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| **COMMUNITY COLLEGE OF PHILADELPHIA**Course Development Template |
| 1. Course Designation
 | FNMT 101 |
| 1. Course Title
 | Quantitative Reasoning |
| 1. Abbreviated Course Title for Banner
 | Quantitative Reasoning |
| 1. Division
 | Math, Science and Health Care Studies |
| 1. Department
 | Foundational Mathematics  |
| 1. Course Description
 | This course is designed to enable students in liberal arts programs to learn how to use and interpret quantitative information in a real-world context. Students will learn how to use data to make decisions in day-to-day life, develop simple mathematical models in their personal and professional settings, and reach logical conclusions in real-world scenarios. The students will learn by exploring topics such as formal logic, algebraic modeling, estimation, and consumer math.  |
| 1. Prerequisites/Co-requisites
 | FNMT 017 or FNMT 019 completed or FNMT 118-ready placement  |
| 1. Placement
 | FNMT 118 ready and ENGL 101 ready |
| 1. Hours and Credits
 | 3-0-3 |
| 1. Class Size (maximum)
 | 25 students  |
| 1. Programs where this course appears
 | Liberal Arts |
| 1. Course Writer(s)
 | Eric Neumann |
| 1. Facilitator(s)
 | Sotiria Koui |
| 1. Recommended starting Semester
 | Fall 2022 |
| 1. Course Revision or New Course
 | New Course  |
| 1. If this is a course revision, indicate which are being revised (check box)
 | N/A  |
| 1. Course Attributes
 | QURE: Quantitative Reasoning MAEL: Mathematics |
| 1. Date
 | January 26, 2022 |

1. **Rationale**

Although the College grants college-level credit for FNMT 118: Intermediate Algebra, many of our transfer institutions require graduates to take an additional math course beyond FNMT 118 to fulfill their mathematics general education requirements. FNMT 101: Quantitative Reasonin~~g~~ is designed to enable those who graduate from Community College of Philadelphia with a liberal arts degree to transfer to other institutions without having to do additional work to complete their general education requirements.

FNMT 101 also addresses the need for more relevant mathematics for students pursuing degrees in the liberal arts. The mathematical content of FNMT 118 and its successor, MATH 161: Precalculus I, which is more-widely accepted by transfer institutions, is almost entirely comprised of symbolic algebra with little emphasis on application. MATH 161 and similar courses are designed to provide a theoretical framework for students to then apply in each context as needed. Those students not in the calculus track, however, would benefit from a much more immediate opportunity to apply these contexts. To accomplish this, FNMT 101 both includes topics not covered in FNMT 118/MATH 161 and includes similar topics, emphasizing their relevance and application to students in a liberal arts pathway. The topics selected for inclusion in this course were chosen based on many interviews and discussions with faculty in the Liberal Studies division at the College. For example, many of the examples given in FNMT 118 or MATH 161 are drawn from physics (e.g., F=MA, d = rt, a = -1/2gt^2 + vt + b). These are often perceived as irrelevant to liberal arts students, and (even if they theoretically boost a general skill of algebraic modeling and manipulation) such examples reinforce the lie that math is only useful for those pursuing STEM careers. Frequently, algebraic topics are presented in other 100-level math courses without any real-world context at all. This class will use personal finance to discuss acceleration and exponential growth; fuel efficiency to discuss parabolic behavior; cell phone bills and pay structures to illustrate linear growth models; course grade calculation to illustrate weighted means; behavior choices and health outcomes to illustrate correlation; and so on. This course will help students see how mathematics is useful to them (not just to other students with different occupations). The connection between logic and reasoning from a philosophical perspective and using data and mathematical calculations to make predictions, to draw conclusions, and support or refute others’ opinions will also be emphasized. Mathematics was originally studied as a liberal art, and while we will not go very far into the theoretical minutiae of classical mathematical proof, we will emphasize the way that math is an art as well as a science.

FNMT 101 may also improve student success rates and retention of knowledge. Our current pass rates for all math courses continue to hover around 50%. This cannot be fully attributed to over-placement because many students continue to struggle with mathematical concepts covered in courses that they have already passed. One potential reason for this (both at our institution and across higher ed, in general) is the widespread sense of hopelessness felt by many students who are self-described “not math people.” Courses that closely resemble those that students took in middle school and high school, with their seemingly endless progression of worksheets covered with numbers and various mysterious symbols, may inadvertently reinforce this attitude. Recent literature suggests that students both understand and retain information better when it is presented in a context relevant to them and asks them to interact with it at multiple levels of Bloom’s taxonomy (see **Appendix**). Because we want students to remember and be interested in the mathematics that they learn, FNMT 101 is explicitly designed to be interactive, applied, and dynamic. It will also have a greater emphasis on writing out one’s reasoning and discussing/critiquing others’ reasoning – an approach shown to lead to greater levels of knowledge retention.

In order to provide significant in-class and out-of-class scaffolding required to help students learn mathematical concepts, apply them to real-world situations, and communicate about them clearly in oral and written form, a restricted class size of 25 is necessary. The multiple-choice style exams and all-or-nothing credit homework assignments that allow for other courses to accommodate more students would undermine both the spirit of this course and its explicit goals for student learning. Group work is an integral component of the class. Research has shown that, for a math class discussion, three is the ideal size of a group. Much more than that, and the weaker or less confident students choose to be (or allow themselves to be) peripheral to the group’s thinking and action. A teacher must be able to follow all groups’ activities simultaneously, and this is not possible to do effectively with 12 groups of 3. Even 8 groups is at the maximum. Students also need to be able to receive feedback not just from the instructor but from students in other groups. After the group activity, a whole class discussion will allow students to present their group’s work and comment on that of other groups. Smaller classes enable participation of more students. And it is this active participation that many students have lacked in their previous math courses (as many traditional math courses are taught as if they are large university lectures, regardless of how many students are in the room). In a class of 25 students, everyone can have the opportunity to participate in class discussion.

Another distinction between this class and traditional math classes with similar prerequisites lies in their differing uses of technology. As students learning the fundamental operations of arithmetic and algebra, it is vital that they develop the understanding for performing calculations by hand. One of the reasons why so many students at the College place into remedial courses is because they never developed the number sense that comes from actually manipulating numbers by hand, but rather were encouraged to use calculators too early in their development. This is akin to using spell check starting in kindergarten and never learning phonics. Or even learning to read and write solely through listening to audiobooks and speech recognition writing software – it leaves out the fundamentals. However, spellcheck and grammar check are indeed useful tools for professionals. Knowing how to use these tools effectively is an important skill necessary for writing at the college level. Likewise, it is important for students to know how to utilize technology effectively in a mathematics context and know when to leverage the computing power of microprocessors to aid in their quantitative reasoning. This course therefore uses calculators, spreadsheets, and other computer programs to handle real (and therefore messy) data. For many students, this class will be the first time they have used the formula feature of Excel. For other students, this may be the first time they were asked to use logic to assess the validity of a calculator’s output, rather than unquestioningly accepting their calculator’s response. The breadth of algebraic expertise necessary for STEM students necessitates further symbolic work unsupported by technology (in courses such as FNMT 118 and FNMT 120). These students can pick up on the computing power of technology later on. Liberal arts students, however, will benefit greatly from being supported by a classroom environment that scaffolds their apprehension of when and how to use technology to aid their reasoning process.

Overall, the course has been developed to address all the Quantitative Reasoning general educational outcomes of the institution. The goals addressed are:

1. Communicate mathematical principles and apply them to follow an extended line of formal reasoning and critical thinking.
2. Read and identify mathematical information that is relevant in a problem.
3. Interpret and critically analyze mathematical information presented.
4. Select appropriate methods to mathematically solve problems.
5. Estimate results and evaluate the validity of results.
6. Effectively communicate quantitative concepts using standard written English and correct mathematical syntax.

While these goals are context-neutral, and other courses at the College also fulfill the Quantitative Reasoning general education requirement, this course was developed with these learning outcomes specifically in mind. Each topic covered in the course has been selected to provide a context for helping students achieve basic understanding of and proficiency in these skills which are relevant for all members of society, regardless of academic or career path.

1. **Course Learning Outcomes and Methods of Assessment**

| **Course Learning Outcome**Upon successful completion of the course, students will be able to: | **Method of Assessment** |
| --- | --- |
| 1. Use deductive and inductive reasoning to make, prove, and disprove conjectures; recognize, choose, and employ problem-solving strategies, including rounding and estimating.
 | In-built assessment in course tests |
| 1. Use logic to determine the veracity of a given statement and the validity of a given argument and identify the occurrence of logical fallacies.
 | In-built assessment in course tests |
| 1. Recognize and use proportional reasoning to answer real-world questions.
 | In-built assessment in course tests |
| 1. Express the relationship between verbal, algebraic, numeric and graphical representations of functions (especially linear, quadratic, exponential, and logarithmic), and convert between the different representations in context-appropriate ways.
 | In-built assessment in course tests |
| 1. Use correlation and regression analysis to critique and create algebraic models of real-world data.
 | In-built assessment in course tests |
| 1. Use mathematical formulas to answer practical questions about personal financial matters such as budgeting, investing, debt, and taxes.
 | In-built assessment in course tests |
| 1. Accurately communicate quantitative information in clear English prose.
 | In-built assessment in course tests |

Assessment is through common final examination and a final project with a common grading rubric. To earn a passing grade, students will have to prove a sufficient understanding by performing at least 50% on the final examination and an all-around 70% in the course as a whole. Standard 10% letter grade divisions. A more detailed list of learning outcomes is included in the **Appendix.**

1. **Grading**

|  |  |
| --- | --- |
| Attendance/Classwork/Discussion  | 20% |
| Written Homework | 16% |
| Procedural Skills Homework | 10% |
| Unit Exams (3 @ 8% ea.) | 24% |
| Final Project | 10% |
| Departmental Final Exam | 20% |
| **Total** | **100%** |

1. **Planned Sequence of Topics (expectation of 3 contact hours per week)**

| **Week** | **Topic** |
| --- | --- |
| **1** | Overview of Course, Types of Reasoning |
| **2** | Estimation and Interpreting Graphs, Problem-Solving Strategies |
| **3** | Logical Statements, Truth Tables |
| **4** | Modifying Logical Statements, Logical Validity and Argument |
| **5** | **Exam 1: Reasoning and Logic**, Ratios and Proportions  |
| **6** | Intro to the Cartesian Plane, Linear Modeling |
| **7** | Linear Correlation, Quadratic Modeling |
| **8** | Linear and Quadratic Regression, Exponential and Logarithmic Modeling |
| **9** | **Exam 2: Proportional Reasoning, Functions, and Modeling,** Introduction of projects |
| **10** | Percent Change, Budgeting |
| **11** | Simple Interest, Compound Interest |
| **12** | Loans, Investments |
| **13** | Taxes, **Exam 3: Consumer Math**  |
| **14** | Project Presentations |
| **15** | Final Exam |

1. **Student Learning Activities and Assignments**

During class, students learn through a combination of direct instruction, solo and group activities, and discussion. Student participation and individual creative thinking are emphasized.

In addition to graded in-class activities, students have three main types of homework:

* + 1. Learning the new ideas through **textbook reading** and **online instructional videos**
		2. Practicing basic procedural skills through an **online homework system** (including just-in-time review of arithmetic or basic algebraic skills)
		3. Composing **Written responses** varying in length from one sentence to multiple pages.

Students also must take **in-class exams** and a **final exam**; both assessments are comprised of multiple choice, short answer, and short essay questions to ensure retention of knowledge and of procedural skills. These exams are standardized across instructors.

Students also have a single **final project** that consists of a written element and a posterboard presentation. In this presentation, students use an existing data set to come to a logical conclusion about a particular topic relevant to their program of study, their personal life experience, and/or to the current cultural or political zeitgeist.

1. **Required and Optional Texts/Reading/Materials**
* An online learning system such as ALEKS 360 McGraw-Hill’s Assessment and Learning in Knowledge Spaces (ALEKS) or Pearson’s MyLabsPlus or myopenmath.com (an OER platform).
* Microsoft Excel or some other spreadsheet application.
* Various news items and other examples from mass media, collected by each instructor.

**Potential Texts:** Any textbook for this course must focus on providing opportunities to engage with ideas and respond with written answers in sentence and/or paragraph form. It should be interactive, engaging, and focus primarily on recognizing and using quantitative reasoning in applied settings. Rote problems that require procedural fidelity should be minimized and used only to gird up underlying computational needs. Example problems should point to methods that the student must apply to novel situations, rather than provide a blueprint for “copy-and-paste” style regurgitation.

* “Math in Our World: A Quantitative Reasoning Approach” David Sobecki & Brian Mercer. McGraw-Hill.
* “Thinking Quantitatively: Communicating with Numbers” Eric Gaze. Pearson.
* “Using and Understanding Mathematics: a Quantitative Reasoning Approach” Bennett/Briggs. Pearson.
* “New Mathways Project: Quantitative Reasoning” UT Dana Center. Pearson.
* “Math in Society” https://www.myopenmath.com/course/public.php?cid=22849
1. **Resources Needed for this Course**

This course will ideally use the Active Learning Classrooms with 6-8 stations. If such rooms are not available, it should take place in an instructor-tech Cleartouch-equipped room with sufficient vertical non-permanent surfaces for student group work: 96 square feet (24 linear feet) of whiteboard space. Groupwork at the whiteboards and/or on the computers will be a daily component of the class time.

A student-tech computer classroom will occasionally be needed.

Based on the format and pacing of the course, two 90-minute class sessions per week are preferred.

**Appendix**

**FNMT 101 Test 3 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Directions:** Get every problem right. Don’t cheat off anyone, and for goodness’s sake don’t choke. **SHOW ALL WORK!!!**

**1.** In 2014, the Cincinnati Reds won 76 games, then won only 64 in 2015. The 2015 Cardinals won 100 games, then dropped to 86 the following year. Based on percent change, which team had the more significant decrease in wins? (8 points)

**2.** Suppose that you find $8,460 in cash in the back of an Uber, and suppose further that you’re the southern end of a northbound mule, and decide to keep and invest it. Your first choice is a two-year certificate of deposit that earns 3.7% simple interest. Find the future value of the investment. (8)

**3.** Your second choice for investing your ill-gotten gains is investing in a business that promises you a return of 5.1% compounded weekly for three years, provided that they don’t go out of business. If they go belly up, you lose it all. Find the future value, and discuss which of the two options you would likely go for. Any reasonable discussion will talk about WHY you made your choice. (8)

A family needs a new central air conditioning unit, a position I’ve been in and I can tell you it sucks bad. The cost is $7,800 and the contractor is offering to finance the unit for 4 years with $500 down. The monthly payment will be $210.56. Use this info for Questions 4–6.

**4.** Find the amount financed and the total installment price. (8)

**5.** How much money would you save if you had the cash to just pay for the unit at the time of installation? (6)

**6.** If the interest calculated was simple interest, find the interest rate. (6)

**7.** When buying a home for $263,000, a couple makes a down payment of $35,000 and gets a 30-year mortgage at 4.6% interest. Find the monthly payment. (8)

**8.** Suppose the couple in Question 7 is also thinking about renting a townhouse for $925 per month. How much less would they pay each year? Explain why this isn’t really “savings” over buying the house. (8)

The stock table below is for a company called… well, whatever. You can read what it’s called if you care. Use the table to answer Questions 9–11.



**9.** What’s the highest price that the stock sold for in the last year? (6)

**10.** What would the proceeds be from selling 500 shares of this stock at the most recent bid price? You’ll be buying through an online broker that has a $9.95 flat fee for all purchases. (8)

**11.** If you’d bought that stock at the LOWEST price in the last year, using the same online brokerage, then sold it as in Question 10, how much money would you have made or lost? Was this a good investment option? JUSTIFY! (10)

**12.** Eileen gets a paycheck for $1,750 every other Friday. Calculate her MONTHLY take home pay. (8)

**13.** Eileen has fixed expenses as shown in the table. Eileen’s credit card bill last month was $2,908.35. Comment on how responsible you think she has been in terms of spending. Use MATH TO BACK UP YOUR ASSESSMENT! (8)

 

**14.** Johanna flips a quarter three times and it lands on heads every time. Philip watches her do this and is convinced that it will continue to land on heads every single time. Explain to Philip, using appropriate terminology, why that is unlikely to be true, even given what he just witnessed. (8)

**15.** According to the 2010 census, 73% of Pennsylvanians lived in urban counties, and 7% of Pennsylvanians are immigrants. From this information alone, what conclusions can you draw about the percentage of Philadelphians who are immigrants? Explain your reasoning. (8)

**FNMT 101 Final Project: Mathematical Modeling**

**Instructions:** Create a trifold posterboard that clearly displays your data, your properly-labeled graph(s), and addresses each of the **five portions** of this modeling exercise.

1. Pick two measurable variables that you think are related, but about whose relationship you are unsure. State the Population and the variables (including units)
	1. Population:
	2. Var1:
	3. Var2:
2. Measure the variables for a sample size of 30 members of your population and record them.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Index | Var1 | Var2 |  | Index | Var1 | Var2 |
| 1 |  |  |  | 16 |  |  |
| 2 |  |  |  | 17 |  |  |
| 3 |  |  |  | 18 |  |  |
| 4 |  |  |  | 19 |  |  |
| 5 |  |  |  | 20 |  |  |
| 6 |  |  |  | 21 |  |  |
| 7 |  |  |  | 22 |  |  |
| 8 |  |  |  | 23 |  |  |
| 9 |  |  |  | 24 |  |  |
| 10 |  |  |  | 25 |  |  |
| 11 |  |  |  | 26 |  |  |
| 12 |  |  |  | 27 |  |  |
| 13 |  |  |  | 28 |  |  |
| 14 |  |  |  | 29 |  |  |
| 15 |  |  |  | 30 |  |  |

1. Using Excel, create a scatterplot of your data and describe the relationship between the two variables qualitatively. Address the following questions:
	1. Why did you choose which variable to be on the horizontal axis vs. the vertical axis?
	2. What pattern do you see in the scatterplot? No relationship? Linear relationship? Other kind of relationship? How strong does the relationship seem to be?
	3. Do there appear to be any outliers? If so, can you explain why that data point would be unusual? If not, how do you know?
2. Using the tools of Excel, calculate the line of best fit, the R-value, and the R^2 value.
	1. What do the R and R^2 values mean in this context?
	2. What do the y-intercept and slope of the line of best fit mean in this context? Be specific!
	3. Based on this quantitative analysis of the relationship between your two variables, does a linear model appear to accurately describe the relationship in question and provide a reasonable basis for predicting future values? If so, explain why you think so and make at least one prediction that appropriately extrapolates beyond your data set. If not, propose next steps (e.g. propose other models to consider, propose reasons for a lack of discernable relationship, even though you expected to find one, …)
3. Now that you have your results, do some research to find out if other people have noticed the same relationship (or lack thereof). List the relevant articles (popular or scientific press).

**Written Element**

The written element of your final project is a paper of **500 to 1000 words** (double spaced), in which you answer the questions posed in the paper topic below, based on the results of your mathematical modeling presentation. In addition to meeting the word count, your paper should also include **graphs** and **data** in an easy-to-read **visual format**.

The **purpose** of this paper is for you to demonstrate

* Your ability to reason quantitatively
* Your ability to make sound inferences drawn from data
* Your ability to interpret others’ results accurately
* Your ability to use clear grammar and sentence structure to communicate mathematical information

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| --- |
| **Paper Topic:** What have you learned about the world by doing this study? Compare your expectations of results with your actual results. What would other people find interesting about your results? How might you change your methodology to improve future studies?  |

**Criteria for Success:** See the rubric below.

| **FNMT 120 SAMPLE PROJECT 1 SLO SCORING RUBRIC** |
| --- |
| **CLO #** | **CLO Description** | **Excellence** **(3 points)** | **Competence** **(2 points)** | **Basic** **(1 point)** | **Not Demonstrated** **(0 points)** |
| **5** | Graph points and lines on rectangular coordinate system. Express the relationship between Verbal, Algebraic, Numeric and Graphical representations of functions – especially linear, quadratic, exponential, and logarithmic, and convert between the different representations in context-appropriate ways. Interpret and use particular examples of multivariate models such as total cost and weighted average. | Chose appropriate variables, measured values accurately, and plotted points accurately. Correctly identified the appropriate type of algebraic model. Clearly showed the cohesion between the numerical, algebraic, and verbal models of the relationship being studied.  | Chose appropriate variables, measured values reasonably but with errors, plotted points but with some ambiguity. Used a reasonable but perhaps suboptimal algebraic model. Showed some understanding of the relationships between the four types of representations. | Chose variables that are hard to measure or that are unrelated. Made significant measuring errors. Graphed points and line incorrectly. Made significant errors in explaining relationship between the four function relationship types. | Did not measure variables accurately. Did not graph ordered pairs or line. Was unable to articulate the numerical, algebraic, graphical, or verbal representations of the relationship under investigation, or explain the connections between these representations. |
| **6** | Use correlation and regression analysis to analyze and create algebraic models of real-world data. | Line of best fit equation, R, and R^2 are calculated correctly and interpreted meaningfully. Explained the meaning of the parameters in the line of best fit equation using clear English prose. | Line of best fit equation, R and R^2 are correctly calculated but not interpreted well. Mathematical or writing errors in describing parameters. | Errors in calculating Line of best fit equation, R, and R^2. Inconsistent or inaccurate interpretation of values and/or parameters. Unclear writing about the model. | Inability to calculate line of best fit equation or correlation coefficient. Incorrect or incomprehensible explanation of correlation and regression. |
| **11** | Demonstrate fluency in reasoning quantitatively: correctly interpret quantitative information and clearly and accurately communicate quantitative information. | Displayed graph in an easy-to-read format. Inferences drawn from experimental data are sound. Grammar and sentence structure in written responses are appropriately formal. Interpretation of others' results is accurate. | Displayed graph accurately, but with suboptimal formatting. Inferences drawn from experimental data include some logical fallacies or unmerited extrapolation. Grammar and sentence structure in written responses is understandable but contains errors. Interpretation of others' results contains minor errors. | Visual representation of data is unclear. Inferences drawn from experimental data are specious or inaccurate. Writing is difficult to parse. Interpretation of others' results has significant flaws. | Visual representation of data is not present. No inferences or explanations of data are attempted. Writing is incomprehensible. Interpretation of others' results is either not attempted or is irrelevant and inaccurate. |

**Sample Project 2**

**Mathematical Modeling Group Project**

1. Use your smartphone to make a **video** of a ball being thrown directly into the air.
2. Using **Logger Pro**, extract the data for the height of the ball at every point in time.
3. Copy the time data into column A of an **Excel spreadsheet** and copy the height data into column B of the same spreadsheet.
4. Use Excel to **make a graph** of the data from columns A and B.
5. Determine if the relationship of height and time is linear, quadratic, exponential, or logarithmic, and **create the appropriate equation** that will best fit the graph using excel.
6. Recall that average velocity is equal to the average rate of change of the height function. Use the **average** **rate of change formula** to find the average velocity between every 2 points of the height graph and copy the result into column C of the spreadsheet.
7. Make a **velocity vs. time graph** in excel using the data from columns A and C.
8. Determine if the relationship of velocity and time is linear, quadratic, exponential, or logarithmic, and **create the appropriate equation** that will best fit the graph using Excel.
9. Recall that average acceleration is equal to the average rate of change of the velocity function. Use the **average rate of change** formula to find the average acceleration between every 2 points of the velocity graph and copy the result into column D of the spreadsheet.
10. Make an **acceleration vs. time graph** in Excel using the data from columns A and D.
11. Determine if the relationship of acceleration and time is linear, quadratic, exponential, or logarithmic, and **create the appropriate equation** that will best fit the graph using excel.
12. Use Excel to **calculate the correlation coefficient for each of the three graphs**.
13. For each graph, is the correlation strong or weak? Explain. Also, explain why the correlation for some graphs may be stronger than others.

**Sample Project 3**

After graduating from CCP, you landed a job earning 42k/ year. Congrats! Now it’s time to think about your long-term life goals. Do you want to buy a car, a house, save for retirement, and attend grad school? Based on the information below and your bi-weekly income displayed in the pay stub below, **compute the monthly costs** for each scenario, and **how long it would take to pay off** each item. Remember that you will also have to pay off your student loan and will need to cover your everyday living expenses.



This assignment consists of several steps:

1. Create an **annual budget** calculation using excel assuming the following monthly expenditures:
	1. Rent ($800)
	2. Utilities ($150)
	3. Groceries ($400)
	4. Clothes ($100)
	5. Miscellaneous ($400)
2. Before deciding which investment(s) into your long-term goals you want to make, you need to think about paying back your student loan. Assuming you borrowed $20,000 in a federal student loan program at 4.7 % capitalized interest. Find the **monthly minimum payment** on the loan if the term is 20 years.

You may want to use this **online calculator** to compute the minimum payment: <http://www.finaid.org/calculators/loanpayments.phtml> (Note that you’ll have to leave a blank in the field “Minimum Payment”).

1. With the money left you want to think about a smart investment. In what follows you will be presented with 4 scenarios. **Complete calculations for each one of the investments and decide which investment(s) would make most sense given your current financial situation.** **Justify your decision** in one paragraph giving clear information about why the scenario(s) you chose to invest in are superior to those you decided not to invest in. (Hint: It might make sense to invest in more than one of the scenarios.)
2. You want to buy a car, as it would save you 2h of time compared to commuting by train to work each day. An installment plan offered by the car dealer comes with a 5% down payment, and after checking your credit your car dealer offers you a finance charge of 12%. How much will can you afford to pay each month for an **installment plan** of 6 years? How much would be the **most expensive** car you could afford?
3. Assuming you want to make a **small investment** with the $5,000 your family gave you as a graduation present. You want to start a 2year CD to save up the amount needed for the down payment on your car purchase. Your bank offers you an interest rate that yields 1% interest compounded weekly. How much money will you have after 2 years?
4. Would it make sense to invest the $5,000 into paying off a part of your student loan or to use the money toward the down payment of your car purchase? What would be the advantages in using the $5,000 toward either of these options? What would be the disadvantages? **Support your answer with numerical evidence.**
5. Let’s say with the leftover income you decide you want to save toward a **larger investment** (such as the purchase of a house). Your bank offers you a savings investment plan (annuity) with 2.5% compounded annually. How much money would you be able to put toward the annuity per month? Use the following online annuity calculator to determine how much money you’d be able to save after a 10 year annuity: <http://www.calculatorsoup.com/calculators/financial/future-value-annuity-calculator.php> *(Hint: Type 0% at the Growth Rate since this is not a growing annuity).* How much interest did the annuity earn over the 10 years?

**.**

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