

**Course: MTH 60: Introductory Algebra – 2<sup>nd</sup> term (4 credits)**

**Term and Section Number:** Winter 2016, CRN 13614

**Meeting Location:** Sylvania campus, SCB 105  
12000 SW 49<sup>th</sup> Ave.  
Portland, OR 97219

**Instructor: Kandace Kling**

**Office Location:** SY ST 203

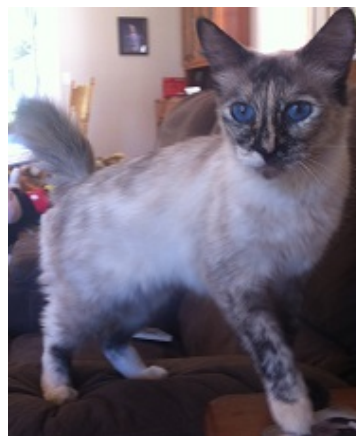
**Phone Number:** 971.722.4137

**FAX Number:** 971.722.8259

**PCC email address:** [kkling@pcc.edu](mailto:kkling@pcc.edu)

**Web Page:** <http://spot.pcc.edu/~kkling>

**Mailing Address:** Portland Community College  
PO Box 19000  
Portland, OR 97280



### **Office Hours**

Monday – Thursday, 10:00 am – 10:50 am in ST 203

### **Course Description**

Introduction to algebraic concepts and processes with a focus on linear equations and inequalities in one and two variables. Applications, graphs, functions, formulas, and proper mathematical notation are emphasized throughout the course. A scientific calculator is required. The TI-30X II is recommended. Prerequisites: MTH 20 and RD 80 (or ESOL 250). Audit available.

### **Course Outcomes**

Upon successful completion students should be able to:

- Use a variable to represent an unknown in a simple linear problem at home or in an academic or work environment, create a linear equation that represents the situation, and find the solution to the problem using algebra.
- Recognize a linear pattern in ordered paired data collected or observed at home or in an academic or work environment, calculate and interpret the rate of change (slope) in the data, create a linear model using two data points, and use the observed pattern to make predictions.
- Be successful in future coursework that requires an understanding of the basic algebraic concepts covered in the course.

View the Course Content and Outcome Guide at:

<http://www.pcc.edu/ccog/default.cfm?fa=ccog&subject=MTH&course=65>

### **Required Materials**

**Textbook:** Introductory Algebra for College Students 6<sup>th</sup> edition by *Blitzer*

**Supplement:** Supplemental Problem Packet MTH 60 (available for download at [http://spot.pcc.edu/academ/math/download/60/m60\\_supplement.pdf](http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf))

**Calculator:** A scientific calculator is required. The TI-30X II is recommended.

**Other:** pencils, graph paper, ruler

### **Grading Policy**

Your course grade will be determined by the total number of points you earn on the top five (of six) worksheets, participation, the three exams, and the final.

**First week checklist – 5 points**

**Worksheets – 75 points total**

**Participation – 50 points total**

**Exam 1 – 100 points**

**Exam 2 – 100 points**

**Exam 3 – 100 points**

**Comprehensive final – 200 points**

**A: 90-100%, B: 80-89, C: 70-79, D: 60-69, F: below 60**

**Missed midterm exam:** NO make-up exams are given. A missed exam score will be replaced by your final exam score (percentage-wise). It will be harder to know how you are doing if you miss an exam and the bulk of your grade will depend on the final.

**Missed (or poor) final exam:** You cannot pass the class if you do not take the final exam. \*\*\*\*\*Please be aware that your final exam must be in the range of your desired grade. If you study and practice diligently, this should not be a problem. A grade average of 80% and a final exam of 90 out of 200 puts you in the D category.\*\*\*\*\*

### **WILL THERE BE HOMEWORK?**

Yes, there will be lots of homework!!! Homework is the most important part of the course. Just as you cannot learn to play the piano by simply listening to someone play, you cannot learn mathematics simply by watching me work problems. You must practice, a lot, and quite frequently. You should set aside about 5 - 10 hours between each class session to practice and finish homework assignments BEFORE the next class. The skills and knowledge from any one lesson will be used to explain the next lesson. Homework is to help you learn. It is not for the instructor and (with the exception of worksheets) will not be turned in. Your suggested homework assignments are listed on the calendar.

You should **ALWAYS study with two pieces of paper** (one to do the examples and problems and the other to write down any questions, ideas, needed clarifications or concerns AS THEY COME UP) and a pencil. If your questions are not cleared up in the course of your study, GET HELP and get them answered well BEFORE taking a test.

**You should read the sections that are going to be covered in class before that class meeting. This will help you get more out of the lesson.**

### **WHAT WORK NEEDS TO BE TURNED IN?**

**Worksheets:** There will be six worksheets. Each worksheet is worth 15 points. The top 5 worksheets will count towards your final grade. **All work for this class must satisfy the requirements specified in the MTH 60 DOCUMENTATION GUIDELINES (located on page 5 – page 7 of this syllabus).**

Keep a draft copy of all submitted work until you get back your graded work. Keep your graded work until you get, and are satisfied with, your course grade.

**Due dates:** The dates/times worksheets are due as well as the dates, locations and times for the exams and the final exam are on the calendar (located on page 9 & 10 of this syllabus).

**You should check your PCC email several times a week for messages from me.**

### **Link to Portland Community College's Grading Guidelines**

<http://www.pcc.edu/resources/academic/standards-practices/documents/G301GradingMarch2011.pdf>

### **Information about auditing, dropping, or withdrawing from the course**

The college has very tight deadlines for auditing, dropping, or withdrawing from a course. For example, during most terms the paperwork to audit a course must be signed and submitted by the end of the first week of the term. Similarly, to receive a refund for a class a drop must be completed the first week of the term. These time frames are even shorter for some summer term courses. In all cases, it is 100% the student's responsibility to process the change in registration status by the due date and time. Term specific information for these deadlines is available at: <http://www.pcc.edu/registration/dropping.html>

### **Flexibility Statement**

The instructor reserves the right to modify course content and/or substitute assignments and learning activities in response to institutional, weather or class situations.

### **School Closures**

In the unlikely event the college is closed on the day of an exam, graded in-class activity, or graded work due date, the exam/activity/work due date will be the following class period unless otherwise informed by instructor via one of the following: MyPCC email, instructor website, MyCourses message)

### **Policies regarding Cell Phones and Other Electronic Devices**

Your cell phone must be in some sort of "silent mode" while you are in the classroom. You may not read or send text messages while testing. No other electronic devices may be used during tests without the express permission of the instructor.

### **ADA Statement**

Students who have a documented disability and require a classroom adjustment or accommodation should contact Disability Services [ <http://www.pcc.edu/resources/disability> ] and provide the Approved Academic Accommodations letter to the Instructor.

### **Academic Integrity Statement**

Students are required to complete this course in accordance with the Student Rights and Responsibilities Handbook. Dishonest activities such as cheating on exams and submitting or copying work done by others will result in disciplinary actions including but not limited to receiving a failing grade. See the Student Rights and Responsibilities Handbook to read the college's Academic Integrity Policy.

### **Link to Portland Community College's Student Rights and Responsibilities Handbook**

<http://www.pcc.edu/about/policy/student-rights/student-rights.pdf>

### **Email communications**

Because of federal privacy laws, all email communications related to this class need to be sent from and to your MyPCC email.

### **PCC's policies on discrimination and harassment**

The College's goal is to provide an atmosphere that encourages individuals to realize their potential. Therefore, it is against the College's policy for any manager, supervisor, faculty, staff, or student to engage in harassment or discrimination of any member of the College community based on his/her race, color, religion, national origin, age, sex, marital status, veteran status, height/weight ratio, physical or mental disability, sexual orientation, creed, organizational affiliation, or political affiliation.

For more information and/or if you feel these policies have been violated please visit:

<http://www.pcc.edu/about/affirmative-action/nonharassment.html>

### **Course Evaluations**

Near the end of the term, students are encouraged to complete course evaluations by answering on-line questions about the class and the instructor. You will receive a PCC email notification when the evaluations become available. You are strongly encouraged to complete the evaluations to provide me feedback on the course and my teaching.

### **Resources For Students:**

- **Student Computing Center** (SY Library, 971-722-4325)

- internet access, mathematics computer programs

- Visit the following address for more information

- <http://www.pcc.edu/resources/computer-labs/>

- Among other services, you have been allocated 100 double-sided pages of free printing for the term. Visit the following address for more information on printing services.

- <http://www.pcc.edu/resources/printing/>

- **Multicultural Center** (SY CC 202, 971-722-4112)

- one-on-one help for math courses, drop-in or by appointment

- <http://www.pcc.edu/resources/culture/>

- **Student Learning Center** (SY Library, 971-722-4540)

- district-wide tutoring information (including hours) can be found at

- <http://www.pcc.edu/resources/tutoring/>

- **College Success Courses**

- There are several one credit courses available to help you find maximum success in your college experience. These include courses specifically geared to study skills. The following site offers information on these courses as well as on-line tips for success at PCC.

- <http://www.pcc.edu/resources/panther-tracks/college-success/study-skills.html>

## MTH 60 DOCUMENTATION GUIDELINES (or how to answer math questions correctly so you can get full credit!)

It is very important to document your work correctly when working an algebra problem. For this reason, I am going to ask you to be very precise about documenting your work. Always start by writing the original problem. When you are working a problem that requires several steps, record all of the terms in each step and line up your equal signs.

### Rules of Thumb

- A number, such as 5, all by its lonesome, is not a well-presented conclusion.

Well-presented conclusions (depending on the type of problem):

- The solution is 5.
- The distance to the ballpark is 5 km.

- Equal signs must be used when changing the form of an expression. When asked to simplify an expression, always start the presentation of the solution with the original expression (and line up the equal signs).

**Example:** Simplify the expression  $3 + 5(7 - 1)$ .  
Well-presented simplification problem:

The diagram shows a well-presented simplification problem:  $3 + 5(7 - 1) = 3 + 5(6)$ ,  $= 3 + 30$ , and  $= 33$ . A callout bubble on the left points to the first term of the original expression, labeled "Original expression". A larger callout bubble on the right points to the first equal sign and the first simplification, containing the text: "Rewrite the original expression to the left of the first equal sign and the first simplification to the right. Keep working DOWN (not across). Line up the equal signs."

- Expressions on either side of an equal sign must be equivalent.

**Example:** Solve and check  $2x - 5 = 11$

**Incorrect presentation:**

**This presentation is missing the given instructions.**

$$2x - 5 = 11$$

$$2x - 5 = 11 + 5$$

$$2x = 16$$

$$x = 8$$

This line is a lie even though the student reached the correct conclusion! +5 must appear on BOTH sides of the equation. Also, the conclusion is not stated separately in a sentence.

**Check:**  $2(8) = 16 - 5 = 11$  This check is **incorrect** as this actually says that  $16 = 16 - 5$  which is false.

**This presentation is missing a sentence that states the solution.**

Correct presentation:

$$2x - 5 = 11$$

$$2x - 5 + 5 = 11 + 5$$

$$2x = 16$$

$$x = 8$$

Note: Equal signs need not be lined up when solving an equation (but they can be).

Check: If  $x = 8$ , then  $2x - 5 = 2(8) - 5$   
 $= 16 - 5$   
 $= 11$

A check is shown and labeled.

The solution is 8.

The answer is written in a complete sentence.

(Note, if there was a variable on the right hand side, you would have to evaluate the right hand side as well when checking your proposed solution. If both sides have the same value, you have found the correct solution.)

Do not confuse simplifying expressions with solving equations. Make sure you understand the difference. When you simplify an expression you don't have a solution.

Don't solve equations by putting an = sign at the beginning of each equation.

### Graphing

- Axes on graphs must be labeled and scaled. Otherwise the graph cannot be read and interpreted. Figure numbers and captions are always a good idea.

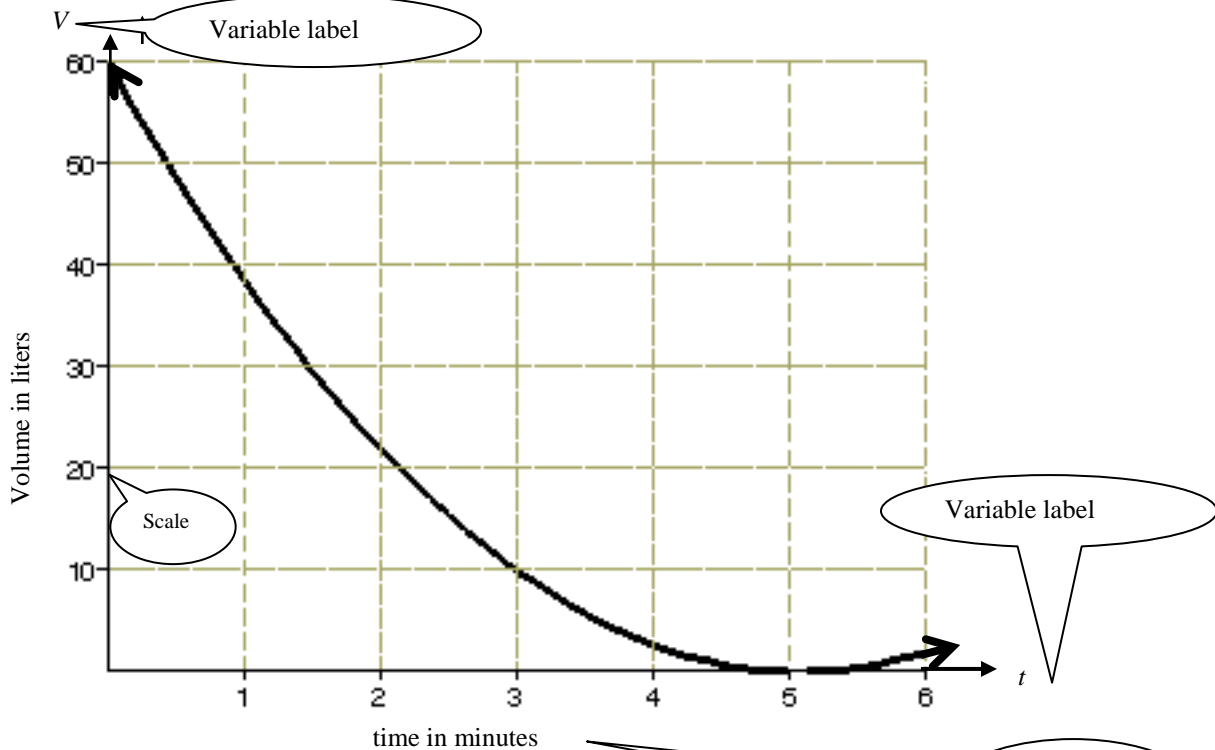


Figure 1: The volume of water in a tub

Figure number

Caption

Good labels include units, where appropriate..

**When preparing work for submittal, the student should keep in mind that:**

- all applications (story problems) must be answered in complete sentences,
- illegible work will remain unmarked,
- ambiguous conclusions will be misinterpreted,
- analyses using improper notation and/or incomplete mathematical sentences will be rejected,
- solutions with incorrect units are incorrect solutions,
- undefined variables have no meaning, and
- graphs with unlabeled and/or unscaled axes have no meaning.

Example of a well-presented solution to an application problem

Statement of the problem to be solved

A car phone company offers two basic plans for the poor executive: plan A and plan B. Plan A is a monthly service charge of \$10, and a charge of 90¢ a minute for telephone air time; plan B is a monthly charge of \$24, and a charge of 70¢ a minute for telephone air time. Create a mathematical model that describes each plan and use these models to estimate *when* one plan is better than the other.

$$\$10 + 0.90(\text{number of minutes}) = \text{total monthly charge for Plan A}$$

$$\$24 + 0.70(\text{number of minutes}) = \text{total monthly charge for Plan B}$$

The variable is well defined with units.

Let  $n$  represent the number of minutes of telephone air time used in a month.  
(Note:  $n = \text{minutes}$  is NOT a well defined variable)

Then setting the total monthly charge for Plan A equal to the total monthly charge for plan B to find out how many minutes would cause the two plans to charge the same amount for a month, I obtain

$$10 + 0.90n = 24 + 0.70n$$

Solving for  $n$ ,

$$10 + 0.90n - 0.70n = 24 + 0.70n - 0.70n$$

$$10 + 0.20n = 24$$

$$10 - 10 + 0.20n = 24 - 10$$

$$0.20n = 14$$

$$\frac{0.20}{0.20}n = \frac{14}{0.20}$$

$$n = 70$$

An explanation of the problem-solving strategy

The conclusion is clear; correct units are included.

Therefore, both plans charge the same amount if the telephone air time for the month is 70 minutes. Since Plan B has the higher monthly charge, Plan B will cost more if fewer than 70 minutes are used and Plan A will cost more if more than 70 minutes are used. In other words, Plan A is a better deal if less than 70 minutes are used and Plan B is a better deal if more than 70 minutes are used.

## Bookwork Strategies

The bookwork problems listed here are a list of problems to study and understand. I expect that you will do all of these problems. If you need more practice, do more than is what listed here.

When completing the bookwork, practice following the MTH 60 Documentation Guidelines. The more you practice them, the more routine they will become.

It is my expectation that after each class meeting you will do the problems corresponding to that lecture. I will not continually remind you to do the bookwork. I will always hold you accountable for completing it.

Check your answers! You can check the answer to the odd-numbered problems in the back of your textbook and the student solutions manual. You can make appointments with me for questions you have on any problems.

Test yourself. Each day after having practiced some problems, pick a few problems that you may or may not have already attempted. Give yourself five or ten minutes to successfully complete them.

If you get stuck on a problem, that is a good thing. It means you're being challenged and having to think. Make a list of the problems and where you got stuck. Leave some room to work on it later, but continue with some other problems. Your bookwork should not look as if it was copied from the solutions manual or someone else's paper. It should definitely not be a list of answers. It should be something that will help you study for the quizzes, tests, and final exam. Having explicit directions, corrections, etc. will help you study.

Again, I expect a minimum of 10 - 15 hours of studying outside of our class each week. More may be necessary depending on your background.

Read ahead in the book. I expect you will have already seen and read about every topic I present in class. You will get more out of class and studying will go faster. You will also do better on the exams.

Make sure you can do all the problems by hand. A calculator is a tool to help you do larger calculations. It should not be the only method you know to solve problems. On some tests you will not be allowed to use your calculator.

Week	Day	Topic/Title	Bookwork Exercises (eoo means every other odd)
1	M 1/4	Introduction to Algebra Review of fraction arithmetic	1.1: read pages 1 – 10, do vocab check 1 – 5 all; do exercises 7 – 79 odd, 83, 85, 92, 100 1.2: read pages 14 – 28; do vocab check 1 – 11 odd; do exercises 2 – 89 eoo, 91, 95, 97, 99, 105, 109, 123, 125, 149
	W 1/6	The real number line Basic Rules of Algebra	1.3: read pages 32 – 41; do vocab check 1 – 8 all; do exercises 1 – 81 eoo, 87, 89, 90, 92,93,103 1.4: read pages 46 – 52; do vocab check 1 – 7 all; do exercises 7 – 71 eoo
2	M 1/11	Arithmetic of real numbers	1.5: read pages 56 – 62; do vocab check 1 – 8 all; do exercises 1 – 46 eoo, 47 – 79 odd 1.6: read pages 65 – 69, do vocab check 1 – 7 all; do exercises 1 – 68 eoo, 69 – 89 odd 1.7: read pages 73 – 83; do vocab check 1 – 11 all; do exercises 1 – 105 eoo
	W 1/13	<b>WS1 due</b> Exponents and Order of operations Three exponent rules	1.8: read pages 87 – 98; do vocab check 1 – 7 all; do exercises 1 – 13 odd, 15 – 72 eoo, 73 – 89 odd, 104 Supplement to 1.8 all; located on pages S1 – S3 at the back of the book (answers on S14) or available at <a href="http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf">http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf</a> 5.2: Three exponent rules – read pages 358 – 360; do vocab check 1 – 3; do exercises 1 – 23 odd
3	M 1/18	Martin Luther King Jr. Day No school	
	W 1/20	Chap 1 Review Pages 102 - 107 Solving linear equations (2.1 & 2.2 bookwork after the test)	Pages 108-112 as many as needed for review.
4	M 1/25	Test 1	2.1: read pages 114 – 120; do vocab check 1 – 7 all; do 1 – 62 eoo 2.2: read pages 122 – 129, do vocab check 1 – 7 all; do 1 – 54 eoo, (Show the properties. Check solutions following order of operations.) 59, 61, 63, 65 (Be sure to write down the equation and define any variables used.)
	W 1/27	Linear equations Problem solving using percents	2.3: read pages 132 – 140; do vocab check 1 – 7 all; do 1 – 45 odd, 49, 53, 59, 61, 65, 73, 75, 87 (Show the properties. Check solutions following order of operations.) 2.4: read pages 148 – 151; do vocab check 4; do 27 – 41 odd, 51 – 69 odd
5	M 2/1	<b>WS2 due</b> Formulas Problem solving using linear equations	2.4: read pages 144 – 147; do vocab check 1,2,4,5; do 1-25 odd, 43 – 49 odd 2.5: read pages 156 – 164, do vocab check 1 – 6 all; 1-19 odd, 23 Be sure to define your variable (try using variables other than $x$ all the time) and write down the equation you used to solve problems.
	W 2/3	More problem solving Linear inequalities and interval notation	2.5: 25 – 45 odd Be sure to define your variable (try using variables other than $x$ all the time) and write down the equation you used to solve problems. 2.7: read pages 182 – 194; do vocab check 1 – 8 all, do 1 – 19 odd, 21 – 80 eoo, 81 – 89 odd, 107, 111

Week	Day	Topic/Title	Suggested Exercises
6	M 2/8	<b>WS3 due</b> Further problem solving Problem solving using ratios, rates, proportions and angle measure, and geometric formulas	2.6: read pages 168 – 176; do vocab check 1 – 10 all, do 3 – 51 odd, 57 – 69 odd 2.8: read pages 209 – 213; do exercises 11 – 23 odd, 27,33 – 39 odd Do supplement to 2.8 all; located on pages S4 – S6 at the back of the book (answers on S15) or available at <a href="http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf">http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf</a>
	W 2/10	Chapter 2 Review	Chapter 2 review exercises and test (pages 204 – 208). Do as many as needed for review. Also review 2.8 for Test 2.
7	M 2/15	Test 2	
	W 2/17	<b>WS4 due</b> Introduction to linear equations with two variables	3.1: read pages 218 – 227; do vocab check 1 – 8 all; do 37 – 45 odd, 57 – 77 odd, 85, 87, 93 Be sure to use graph paper and label and scale your axes! 3.2: read page 231 – 238; do vocab check 1 – 9 all; do 1 – 17 odd, 19 – 43 eoo, 47 – 61 eoo, 69, 73, 77 Be sure to use graph paper and label and scale your axes!
8	M 2/22	Introduction to slope Comparing slopes Graphing linear equations with two variables	3.3: read pages 242 – 248; do vocab check 1 – 8 all, do 1 – 49 odd, 53, 54, 55, 56 Supplement to 3.3 all: located on pages S7 & S8 at the back of the book (answers on S16) or available at <a href="http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf">http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf</a> 3.4: read pages 252 – 256; do vocab check 1 – 3; do 1 – 49 odd, 55 Be sure to use graph paper and label and scale your axes! Supplement to 3.4 all: located on pages S9 & S10 at the back of the book (answers on S17 & 18) or available at <a href="http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf">http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf</a>
	W 2/24	<b>WS5 due</b> Determining the equation of a line Point-slope form Linear modeling	3.4: read pages 257 – 258, do 57 - 65odd, 69 3.5: read pages 262 – 267; do vocab check 1 – 6 all; do 1 – 41 odd, 47, 50 Supplement to 3.5; 1 – 3 all parts; located on pages S11& S12 at the back of the book (answers on S19) or available at <a href="http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf">http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf</a>
9	M 2/29	Chapter 3 review	Chapter 3 review exercises and test (pages 283 – 286). Do as many as needed for review.
	W	Test 3	<b>Linear Model Exercises on the last three pages of this syllabus</b> Supplement to 3.5; 4 – 5 all parts; located on pages S13 at the back of the book (answers on S19) or available at <a href="http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf">http://spot.pcc.edu/academ/math/download/60/m60_supplement.pdf</a>
10	M	<b>WS6 due</b> Linear inequalities with two variables	3.6: read pages 270 – 276; do vocab check 1 – 6 all; do 3 – 33 odd, 37, 39, 45, 47, 49
	W 3/10	Review	Chapter 1, 2, and 3 review exercises and tests. Also study 2.8 and the 3 exponent rules in 5.2 Study for final ☺
		Comprehensive Final Monday, March 14 <sup>th</sup> 11:00 am – 12:50 pm	

## Additional Exercises for Linear Models

### Linear Models (the questions)

- Happy Cow 2% reduced fat milk can be used 10 days after opening if it is stored at 40 degrees Fahrenheit and 26 days after opening if it is stored at 32 degrees Fahrenheit. Assume that the number of days that fresh milk stays unspoiled depends linearly on the temperature at which the milk is kept.
  - Write a linear equation for this relationship.
  - How long will the milk stay unspoiled at 34 degrees?
  - If the milk is supposed to last 30 days, at what temperature should it be stored?
  - What is the slope of your equation and what does it mean in practical terms? Make sure you interpret the slope as a rate.
- Suppose there were 200 web pages on a particular site on June 1, 2005. Suppose that 5 weeks later there were 206 web pages on that site.
  - Write a linear equation that gives the number of web pages on the site  $n$  weeks after June 1, 2005.
  - How many web pages were on the site on June 22, 2005?
  - When were there 224 web pages on the site?
  - What is the slope of your equation and what does it mean in practical terms? Make sure you interpret the slope as a rate.
- Suppose that a 9 lb turkey takes 3 hours to cook and a 20 lb turkey takes 6 hours and forty minutes to cook. Write a linear equation describing this relationship. How many hours does a 14 lb turkey take to cook? If a turkey takes 4 hours to cook, how much does the turkey weigh?
- Logan and Elijah are starting a business tutoring students in math. They rent an office for \$400 per month and charge \$40 per hour per student. Write a linear equation that gives their monthly profit in terms of the total number of hours they spend tutoring in a month. How many hours must they tutor in a month to cover the cost of renting the office? What is their profit if they tutor a total of 23 hours in a month? How many hours do they have to tutor in a month in order to make a profit of \$2040?
- In 1990, 35 million years of healthy life was lost globally due to tobacco. This quantity grew linearly at a rate of 28 million years each decade. In contrast, 100 million years of healthy life were lost due to diarrhea in 1990, with the rate going down linearly 22 million years each decade. Write two linear equations representing the years of healthy life (in millions) lost to tobacco and diarrhea. Find the year the amount of healthy life lost to tobacco first exceeded that lost to diarrhea.
- A bike shop rents mountain bikes for an \$8.50 insurance charge plus \$3.50 per hour. Write an equation that gives the total cost of renting a mountain bike based upon the number of hours rented. How much does it cost to rent a bike for 4 hours? How many hours can you rent a mountain bike for \$33.
- The equation  $200A + 100C = 1500$  relates the adult ticket **price**,  $A$ , (in dollars) to the children's ticket **price**,  $C$ , (in dollars) for a spaghetti dinner to raise \$1500 in funds for the zoo.
  - Solve the equation for  $C$ .
  - What is the slope of this linear relationship and what does it mean in practical terms?
  - What are the horizontal and vertical-intercepts of this equation?
  - What do these intercepts mean in practical terms?
  - If adult tickets cost \$6 each, what does a child's ticket cost?
- On January 1, 1990, the population of Georgia was 6.5 million and the population of North Carolina was 6.8 million. On January 1, 2003, the population of Georgia was 8.7 million and the population of North Carolina was 8.4. Write two linear equations to model the populations of the two states. Use your equations to determine when the two states will have equal populations. What is that population?

### Linear Models (the answers)

1. a. Let  $N$  represent the number of days the milk can be used if it is stored at a temperature of  $T$  (in degrees Fahrenheit).  
$$N = -2T + 90$$
  - b. The milk can be used for 22 days if it is stored at 34 degrees Fahrenheit.
  - c. If the milk is stored at 30 degrees Fahrenheit, then it can be used for 30 days.
  - d. The slope is  $-2$  and it means that the number of days the milk can be used is decreasing at a rate of  $2 \frac{\text{days}}{^\circ\text{F}}$ .
2. a. Let  $W$  represent the number of web pages on the site  $n$  weeks after June 1, 2005.  
$$W = 1.2n + 200$$
  - b. There were 203.6 web pages on the site on June 22, 2005.
  - c. There were 224 web pages on the site on October 19, 2005.
  - d. The slope is 1.2 which means that the number of web pages is increasing at a rate of  $1.2 \frac{\text{web pages}}{\text{week}}$ .
3. Let  $t$  represent the time (in minutes) it takes a turkey that weighs  $w$  (in lbs) to cook.  
$$t = 20w$$

It takes 4 hours and 40 minutes for a 14 lb turkey to cook.  
A 12 lb turkey takes 4 hours to cook.
4. Let  $P$  represent their monthly profit (in dollars) if they tutor for a total of  $h$  hours in a month.  
$$P = 40h - 400$$

They must tutor a total of 10 hours in a month to cover the cost of renting the office.  
They make a profit of \$520 if they tutor a total of 23 hours in a month.  
The tutor a total of 61 hours if they make \$2040 in a month.
5. Let  $T$  represent the number of years (in millions) of healthy life lost globally due to tobacco  $n$  years after 1990.  
Let  $D$  represent the number of years (in millions) of healthy life lost globally due to diarrhea  $n$  years after 1990.  
$$T = 2.8n + 35$$
$$D = -2.2n + 100$$

These two lines intersect at  $n = 13$ , so the number of years of healthy life lost globally due to tobacco was the same as the number of years of healthy life lost globally due to diarrhea in 2003. After that, there have been more years of healthy life lost to tobacco than to diarrhea.
6. Let  $T$  represent the total cost (in dollars) to rent a mountain bike for  $h$  hours.  
$$T = 3.5h + 8.5$$

It costs \$22.50 to rent a mountain bike for 4 hours.  
If you rent a mountain bike for 7 hours, the total cost is \$33.
7. a.  $C = -2A + 15$ 
  - b. The slope is  $-2$  which means that the cost of a child's ticket is decreasing at a rate of  $2 \frac{\text{dollars}}{\text{dollar increase in adult ticket price}}$ .
  - c. The horizontal-intercept is  $(-7.5, 0)$  and the vertical-intercept is  $(0, 15)$ .

- d. The horizontal-intercept doesn't have a practical meaning since the cost of an adult ticket cannot be negative. The vertical intercept means that if adult tickets are free, then the cost of a child's ticket is \$15.
- e. If adult tickets cost \$6 each, a child's ticket costs \$3.
8. Let  $G$  represent the population of Georgia (in millions) at time,  $t$ , where time is measured in years since January 1, 1990.

Let  $N$  represent the population of North Carolina (in millions) at time,  $t$ , where time is measured in years since January 1, 1990.

$$G = \frac{11}{65}t + 6.5$$

$$N = \frac{8}{65}t + 6.8$$

According to these equations, the two states had equal populations 6.5 years after January 1, 1990, that is on July 1, 1996. The population was about 7.6 million.