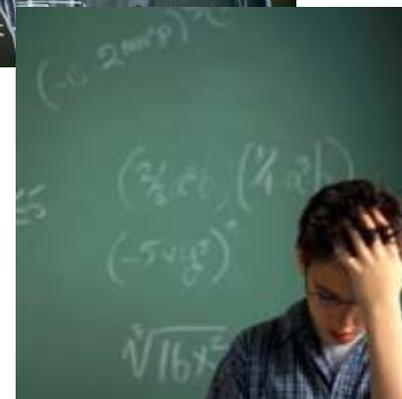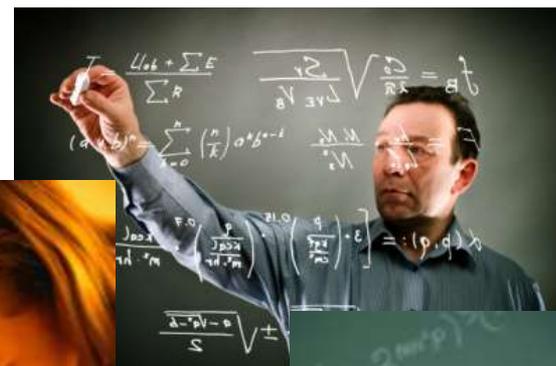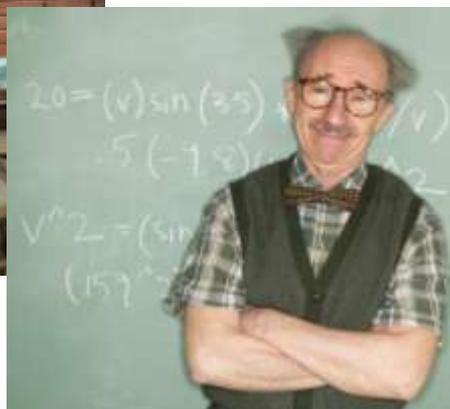**ProLiteracy**

From Stress to Success
Solving Math Word Problems

Todd Evans
LITERACY FOR LIFE| 1 NOVEMBER 2014

What Do You See?

Teaching Strategies for Word Problems

- Providing Context for Math
  - Math biography, surveys, and writing activities
  - Giving math problems a context
  - Writing math problems
- Reading Comprehension
  - Active reading strategies
  - Graphic organizers

- Critical Thinking/ Reasoning
  - Think Aloud technique
  - Brainteasers/ Fermi questions
- Eliminating Barriers
  - Early introduction
  - Simplifying
  - Aids

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Accessibility

- Small books
- Small amounts of information
- Clearly written
- Simple explanations
- Easy to follow examples

GED Skill Workbook
Mathematics 1

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Math Biographies, Surveys, & Writing Activities

- Overcome negative feelings toward problem solving
- Become familiar with seeing math problems expressed in words
- Connect math concepts to real world experiences
- Transfer everyday problem solving skills to solving word problems
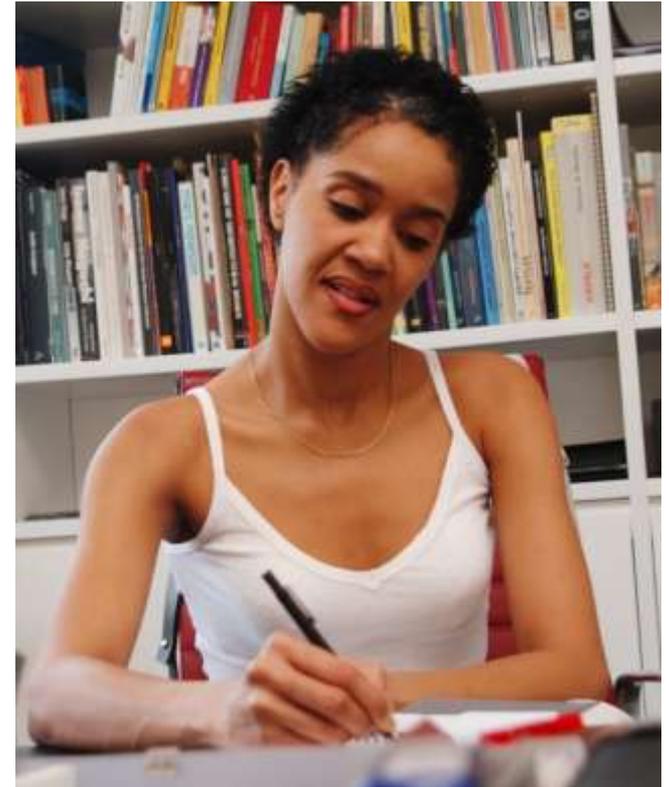
Math Biography

- Do you like math?
  If no, when did you start to dislike math?
- With what kind of math problems do you feel most confident?
- With what kind of math problems do you feel least confident?
- What do you want to learn in math that could help you in your life?

Math Survey

- Each of the following situations involves a fraction, decimal, percent, or ratio. Check off any experiences you've had.
    - ❑ Following a recipe
    - ❑ Figuring out mileage
    - ❑ Determining a sales price
    - ❑ Using a measurement tool such as a ruler
    - ❑ Reading percents in a newspaper article
    - ❑ Paying for something with coins
    - ❑ Using the metric system for measurement
- Describe the last time you used fractions when measuring something.
- Where have you seen the word percent or the symbol %?
- When was the last time you used digital measurement?
- You use money everyday. With a partner, list other places that you see decimals.

Math Survey
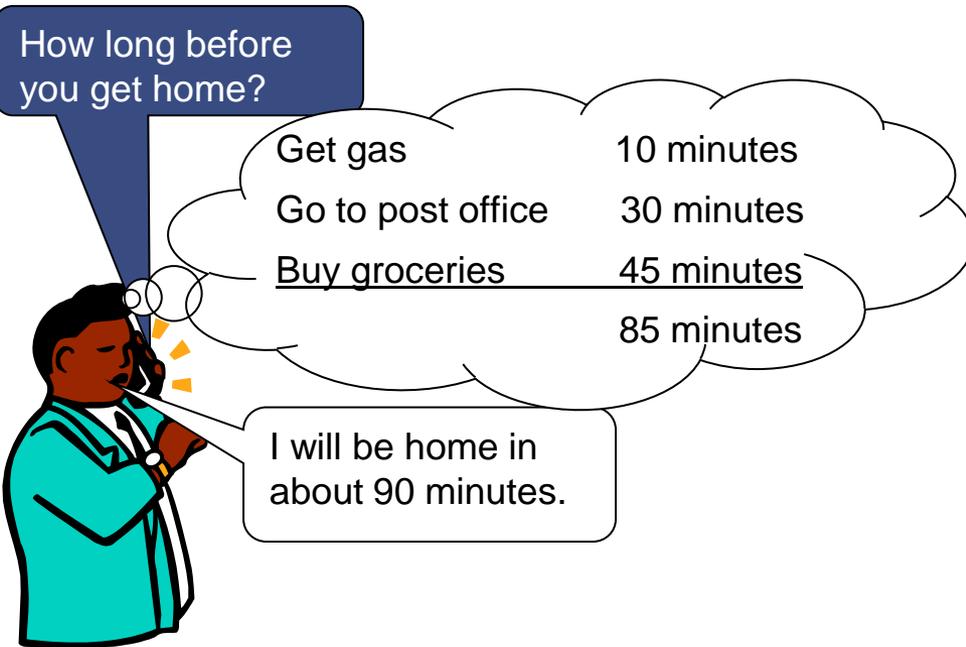
How long before you get home?

Get gas — 10 minutes

Go to post office — 30 minutes

Buy groceries — 45 minutes

85 minutes

I will be home in about 90 minutes.

Have you ever had a similar experience? Write about it.

Providing Context

- Ask students to provide a context for the problems they solve

- Ask students to share context when reviewing in class

Providing Context

- 18 x 8 =

- $(p + \frac{1}{2} p) n =$

- $\frac{1}{2} + \frac{1}{4} + \frac{1}{4} =$

- Circumference of a circle with radius 3

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Writing Word Problems

- Work in pairs
- Make up and write a math problem
  $10 \div 2 = 5$
- Trade math problems with your partner
- Make up a context for your partner's problem
  $\$10 \div 2 \text{ people} = \$5 \text{ each}$
- Write a word problem for your partner's problem
- Exchange problems with other pairs

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Active Reading Strategies

- Circling Numbers
- Underlining key phrases
- Rereading a problem
- Restating the problem in your own words

- Thinking of a similar problem
- Studying a graph or diagram before reading the problem
- Drawing a graph or diagram of the problem

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Problem Solving Graphic Organizer

- Consistently apply problem solving process

- Writing responses helps students understand their thinking process

Think Aloud Technique

- Carefully select problem
- Review problem and select strategies
- Put problem in own words
- Model strategies
- Identify and discuss strategies
- Give students problem
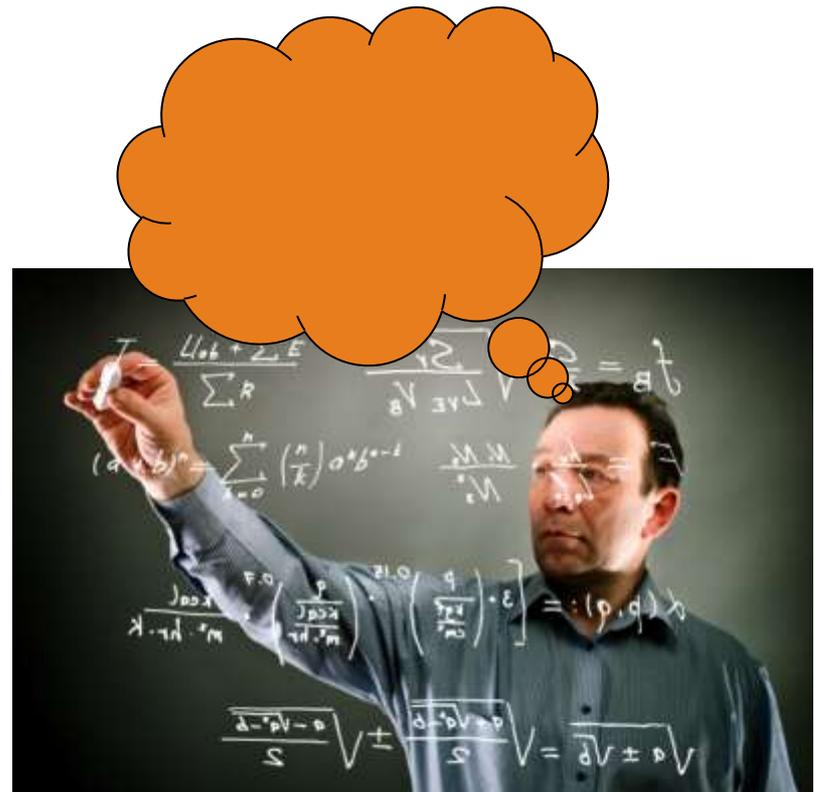
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Think Aloud Technique

A department store advertises a clearance sale that offers "Take an additional 40% off the sale price." A coat that was originally $75 is on sale for $50.00. What is the clearance price?

1) $20.00
2) $25.00
3) $30.00
4) $40.00
5) $45.00

What am I being asked to find?	I am trying to find the clearance price of the coat.

Think Aloud Technique

A department store advertises a clearance sale that offers "Take an additional 40% off the sale price." A coat that was originally $75 is on sale for $50.00. What is the clearance price?

1) $20.00
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5) $45.00

What is the information (with labels) in the problem? Identify information you think is necessary and information which you may not need.	The important information is $50 Sale price of coat 40% off sale price The $75 original price of coat is not important because the discount is on the sale price

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Think Aloud Technique

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What operations will I use?

To solve the problem, I will find the discount (40% off sale price).
40% x $50 = discount

Next I will find the clearance price.
Sale price – discount = clearance

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Think Aloud Technique

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Solve the problem.

First I multiply .40 x 50 = 20 ($20)

Then I subtract $50 - $20 = $30

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Think Aloud Technique

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Check my answer. Did I answer the question?

Does my answer make sense?

This answer is $30.

I was asked to find the clearance price. I took an additional 40% from the sale price of $50 ($20). I subtracted that amount from $50 to get the clearance price

This answer makes sense. Since it is an additional discount, it should be less than $50. Since the discount is not quite half off, the final price should be a little more than half the sale price

![ProLiteracy logo]

Think Aloud Technique

Susan has five bills in both $5 and $10 denominations. If the total value is $35, how many are $5 bills?

A sign pole casts a 6-foot shadow. At the same time of day, a 4-foot child casts a 3-foot shadow. What is the height of the pole in feet?

Brainteasers

- How many one-eighth-inch marks are there on a yardstick?

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How many one-eighth-inch marks are there on a yardstick?

- 288
  - There are 8 marks per inch. 8 x 36 = 288
- 144
  - Only the marks at 1/8, 3/8, 5/8 and 7/8 are 1/8-inch marks. The others are marks for quarter, half, and whole inches. So, there are 4 marks per inch. 4 x 36 = 144
- 36
  - The 3/8-inch mark is not a 1/8-inch mark. So, there is one mark per inch.
- 1
  - The mark at 1 1/8 is a 1 1/8-inch mark. So there is only one 1/8-inch mark.

Important Questions

- What are the relevant facts in this question?
- Can the question be interpreted in any other way?
- Are there any terms that are unclear or ambiguous?
- What is the larger context (big picture) for understanding this question?
- What insights into your own thinking can you draw from answering this question?
- What assumptions are implied by your answer to this question?
- What process did you use in answering this question?
- What is most important to you in this question? Why?
- How did your values impact how you answered this question?
- Are you pulled in different directions about how to answer this question? Why or why not?

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Brainteasers

- How can you add eight 8's to get the number 1,000? (only use addition)
  - The key to this math riddle is realizing that the ones place must be zero.
    888 +88 +8 +8 +8 =1,000

Fermi Questions

- Estimation questions that help students develop critical thinking and problem solving skills

- How many piano tuners are there in Chicago?

Fermi Questions

- 5,000,000 people living in Chicago.
- Two persons in each household
- One household in twenty has a piano that is tuned regularly.
- Pianos are tuned once a year.
- Two hours to tune a piano, including travel time.
- Piano tuner works eight hours in a day, five days in a week, and 50 weeks in a year.

- Piano tunings per year
  - (5,000,000/2) /20 = 125,000

- Average number of jobs a piano tuner performs
  - (8 x 5 x 50)/2 = 1,000

- Number of piano tuners in Chicago
  - 125,000/1,000 = 125

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Eliminating Barriers

- Early introduction to word problems
- Simplify word problems

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Simplify Word Problems

Jan is using a cake that calls for the following liquid ingredients: 1/3 cup cooking oil, 1¼ cups buttermilk, 1/8 cup water. How many cups of liquid will she use to make the cake?

Jan is using a cake that calls for the following liquid ingredients: ½ cup cooking oil, ¼ cup buttermilk, ¼ cup water. How many cups of liquid will she use to make the cake?

Eliminating Barriers

- Early introduction to word problems
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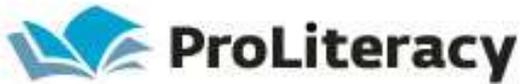
Math Aids

Lance worked 6¼ hours on Monday and 4 7/8 hours on Tuesday. How many total hours did Lance work?

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Adding Mixed Numbers

Problem	6 1/4 + 4 7/8
1. Do the fractions have the same denominator?	Yes (No)
1a. If no, find a common denominator and rewrite the numerators.	1/4 = 2/8 7/8 = 7/8
2. Find the sum of the fractions (not the whole numbers) 2a. Can you simplify the sum of the fractions? 2b. If yes, write the fraction in the simplest terms.	2/8 + 7/8 = 9/8 Yes (No)

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Adding Mixed Numbers

Problem	6 1/4 + 4 7/8
3. Is the sum of the fractions (2b) greater than or equal to 1?	(Yes) No
3a. If yes, convert the fraction to a mixed number and write it here..	9/8 = 1 1/8
3b. Find the sum of the whole numbers in the original problem plus any whole number from 3a and write it here.	6 + 4 + 1 = 11
4. Combine the sum in 3b with the fraction from 3a.	11 1/8