**(abe)2 Algebra**

**Adult Basic Education**

**Developmental Math**

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**Executive Summary**

As of fall semester 2017, Central Lakes College Staples Campus in conjunction with Adult Basic Education (ABE) Central Minnesota-North (Consortium partner: <http://stcloud742.schoolwires.net/Page/908>) will be offering an Adult Basic Education math prep course to students with the primary need to increase their math skills, to prepare them for the math portions of the Accuplacer test, or to increase their Accuplacer math test results to better prepare them for math courses at Central Lakes College. All Robotics students that score 65 or below will be strongly encouraged to take this math course to better prepare them for the math that is used in basic electronics. This math course is to be modeled after the Robotics Automated Systems Technology (RAST 1114) Math for Industrial Technology course, which is no longer offered as a part of the Robotics Automated Systems Program.

The target audience for this math class will be both traditional and nontraditional students ranging in age from 18 to over 65. This course will align to the Central Lakes College course outline for Robotics’ Math for Industrial Technology. In the course outline, the following text book is suggested: McKeague, C. P. (2008). Elementary Algebra. CA: Brooks/Cole. (ISBN-13: 978-0-495-10839-9) This text book will be referenced in this text simply as the text book here after.

The college course outline also lists specific course outcomes as defined by the Central Lakes College Course Outline. Per this outline, “the student will be able to…”

1. Manipulate SI engineering units;
2. Demonstrate order of operations;
3. Manipulate real number systems;
4. Add, subtract, multiply, and divide fractions;
5. Solve word or application problems;
6. Simplify linear and nonlinear equations;
7. Graph linear equations;
8. Demonstrate polynomial addition, subtraction, multiplication, and division.

It is the intention of this document to provide lesson plans that incorporate learning activities that can be taught in this ABE math course that meet the course objectives listed above.

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**Lesson 1:** Simplifying Expressions (2 days)

**Objective:** The student will be able to simplify expressions by combining like terms, using the distributive property, and calculate the value of a given variable. (Related to Course Objective 3, 5, 6).

**Launch:** A cell phone company charges $35 per month plus $0.25 for each minute, or fraction of a minute, that you use your cell phone. Does that sound like a good deal? How do you determine how much you will pay for your monthly bill? (35 + 0.25t) How many minutes do you typically use in a month? 30 minutes, 100 minutes, 450 minutes, more? How much would you pay?

**Explore:**

1. (Day 1) Define similar terms: Two or more terms with the same variable part are called similar (or like) terms. Demonstrate examples on combining similar terms using distributive, commutative, and associative properties:
   1. 3x + 4x = (3 + 4)x
   2. 7a – 10a = (7 – 10)a
   3. 3x + 5 + 2x – 3 = 3x + 2x + 5 – 3
2. Play the game SCOOT to get the students moving! Place 20-30 task cards around the room. (These task card can be made by you using the example equations given in the text book chapter 2.1.) It may be best to have a total number of task cards equal the number of students in the class, or be a multiple of that number so each student can report out on at least one task card. Students move from problem to problem, copying the expressions and simplifying them.

(<https://www.teacherspayteachers.com/Product/Simplifying-Algebraic-Expressions-Task-Card-Activity-SCOOT-950782>)

1. (Day 2) Rearrange the classroom as needed. Divide the class in groups of three or four. Give each group a yard stick or meter stick (it is best if you have both) and some masking tape.
   1. Assign some rectangle dimensions to each group. Examples:
      1. 80 centimeters by 50 centimeters
      2. 28 inches by 21 inches
   2. Have the students construct their rectangles on the floor.
   3. After each group has finished, explain what perimeter means (if necessary) and have each group measure the perimeter of their rectangle.
   4. Is there a more efficient way of calculating perimeter? Is there an expression? (2l + 2w)
   5. Have the students rotate and measure and/or calculate the perimeter of the other group’s rectangles.
2. Assign the “Applying the Concepts” (word) problems from the text chapter 2.1. Have the students work in groups to address these word problems.

**Share:**

1. (Day 1) Once all the students have simplified each task card, have them report out, one by one, on how they went about simplifying the equation and the answer they came up with. There should be multiple ways to simplify and equation, so if students come up with different methods to solve a task card, be sure to show each method. Encourage multiple ways to solve each task card.
2. (Day 2) Have the each group report on their construction of their rectangles, how they measured perimeter, and how they solve the expression. Address any differences. If necessary address the accuracy of the measurements of the rectangles (for example 0.8 meters versus 0.85 meters). How does that affect the perimeter calculation? How does the measuring unit (inches v. cm) affect the calculation?
3. At the end of class, have the student groups report on how they are doing on solving the word problems. Have each group give an example of one.

**Summarize:** The first step in solving equations is to simplify both sides of the equation as much as possible by combining like terms. There are multiple ways to go about solving or simplifying equations.

**Assignment:**

1. (Day 1) Assign Problem Set 2.1 (odd) in the text book.
2. (Day 2) Assign the “Applying the Concepts” (word) problems from the text chapter 2.1. Have the students work in groups to address these word problems.

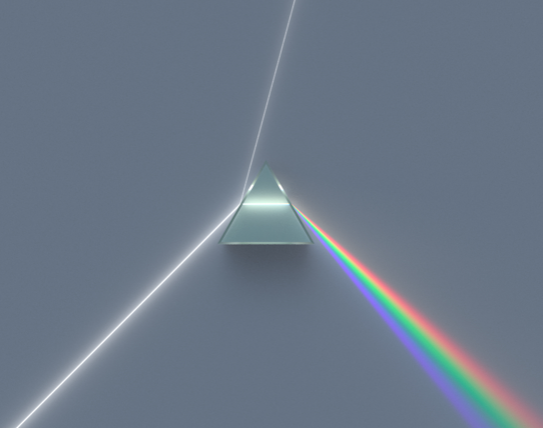
**Example Assessment Problem:**

1. -9(2x + 1) – (x + 5)
2. The word problem from the launch of this lesson.
3. See sample test 2

**Lesson 2:** Addition of Equality (3 days)

**Objective:** The student will be able to use the addition property of equality to solve and equation and check a solution of an equation by substitution. (Related to Course Objective 3, 5, 6).

**Launch:** If possible, obtain a prism or piece of glass from the science department or (show a picture like this one) to demonstrate.

When light comes in contact with any object, it is reflected, absorbed, and transmitted (as shown or demonstrated). For a certain type of glass, 88% of the light hitting the glass is transmitted through to the other side, whereas 6% of the light is absorbed into the glass. To find the percent of light that is reflected by the glass, we can solve the equation:

88 + 6 + R = 100

**Explore:** 1

1. (Day 1) If you actually have a real balance scale (and yes I do!), demonstrate the balance of multiple weights. For example 1 – 5 ounce weight equals (or is balanced) to 5 – 1 ounce weights. Then “weigh” unknown objects (x) and show that they equal a weight.
2. Demonstrate the use of the balance scale to demonstrate the addition of equality from PBS website. <https://tpt.pbslearningmedia.org/resource/mgbh.math.ee.balance/balancing-scales-to-solve-equations/#.WXNgDoWcE1I>
3. Introduce the Balance Scale game (from [Hands-on Equations](http://www.borenson.com/)) using pawns and numbered blocks. Explain what the pieces (pawns and block) mean. Demonstrate how the game board works using an equations like:

4x – 2 = 3x – 9

Introduce the concept of “zero pair” and how when you add it to any place on the balance scale, it does not affect balance. It is ultimately zero, and when adding or subtracting zero, it has no effect.

1. Divide the class up in pairs, and yes, these groups should change every day. Give the class an equation (3x + 4 = x + 6). Have one student represent the equation using the game pieces and have the other document the equation (abstractly). Have the two students work together to solve the equation and report out as a class.
2. Switch the roles of each pair, give another example equation. Have the class report out.
3. (Day 2) Define the Addition Property of Equality: for any three algebraic expressions a, b, and c; if a = b, then a + c = b + c. Adding the same quantity (c) to both sides of an equation will not change the solution set. Give an example.
4. Continue with the Balance Scale game board and pieces. Use the Balance Scale to demonstrate: “Is 5 a solution to 2x – 3 = 7?” When working toward solution, when you substitute the 5 for each of the pawns you will show that 5 + 5 – 3 does indeed equal 7.
5. Distribute the game board and pieces. Have the students work in groups of two. Have the students demonstrate: “Is -2 a solution to 2x + 4 = 8?” When working towards conclusion, the students will substitute a -2 block for each pawn (-2 -2 + 4 = 8). They should come to the conclusion that 0 and 8 are not balanced. Is there a solution to make the equation balanced?
6. Continue to work on example problems from the text chapter 2.2 with the students working in pairs. Have the students demonstrate after each example.
7. (Day 3) Go back to the Launch and repeat. How can we represent this using the Balance Scale? How can we represent 88 + 6 + R = 100? (Make larger block values). Use the website or simply draw the balance scale on the board using values 88, 6, and 100. Draw a symbol to represent the pawn.
8. Have the students work in groups of two. Have the groups work on the “Applying the Concepts” word problems from the text 2.2. Have the groups represent the problem on the Balance Scale and have them represent the problem as an abstract math equation. Have them solve both.
9. There are only four problems, so you should be able to review the answers and strategies at the end of the class period.

**Share:**

1. (Day 1) After each pair of students solve an equation using the balance scale, have each group demonstrate how they did it and encourage the groups to find different ways in solving or balancing the equation. Have a discussion as to why there are multiple ways or why you can do this.
2. (Day 2) Have each group of students demonstrate how they solved the example problems using the balance scale. Each group should get an opportunity.
3. (Day 3) Review solutions to the assigned word problems. You should demonstrate with the class participating and directing the demonstrations for each problem.

**Summarize:** The big idea is to keep the scale balanced at all times. You can keep it balanced by adding the same (weight) to both sides or by taking away the same (weight) from both sides. This relates to solving equations. Both sides of the equal sign always has to balance just like the balance scale.

**Assignment:**

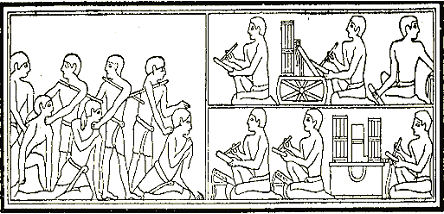
1. (Day 1) In class assignment: Learning how to use the Balance Scale, pawns, and number blocks.
2. (Day 2) Problem Set 2.2 (odd) from the text book.
3. (Day 3) In class assignment: Word Problems.

**Example Assessment Problems:**

1. 3x – 10 = 4x
2. 2(x + 3) – x = 4
3. The word problem from the launch of this lesson.
4. See sample test 2

**Lesson 3:** Multiplication of Equality (2 days)

**Objective:** The student will be able to use the multiplication property of equality to solve an equation and use both the addition and multiplication properties of equality to solve an equation. (Related to Course Objectives 2, 3, 4, and 6).

**Launch:** As most of you know, we all have to pay taxes! Even the ancient Egyptians paid taxes. We’ve been paying taxes for a very long time. If 21% of your monthly pay is withheld for federal income tax and another 8% is withheld for Social Security and state income tax, leaving you with a net pay of $987.50 a month in take-home pay, then how can you determine what you made originally (or what you gross pay was)?

Solve the equation: G – 0.21G – 0.08G = 987.50

**Explore:**

1. (Day 1) Define Multiplication Property of Equality: For any three algebra expressions a, b, and c, where c ≠ 0; if a = b, then ac = bc. Multiplying both sides of an equation by the same nonzero number will not change the solution set. Give an example.
2. Play the game Solving Equations Bingo (see appendix). Have student create game boards (or you could pre-create the game boards). Have the students share how they were able to solve the equations for the game for each equation give. Be sure to discuss how to handle decimal numbers and fractions.
3. Have the students work in groups to complete the example problems in the text chapter 2.3.
4. (Day 2) Play the game Substitution Bingo (see appendix). Have student create game boards (or you could pre-create the game boards). Have the students share how they were able to solve the equations for the game for each equation give. Be sure to discuss how to handle decimal numbers and fractions.
5. Define Linear Equation (in one variable) is any equation that can be put in the form ax + b = 0, where a and b are real numbers and a ≠ 0.
6. Review strategies for solving linear equations:
   1. Use the distributive property to separate terms (if necessary).
   2. If fractions are present, consider multiplying both sides by the LCD to eliminate fractions.
   3. If decimals are present, consider multiplying both sides by a power of 10 to clear the decimals.
   4. Combine similar terms on each side of the equation.
   5. Use the addition property of equality to get all variable terms on one side of the equation and all constant terms on the other side.
   6. Use the multiplication property of equality to get the variable by itself on one side of the equation.
   7. Check your solution in the original equation to be sure you didn’t make a mistake.
7. Have the students work in groups of two. Assign each group two problems from the example problems in the text book chapter 2.4 (use even number problems from the problem set if there isn’t enough example problems). Give the groups a few minutes to review and determine how to solve their two problems using the above listed strategy. Have each student demonstrate to the class how to solve their example problems.

**Share:**

1. Have the students share how they were able to solve the math equations while playing the game. Talk about multiplication and division rules when solving equations. Be sure to discuss how to handle decimal numbers and fractions.
2. Have the students demonstrate the strategy their group used when solving the sample problems.

**Summarize:** When working with the addition property of equality, we found that we could add or subtract the same value from both sides of the equation without changing the “balance” of the equation. The multiplication property of equality is basically the same, but using multiplication instead of addition. We can multiply (or divide) both sides of the equation by the same number without changing the value (or solution set) of the equation.

**Assignment:**

1. (Day 1) Assign Problem Set 2.3 (odd) from the text book.
2. (Day 2) Assign Problem Set 2.4 (odd) from the text book.

**Example Assessment Problems:**

1. – 3 – 5 = 3x – 10x
2. 0.06x + 0.08(100 – x) = 6.5
3. The word problem from the launch of this lesson.
4. See sample test 2

**Lesson 4:** Formulas (2 day)

**Objective:** The student will be able to solve a formula for one of its variables and find the value of a variable in a formula given replacements for the other variables. (Related to Course Objectives 2, 3, 4, 5, and 6).

**Launch:** I need to re-carpet my living room in my house. How can I figure out how much it’s going to cost me so I can budget my money and I know how much carpet I should order?

**Explore:**

1. Activity: Have students divide into groups of 2. Distribute 25 blocks to each group of students. Have the students construct as many rectangles as they can using these block with a perimeter of 20. There should be 9 solutions. Example:

XXXXXXXXX

Where each X = one block, there are 20 sides of the block. (9 on top, 9 on the bottom, and 1 one each side.)

1. Have the students construct a table of their findings.

Length | Width = Perimeter of 20

|

|

|

|

|

1. Discuss the perimeter formula: P = 2l + 2w. Does the findings listed in their tables support the formula?
2. Add another column to the table, call it area, and have the students rebuild each rectangle and count and record the number of blocks it takes to build each rectangle.
3. Discuss what area means and ask if there is a formula we could use to calculate each. L x W = A.
4. What about the area of a triangle? Is there a formula for that? A = ½ bh
   1. Discuss what the base and the height is of a triangle. Point out that the base and the height of the triangle must be perpendicular or for a 90 degree angle, discuss as a class why this is important. Relate this question and the triangle area formula to the formula for a rectangle. Note the similarities.
5. Discuss the formulas for determining the circumference and the area of a circle. Discuss why we use the work circumference and not perimeter when discussing a circle. C = 2πr and A = πr2. Explain the r means the radius and describe what the radius is and what the diameter is. Explain what the constant π is and use the decimal number 3.14 (for now). Give examples on how to calculate when r = 2.
6. Introduce some facts about complementary and supplementary angles.
   1. Complementary angles, when added together form what’s called a right angle or an angle equal to 90°, so x + y = 90
   2. Supplementary angles, when added together form a straight line or an angle equal to 180°, so x + y = 180
7. (Day 2) Have the class discuss and think about answers to the following questions:
   1. What is a formula?
   2. How do you solve a formula for one of its variables? (For example, you know the perimeter of a rectangle and the length, but you need to find the width.)
   3. What are complementary angles? What does the term ‘complement’ mean?
   4. What does percent mean?
8. Day 2 activity: Have the students pull loose change from their pockets. Students can share if needed, or you can provide some change to each. Limit the amount of change to one dollar or less.
   1. Pull out one penny, ask the students what percent of a dollar is one penny. You can relate cents to percent and talk about all the similarities, but be sure that the students relate one penny to .01 to 1 percent of a dollar and explain the symbol 1% and how it relates to .01.
   2. Have the students make a chart of coins and percent of a dollar. In the end, the chart should include penny, nickel, dime, quarter, ½ dollar, and gold dollar coin. Relate these to 1%, 5%, 10%, 25%, 50%, and 100%.
   3. Add another column to the table and convert the percent’s into their equivalent decimals: .01, .05, .10, .25, .50, and 1.00.
9. Have the students work in groups (they can decide the size of the groups) and they can work together on the Applying the Concepts 2.5 from the text book.

**Share:**

1. Have the students share the results of the tables on making rectangles. Make sure that all nine possibilities are shown. Have them explain in their words the definition of perimeter and area. Have them share what is the difference in the area of a triangle and of a rectangle.
2. (Day 2) Towards the end of the class period have a couple of groups report out on how they went about solving some of the concept problems.

**Summarize:** Formulas, for objects such as rectangles and triangles, are a tool for finding quantities such as perimeter and area. For example, when we need to re-carpet a room in our house, it is helpful to be able to calculate the area of the room to be re-carpeted when ordering carpet or when figuring out how much it is going to cost.

**Assignment:**

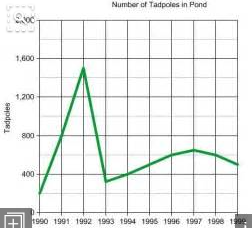
1. (Day 1) Problem Set 2.5 (odd) from the text book.
2. (Day 2) Applying the Concepts from the text book chapter 2.5

**Example Assessment Problems:**

1. Let F = 68 in the formula C = 5/9(F – 32). Solve for C.
2. Reorder the formula C = 5/9(F – 32) to solve for F.
3. See sample test 2

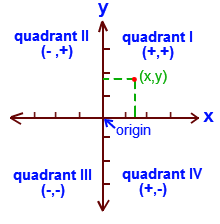
**Lesson 5:** Paired Data Graphing (4 days)

**Objective:** The student will be able to create a table and multiple charts (or diagrams) to represent two variable data on the rectangular coordinate system. (Related to Course Objectives 5, 6, and 7).

**Launch:** Graphs are an important way we represent data. Some graphs are used to report things like the number of tadpoles in a pond, or the number of days that Jim has been absent from school over the years.

Graphs are an important way of communicating information.

**Explore:**

1. (Day 1) Divide the class into groups of three. Have them conduct the Marble Rolls exercise (see appendix) and record their data. Materials needed per group: 2 or three text books, some masking tape, two meter sticks, a measuring tape, and a marble.
   1. Directions: Construct the incline “ramp” by taping two meter sticks together in order to form a “v” for the marble to roll down.
   2. Place the “v” ramp on two or three text books to create an incline.
   3. For the first measurement, place the marble at 15 cm on the incline and release. Record the distance the marble traveled after it left the ramp using the measuring tape. Repeat 5 times and record your data in columns A, B, C, D, E.
   4. Place the Marble at 30 cm and repeat step c.
   5. Repeat for measurements at 45cm, 60cm and 75cm.
   6. NOTE: DO NOT CONDUCT THE EXPERIMENT AT 90cm. This will be done after the students have made their predictions based on the data.
   7. For the most interesting class results, have students perform the experiment on multiple flooring types, for example carpet and tile. Also have groups setup various incline heights. Once a group decides what incline height to use, they cannot change it.
2. (Day 2) Have the students determine formulas for the calculations needed in the chart.
   1. Range of Distance: Largest value – Smallest value
   2. Median Distance: The distance value in the middle (example: distances of 10, 11, 12, 13, 14; the median value or the value in the middle is 12).
   3. Mean (average) distance: The sum of the distances divided by the attempts.
   4. Carpet to Plane Ration: The distance rolled on the carpet (or floor) divided by the distance rolled on the incline.
3. Have the students create a scatter diagram (scatter plot) of their data. Plot the mean distance rolled on the floor against the distance rolled on the incline. The distance rolled on the incline should be potted the horizontal (x) axis. The distance rolled on the floor should be plotted on the vertical (y) axis. Have the students label the x and y axis and give the chart a title.
4. (Day 3) Define:
   1. Ordered Pair: as a pair of numbers enclosed in parentheses and separated by a comma, such as (3,7).
   2. X Coordinate: The first number in an ordered pair, such as the number 3 in the example.
   3. Y Coordinate: The second number in an ordered pair, such as the number 7 in the example.
   4. Cartesian or Rectangular Coordinated System:
5. Relate the x coordinate system to the incline distance and the y coordinate to the floor distance measurements from The Marbelous Rolls experiment. Have the students get back into their groups and list their data as ordered pairs. Create a large chart on the board and have the students list their ordered pairs for their data. Example:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Group 1 | Group 2 | Group 3 |
| 1 | (15, 35) | (15, 36) | (15, 10) |
| 2 | (30, 50) | (30, 51) | (30, 25) |
| 3 | (45, 65) | (45, 66) | (45, 40) |
| 4 | (60, 80) | (60, 81) | (60, 55) |
| 5 | (75, 95) | (75, 94) | (75, 70) |

1. Have the class create a graph including every group’s data. Have the students share their graphs with the class. If they have multiple color pens or markers would be helpful in organizing the data from each group. If using colors be sure to create a legend.
2. (Day 4) Have the original groups of students get back together to make their predications on how far a marble will roll when placed at 90 cm. Have the group write down their prediction, then have the group reconstruct the experiment, roll the marble 5 times, complete the worksheet, and report out.

**Share:**

1. (Day 1) Have the students share and review other groups’ setups and data. Note similarities and discrepancies. Speculate on reasons why.
2. (Day 2) Have the student groups share their data and graphs with the class. Discuss why the charts all look different (and they should if they had different floor types and incline heights).
3. (Day 3) Have multiple students share their graphs with the class. Have them explain what the graph represents and how the data is being displayed.
4. (Day 4) Have each group of students share their reasoning for their predictions. Have them tie in calculations and their graphs in their discussion making process. Have the group report on what it was like reconstructing the experiment. Did they remember how many text books they used to create the incline? Would something like that influence the result of the experiment? And of course, have the students report on how close their prediction was and why it was or was not close.

**Summarize:** The big idea in this lesson is the distance rolled on the incline is the x variable and relates to the x axis of the chart. The distance rolled on the floor is the y variable and relates to the y axis of the chart.

**Assignment:**

1. (Day 1) none
2. (Day 2) none
3. (Day 3) Problem Set 3.1 from the text book.
4. (Day 4) Problem Set 3.2 from the text book.

**Example Assessment Problems:**

1. Graph the following ordered pairs (3, 4), (-2, 5), (5, -4), and (-2, -3)
2. 3x + 4y = 12; find the solution for the ordered pairs: (0, \_\_), (\_\_, 0) and (-4, \_\_\_)
3. See sample test 3

**Lesson 6:** Graphing Linear Equations (3 days)

**Objective:** The student will be able to find the intercepts of a line, use the intercepts to graph the line, and determine the slope of the line. (Related to Course Objectives 2, 3, 4, 5, and 7).

**Launch:** Nate and Todd need to build a roof. They heard from Allen that a good roof has a slope of 4/12. They really had no idea what this meant, so they went and made some measurements of Allen’s roof. They started at the end of the eave and measured horizontally 3 feet and then measure up, 1 foot. They liked this measurement because it was whole feet and they didn’t need to worry about inches. Then the measured 6 feet over from the edge of the eave and then measured up 2 feet. Wow! Again, whole numbers. Then they began to notice a pattern and measured 9 feet over from the edge of the eave and then measured up and found the measurement was 3 feet. Does what Nate and Todd measured match what Allen said about the slope being 4/12?

**Explore:**

1. (Day 1) Let’s graph the line! First we need to know the rules for graphing
   1. Step 1: Find three ordered pairs
   2. Step 2: Graph the ordered pairs from step 1. Actually, we only need two point to graph a straight line. The third point is a double check. All three points need to line up.
   3. Step 3: Draw a straight line.
2. In the example do we have three ordered pairs? (1, 3), (2, 6), and (3, 9). YES. Be sure to relate the horizontal measurement as x and the vertical measurement as y
3. Graph the ordered pairs as a class. Draw a straight line through the points. Do they line up? YES
4. Definitions:
   1. Define Standard Form of a Line: Any equation that can be put into the form ax + by = c, where a, b, and c are real numbers and a and b are not both 0. This is also called a linear equation in two variables (for x and y).
   2. Define X Intercept: The x coordinate of the point where the line on the graph crosses the x axis (when the y coordinate is 0). (x, 0)
   3. Define Y Intercept: The y coordinate of the point where the line on the graph crosses the y axis (when the x coordinate is 0). (0, y)
   4. Slope Intercept Form: The equation of the line with slope m and y intercept b is always given by y = mx + b.
5. Work as a class to graph the example problems list in the text book chapter 3.3 that graphs the equation given. Have the students come up with solution sets.
6. (Day 2) First review the terms in the slope intercept form, such as, y-intercept and slope (m). Demonstrate the Slope Intercept Basketball Game. <http://www.math-play.com/slope-intercept-game.html>
   1. First as a class (boys v. girls) regulate the play of the game to show 1) how to play and 2) to help the students understand the terms and how to find out what the question is asking. Play to 21?
   2. Then have the students pair up in twos and go to the computer lab so everyone can play the game. Have them keep track of their scores to report out at the end of class.
7. (Day 3) Review terms of the slope intercept form.
   1. Describe slope as the vertical change divided by the horizontal change, like in the example given in the launch. Help them understand the concept rise over run. The rise is vertical change divided by the horizontal change.
   2. Define Slope: If points (x1, y1) and (x2, y2) are two different points, then the slope of the line on which they lie is:

rise y2 – y1

Slope = m = ------- = ----------

run x2 – x1

1. Go back and retell the launch story. Re-graph the ordered pairs. Demonstrate how to work the slope equation. Write the equation for the line in slope intercept form y = mx + b. (y = (1/3)x + 0). Be sure to note the y-intercept and relate it to b and where it goes in the equation.
2. Now tie in the part about what Allen said about the slope being 4/12. Does that make sense? Is the ordered pair on the line? Does the formula result in 4 if you substitute a 12 for x?
3. Have the students work in groups on the example problem sets 3.6 in the text book finding the equation of a line. Have them report out at the end of the day.

**Share:**

1. (Day 1) Have the students demonstrate to the class how they made a graph, given an equation of a line and how they determined ordered pairs.
2. (Day 2) Have the student pairs report the scores and the play of their game. Have the students describe what the following terms mean:
   1. Standard form
   2. Slope intercept form
   3. X intercept
   4. Y intercept
3. (Day 3) Select an example problem set 3.6 to find an equation of a line given ordered pairs. Have the students direct the example, but do the work with them. Have them explain slope. Have them explain what the letters in the slope intercept form means. Talk about these questions as a class: 1) Does every line have a y-intercept? Why or why not. 2) Does every line have an x-intercept? Why or why not.

**Summarize:** Nate and Todd determined the slope of Allen’s roof by measuring ordered pairs and graphing a line. From there, they were able to see that the line passed through the point (12, 4) which was the slope that Allen told them in the beginning. Every equation that has two variables (such as x and y) can be graphed into a line and has an infinite number of solutions, as we found when measuring Allen’s roof. To determine slope of the line, you need to determine the change in the y direction and compare to (or divide by) the change in the x direction. You can determine change by selecting to points and subtracting them. The y intercept is simply where the line passes through the y axis.

**Assignment:**

1. (Day 1) Problem Set 3.3 from the text book on graphing ordered pairs.
2. (Day 2) Problem Set 3.4 from the text book on intercepts.
3. (Day 3) Problem Set 3.5 from the text book on slope.

**Example Assessment Problems:**

1. Graph a line given the ordered pairs (2, 1) and (4, 4)
2. Determine x and y intercepts of the line -2x + y = -4
3. Determine slope given ordered pairs (2, 1) and (4, 4)
4. See sample test 3

**Appendix**

**Sample Test 2**

**A. Simplify the following expressions:**

**1.** (7x – 3) – (4x + 2) **2.** 9(3a + 5) – (8a – 7)

**3.** 2(2x + 1) – (x + 4) **4.** 5(y – 3) – (y – 4)

**5.** –3(3x – 2) – (2x + 3)

**B. Solve:**

**6.** –10x + 5 – 4x + 15x = 0 **7.** 15 – 21 = 8x + 3x – 10x

**8.** 5(x + 1) – 4x = 2 **9.** –2(x – 5) + 3x = 4 – 9

**10.** 4(2a – 1) – 7a = 9 – 5 **11.** 7x – 5x + 8x = 20

**12.** 5x + 4x + 3x = 4 + 8 **13.** 10 – 16 = 12x – 6x – 3x

**14.** 8x = 3x – 10 **15.** –5x = –2x – 12

**16.** – 8 – 2(3 – a) = 0 **17.** – 3(t – 5) – 2(2t + 1) = – 8

**18.** 3(x – 1) – (4x – 5) = 2(5x – 1) – 7 **19.** 3(4x – 2) – (5x – 8) = 8 – (2x + 3)

**20.** –(6x + 2) – (8x – 3) = 8 – (5x + 1)

**C. Word Problems. Solve.**

**21.** One number is three less than another. Their sum is fifteen. Find the numbers.

**22.** One number is five more than twice another. If their sum is decreased by ten, the result is twenty-two. Find the numbers.

**23.** The width of a rectangle is 3 feet less than the length. The perimeter is 10 feet. Find the length and width.

**24.** One side of a triangle is twice the shortest side. The third side is 3 feet more than the shortest side. The perimeter is 19 feet. Find all three sides.

**25.** Mike has $1.55 in dimes and nickels. If he has 7 more nickels than dimes, how many of each coin does he have?

**26.** Suppose you invest a certain amount of money in an account that pays 11% interest annually, and $4000 more than that in an account that pays 12% annually. How much money do you have in each account if the total interest for a year is $940?

**27.** Travis has a savings account that his parents opened for him. It pays 6% annual interest. His uncle also opened an account for him, but it pays 8% annual interest. If there is $800 more in the account that pays 6%, and the total interest from both accounts is $104, how much money is in each of the accounts?

**28.** One angle in a triangle measures twice the smallest angle, whereas the largest angel is six times the smallest angle. Find the measures of all three angles.

**29.** Diane has a part-time job that pays her $6.50 an hour. During one week she works 26 hours and is paid $178.10. She realizes when she sees her check that she has been given a raise. How much per hour is that raise?

**30.** Tyler is taking piano lessons. Because he doesn’t practice as often as his parents would like him to, he has to pay for part of the lessons himself. His parents pay him $0.50 to do the laundry and $1.25 to mow the lawn. In one month, he does the laundry 6 more times than he mows the lawn. If his parents pay him $13.50 that month, how many times did he mow the lawn?

**Sample Test 3**

Double click on the test to open the entire .pdf

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**Solving Equations Bingo** from sharemylesson.com <https://sharemylesson.com/teaching-resource/algebra-bingo-162858>

Double click on presentation slide to start the PowerPoint presentation.



**Substitution Bingo** from sharemylesson.com <https://sharemylesson.com/teaching-resource/algebra-bingo-162858>

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