MAT 1033C – WEST CAMPUS

Instructor Manual for Lab Assignments

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MAT1033C Lab Overview

Philosophy:

The lab is designed to enhance the student's learning experience as they master the algebraic skills needed to successfully complete MAT 1033C. Each chapter is accompanied by a lab activity that extends the real-life applications covered in class. It is suggested that the lab component consist of 10-15% of a student's overall grade.

Requirements:

The student is to complete the lab activities (explained in full below) and spend a specified amount of time each week in the West Campus Math Center. Their time can be fulfilled by working on the lab activities, by working on homework assignments, or by attending tutoring workshops.

Attendance:

Fall & Spring Semesters	Summer Semester
Full term: 50 minutes per week	Full term: 60 minutes per week
TWK: 60 minutes per week	Summer A or B: 120 minutes per week

Time spent in the Math Center is recorded on individual computers and will be provided to you a few times a semester by Math Center staff. However, a Lab Attendance Documentation Sheet is provided within the student lab syllabus for a student to document their time on written paper. You can utilize either or both options for recording student attendance time in the Math Center.

Lab Activities:

- A complete lab syllabus is provided within Blackboard for the students.
- All lab videos, worksheets and assessments are located within MyMathLab.
- The process of the lab activities are as follows:
    0. Student learns required material in class.
    1. Introduction - student watches Icebreaker and Concept Videos/Animations.
    2. Lab Worksheet - student completes Lab Worksheets.
    3. Worksheet Self-Check - student takes completed worksheets to West Campus Math Center, Math Connections, or Hands-On to check their answers. When a lab instructor feels they have successfully completed the worksheets they will sign and stamp them.
    4. Lab Assessment - student completes an online password protected assessment (within MyMath Lab) that must be taken in the West Campus Math Center. Signed and stamped worksheets will be shown as evidence to a Lab Instructor who will give them access to the assessment. They have 3 attempts to get the best score possible.

- Grading for Lab Assignments (using a 100 point scale)
    - 0 (not completing) or 50 points (for completing) Lab Worksheets
    - 0 to 50 points based on the grade from the Lab Assessment. It is advised you require the students to get a 70% or higher on the assessments.
    - You can record a student's lab grade by viewing the gradebook in MyMathLab and by checking their score on the lab activity assessment. A score on the assessment means they completed the worksheets, thus earning the 50 point completion part of the grade. The rest of the grade is dependent upon the assessment grade.
    - A Lab Grade Recording Summary Sheet is provided within the student lab syllabus for a student to keep track of their own lab grades. You may require a student to use this to record their own grades, or you can collect them and use them as a lab grade organization of your own.

Outline of Tips for each Chapter:

The rest of this manual contains information about each lab activity as well as tips for connecting the lab material with the class material. Note, this in no way implies you cover the lab worksheets in class but it is important for the students to see the connection between their classroom assignments and the lab assignments. The tips provide examples within specified sections that will allow you to make this connection.

Within each lab overview you will be given:

1. The purpose of the lab activity.
2. A suggestion of when the lab activity should be due.
3. The movie title for the scene that the Icebreaker Video comes from
4. The titles of the animations/videos that are taken from the electronic aids within MyMathLab.
5. Suggestions for incorporating the lab material into the class. (Classroom Discussion Possibilities.)
6. A list of the lab assessment questions.

Final Tips

- The actual lab worksheets have not been provided in this manual but can be easily found by opening up the student lab syllabus from within your Blackboard course, or within MyMathLab after selecting Lab Materials & Assignments, then the appropriate chapter.
- The answer keys to the lab worksheets can be accessed by talking to a Lab Instructor in the West Campus Math Center, Math Connections, or Hands-On.
- It is highly advised you have the lab activities due periodically throughout the semester. Waiting until the end of the semester to have them due causes a rush and long lines for students and Lab Instructors during the last few weeks of class.
- To reiterate, it is not expected that you cover the worksheets in class, that is part of the lab component. However, by making the connection between the lab assignments and the class material, and by speaking of the lab assignments in class it aids in a deeper understanding of lab expectations and a greater appreciation of the lab experience for your students.

Orientation Lab Overview: Basic Algebra (Instructor Optional)

Purpose:

The purpose of the Overview Lab is to familiarize students with the lab experience. It uses basic algebra prerequisites to have them complete a practice lab, before completing required labs. After completing this lab, the students will be able to:

1. ***Use problem solving skills to answer questions.***
2. ***Learn about the format and structure of the required lab component of the course.***

The students will answer a short 3-question lab worksheet, followed by a short 4 question lab assessment in MyMathLab. It is up to the instructor as to whether the students complete this lab or not.

The lab material is prerequisite material and is designed to be down at the start of the semester to introduce the lab format to the students.

Icebreaker video clip/project theme: *"Big" (scene from the movie)*

Videos/Animations from supporting materials of textbook:

Video on 1.2 - Obj 5 Write Phrases as Algebraic Expresssions

Classroom Discussion Possibility:

During the first week of class:

1) Explain the reasoning behind the lab. They are to extend the concepts learned in class to real-life examples. The material on the labs themselves may be harder than what is covered in class and on homework, but that is because they are extending the concepts.
2) Explain the process behind the lab. You can verbally go through these steps, and have the students complete the orientation lab on their own, or you can walk through the steps with them.
    a. Material is covered in class.
    b. Students log into MyMathLab to watch the Icebreaker video, and supporting videos/animations from the textbook.
    c. Students complete the lab worksheets.
    d. Students get their answers checked by a Math Center Instructor, who will sign and stamp their worksheets once they feel they have sufficiently completed the work.
    e. Students will take a password protected assessment within MyMathLab while in the West Campus Math Center – up to 3 attempts are allowed, with the best score counting.
3) Explain the help tools available to them while completing the lab worksheets.
    a. Introduction Videos – concepts that will be helpful when completing the worksheets.
    b. Worksheet help videos – created by Courtney Watson and offers direct explanation about completing the worksheets.
    c. Help from the Lab Instructors in the West Campus Math Lab.
    d. You (their instructor) and their other classmates!

Lab Assessment Questions:

Note – the order of the questions has been scrambled for each attempt and question (1) is algorithmically generated.

1) Write the phrase as an algebraic expression. Use the variable x to represent the unknown number.
   Four more than twice a number.

2) If the Tampa Bay Rays earns 2 runs in the first inning of a baseball game, and they continue to earn runs in this manner for the entire game (nine innings), how many runs in total will they earn?

3) If the Tampa Bay Rays earns y runs in the first inning of a baseball game, and increase the number of runs they earn each inning by 1 for the rest of the game (nine innings), how many runs in total will they earn?

4) If the Tampa Bay Rays earns x runs in the first inning of a baseball game, and they continue to earn runs in this manner for the entire game (nine innings), how many runs in total will they earn?

Chapter 2 Lab Overview: Simple and Compound Interest

Purpose:

The purpose of the Chapter 2 Lab is to have the students further investigate material from section 2.3: Formulas and Problem Solving. After completing this lab, the students will be able to:

1. Understand how to use the simple interest formula in real-life applications.
2. Understand the properties of exponents, and work with the compound interest formula by applying it to real-life applications.
3. Analyze the relationship between the simple interest and the compound interest formula.

The students will be manipulating, solving, and investigating the simple interest and compound interest formulas. They will replace numerical values into the formulas and solve for the remaining unknown. They will begin by working with the simple interest formula, and then complete problems with the compound interest formula. The formula's are also compared and contrasted. Finally, students use the simple interest formula to generate a real world scenario of taking a loan out for a car, including the car amount plus interest.

Since this lab covers material from 2.3, having the students complete the lab by or on the day of the chapter 2 test should give them sufficient time to complete the lab in its entirety.

Icebreaker video clip/project theme: *"The Bank" (scene from the Australian movie)*

Videos/Animations from supporting materials of textbook:

Animation - Solve a Formula or Equation for One Variable
Video on 2.3 - Obj 1 Solve a Formula for a Specified Variable
Video on 2.3 - Obj 2 Use Formulas to Solve Problems

Classroom Discussion Possibility:

When covering section 2.3 in class:

1) Define the simple interest and compound interest formulas.
2) Complete the simple interest and compound interest problems below (or similar ones).
   - You invest $5000 in an account paying a simple interest rate of 5% for 2 years. How much interest is earned? How much money do you have at the end of 2 years?
   - A principle of $5000 is invested in an account paying an annual percentage rate of 5%. Find the amount in the account after 2 years if the interest is compounded:
     a) semi-annually b) quarterly c) monthly.
     How much interest was earned for each type of compound?
3) Briefly discuss the differences in the results and formula's.
4) Briefly review of order of operations and calculator input while completing the compound interest problem. (Note, directions on how to input the values of the compound interest formula into a scientific and graphing calculator have been included on the worksheets.)
5) Show the class a copy of the lab worksheets, and remind them of the lab process.

Lab Assessment Questions:

Note – the order of the questions has been scrambled for each attempt. All questions come from 2.3.

1) If $8500 was deposited in an account earning simple interest at an annual interest rate of 7% for 10 years, how much interest was earned?

2) To invest money at a rate of r, which investment plan should be chosen – one compounding 4 times per year or 12 times per year?

3) If $8500 was deposited in an account earning compound interest at an annual interest rate of 7% for 10 years, and interest is compounded semi-annually, how much money is in the account at the end of 10 years?

4) Solve the simple interest formula for T. (I=PRT)

5) If $8500 was deposited in an account earning compound interest at an annual interest rate of 7% for 10 years, and interest is compounded semi-annually, how much interest was earned?

6) A principal of $5500 is invested in an account paying an annual rate of 6%. Find the amount in the account after 4 years if the account is compounded semiannually, quarterly, and monthly.
(Questions will vary as this is algorithmically generated.)

7) Solve $x - 2y = 17$ for y.
(Questions will vary as this is algorithmically generated.)

8) If $8500 was deposited into an account earning simple interest at an annual interest rate of 7% for 10 years, how much money is now in the account?

Chapter 3 Lab Overview: Linear Functions

Purpose:

The purpose of the Chapter 3 Lab is to have the students further investigate material from sections 3.1 – 3.5: Graphing Equations, Intro to Functions, Graphing Linear Equations, The Slope of a Line, and Equations of Lines. After completing this lab, the students will be able to:

1. ***Recognize the mathematical function concept and describe relationships between variables in real world situations.***
2. ***Use functions expressed verbally, numerically, graphically, and symbolically.***
3. ***Recognize, model, and analyze linear equations in the real world.***
4. ***Determine the slope of a line.***

The students will perform a manual linear regression on a real-world set of data. They will be required to determine if the data is a function, graph the data, and then draw a line of best-fit through the data. The students will identify two points their line goes through, and write a linear function for the points. After the students have created their function they will have to answer questions by plugging in values for x and f(x). (Note, because of the nature of this project, there will be many answers to the majority of the project.) Finally, the students are given the correct linear regression model of the data. They will then compare their model against the computer generated regression model.

Since this lab covers material from 3.1-3.5, you may want to consider giving the students extra time beyond the day of the chapter 3 test to give them sufficient time to complete the lab in its entirety.

Icebreaker video clip/project theme: *Video of Lake Pamela (created by Courtney Watson)*

Videos/Animations from MML/textbook:

Video on 3.2 - Obj 2 Identify Functions
Video on 3.2 - Obj 5 Use Function Notation
Animation - Use the Point Slope Form to Write the Equation of a Line
Video on 3.5 - Obj 3 Use the Point-Slope Form to Write the Equation of a Line

Classroom Discussion Possibility:

With the nature of this project, you may find that you do not have time to complete a problem exactly like the lab activity for this chapter. You can however, complete application problems in each section and reference the project at that time. Below are some suggestions of how to cover the various pieces of the project within the required material of the course.

When covering section 3.1:

1) Complete the graphing problem below:
   The distance *y* traveled in a train moving at a constant speed of 50 miles per hour is given by the equation *y=50x*, where *x* is the time in hours traveled. *(p. 130 #88)*
   a) Draw a graph of this equation.
   b) Read from the graph, the distance y traveled after 6 hours.
2) Emphasize graphing application problems in the first quadrant.

When covering section 3.2:

3) Complete the problem, or one similar to it, below:
   Determine whether the relation is a function. { (4,3), (-4,9), (2,3), (10, -5)}
4) Explain that a set of ordered pairs is comparable to a table of data values. So you determine whether a table of data values is a function the same way as a set of ordered pairs.
5) Complete the problem, or one similar to it, below:
   Given *f(x) = 3x+7*, find *f(-6)* and find *x* when *f(x) = 10*.

When covering section 3.4:

6) Complete the problem, or one similar to it, below:
   Find the slope of the line through the points (3, 7) and (-2, 11)
7) Complete the problem, or one similar to it, below:
   The number of women completing bachelor degrees surpassed the number of men completing bachelor degrees in 1982. The number of women completing bachelor degrees (in thousands) is given by the equation *y = 23.3x+708.7*, where *x* is the number of years since 2000. *(p. 166 #80)*
   a) Find the number of women completing bachelor degrees in 2015.
   b) Find and interpret the slope of the equation.
   c) Find and interpret the y-intercept of the equation.

When covering section 3.5:

8) Complete the problem, or one similar to it, below:
   In 2014, the average price of a new home sold in the United Stated was $342,800. In 2009, the average price of a new home sold in the US was $268,200. Let *y* be the average price of a new home in the year *x*, where *x=0* represents the year 2009. *(p. 177 #81)*
   a) Write a linear equation that models the average price of a new home in terms of the year *x*.
   b) Use this equation to predict the average price of a new home in 2018.
9) Show the class a copy of the lab worksheets. Discuss the difference between real-life data and the last application problem completed. Discuss that real life data will have more than two points, and won't be perfectly linear, but may show a linear pattern. So, the data can be graphed, and a straight line can be drawn through two points of the data to approximate that linear pattern. By picking two data points, a linear model of the data can be found, and the work is exactly like the last application problem completed. The only difference is the student must pick which two data points they feel will work best out of 6 points, instead of just being given two points.

Lab Assessment Questions:

Note – the order of the questions has been scrambled for each attempt. All questions have been algorithmically generated so the numbers given will vary.

1) Plot the ordered pair (2,3). State in which quadrant or on which axis the point lies. (*Section 3-1)*

2) State the domain and range of the relation. Determine whether the relation represents a function.
{(-6,-6), (0,0), (6,6)} *(Section 3-2)*

3) The dosage in milligrams D of a heartworm preventive for a dog who weighs x pounds is given by D(x) = (136/25)x. Find the proper dosage for a dog that weighs 28 pounds. *(Section 3-2)*

4) The cost of renting a car for a day is given by the linear function C(x)=0.1x+23, where C(x) is in dollars and x is the number of miles driven. Use this information to answer the questions below.
a. Find the cost of driving the car 100 miles.
b. Graph C(x)=0.1x+23. (Choose from 4 graphs given).
c. How can you tell from the graph of C(x) that as the number of miles driven increases, the total cost increases also? *(Section 3-3)*

5) Find the slope of the line that goes through (-3,-8) and (3,-5). *(Section 3-4)*

6) The yearly cost of tuition and required fees for attending a public two-year college full time can be estimated by the linear function $f(x) = 503x + 7181$, where x is the number of years after 2007 and $f(x)$ is the total cost. Use the given function to:
a. approximate the yearly cost of attending a two-year college in the year 2024.
b. predict in what year the yearly cost of tuition and required fees will exceed $17,000.
c. approximate the yearly cost of attending a two-year college in 2014. (Section 3-3)

7) Find equation of a line in standard form. Slope 4; Through (-5, 8). *(Section 3-5)*

8) The number of people employed in some country as medical assistants was 375 thousand in 2007. By the year 2017, this number is expected to rise to 588 thousand. Let y be the number of medical assistants (in thousands) employed in the country in the year x, where x=0 represents the year 2007.
a. Write a linear equation that models the number of people (in thousands) employed as medical assistants in the year x. [HINT: the line must pass through the points (0,375) and (10,588)].
b. Use this equation to estimate the number of people who will be employed as medical assistants in the year 2016. *(Section 3-5)*

Chapter 6 Lab Overview: Work Problems

Purpose:

The purpose of the Chapter 6 Lab is to have the students further investigate work problems from section 6.6: Rational Equations and Problem Solving. After Completing this lab, the students will be able to:

1. ***Perform all arithmetic operations on rational expressions.***
2. ***Solve an equation containing rational expressions.***
3. ***Construct and apply equations containing rational expressions to real world situations.***

The students will investigate a few different techniques of solving work application problems. They will be manipulating rational formulas, and solving work problems involving 2 or 3 input quantities. The various techniques may involve, adding rational expressions, clearing fractions from rational equations, and using short-cut formulas.

Since this lab covers material from 6.6, you may want to consider giving the students extra time beyond the day of the chapter 6 test to give them sufficient time to complete the lab in its entirety.

Icebreaker video clip/project theme: *"Little Big League" (scene from the movie)*

Videos/Animations from MML/textbook:

Video on 6.2 - Obj 2 Identify the LCD of Two or More Rational Expressions
Video on 6.2 - Obj 3 Add or Subtract Rational Expressions with Unlike Denominators
Video on 6.6 - Obj 1 Solve an Equation containing Rational Expressions for a Specified Variable
Vidoe on 6.6 – Obj 4 Solve Problems about Work

Classroom Discussion Possibility:

When covering section 6.6:

1) Complete the work problems below (or similar ones) in class, using the algebraic method of your choice.
   a. An experienced roofer can roof a house in 26 hours while a beginning roofer needs 39 hours. Find how long it takes for the two to do the job together. How long would it take for them to roof 2 houses? (Note – you may want to use 6 and 9 hrs to simplify the problem.) *(p. 394 #27)*
   b. Three postal workers can sort a stack of mail in 20 minutes, 30 minutes, and 60 minutes, respectively. Find how long it takes them to sort the mail if all three work together. *(p. 394 #29)*
   c. Alan can word process a research paper in 6 hours. With Steve's help, the paper can be processed in 4 hours. Find how long it takes Steve to word process the paper alone. *(p. 394 #28)*

2) Explain to the class that the focus of the Ch 6 Lab Activity is solving work problems. It investigates a shortcut formula that was used from the movie clip "Little Big League" (the Icebreaker video) for solving work problems involving two people. Further investigation is done to determine a shortcut formula when a work problem involves three people. It should be explained that this is necessary because, while shortcuts are nice they typically only work under specific conditions.
3) The students should be encouraged to use whatever technique they prefer but should know that the algebraic approach will work regardless of the number of people involved while shortcut formula's would have to be determined for each addition of a person into the problem.

Lab Assessment Questions:

Note – the order of the questions has been scrambled for each attempt. MOST questions have been algorithmically generated so the numbers given will vary.

1) Find LCD of $\frac{2a}{a^2-b^2}$ and $\frac{1}{a^2-2ab+b^2}$ *(Section 6-2)*

2) Find the LCD of the rational expressions in the list. $\frac{3}{x}$ and $\frac{2}{x-7}$ *(Section 6-2)*

3) Add or subtract as indicated. $\frac{1}{x-5}-\frac{26-3x}{(x-5)(x+6)}$ *(Section 6-2)*

4) Solve $\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}$ for R. *(Section 6-5)*

5) A tank has inlet pipes A and B. Pipe A alone can fill the tank in 5 hrs. Pipe B alone can fill the tank in 2 hours. Choose a reasonable time to fill the tank using both pipes.
Choose from: more than 5 hrs, less than 2 hrs, and between 2 and 5 hrs. *(Section 6-6)*

6) Sally can paint a room in 4 hours while it takes Steve 8 hours to paint the same room. How long would it take them to paint the room if they worked together? *(Section 6-6)*

7) Three postal workers can sort a stack of mail in 15 minutes, 20 minutes, and 20 minutes, respectively. Find how long it takes them to sort the mail if all three work together. *(Section 6-6)*

8) In the movie "Little Big League," one of the baseball players explains that a formula can be used to find the time a task can be completed if two individuals are working together, given the work time of each individual. Given that the work times are A and B respectively and x is the time it takes to complete a task together, what is the formula that can be used? *Students choose from a list of choices.*
(CH 6 Lab Project)

Chapter 7 Lab Overview: Distance and Midpoint Formulas and the Pythagorean Theorem

Purpose:

The purpose of the Chapter 7 Lab is to have the students further investigate applications from section 7.3 (distance and midpoint formulas) and section 7.6 (problem solving using the Pythagorean Theorem). After completing this lab, the students will be able to:

1. Apply Midpoint and Distance Formulas in real world situations
2. Analyze and apply radical expressions in real world situations.
3. Apply Pythagorean Theorem in the context of a real-world situation.

The students will be applying the midpoint and distance formula's, and Pythagorean Theorem to real life applications, with most examples dealing with the Pythagorean Theorem. They will be simplifying radicals as well as finding rounded approximations.

Since most of this lab covers material from 7.6, you may want to consider giving the students extra time beyond the day of the chapter 7 test to give them sufficient time to complete the lab in its entirety.

Icebreaker video clip/project theme: *"Merry Andrew" (scene from the Danny Kaye movie)*

Videos/Animations from MML/textbook:

Video on 7.3 - Obj 3 Simplify Radicals
Video on 7.3 - Obj 4 Use the Distance and Midpoint Formulas
Video on 7.6 - Obj 2 Use the Pythagorean Theorem to Model Problems

Classroom Discussion Possibility:

When covering section 7.3:

1) After simplifying radicals, define the distance and midpoint formulas.
2) Complete the problem below (or similar one).
   Given the two points, (-9, 4) and (-8,1) find:
   a) the distance between them. Give an exact distance and a 3-decimal approximation.
   b) the midpoint of the line segment whose endpoints are the two given above.

When covering section 7.6:

3) Define the Pythagorean Theorem.
4) Complete the problems below (or similar ones).
   Find the length of the unknown side of each right triangle.
   a) Draw a right triangle with a = 3m and c = 7m. *(p. 460 #53)*
   b) Draw a right triangle with a = $5\sqrt{3}$ cm and b = 10 cm. *(p. 460 #56)*

5) Complete the problem below (or a similar one). With this last problem, stress to the students to read the problem carefully to determine ahead of time if they need to simplify the radical or simply approximate it.

   The tallest structure in the United States is a TV tower in Blanchard, North Dakota. Its height is 2063 feet. A 2382-foot length of wire is to be used as a guy wire attached to the top of the tower. Approximate to the nearest foot how far from the base of the tower the guy wire must be anchored.

   (p. 461 #60)

Lab Assessment Questions:

Note – the order of the questions has been scrambled for each attempt. All questions have been algorithmically generated so the numbers given will vary.

1) Simplify by factoring. Assume that all variables under radicals represent nonnegative numbers. $\sqrt{9x^6}$ *(Section 7-1)*

2) Approximate the square root. $\sqrt{120}$ *(Section 7-1)*

3) Simplify. Assume that all variables represent positive real numbers. $-\sqrt{252x^6y^{15}}$ *(Section 7-3)*

4) Find the distance between the pair of points. (5,2) and (17,7) *(Section 7-3)*

5) Find the distance between the pair of points. Type an exact answer and an approximate answer, rounded to the nearest thousandth. (-11,5) and (-6, 1) *(Section 7-3)*

6) Find the midpoint of the line segment whose endpoints are given. (11,5) and (-4,-5) *(Section 7-3)*

7) Find the length of the unknown side of the triangle. The legs of a right triangle are 12 ft and 4 ft. *(Section 7-6)*

8) A spotlight is mounted on the eaves of a house 24 feet above the ground. A flower bed runs between the house and the sidewalk, so the closest the ladder can be placed to the house is 18 feet. How long a ladder is needed so that an electrician can reach the place where the light is mounted? *(Section 7-6)*

Chapter 8 Lab Overview: Quadratic Functions

Purpose:

The purpose of the Chapter 8 Lab is to have the students further investigate material from sections 5.8, 8.1, 8.2, and 8.6: Solving Quadratic Equations, and Applications of Quadratic Equations and Problem Solving with more realistic data. After completing this lab, the students will be able to:

1. Analyze quadratic functions in the context of a real world situation.
2. Apply quadratic functions to a real-world situation.
3. Find x and y-intercepts and the vertex of a parabola.

The students will be manipulating, solving, and investigating quadratic equations. They will be working with realistic data and situations involving rocket trajectories. They will need to set up the equations given the general formulas for the height of a projectile only affected by gravity near the earth's surface, initial values, and initial heights. (The formula for meters and feet are both included.) They will be asked to find maximum heights, and time it takes an object the hit the ground given different initial velocities and heights. They will be required to solve quadratic equations using any appropriate techniques, including factoring, completing the square, and the quadratic formula.

Though majority of this lab covers material from 5.8, 8.1, and 8.2, you still may want to consider giving them extra time beyond the day of the chapter 8 test to give them sufficient time to complete the full lab, because of the few questions from 8.6.

Icebreaker video clip/project theme: *"October Sky" (scene from the movie)*

Videos/Animations from MML/textbook:

Video on 8.1 - Obj 1 Use the Square Root Property to Solve Quadratic Equations
Video on 8.2 - Obj 1 Solve Quadratic Equations by Using the Quadratic Formula
Video on 8.6 - Obj 3 Find the Minimum or Maximum Value of a Quadratic Function

Classroom Discussion Possibility:

When covering section 8.2:

1) Complete the problem below (or similar one).
   The Wollomombi Falls in Australia have a height of 1100 feet. A pebble is thrown upward from the top of the falls with an initial velocity of 20 feet per second. The height of the pebble h after t seconds is given by the equation $h = -16t^2 + 20t + 1100$. Use this equation to answer the questions below. Round to the nearest tenth of a second.
   a) How long after the pebble is thrown will it be 550 feet from the ground? *(p. 501 #64)*
   b) How long after the pebble is thrown will it hit the ground? *(p. 501 #63)*
2) At this point the students have learned sufficient information for all worksheet questions except for #2. Problems #1 and #6 have the formulas necessary provided within the questions. They have to identify what each variable represents, and what variable they are trying to solve for, then plug in and solve.

3) Problem #3-5, is similar to the example done on the previous page but they must CREATE the equation that models the scenario. From the example show how the initial velocity and initial height are built into the equation, and since the units are in feet, the equation started with -16. Explain that for the lab worksheets, they must identify whether to use the formula for meters or feet, then determine what the initial velocity and height are to create the equation. Then, they should try to answer the question asked.

When covering sections 8.5 and 8.6:

As you are graphing parabolas and identifying where the vertex is, have the students recognize whether it is a maximum or minimum, and how they know (from $a > 0$ *or* $a < 0$). This gets them to correlate the vertex of a parabola with a maximum or minimum value.

4) Complete the problem below (or a similar one). This is similar to problem #2 of the worksheets.
If Rheam Gasper throws a ball upward with an initial speed of 32 feet per second, then it's height h in feet after t seconds is given by the equation $h(t) = -16t^2 + 32t$. *(p. 535 #56 with added questions.)*
   a) When will the ball hit the ground?
   b) Find the maximum height of the ball. After how many seconds did it occur?

Lab Assessment Questions:

Note – the order of the questions has been scrambled for each attempt. All questions have been algorithmically generated so the numbers given will vary.

1) Use the square root property to solve the equation. The equation has real number solutions. (*Section 8-1)*
$x^2 = 25$

2) Use the square root property to solve the equation. The equation has real number solutions. *(Section 8-1)*
$x^2 - 17 = 0$

3) Solve using the quadratic formula. $(x + 5)(x - 1) = 2$ *(Section 8-2)*

4) Without calculating, tell whether the graph has a minimum value or a maximum value. *(Section 8-5/8-6)*
$f(x) = 6x^2 - 1$.

5) Find the vertex of the following quadratic function. $f(x) = -x^2 + 5x + 4$ *(Section 8-6)*

6) Find the vertex of the graph of the following quadratic function. $f(x) = 3x^2 + 6x + 2$ *(Section 8-6)*

7) Match the function with its graph. $f(x) = x^2 - 6x - 7$ (a choice of 4 graphs is given). *(Section 8-6)*

8) If a projectile is fired straight upward from the ground with an initial speed of 96 feet per second, then its height h in feet, after t seconds, is given by the equation: $h(t) = -16t^2 + 96t$. Find the maximum height of the projectile.

(Section 8-6)

Chapter 4 Lab Overview: Systems of Linear Equations

Purpose:

The purpose of the Chapter 4 Lab is to have the students further investigate material from section 4.1 and 4.3: Solving Systems of Linear Equations and Problem Solving. After completing this lab, the students will be able to:

1. ***Solve a system of linear equations graphically, numerically, and through symbolic methods including substitution and elimination.***
2. ***Recognize inconsistent and dependent system of equations.***
3. ***Construct and apply systems of linear equations to real world situations, develop solutions to those situations, and interpret the solution in the context of the problem.***

The students will utilize the different techniques of solving systems of linear equations including graphing, substitution and elimination. They will interpret what the point of intersection means from a graphing standpoint, and investigate scenarios where the system is dependent or inconsistent. The students are given the equations of the systems for the questions on the lab worksheets, but will be required to set up a system for one question in the lab assessment.

Since the majority of the material for this lab comes from 4.1, having the students complete the lab by or on the day of the chapter 4 test should give them sufficient time to complete the lab in its entirety.

SPECIAL NOTE – you may want to consider using this lab as an optional or replacement lab. If you cover these sections at the end of the semester as suggested on the timeline, you may find the students are short on time to complete this lab. If that is the case, this lab can be used as a replacement lab for a missed or low score lab assignment from throughout the semester.

Icebreaker video photo/project theme: *"Pirates of the Caribbean" (scene from the movie)*

Videos/Animations from MML/textbook:

Video on 4.1 - Obj 2 Solve a System by Graphing
Video on 4.1 - Obj 3 Solve a System by Substitution
Video on 4.1 - Obj 4 Solve a System by Elimination
Animation on 4.1 – Systems of Linear Equations in Two Variables

Classroom Discussion Possibility:

When covering section 4.1:

1) Be sure to cover substitution method, elimination method, and the graphing method for solving a system of linear equations.
2) Discuss and show examples of consistent versus inconsistent versus dependent systems and how they are determined graphically and algebraically.
3) Some examples that can be used while covering this section.

   Solve by graphing. x + y = -5
   -2x + y = 1

   Solve by substitution. 4x – 5y = -11
   x + 2y = 7

   Solve by elimination. 6x + 5y = -7 and 4x+3y=1
   -6x – 11y = 1 3x+2y=2

   Solve using any method of your choice.
   $\frac{1}{2}x - \frac{1}{8}y = -\frac{1}{4}$ and x = 5y
   4x – y = -2 5x – 25y = 5
   (dependent) (inconsistent)

Lab Assessment Questions:

Note – the order of the questions has been scrambled for each attempt. All questions have been algorithmically generated so the numbers given will vary.

1) Solve the following system by graphing. (Equations are graphed, then solution entered in.) *(Section 4-1)*
   5y – 10x = 0
   x + 2y = 10

2) Solve the following system by graphing. (Equations are graphed, then solution entered in.) *(Section 4-1)*
   2x – y = 6 *Note – the equations are parallel, so there is no solution.*
   4x – 2y = 6

3) Solve the system of equations. *(Section 4-1)*
   4x + 8y = 40 *Note – the equations are the same, so this is a dependent system.*
   3x + 6y = 30

4) Use the substitution method to solve the following system of equations. *(Section 4-1)*

$7x - y = 51$

$2x + 6y = 2$

5) Solve they system of equations by the elimination method. *(Section 4-1)*

$3x - 6y = -12$

$7x - 5y = 26$

6) Solve they system of equations using elimination. Type in your solution as an ordered pair. *(Section 4-1)*

$$\frac{1}{3}x + y = \frac{4}{3}$$

$$-\frac{1}{4}x - \frac{1}{2}y = -\frac{1}{4}$$

7) Solve the following problem: The Black Pearl is following a course that is represented by the equation $5x - 4y = 9$. The interception course of the Flying Dutchman is represented by the equation $3 - 2y = -x$. At what coordinate point will the two ships' paths meet? *(CH 4 Lab Project and Section 4-1)*

8) There are two aircraft carriers, A and B, and carrier A is longer in length than the carrier B. The total length of these two carriers is 2178 feet, while the difference of their lengths is only 14 feet.

a. Find the length of each carrier. *(Section 4-3)*

b. If a football field has a length of 110 yards, determine the length of carrier A in terms of number of football fields.