charges are made. - be based on APR (annual rate = periodic rate x number of periods). - have constant annual and periodic interest rates. - assume payments are made at the end of the period. Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.

Sample Item 1   A credit card has an annual percentage rate of 23.988%. The balance owed is $1500.00. Assuming no additional charges are made, what is the minimum monthly payment, in dollars, required to pay off the balance in 12 months?

Sample Answer: 154.99

Sample Item 2   A credit card has annual percentage rate of 18.9%. The required minimum monthly payment is 10% of the balance, plus the monthly finance charge. If the balance on the card is $1000.00, what is the required minimum monthly payment, in dollars?

Answer: 115.75

Sample Item 3   Chris got a new credit card and was eager to use it. He went to the mall and charged $500 in purchases. He has enough money saved to make a payment of $350. The annual percentage rate is 17%. In dollars, how much will he pay in finance charges this month?

Answer: 2.13

Sample Item 4   Carlos wants to purchase a computer for $1049 plus 7% sales tax. He can afford to pay $80 per month to purchase the computer. He can save $80 per month and purchase the computer with cash later, or he can purchase the computer now using a credit card that charges a 14.9% annual percentage rate. To the nearest hundredth, which method will take longer, and how much longer will it take?

A. Saving enough money to purchase the computer will take 1.29 months longer than paying off the credit card balance.
B. Paying off the credit card balance will take 1.29 months longer than saving enough money to purchase the computer.
C. Saving enough money to purchase the computer will take 1.48 months longer than paying off the credit card balance.
D. Paying off the credit card balance will take 1.48 months longer than saving enough money to purchase the computer. *

Sample Item 5   Callie fills her 22.5-gallon gas tank and pays with her credit card. Gas is $3.159 per gallon, and the credit card charges an annual percentage rate of 13.8%. She will pay $10 each month and will make no additional charges until the balance is paid in full. How much **more,** in dollars**,** will Callie pay for the gas by using her credit card instead of paying cash?

Answer: 3.50

MA.912.F.3.5

Reporting Category	Financial Literacy
Standard	Loans and Financing
Benchmark Number	MA.912.F.3.5
Benchmark	Calculate deferred payments.
Also Assesses	MA.912.F.3.4
	MACC.K12.MP.1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will be able to calculate the actual costs of deferred payment plans
	Students will be able to compare the advantages and disadvantages of deferred payments.
Content Limits	Not Applicable
Stimulus Attributes	Items will NOT require that students find the original purchase price, interest rate, or deferment term.
	Items must state whether interest rate applies retroactively to the original purchase or to remaining balance after the deferment period.
	Items may present multiple deferment plans and require student to select the most advantageous.
	Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.

Sample Item 1 Anthony purchased a big screen television for $2499 including sales tax. The electronics company offered a 2 year deferred payment plan. After 2 years, the company charges a 20% annual interest applied retroactively to the original purchase. He made no payments the first year. During the second year, he made payments totaling $2100. Assuming that Anthony pays the account balance in full at the beginning of the third year, how much, in dollars, did the television actually cost?

Answer: 3598.56

Sample Item 2 Jackie wants to purchase a set of furniture for her living room that costs $3999. The sales tax on the purchase is 7%. The furniture company is offering an 18-month deferred payment plan with a minimum payment of $20 per month. After 18 months, the company will charge a 28.99% annual interest on the remaining balance. If Jackie makes only the required minimum monthly payments, how much, in dollars, will be subject to the 28.99% annual interest rate?

Answer: 3918.93

MA.912.F.3.6

Reporting Category	Financial Literacy
Standard	Loans and Financing
Benchmark Number	MA.912.F.3.6
Benchmark	Calculate total cost of purchasing consumer durables over time given different down payments, financing options, and fees.
Also Assesses	MA.912.F.3.9 MACC.K12.MP.1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will be able calculate the actual cost of purchasing durable goods. Students will calculate the total amount to be paid over the life of a fixed rate loan.
Content Limits	Students will be provided a reference sheet that includes the monthly payment formula. Deferred payment plans will not be assessed under this benchmark.
Stimulus Attributes	Items will NOT require that students find the original purchase price, interest rate, or loan term. Items will NOT require the use of an amortization table. Items may present multiple payment plans and require student to select the most advantageous. Items can be set in a mathematical or real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.

Sample Item 1   A car dealership is offering a 4% APR for 60 months with no down payment required. You would like to purchase a car that costs $14,900 including taxes, tag, and title. If you take advantage of the offer, what is the actual cost of the car, in dollars?

Sample Answer: 16464.37 [range of acceptable answers 16464.00-16465.00]

Sample Item 2   Sam wants to buy a car that costs $24,900 including taxes, tag, and title. The dealership is offering a 5% APR for 72 months with a 15% down payment. If Sam takes advantage of the offer, what is the actual cost of the car, in dollars?

Sample Answer: 28276.98 [range of acceptable answers 28276.00-28278.00]

Sample Item 3   What is the total amount paid for a $210,000 fixed rate loan at 4.875% annual interest over a 30-year period, rounded to the nearest dollar?

A. $400,081*
B. $401,094
C. $402,523
D. $403,889

MA.912.F.3.10

Reporting Category	Financial Literacy
Standard	Loans and Financing
Benchmark Number	MA.912.F.3.10
Benchmark	Calculate the effects on the monthly payment in the change of interest rate based on an adjustable rate mortgage.
Also Assesses	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will be able to calculate monthly mortgage payments. Student will be able to calculate changes in monthly mortgage payments caused by changes in interest rates.
Content Limits	Students will be provided a reference sheet that includes the monthly payment formula.
Stimulus Attributes	Items will NOT require the use of an amortization table. Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.
Sample Item 1	Ximena is considering an adjustable rate mortgage. She plans to borrow $245,000 using a 30-year, 1-year ARM indexed to the 1-year Treasury security with a 2.75 % margin and 2/6 caps (2% per year and 6% lifetime). The initial interest rate on this loan is 2.75%. What is the initial monthly payment for principal and interest, in dollars, on this mortgage? Sample Answer: 1000.19 [range of acceptable answers 1000.00-1001.00]

Sample Item 2   Paul took out a $250,000, 15-year adjustable rate mortgage with an initial rate of 6%. After the first year, the interest rate increased by 0.75%. The loan balance was $239,395.86. How much did Paul's mortgage payment increase as a result of the change in interest rate?

A. $2,702.36
B. $2,118.44
C. $592.72
D. $8.80

MA.912.F.3.13

Reporting Category	Financial Literacy
Standard	Loans and Financing
Benchmark Number	MA.912.F.3.13
Benchmark	Calculate the total amount paid for the life of a loan for a house including the down payment, points, fees, and interest.
Also Assesses	MA.912.F.3.7, MA.912.F.3.11, MA.912.F.3.12, MA.912.F.3.14
	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Student will calculate fees associated with obtaining a mortgage (e.g, discount points, origination fee, maximum brokerage fee on a net or gross loan, documentary stamps, and prorated expenses (interest, county and/or city property taxes, and mortgage on an assumed mortgage)).
	Students will be able to calculate the total cost involved when purchasing a house including the down payment, points, fees, and interest.
	Students will compare the cost of paying higher interest rates and lower points with the cost of paying lower interest rates and higher points.
	Students will be able to calculate the final pay out amount of a balloon mortgage.
	Students will compare the total cost of fixed rate and balloon mortgages.
	Students will understand the benefits and risks of fixed rate, adjustable rate, and balloon mortgages.
Content Limits	Students will be provided a reference sheet that includes the monthly payment formula.

Stimulus Attributes	Items will NOT require that students find the original purchase price, interest rate, or loan term.

Items will NOT require students to find the total cost of an adjustable rate mortgage.

Items will NOT require the use of an amortization table.

Items may ask students to identify or compare the benefits and/or risks of different mortgage types.

Items should be set in a real-world context.

Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.

Sample Item 1   A $185,340 loan has an annual interest rate of 5.625%. Using the 365 day method, how much interest, in dollars, would a buyer owe for the 25 days remaining for a May closing?

Answer: 714.07

Sample Item 2   Yoshiko is calculating the cost, before interest, of purchasing her first home. The HUD statement shows a breakdown of fees as shown below.

Fee	Amount
Purchase Price	$200, 000
Points	2
Origination Fee	$1,250
Broker Fee	$2,000
Documentary Stamps	$750
Prorated Expenses	$560

To the nearest whole dollar, what is the total cost of the fees that Yoshiko must pay, excluding principal and interest?

Answer: 8560

Sample Item 3   Briana's new home has a purchase price of $250,000. She has a down payment of $50,000. The lender is charging 2 points, and the remaining fees total $2500. If she obtains a fixed rated 30-year mortgage with a 2.75% annual interest rate, what is the total amount Briana will pay for her home? Round your answer to the nearest whole dollar.

Answer: 350434

Sample Item 4   Theodore is considering financing a house for $500,000. His monthly payment would be $2604.17. His mortgage broker told him that if he purchased one point (for one percent of the amount financed) he could lower his monthly payment to $2447.92.

What is the minimum number of months Theodore would need to own the house for it to be beneficial to purchase one point?

Answer: 32

Sample Item 5   Mercedes is considering purchasing 3 points on a $400,000 home mortgage for 30 years. If she purchases the 3 points, at a cost of 1 percent per point, her monthly mortgage would be approximately $2,147. If she decides not to purchase any points, Mercedes' monthly payment would be approximately $2,271. How much money will Mercedes save over the life of the loan if she purchases the three points?

A. $32,640*
B. $36,640
C. $40,640
D. $44,640

Sample Item 6   Jeong is purchasing a home and plans to take out a mortgage for $125,000. He is considering two options.

Option 1: a 30-year, fixed rate mortgage with a rate of 6.35%
Option 2: a 10-year interest-only balloon mortgage with a rate of 5.5%

Assume that Jeong can pay the final balloon payout in full. How much will he save, to the nearest whole dollar, for the total cost of purchasing the home if he chooses option 2?

Answer: 117217

MA.912.F.4.1

Reporting Category	Financial Literacy
Standard	Personal Financial Planning
Benchmark Number	MA.912.F.4.1
Benchmark	Develop personal budgets that fit within various income brackets.
Also Assesses	MA.912.F.4.2
	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1.
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will solve problems related to personal budgets.
	Students will understand cash management strategies including debit accounts, checking accounts, and savings accounts.
Content Limits	Use of tax tables to determine income tax will not be assessed under this benchmark.
Stimulus Attributes	Tax rate or tax amount must be provided for items requiring the calculation of net income.
	Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.

Sample Item 1   According to the U.S. Department of Labor, consumers had the following spending patterns in 2011:

Item	% of Gross Income
Housing	26.4
Transportation	13.0
Food	10.1
Personal Insurance & Pensions	8.5
Other	5.3
Health Care	5.2
Entertainment	4.0
Apparel & Services	2.7
Cash Contributions	2.7

You spend $750 each month on housing. Based on the chart, how much, in dollars, should you budget for transportation expenses?

Answer: 369.32

Sample Item 2   Kim earns an annual salary of $30,000. Her federal income tax bracket is 20%. She also must pay 7.65% in Social Security and Medicare taxes. She plans to deposit 10% of her net income into a savings account. How much, in dollars, will she save annually?

Answer: 2170.50

Sample Item 3   Sharon has a savings account with a minimum balance requirement of $1000 which pays 3.75% simple interest annually. She is charged a $10 monthly fee each time her balance is below the minimum. Over a period of 4 months, she maintained a balance of $900. How much interest did Sharon earn during the 4 months, and how much was she charged in fees?

A. Interest $33.75; Fees $10
B. Interest $8.44; Fees $10
C. Interest $33.75; Fees $40
D. Interest $8.44; Fees $40*

MA.912.F.4.3

Reporting Category	Financial Literacy
Standard	Personal Financial Planning
Benchmark Number	MA.912.F.4.3
Benchmark	Calculate net worth.
Also Assesses	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Students will calculate net worth.
Content Limits	Not Applicable
Stimulus Attributes	Items should be set in a real-world context.
Response Attributes	Net worth values can be negative. Monetary answers should be rounded to the nearest hundredth unless specified otherwise.

Sample Item 1 Shane is retired and owns a home. Below is a summary of his current assets and liabilities:

Assets		Liabilities	
Home	$375, 000	Mortgage balance	$65,000
Car	$18,750	Combined credit card debt	$12,500
Cash and checking	$55,000		
Savings	$90,000		

Last year Shane's net worth was $456,000. What was is percent of increase or decrease in his net worth from last year to this year?

A. 1.15% decrease
B. 1.15% increase*
C. 11.5% decrease
D. 11.5% increase

Sample Item 2 The Smith family has assets and liabilities as shown below.

Assets		Liabilities	
Monetary Assets		Current Liabilities	
Cash/Checking	$1,000	Visa/Mastercard	$500
Savings/CDs	$5,000	Other credit cards	$200
Investments		Long Term Liabilities	
Stocks/Bonds	$1000	Auto loan	$500
Mutual Funds	$1500	Student loans	$3000
Retirement Plans			
401k, 403b, 457	$1200		
IRAs	$500		
Automobiles	$3500		
Personal Property	$750		

What is the family's net worth?
A. $24,720
B. $14,450
C. $10,250*
D. $ 4,250

MA.912.F.4.5

Reporting Category	Financial Literacy
Standard	Individual Financial Planning
Benchmark Number	MA.912.F.4.5
Benchmark	Develop and apply a variety of strategies to use tax tables, and to determine, calculate, and complete yearly federal income tax.
Also Assesses	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response
Benchmark Clarification	Student will determine tax liability based on income, deductions, and filing status.
Content Limits	Not Applicable.
Stimulus Attributes	Tax tables should be provided as a graphic as needed. Items should be set in a real-world context.
Response Attributes	Monetary answers should be rounded to the nearest hundredth unless specified otherwise.

Sample Item 1
Below are excerpts from the 2012 Federal Income Tax Table.

If line 43 (taxable income) is—		And you are—				If line 43 (taxable income) is—		And you are—			
At least	But less than	Single	Married filing jointly *	Married filing sepa-rately	Head of a house-hold	At least	But less than	Single	Married filing jointly *	Married filing sepa-rately	Head of a house-hold
		Your tax is—						Your tax is—			
33,000						**40,000**					
33,000	33,050	4,519	4,084	4,519	4,334	40,000	40,050	6,036	5,134	6,036	5,384
33,050	33,100	4,526	4,091	4,526	4,341	40,050	40,100	6,049	5,141	6,049	5,391
33,100	33,150	4,534	4,099	4,534	4,349	40,100	40,150	6,061	5,149	6,061	5,399
33,150	33,200	4,541	4,106	4,541	4,356	40,150	40,200	6,074	5,156	6,074	5,406
33,200	33,250	4,549	4,114	4,549	4,364	40,200	40,250	6,086	5,164	6,086	5,414
33,250	33,300	4,556	4,121	4,556	4,371	40,250	40,300	6,099	5,171	6,099	5,421
33,300	33,350	4,564	4,129	4,564	4,379	40,300	40,350	6,111	5,179	6,111	5,429
33,350	33,400	4,571	4,136	4,571	4,386	40,350	40,400	6,124	5,186	6,124	5,436
33,400	33,450	4,579	4,144	4,579	4,394	40,400	40,450	6,136	5,194	6,136	5,444
33,450	33,500	4,586	4,151	4,586	4,401	40,450	40,500	6,149	5,201	6,149	5,451
33,500	33,550	4,594	4,159	4,594	4,409	40,500	40,550	6,161	5,209	6,161	5,459
33,550	33,600	4,601	4,166	4,601	4,416	40,550	40,600	6,174	5,216	6,174	5,466
33,600	33,650	4,609	4,174	4,609	4,424	40,600	40,650	6,186	5,224	6,186	5,474
33,650	33,700	4,616	4,181	4,616	4,431	40,650	40,700	6,199	5,231	6,199	5,481
33,700	33,750	4,624	4,189	4,624	4,439	40,700	40,750	6,211	5,239	6,211	5,489
33,750	33,800	4,631	4,196	4,631	4,446	40,750	40,800	6,224	5,246	6,224	5,496
33,800	33,850	4,639	4,204	4,639	4,454	40,800	40,850	6,236	5,254	6,236	5,504
33,850	33,900	4,646	4,211	4,646	4,461	40,850	40,900	6,249	5,261	6,249	5,511
33,900	33,950	4,654	4,219	4,654	4,469	40,900	40,950	6,261	5,269	6,261	5,519
33,950	34,000	4,661	4,226	4,661	4,476	40,950	41,000	6,274	5,276	6,274	5,526

Justin is filing his federal income taxes as a single person. He earned $40,000 in 2012 and has deductions totaling $6,240. According to the tax table, how much federal income tax will he pay this year?

Answer: 4331

Sample Item 2

Below is an excerpt from the 2012 Federal Income Tax Table.

If line 43 (taxable income) is—		And you are—			
At least	But less than	Single	Married filing jointly *	Married filing sepa-rately	Head of a house-hold
		Your tax is—			
27,000					
27,000	27,050	3,619	3,184	3,619	3,434
27,050	27,100	3,626	3,191	3,626	3,441
27,100	27,150	3,634	3,199	3,634	3,449
27,150	27,200	3,641	3,206	3,641	3,456
27,200	27,250	3,649	3,214	3,649	3,464
27,250	27,300	3,656	3,221	3,656	3,471
27,300	27,350	3,664	3,229	3,664	3,479
27,350	27,400	3,671	3,236	3,671	3,486
27,400	27,450	3,679	3,244	3,679	3,494
27,450	27,500	3,686	3,251	3,686	3,501
27,500	27,550	3,694	3,259	3,694	3,509
27,550	27,600	3,701	3,266	3,701	3,516
27,600	27,650	3,709	3,274	3,709	3,524
27,650	27,700	3,716	3,281	3,716	3,531
27,700	27,750	3,724	3,289	3,724	3,539
27,750	27,800	3,731	3,296	3,731	3,546
27,800	27,850	3,739	3,304	3,739	3,554
27,850	27,900	3,746	3,311	3,746	3,561
27,900	27,950	3,754	3,319	3,754	3,569
27,950	28,000	3,761	3,326	3,761	3,576

Mary's filing status for her federal income taxes is Head of Household. In 2012, she had an adjustable gross income of $27,561 and paid in $3,230 in federal income tax. Based on the tax table, what will be the amount, in whole dollars, of Mary's tax refund?

Answer: 286

MACC.912.A-CED.1.3

Reporting Category	Algebra
Standard	Creating Equations
Benchmark Number	MACC.912.A-CED.1.3
Benchmark	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
Also Assesses	MACC.912.A-CED.1.2, MACC.912.A-REI.3.8, MACC.912.A-REI.3.9 MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response, Extended-Response
Benchmark Clarification	Students will create and/or solve systems of linear equations or inequalities in two variables. Students will interpret solutions as viable or non-viable options in a business modeling context.
Content Limits	Items will NOT specify a method for solving systems of equations, such as substitution, elimination, or graphing. Students may **choose** to solve systems of equation using a matrix, but items will NOT ask students to represent a system of equation using a matrix or specify that they solve a system of equations using the inverse of a matrix. Items will not assess non-linear systems of equations or inequalities. Items will not assess systems of equations or inequalities in three or more variables.
Stimulus Attributes	Items should be set in a business or economics context (e.g., supply and demand, breakeven analysis, revenue and expense, etc).
Response Attributes	Gridded-response or short-response items may ask students to provide the x- or y-coordinate of the solution. Items may require students to graph an equation, inequality, or system of equations or inequalities.

Sample Item 1   The demand function for step stools manufactured by U-Step is
$q = -370p + 21,500$. Given the revenue formula $R = pq$, what is the revenue
if the price per step stool is $16?

    A. $94,720
    B. $15,580
    C. $249,280*
    D. $344,000

Sample Item 2   To produce a new line of shirts, Custom Shirt Company must pay a one-time
design fee of $85.00 plus $3.50 per shirt. The shirts are then sold for $7.50
each. What is the minimum number of shirts Custom Shirt Company has to
sell in order to make a profit?

    Answer: 22

Sample Item 3   The supply curve for a certain widget is given by the equation $P = 20 + 2Q$.
The demand curve for the same widget is given by the equation $P = 80 - Q$
where P represents the price of the widget, in dollars, and Q represents the
quantity sold.

    Part A
    Graph the supply and demand curves on the same coordinate plane.

    Part B
    What is the equilibrium quantity?

    Part C
    What is the equilibrium price?

   Suggested materials: graph paper, ruler

	Scoring Rubric
4	Work demonstrates a **clear and complete** understanding of the mathematical concepts and/or procedures required by the task. Appropriate strategy is shown with clear and complete explanations and interpretations.
3	Response demonstrates a **clear** understanding of the mathematical concepts and/or procedures but is not complete. Appropriate strategy is shown, but explanation or interpretation has minor flaws. OR Response is incorrect because of calculation errors. Work and strategy indicate a **clear** understanding of the mathematical concepts and/or procedures required by the task.
2	Response demonstrates a **partial** understanding of the mathematical concepts and/or procedures. Appropriate strategy is shown, but explanation or interpretation has minor flaws.
1	Response shows **minimal** understanding of the mathematical concepts and/or procedures or provides no explanation or interpretation for the solution or shows major flaws.
0	Response is irrelevant, inappropriate, or not provided.

Maximum Points – 4

Part A – 2 points
Student creates a graph similar to the one below that includes all appropriate labels. The scale on the *x*- and/or *y*-axis may vary, but should be appropriate to the situation. Labels may vary, but should be appropriate to the situation.
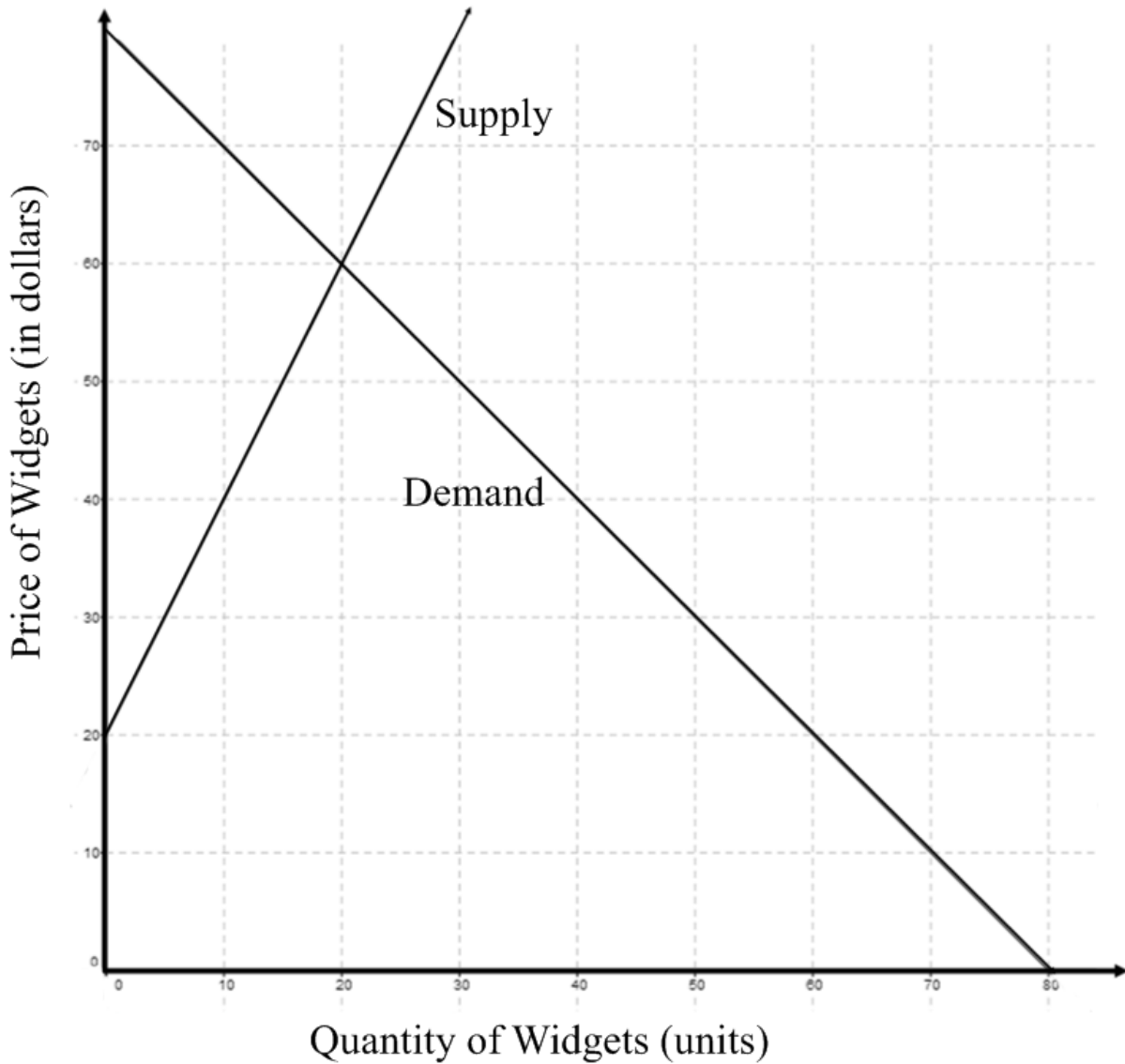
Part B – 1 point
Student indicates that the equilibrium quantity is 20 units.

Part C – 1 point
Student indicates that the equilibrium price is $60.

MACC.912.F-BF.1.1a, b

Reporting Category	Functions
Standard	Building Functions
Benchmark Number	MACC.912.F-BF.1.1a, b
Benchmark	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculations from a context. b. Combine standard function types using arithmetic operations.
Also Assesses	MACC.912.F-BF.1.2 MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response, Constructed-Response, Extended-Response
Benchmark Clarification	Students will write a function that describes a given relationship between two variables. Students will evaluate functions and interpret the meaning in the given context. Students will add, subtract, multiply, and divide functions.
Content Limits	Items will assess linear, quadratic, or exponential relationships only. Items may require students to write an explicit or recursive formula for an arithmetic or geometric sequence. Items requiring students to find the finite sum of an arithmetic or geometric sequence may not exceed 5 terms. Summation notation will not be used.
Stimulus Attributes	Items should be set in a real-world, preferably financial, context.
Response Attributes	Not Applicable

Sample Item 1

A company that manufactures tennis rackets has fixed costs of $78,490. It costs $15 to produce each racket. If $C(x)$ is a function that describes the total cost of manufacturing x number of tennis rackets, what is the value of $C(2500)$?

Answer: 115990

Sample Item 2

A company that sells digital cameras has yearly fixed cost of $550,000. It costs the company $45 to produce each camera. Each camera will sell for $75. The company's cost and revenues are modeled by the following functions, where x represents the number of cameras produced and sold.

$$C(x) = 550,000 + 45x$$
$$R(x) = 75x$$

What is $(R-C)(30,000)$ and what does it represent?

A. -350,000; company losses when 30,000 cameras are produced and sold
B. 350,000; company profits when 30,000 cameras are produced and sold *
C. 1,900,000; company costs when 30,000 cameras are produced
D. 2,225,000; company revenues when 30,000 cameras are sold

Sample Item 3

You are considering two different employment opportunities. Company A offers $32,000 the first year. During the next 3 years, the salary is guaranteed to increase by 6% per year. Company B offers $34,000 the first year, with a guaranteed increase of 2% per year.

Part A
If a_n represents the salary after n years of employment, write an explicit or recursive formula for a_n for company A.

Part B
If a_n represents the salary after n years of employment, write an explicit or recursive formula for a_n for company B.

Part C
How does the salary for Company A compare to the salary for Company B in year 3? Which company offers the better **total** salary for a three-year contract?

	Scoring Rubric
4	Work demonstrates a **clear and complete** understanding of the mathematical concepts and/or procedures required by the task. Appropriate strategy is shown with clear and complete explanations and interpretations.
3	Response demonstrates a **clear** understanding of the mathematical concepts and/or procedures but is not complete. Appropriate strategy is shown, but explanation or interpretation has minor flaws. OR Response is incorrect because of calculation errors. Work and strategy indicate a **clear** understanding of the mathematical concepts and/or procedures required by the task.
2	Response demonstrates a **partial** understanding of the mathematical concepts and/or procedures. Appropriate strategy is shown, but explanation or interpretation has minor flaws.
1	Response shows **minimal** understanding of the mathematical concepts and/or procedures or provides no explanation or interpretation for the solution or shows major flaws.
0	Response is irrelevant, inappropriate, or not provided.
	Scoring Exemplar

Maximum Points – 4

Part A – 1 point
Student response is **equivalent** to one of the following:

$$a_n = 32,000(1.06)^{n-1} \quad \text{OR} \quad \begin{aligned} a_1 &= 32,000 \\ a_n &= a_{n-1}(1.06) \end{aligned}$$

Part B – 1 point
Student response is **equivalent** to one of the following:

$$a_n = 34,000(1.02)^{n-1} \quad \text{OR} \quad \begin{aligned} a_1 &= 34,000 \\ a_n &= a_{n-1}(1.02) \end{aligned}$$

Part C – 2 points
Student response should indicate that the salary for Company A is greater in year 3. Student response may or may not indicate the salary for Company A in year 3 is $35,955.20 and the salary for Company B in year 5 is $35, 373.60. Student may round salaries to the nearest dollar.

Student response indicates that Company B offers the greatest total salary for a five year contract. Students may or may not indicate the sum of the salaries for Company A is $101,875.20 and the sum of the salaries for Company B is $104,053.60. Student may round sums to the nearest dollar.

Sample Item 4   A car was purchased for $18,500. The value of the car decreased by $2750 per year for the first five years.

Part A
Write a function, $V(x)$, that describes the value of the car after x years where $0 \leq x \leq 5$.

Part B
What is $V(3)$ and what does it represent?

Scoring Rubric	
2	Work demonstrates a **clear and complete** understanding of the concept and/or procedures required by the task. Appropriate strategy is shown with clear and complete explanations and interpretations.
1	Response demonstrates a **partial** understanding of the concepts and/or procedures. Appropriate strategy is shown, but explanation or interpretation has minor flaws. OR Response is incorrect because of calculation errors. Work and strategy indicate a **clear** understanding of the concepts and/or procedures required by the task.
0	Response is irrelevant, inappropriate, or not provided.

Scoring Exemplar
Maximum Points – 2
Part A – 1 point Student writes a function equivalent to $V(x) = 18,500 - 2750x$. Student may show that the domain is restricted to $0 \leq x \leq 5$, but it is not necessary.
Part B – 1 point Student response indicates that $V(3) = 10,250$ (or correctly finds the value of $V(3)$ based on the function given in Part A), and that it represents the value of the car after 3 years.

MACC.912.F-IF.2.4

Reporting Category	Functions
Standard	Interpreting Functions
Benchmark Number	MACC.912.F-IF.2.4
Benchmark	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features may include: intercepts; intervals where function is increasing or decreasing; positive, or negative; relative maximums and minimums, symmetries; end behavior; and periodicity.*
Also Assesses	MACC.912.F-IF.2.5 MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1
Item Types	Selected-Response, Gridded-Response, Short-Response, Extended-Response
Benchmark Clarification	Given a function that models a relationship between two quantities, students will interpret key features of its graph. Students will describe restrictions on domain and/or range given a real-world context.
Content Limits	Items will assess linear, quadratic, or exponential relationships only. Items will not require students to create graphs.
Stimulus Attributes	Items should be set in a business or economics context. Functions should be provided.
Response Attributes	Gridded-response or short-response items may ask students to provide the *x*- or *y*-coordinate of an intercept.

Sample Item 1   The average number of miles per gallon for U.S. automobiles in the years between 1940 and 2000 can be modeled by the quadratic function $f(x) = 0.005x^2 - 0.170x + 14.817$ where x represents the number of years after 1940. Based on the function, during what year was fuel efficiency at its lowest level?

    A. 1940
    B. 1957 *
    C. 1964
    D. 1970

Sample Item 2   The ABC Toy company has completed a profit analysis of their newest product. The profit function for the new product was determined to be $P(x) = -250x^2 + 4500x - 22,000$, where x is the unit price of the product.

Part A
What is an appropriate domain for $P(x)$ and why?

Part B
For which interval(s) in the domain is the profit increasing?

Part C
What price, in dollars, should ABC Toys charge for their new product, in order to achieve maximum profit?

Part D
What is the maximum profit that ABC toys will earn from sales of the new product?

Scoring Rubric	
4	Work demonstrates a **clear and complete** understanding of the mathematical concepts and/or procedures required by the task. Appropriate strategy is shown with clear and complete explanations and interpretations.
3	Response demonstrates a **clear** understanding of the mathematical concepts and/or procedures but is not complete. Appropriate strategy is shown, but explanation or interpretation has minor flaws. OR Response is incorrect because of calculation errors. Work and strategy indicate a **clear** understanding of the mathematical concepts and/or procedures required by the task.
2	Response demonstrates a **partial** understanding of the mathematical concepts and/or procedures. Appropriate strategy is shown, but explanation

	or interpretation has minor flaws.
1	Response shows **minimal** understanding of the mathematical concepts and/or procedures or provides no explanation or interpretation for the solution or shows major flaws.
0	Response is irrelevant, inappropriate, or not provided.

Scoring Exemplar
Maximum Points – 4
Part A – 1 point Student response indicates that domain is $x \geq 0$, as the price of a product cannot be negative. Alternatively, a domain of $x > 0$ is acceptable if the student explains that the product could not be free nor have a negative price. The response could be stated as an inequality, using set notation, or in words.
Part B – 1 point Student response indicates that the profit is increasing in the interval $0 < x < 9$. The response could be stated as an inequality, using set notation, or in words.
Part C – 1 point Student response indicates that the profit is maximized when the price is $9.00.
Part D – 1 point Student response indicates that the maximum profit is $18,050.

MACC.912.S-ID.2.6

Reporting Category	Statistics and Probability
Standard	Interpreting Categorical and Quantitative Data
Benchmark Number	MACC.912.S-ID.2.6.a, b, c
Benchmark	Represent data on two quantitative variables on a scatterplot, and describe how the variables are related.

a. Fit a function to the data; use function fitted to data to solve problems in the context of the data. *Use functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*
b. Informally assess the fit of a function by plotting and analyzing residuals.
c. Fit a linear function for a scatter plot that suggest a linear association.

Also Assesses	MACC.K12.MP.1.1, 2.1, 4.1, 5.1, 6.1, 7.1
Item Types	Multiple Choice, Gridded Response, Short-Response
Benchmark Clarification	Students will identify scatterplots of given data.
	Students will describe correlations based on scatterplots of given data.
	Students will find linear regression equations for given data.
Content Limits	Items requiring students to given all or part of a regression equation are limited to linear regression.
Stimulus Attributes	Items should be set in a business or economics context.
Response Attributes	Not applicable.

Sample Item 1   The chart below shows the quantity of a product retailers would purchase at a given price.

Wholesale Price of a Product (*in dollars*)	Quantity Retailers would purchase
6.50	10,750
7.00	9,980
7.50	9,100
8.00	8,725
8.50	7,800
9.00	4,050
9.50	3,930
10.00	2,080

If the linear regression equation $y = ax + b$ represents the retailer's demand for the product at a given price, what is the value of a?

Answer: -2547.98

Sample Item 2   The chart below shows the shoe sizes of test takers and their scores on a spelling test.

Shoe Size	Spelling Test Score
3	80
5	90
2	75
6	80
7	90
1	50
2	65
7	85
1	40

Based on a scatterplot of the data, which of the following best describes the correlation between a test takers shoe size and spelling test scores?

    A. no correlation
    B. low correlation
    C. perfect correlation
    D. positive correlation*

Appendix A: Reference Sheet for Advanced Algebra with Financial Applications

Interest Formulas

		Key
Simple Interest	$I = Prt$	I = interest earned
		P = principal amount
		r = annual rate of interest
Compound Interest, n compoundings per year	$A = P\left(1 + \dfrac{r}{n}\right)^{nt}$	t = time, in years
		A = amount of money in account, including interest
Compound Interest, continuous	$A = Pe^{rt}$	n = number of compoundings per year
		B = ending balance
		M = monthly payment

	Net Future Value Formulas	Net Present Value Formulas
Single Deposit	$FV = P\left(1 + \dfrac{r}{n}\right)^{nt}$	$PV = \dfrac{B}{\left(1 + \dfrac{r}{n}\right)^{nt}}$
Periodic Deposit	$FV = \dfrac{P\left(1 + \dfrac{r}{n}\right)^{nt} - 1}{\dfrac{r}{n}}$	$PV = \dfrac{B\left(\dfrac{r}{n}\right)}{\left(1 + \dfrac{r}{n}\right)^{nt} - 1}$

Monthly Payment Formula

$$M = \dfrac{P\left(\dfrac{r}{12}\right)\left(1 + \dfrac{r}{12}\right)^{12t}}{\left(1 + \dfrac{r}{12}\right)^{12t} - 1}$$