Title: Problem Solving Model

Brief Overview:

Students will learn to translate the language of word problems into mathematical sentences they solve. Students practice translating words into mathematical operations by creating a vocabulary chart. The chart will help students categorize words and phrases under the categories: Addition, Subtraction, Multiplication, Division, Equalities/Inequalities, and Type of Question Being Asked. Students will practice using a 3-step model to solve the questions. The three-step process will include: (1) Analysis, (2) Representation, and (3) Application with explanation.

NCTM Content Standard/National Science Education Standard:

Instructional programs from grade 6 - 8 should enable all students to—

- Build new mathematical knowledge through problem solving;
- Solve problems that arise in mathematics and in other contexts;
- Apply and adapt a variety of appropriate strategies to solve problems;
- Monitor and reflect on the process of mathematical problem solving

Grade/Level:

Grades 6 - 8

Duration/Length:

Three days (approximately 50 minutes each day)

Student Outcomes:

Students will:

- Identify mathematical vocabulary.
- Develop a vocabulary chart for future use as a personal manipulative.
- Represent the mathematical vocabulary in mathematical expressions/equations.
- Follow a 3-step process to decode and solve word problems.
- Identify the question being asked in the problem.
- Solve the problem.
- Explain the solution using the correction definitions and vocabulary.

Materials and Resources:

- Resource Worksheets
- Bottle and Note
- Vocabulary Cards
- Cryptology Activities
- Highlighter

Development/Procedures:

Lesson 1

Preassessment – Students should be able to read, have basic math operations skills, and understand the process of problem solving

Launch – As the students arrive, the "Warm-up" (encoded portion of Cryptology Message 1) is on the overhead projector .

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KYRF PMAIQ

On the Board is the message, "You are entering the world of Cryptology. This message was left in a bottle floating on the Chesapeake Bay."

Immediately the questions to ask the class are:
"What is Cryptology?"
"What does the message say on the transparency??"
"How can I figure it out?"

Lead the class into discussions until the students state that they need a "key" to decode the message.

Pass out student copy of "Cryptology Message 1." Discuss how to read Key 2. Capital letters are the encoded message, and lower case letters represent the actual letter. Complete the capital letter alphabet, and then draw a line to the actual letter to spell "math rocks." What does Key 2 mean? (The letters of the alphabet are moved down 2 spaces.)

Teacher Facilitation – Present to the students the analogy between a word problem and codes. Explain the practical use of codes in our present day environment. The internet is full of codes that have meaning to any one person as well as to the world (for example – all web site addresses start out with **http://www.xxx).**

Redirect the discussion to similarities between math word problems and codes. Explain how mathematics itself is a code and how math symbols have corresponding math vocabulary words. For example, the symbol "-" means take away.

Put "Math Vocabulary for Word Problem Solving" worksheet on overhead, and pass out copies to students. Have the words "take away" in the building block that says "subtraction". Discuss the various math operations (addition, subtraction, multiplication, and division) along with math expressions (4 – 3).

Engage the students in completing the worksheet using the "Think- Pair-Share" format. Time each segment of the activity and allow a total of 10 minutes for completion. Share responses as a whole class, recording all responses.

Have students keep the completed worksheet in their folders for reference.

Put "Decoding Word Phrases" on overhead, and pass out copies to students. Demonstrate how the math vocabulary from the previous exercise is used in "Verbal Phrases." Notice that there is no period at the end of the phrase. As a class, go over the first problem. Have the students underline the key vocabulary words in the verbal phrases, and write the math symbols below the phrase. Complete the remainder of the worksheet individually. Review as whole class.

Put "Decoding Word Sentences" on overhead. Notice we now have periods at the end of the words (sentences), and an equality or inequality at the end of the numbers (number sentence).

Student Application – The worksheet "Decoding Word Phrases"

Embedded Assessment – At the end of class, pass out "Exit Ticket" worksheet. "Exit Tickets" for review of student understanding.

Reteaching/Extension –

- For those who have not completely understood the lesson, have students create flash cards for math vocabulary.
- For those who have understood the lesson, have students create their own expressions/equations using two or more operations.

Lesson 2

Preassessment – Students should have prior knowledge of: basic understanding of cryptology, math vocabulary, decoding word phrases and decoding word sentences.

Launch – As the students arrive, the "Warm-up", which is a bag of laminated math vocabulary flash cards, is on desks for groups of two students.

Immediately ask the students to organize the vocabulary cards with their partner (seats are paired). No other directions are given.

After five minutes, walk around and make sure they have the flash cards in operation groupings.

Ask the students to play Coach/Player with the cards. The Coach creates the word sentence with the flash cards. Write an example on the board. Example: 4 plus 2 times a number equals 10. The player writes down the math sentence using math symbols on a piece of paper and explains the answer to the Coach. When both agree, they switch roles. Each role is played twice, creating four problems.

Pick one group to create their problems on board. Use these examples to assess class understanding and lead into example of decoding word problems.

Teacher Facilitation - From the word sentence on the board, make up a word problem (off the top of your head). Introduce the topic of Word Problem Solving. Use the word "decoding" to emphasize what was taught the prior class.

Lead the class into discussions on the 3-step process for decoding word problems. The 3 key words are: Analysis, Representation, and Application (put on the board). Assess the class by asking what these words mean. Explain the definition of each word.

Analysis: What is the problem asking you to do? What information do you need? Do you have enough information?

Representation: How are you going to set up your problem? What do you need to solve? Will you use variables?

Application: Show how you solved the problem here. Solve the problem.

Put "Decoding Word Problems I" on overhead. Pass out student copies. As you explain each step, include the following thoughts:

Step 1: Analysis

- Read the word problem at least 2 times.
- Identify what is being asked.
- Circle what is being asked – including the units!
- Count the number of questions being asked and label as (1), (2), etc.
- Write down what is being asked. Leave a blank line for the answer with the label behind the blank line. For example: Bob is ____yrs old
- Re-read the word problem.
- Write down the mathematical information needed to solve the problem. Decode the mathematical vocabulary to help determine what operation is needed.

Step 2: Representation

- Create word model.
- Replace words with numbers and or variable.
- Represent the mathematical sentence for the information in the correct form to solve the word problem.

Step 3: Application

- Solve the mathematical expressions from Step 2.
- Answer the question completely.

Complete "Decoding Word Problems I" as a whole class, modeling problem-solving strategy. Explain the importance of answering the questions completely. $\therefore$ is another math code that means "in conclusion" or "therefore."

Hand out "Decoding Word Problems II" and ask students to highlight key vocabulary word codes. Have the students complete individually. Walk around the room and assess how individuals understand concept. Homework is "Decoding Word Problems III." Ask students to keep these decoding word problems in a safe place. They will use for the next class.

Student Application – Students completion of worksheets, Decoding Word Problems I and II.

Embedded Assessment – After worksheets are completed and/or 15 minutes have ended, ask for volunteers to put their answer on the overhead and review as a

group. Discuss as a class each step of the process. Be sure to encourage and build confidence for each step of the process.

Reteaching/Extension – Ask the students who understand the material to pair up with students who are still uncertain. Have the students who understand the materials explain it to those who do not, and to try creating their own word problems with math codes. "Decoding Word Problems IV" is another extension for the high achieving students.

Lesson 3

Preassessment – Students should have prior knowledge of: basic understanding of cryptology, math vocabulary, decoding word phrases, decoding word sentences, the 3-step process for decoding word problems.

Launch – As the students arrive the "Warm-up Cryptology Message 2" is on the overhead, showing only the message.

On the Board is the message, "You are entering the world of Cryptology. This message was left in a bottle floating on the Chesapeake Bay."

Immediately the questions to ask the class are:

"What is Cryptology?"
"What does the message say on the transparency??"
"How can I figure it out?"

Pass out the student copy of "Cryptology Message 2." Ask students to complete the Key 5 Decoder and to decipher the message on the transparency. Ask students why this decoder is entitled Key 5. (It is called Key 5 because each letters of the alphabet is moved down five positions from its original position.)

Teacher Facilitation - Review with the students analogy between a word problem and math codes. Introduce the concept of word problem explanation. Explain why it is important to explain your work in real world situations. Present to the students the definition of explanation and how this applies to mathematics.

Brainstorm, as a class, the importance of explaining your work and discuss the different ways of presenting your explanation (words, numbers, symbols, words and or numbers, and or symbols).

Place on overhead and distribute to students "Explaining Word Problem Solutions Ia and Ib." These are the same word problems as in the prior lesson, with an added section "Explain how you found your solutions" section.

Ask students to retrieve their Decoding Word Problem I, Decoding Word Problem II, and Decoding Word Problem III worksheets from the prior day. Review the analysis, representation, application, and solution. Remind students that the explanation uses mathematics vocabulary. Pair students, and ask each student, one at a time, to explain in words how they found their solutions. After each has shared, the pair of students will write in words their explanation in the space noted. Share explanations as a

whole class, exposing effective explanations that use math vocabulary, and incomplete explanations.

Distribute "Explaining Word Problems Solution IIa and IIb. Have same pair of students explain to each other how each would explain their solution using words. After each has responded verbally, have the pair write down their explanation using words.

Homework will be completion of "Explaining Word Problem Solutions IIIa and IIIb.

Student Application – Students completion "Explaining Word Problems Ia and Ib and IIa and IIb."

Embedded Assessment – The explanations will be reviewed.

Reteaching/Extension –

- For those who have not completely understood the lesson, have students review the flash cards for math vocabulary and make up a word problem.
- For those who have understood the lesson, have students create their own word problems and a cryptology code for the class to decode. "Explaining Word Problem Solutions" IVa and IVb are available for extensions.

Summative Assessment:

Students will be given a BCR for an assessment on Day 4. Create your own word problem, requesting an analysis, representation, application, with an explanation of how the solution was found.

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Math Vocabulary *for* Word Problem Solving

Division ÷

Equality / Inequality

$\neq \quad = \quad > \quad < \quad \leq \quad \geq$

Addition +

Subtraction -

Take away

Multiplication ●

Math Vocabulary *for* Word Problem Solving

Answer Key

Division ÷	Equality / Inequality $\neq$ $=$ $>$ $<$ $\leq$ $\geq$	
Divided by	*Equal to*	*Does not equal*
Separated by	*Is*	*Is not*
Quotient		*Greater than*
		Less than
		Greater than or equal to
		Less than or equal to

Addition +	Subtraction -	Multiplication ●
More than	Take away	*Times*
Sum	*Decreased by*	*Of*
Plus	*Less than*	*In all*
In all	*Left*	*Product*
Total	*Minus*	*Total*
Gained	*Lost*	*Twice*
Increased by	*Less*	*Square*
And	*Subtract*	*Cube*
	Difference	

Underlined words are math vocabulary for the answer to this operation.

Cryptology Message I

KYRF PMAIQ

Cryptology Decoder I

Key 2

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

		A	B	C																				

Decoded Response

_____

Cryptology Message I

Answer Key

KYRF PMAIQ

Cryptology Decoder I

Key 2

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

Y	***Z***	A	B	C	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***K***	***L***	***M***	***N***	***O***	***P***	***Q***	***R***	***S***	***T***	***U***	***V***	***W***	***X***

Decoded Response

math rocks

_____

Decoding Word Phrases

Underline the key vocabulary words in the verbal phrases below, writing the math language below the phrase. Then, match your phrase with the mathematical expressions on the right to verify your answer. The first problem is completed for you.

Verbal Phrase	Match	Math Expression
Example: 1.Fifteen **less** seven **15 - 7**	**e**	a. n + 4
2. The product of three and eight		b. 20 - 15
3. Fifteen less than twenty		c. 6 - n
4. 4 more than a number		d. 3 · 8
5. The difference of six and a number		e. 15 - 7
6. The quotient of 10 and a number		f. (n + 6) - 15
7. 15 less than the sum of a number and 6		g. 10 ÷ n
8. Three more than 8 times a number		h. $\frac{n}{10+2}$
9. The difference between 3 times a number and 6		i. 8n + 3
10. A number divided by the sum of 10 and 2		j. 3n - 6

Decoding Word Phrases

Answer Key

Underline the key vocabulary words in the verbal phrases below, writing the math language below the phrase. Then, match your phrase with the mathematical expressions on the right to verify your answer. The first problem is completed for you.

Verbal Phrase	Match	Math Expression
Example: 1. Fifteen **less** seven ***15 - 7***	***e***	a. n + 4
2. The product of three and eight ***3 x 8***	***d***	d. 20 - 15
3. Fifteen less than twenty ***20 - 15***	***b***	e. 6 - n
4. Four more than a number ***n + 4***	***a***	d. 3 · 8
5. The difference of six and a number ***6 - n***	***c***	e. 15 - 7
6. The quotient of 10 and a number ***10 ÷ n***	***g***	f. (n + 6) - 15
7. 15 less than the sum of a number and 6 ***(n + 6) - 15***	***f***	g. 10 ÷ n
8. Three more than 8 times a number ***8n + 3***	***i***	h. $\frac{n}{10+2}$
9. The difference between 3 times a number and 6 . ***3n - 6***	***j***	i. 8n + 3
10.A number divided by the sum of 10 and 2 . $\frac{n}{10+2}$	***h***	j. 3n - 6

Decoding Word Sentences

Underline the key vocabulary words in the verbal sentences below, writing the math language below the sentence. Then, match your phrase with the mathematical equality or inequality on the right to verify your answer. The first problem is completed for you.

Math Equation or Verbal Sentence	Match	Inequality
Example: 1. The **<u>sum</u>** of a number **<u>and</u>** 8 **<u>is</u>** 20. **n + 8 = 20**	**d**	a. $7 + n > 85$
2. Six times a number less five equals 55.		f. $2n - 8 = 12$
3. Seven plus a number is greater than 85.		g. $n \div 8 = 96$
4. The product of 4 and a number is less than or equal to 85.		d. $n + 8 = 20$
5. The quotient of a number and 8 is 96.		e. $4n \leq 85$
6. 4 increased by 10 times a number is greater than 100.		f. $\frac{2n}{8} \leq 3$
7. The difference between 2 times a number and 8 is 12.		g. $6n - 5 = 55$
8. The quotient of 2 times a number and 8 is less than or equal to 3		h. $4 + 10n > 100$
Create your own verbal sentence 9.		i.
Create your own verbal sentence 10.		j.

Decoding Word Sentences

Answer Key

Underline the key vocabulary words in the verbal sentences below, writing the math language below the sentence. Then, match your phrase with the mathematical equality or inequality on the right to verify your answer. The first problem is completed for you.

Math Equation or Verbal Sentence	Match	Inequality
Example: 1.The **sum** of a number **and** 8 **is** 20. ***n + 8 = 20***	***d***	a. $7 + n > 85$
2. Six times a number less five equals 55. ***6n - 5 = 55***	***g***	b. $2n - 8 = 12$
3. Seven plus a number is greater than 85. ***7 + n > 85***	***a***	c. $n \div 8 = 96$
4. The product of 4 and a number is less than or equal to 85. ***4n ≤ 85***	***e***	d. $n + 8 = 20$
5. The quotient of a number and 8 is 96 . ***n ÷ 8 = 96***	***c***	e. $4n \leq 85$
6. 4 increased by 10 times a number is greater than 100. ***4 +10n > 100***	***h***	f. $\frac{2n}{8} \leq 3$
7. The difference between 2 times a number and 8 is 12. ***2n - 8 = 12***	***b***	g. $6n - 5 = 55$
8. The quotient of 2 times a number and 8 is less than or equal to 3. $\frac{2n}{8} \leq 3$	***f***	h. $4 + 10n > 100$
9. Create your own verbal sentence		i.

Exit Ticket

Name_____

Date_____

Period_____

Circle the key vocabulary word that indicates the mathematical operation. Write each sentence as a mathematical equation.

1. Sixteen more than a number is 36

_____

2. The product of 7 and a number is one.

_____

Exit Ticket

Name_____

Date_____

Period_____

Circle the key vocabulary word that indicates the mathematical operation. Write each sentence as a mathematical equation.

1. Sixteen more than a number is 36.

_____

2. The product of 7 and a number is one.

_____

Exit Ticket

Answer Key

Name_____

Date_____

Period_____

Circle the key vocabulary word that indicates the mathematical operation. Write each sentence as a mathematical equation.

1. Sixteen more than a number is 36 ***16 + n = 36.***

2. The product of 7 and a number is one. ***7n = 1***

Math Flash Cards

more than	**plus**	**increased by**	**and**
sum	**total**	**gained**	**minus**
decreased by	**in all**	**left**	**lost**
take away	**less than**	**less**	**subtract**
difference		**times**	**multiply**
product	**quotient**	**separated by**	**of**
quotient	**is**	**equals**	**is**

greater than	**is greater than**	**is less than**
is less than	**a number n**	**or equal to**

Math Flash Cards (continued)

A	**0**	**1**	**2**
3	**4**	**5**	**6**
7	**8**	**9**	**10**
11	**12**	**13**	**14**

Decoding Word Problems I

1. Three packages of chicken weigh 2.45 lbs., 3.2 lbs, and 2 lbs. What is the total of the weight of the chicken?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: 3. Application (solve): ∴

2. Sasha purchased three packages of chicken. The first package is 2.75 lbs, and second package is 3.4 lbs. She purchased a total of 8.5 lbs. of chicken. What is the weight of the third package?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: . 3. Application (solve): ∴

Decoding Word Problems I *Answer Key*

1. Three packages of chicken weigh 2.45 lbs., 3.2 lbs, and 2 lbs. What is the total of the weight of the chicken?

1. Analysis: • What is being asked? ***What is the total weight of the chicken?*** • What labels needed? ***lbs.*** • What information do you need to solve the problem? ***The weight of each package of chicken*** • What operations do you need to use? ***Addition***	2. Representation: ***weight of package 1 + weight of package 2 + weight of package 3 = total*** ***2.45 + 3.2 + 2 = total weight*** ***n = total weight*** 3. Application (solve): ***2.45*** ***3.2*** ***2*** ***7.65 lbs.*** • • •***The weight of the chicken is 7.65 lbs.***

2. Sasha purchased three packages of chicken. The first package is 2.75 lbs, and second package is 3.4 lbs. She purchased a total of 8.5 lbs. of chicken. What is the weight of the third package?

1. Analysis: • What is being asked? ***What is the weight of 3rd package of chicken?*** • What labels needed? ***lbs.*** • What information do you need to solve the problem? ***The weight of package 1 and 2, and the total weight.*** • What operations do you need to use? ***Addition and subtraction***	2. Representation: ***weight of package 1 + weight of package 2 + weight of package 3 = total*** ***2.75 + 3.4 + package 3 = total weight*** ***n = package 3*** 3. Application (solve): ***2.75*** ***3.4*** ***6.15*** ***6.15 + n = 8.5*** ***-6.15 = -6.15*** ***n = 2.35*** • • •***The weight of the 3rd package of chicken is 2.35 lbs.***

Decoding Word Problems II

1. The Eagles were playing a football game against the Sharks. During one series of plays, the Eagles gained 5 yards, gained 9 yards, lost 7 yards, and received a 10-yard penalty. If they started play on their own 40-yard line, on which line did they finish?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: . 3. Application (solve): ∴

2. On one series of play, the Eagles football offense began on their 10-yard line, and after 3 plays ended up on their own 45-yard line. They lost 5 yards on play 1, and gained 12 yards on play 2. How many yards were gained or lost on play 3?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operation do your need to use?	2. Representation: . 3. Application (solve): ∴

Decoding Word Problems II *Answer Key*

1. The Eagles were playing a football game against the Sharks. During one series of plays, the Eagles gained 5 yards, gained 9 yards, lost 7 yards, and received a 10-yard penalty. If they started play on their own 40-yard line, on which line did they finish?

1. Analysis: • What is being asked? ***On what yard line did the Eagles finish?*** • What labels needed? ***yards*** • What information do you need to solve the problems? ***Beginning yard line, gains, losses, penalties*** • What operations do you need to use? ***Addition and subtraction***	2. Representation: ***Beginning yardage + gains – losses - penalties = ending yardage*** ***40 + 5 + 9 -7 - 10 = ending yardage*** ***n = ending yardage*** . 3. Application (solve): ***54 - 17 = n*** ***37 = n*** • • •***The Eagles finished on their 37 yard line.***

2. On one series of play, the Eagles football offense began on their 10-yard line, and after 3 plays ended up on their own 45-yard line. They lost 5 yards on play 1, and gained 12 yards on play 2. How many yards were gained or lost on play 3?

1. Analysis: • What is being asked? ***How many yards were gained or lost on play 3*** • What labels needed? ***yards*** • What information do you need to solve the problem? ***Beginning yardage, yards gained/lost for play 1 and play 2, ending yard*** • What operation do your need to use? ***Addition, subtraction***	2. Representation: ***Beginning yardage + yards for play 1 + yards for play 2 + yards for play 3= ending yardage*** ***N = yards for play 3*** ***10 + - 5 + 12 + n = 45*** 3. Application (solve): ***22 - 5 + n = 45*** ***17 + n = 45*** ***-17 = -17*** ***n = 28*** • • •***The Eagles gained 28 yards on play 3.***

Decoding Word Problems III (HOMEWORK)

1. Derrick took $25 shopping. He spent $4.38 for lunch, and a movie ticket. He had $13.37 left after the trip. How much did Derrick spend on the movie ticket?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operation do you need to use?	2. Representation: . 3. Application (solve): • • •

2. Joseph took all of his birthday money shopping. He purchased a pair of jeans for $25.35, a t-shirt for $12.50, and a pair of shoes for $35.40. He had $14.75 left. How much money did he receive for his birthday?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: 3. Application (solve): • • •

Decoding Word Problems III (HOMEWORK) *Answer Key*

1. Derrick took $25 shopping. He spent $4.38 for lunch, and a movie ticket. He had $13.37 left after the trip. How much did Derrick spend on the movie ticket?

1. Analysis: • What is being asked? ***How much did Derrick spend on the movie ticket?*** • What labels needed? ***$*** • What information do you need to solve the problem? ***Total money Derrick took shopping*** ***How much he spent for lunch, and had left over.*** • What operation do you need to use? ***Addition and subtraction***	2. Representation: ***cost of lunch + cost of movie ticket + amount left over = total amount for shopping*** ***n = cost of movie ticket*** 3. Application (solve): ***$4.38 + n + $13.37 = $25*** ***n + $17.75 = $25*** ***n = $7.25*** • • •***Derrick spent $7.25 on the movie ticket.***

2. Joseph took all of his birthday money shopping. He purchased a pair of jeans for $25.35, a t-shirt for $12.50, and a pair of shoes for $35.40. He had $14.75 left. How much money did he receive for his birthday?

1. Analysis: • What is being asked? ***How much money did Joseph receive for his birthday?*** • What labels needed? ***$*** • What information do you need to solve the problem? ***How much Joseph spent on the trip*** ***How much he had left over*** • What operations do you need to use? ***Addition and subtraction***	2. Representation: ***Sum of the purchased + amount left over = total amount taken shopping*** ***Amount spent on jeans + amount spent on t-shirt + amount spent on shoes, + amount left over = total amount*** ***n = total amount taken shopping (total amount received for birthday)*** 3. Application (solve): ***$25.35 + $12.50 + $35.40 + $14.75 = n*** ***n = $88*** • • • ***Joseph received $88 for his birthday.***

Decoding Word Problems IV

1. Joyce took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 28 miles. If the trip was 108 miles long, how far did Joyce ride on the first day?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do your need to use?	2. Representation: . 3. Application (solve): • • •

2. Jordan took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 3 times as far as she did on the first day. If the trip was 108 miles long, how far did Jordan ride on the first day?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do your need to use?	2. Representation: . 3. Application (solve): • • •

Decoding Word Problems IV *Answer Key*

1. Joyce took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 28 miles. If the trip was 108 miles long, how far did Joyce ride on the first day?

1. Analysis: • What is being asked? ***How far did Joyce ride on the first day?*** • What labels needed? ***Miles*** • What information do you need to solve the problem? ***How far was the total trip*** ***How many miles were travel on day 2 and day 3*** • What operations do your need to use? ***Addition and subtraction***	2. Representation: ***miles on day 1 + miles on day 2 + miles on day 3 = total miles traveled*** ***where n = miles travel day 1*** . 3. Application (solve): ***n + 36 + 28 = 108*** ***n = 108 - 64*** ***n = 44 miles*** ∴ ***Joyce traveled 44 miles on day 1***

2. Jordan took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 3 times as far as she did on the first day. If the trip was 108 miles long, how far did Jordan ride on the first day?

1. Analysis: • What is being asked? ***How far did Jordan ride on the first day?*** • What labels needed? ***Miles*** • What information do you need to solve the problem? ***How far was the total trip*** ***How many miles were travel on day 2 and day 3*** • What operations do your need to use? ***Addition, subtraction, and multiplication***	2. Representation: ***miles on day 1 + miles on day 2 + miles on day 3 = total miles traveled*** ***where n = miles travel day 1*** ***where 3n = miles on day 3*** 3. Application (solve): ***n + 36 + 3n = 108*** ***4n + 36 = 108*** ***4n = 72*** ***n = 18*** ∴ ***Jordan traveled 18 miles on the first day.***

Cryptology Message 2

SDWP ZEZ KJA IWPD XKKG OWU PK PDA KPDAN IWPD XKKG?

“ZKJ’P XKPDAN IA, E DWRA IU KSJ LNKXHAIO.”

Cryptology Decoder 2

Key 5

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
				A	B	C																			

Decoded Response

_____

_____

_____

_____

Cryptology Message 2

Answer Key

SDWP ZEZ KJA IWPD XKKG OWU PK PDA KPDAN IWPD XKKG?

"ZKJ'P XKPDAN IA, E DWRA IU KSJ LNKXHAIO."

Cryptology Decoder 2

Key 5

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

W	X	Y	Z	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V

Decoded Response

What did one math book say to the other math book?

Don't bother me, I have my own problems.

Explaining Word Problem Solutions Ia

1. Three packages of chicken weigh 2.45 lbs., 3.2 lbs, and 2 lbs. What is the total of the weight of the chicken?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: 3. Application (solve): • • •

4. Explain how you found your solutions:

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Explaining Word Problem Solutions Ib

2. Sasha purchased three packages of chicken. The first package is 2.75 lbs, and second package is 3.4 lbs. She purchased a total of 8.5 lbs. of chicken. What is the weight of the third package?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: . 3. Application (solve): • • •

4. Explain how you found your solutions:

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Explaining Word Problem Solutions Ia *Answer Key*

1. Three packages of chicken weigh 2.45 lbs., 3.2 lbs, and 2 lbs. What is the total of the weight of the chicken?

1. Analysis: • What is being asked? ***What is the total weight of the chicken?*** • What labels needed? ***lbs.*** • What information do you need to solve the problem? ***The weight of each package of chicken*** • What operations do you need to use? ***Addition***	2. Representation: ***weight of package 1 + weight of package 2 + weight of package 3 = total*** ***2.45 + 3.2 + 2 = total weight*** ***n = total weight*** 3. Application (solve): ***2.45*** ***3.2*** ***2*** ***7.65 lbs.*** • • •***The weight of the chicken is 7.65 lbs.***

4. Explain how you found your solution.

To find the total weight of the chicken I found the sum of all of the packages of chicken.

Explaining Word Problem Solutions Ib *Answer Key*

2. Sasha purchased three packages of chicken. The first package is 2.75 lbs, and second package is 3.4 lbs. She purchased a total of 8.5 lbs. of chicken. What is the weight of the third package?

1. Analysis: • What is being asked? ***What is the weight of 3rd package of chicken?*** • What labels needed? ***lbs.*** • What information do you need to solve the problem? ***The weight of package 1 and 2, and the total weight.*** • What operations do you need to use? ***Addition and subtraction***	2. Representation: ***weight of package 1 + weight of package 2 + weight of package 3 = total*** ***2.75 + 3.4 + package 3 = total weight*** ***n = package 3*** 3. Application (solve): ***2.75*** ***3.4*** ***6.15*** ***6.16 + n = 8.5*** ***-6.15 = -6.15*** ***n = 2.35*** • • •***The weight of the 3rd package of chicken is 2.35 lbs.***

4. Explain how you found your solution.

I know that the sum of all 3 packages of chicken equals the total weight. I found the sum of the 2 packages of chicken, and subtracted that sum from the total weight to find the weight of the remaining package 3.

Explaining Word Problem Solutions IIa

1. The Eagles were playing a football game against the Sharks. During one series of plays, the Eagles gained 5 yards, gained 9 yards, lost 7 yards, and received a 10-yard penalty. If they started play on their own 40-yard line, on which line did they finish?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: . 3. Application (solve): ∴

4. Explain how you found your solutions:

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Explaining Word Problem Solutions IIb

2. On one series of play, the Eagles football offense began on their 10-yard line, and after 3 plays ended up on their own 45-yard line. They lost 5 yards on play 1, and gained 12 yards on play 2. How many yards were gained or lost on play 3?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operation do your need to use?	2. Representation: . 3. Application (solve): • • •

4. Explain how you found your solutions:

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Explaining Word Problem Solutions IIa *Answer Key*

1. The Eagles were playing a football game against the Sharks. During one series of plays, the Eagles gained 5 yards, gained 9 yards, lost 7 yards, and received a 10-yard penalty. If they started play on their own 40-yard line, on which line did they finish?

1. Analysis: • What is being asked? ***On what yard line did the Eagles finish?*** • What labels needed? ***yards*** • What information do you need to solve the problems? ***Beginning yard line, gains, losses, penalties*** • What operations do you need to use? ***Addition and subtraction***	2. Representation: ***Beginning yardage + gains – losses - penalties = ending yardage*** ***40 + 5 + 9 -7 - 10 = ending yardage*** ***n = ending yardage*** . 3. Application (solve): ***54 - 17 = n*** ***37 = n*** • ***The Eagles finished on their 37 yard line.***

4. Explain how you found your solution.

I know if I begin on the 40-yard line, I add my gains, subtract my losses and penalty to find on what yard I finished. I found the sum of like signs, and subtracted the unlike signs to find unknown n, the yard line on which the Eagles finished.

Explaining Word Problem Solutions IIb *Answer Key*

2. On one series of play, the Eagles football offense began on their 10-yard line, and after 3 plays ended up on their own 45-yard line. They lost 5 yards on play 1, and gained 12 yards on play 2. How many yards were gained or lost on play 3?

1. Analysis: • What is being asked? ***How many yards were gained or lost on play 3*** • What labels needed? ***yards*** • What information do you need to solve the problem? ***Beginning yardage, yards gained/lost for play 1 and play 2, ending yard*** • What operation do your need to use? ***Addition, subtraction***	2. Representation: ***Beginning yardage + yards for play 1 + yards for play 2 + yards for play 3= ending yardage*** ***N = yards for play 3*** ***10 + - 5 + 12 + n = 45*** 3. Application (solve): ***23 - 5 + n = 45*** ***17 + n = 45*** ***-17 = -17*** ***n = 28*** • • • ***The Eagles gained 28 yards on play 3.***

4. Explain how you found your solution. ***I know my beginning yards plus the yards gained or lost on each play will give me my ending yards. If I know my beginning yards, and the yards for play 1 and play 2, I can add these together, and subtract this total from my ending yards, to find my missing yards gained on play 3.***

Explaining Word Problem Solutions IIIa
(HOMEWORK)

1. Derrick took $25 shopping. He spent $4.38 for lunch, and a movie ticket. He had $13.37 left after the trip. How much did Derrick spend on the movie ticket?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operation do you need to use?	2. Representation: . 3. Application (solve): • • •

4. Explain how you found your solutions:

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Explaining Word Problem Solutions IIIb
(HOMEWORK)

2. Joseph took all of his birthday money shopping. He purchased a pair of jeans for $25.35, a t-shirt for $12.50, and a pair of shoes for $35.40. He had $14.75 left. How much money did he receive for his birthday?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do you need to use?	2. Representation: . 3. Application (solve): • • •

4. Explain how you found your solutions:

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Explaining Word Problem Solutions IIIa *Answer Key*

1. Derrick took $25 shopping. He spent $4.38 for lunch, and a movie ticket. He had $13.37 left after the trip. How much did Derrick spend on the movie ticket?

1. Analysis: • What is being asked? ***How much did Derrick spend on the movie ticket?*** • What labels needed? ***$*** • What information do you need to solve the problem? ***Total money Derrick took shopping How much he spent for lunch, and had left over.*** • What operation do you need to use? ***Addition and subtraction***	2. Representation: ***cost of lunch + cost of movie ticket + amount left over = total amount for shopping*** ***n = cost of movie ticket*** 3. Application (solve): ***$4.38 + n + $13.37 = $25*** ***n + $17.75 = $25*** ***n = $7.25*** ∴ ***Derrick spent $7.25 on the movie ticket.***

4. Explain how you found your solutions: ***I know if I find the sum of the cost of the movie ticket, the lunch, and the amount I have left over, it will give me my total. I subtracted from my total the amount I know, the $4.38 and $13.37 to find I had $7.25 left to spend on the movie ticket.***

Explaining Word Problem Solutions IIIb *Answer Key*

2. Joseph took all of his birthday money shopping. He purchased a pair of jeans for $25.35, a t-shirt for $12.50, and a pair of shoes for $35.40. He had $14.75 left. How much money did he receive for his birthday?

1. Analysis: • What is being asked? ***How much money did Joseph receive for his birthday?*** • What labels needed? ***$*** • What information do you need to solve the problem? ***How much Joseph spent on the trip*** ***How much he had left over*** • What operations do you need to use? ***Addition and subtraction***	2. Representation: ***Sum of the purchased + amount left over = total amount taken shopping*** ***Amount spent on jeans + amount spent on t-shirt + amount spent on shoes, + amount left over = total amount*** ***n = total amount taken shopping (total amount received for birthday)*** 3. Application (solve): ***$25.35 + $12.50 + $35.40 + $14.75 = n*** ***n = $88*** • • • ***Joseph received $88 for his birthday.***

4. Explain how you found your solutions: ***I know that Joseph took all of his birthday money shopping. The sum of all his purchases plus any amount left over equals the total amount he took shopping. The total is $88.00.***

Explaining Word Problem Solutions IVa

1. Joyce took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 28 miles. If the trip was 108 miles long, how far did Joyce ride on the first day?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do your need to use?	2. Representation: . 3. Application (solve): • ∴

4. Explain how you found your solutions:

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Explaining Word Problem Solutions IVb

2. Jordan took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 3 times as far as she did on the first day. If the trip was 108 miles long, how far did Jordan ride on the first day?

1. Analysis: • What is being asked? • What labels needed? _____ • What information do you need to solve the problem? • What operations do your need to use?	2. Representation: . 3. Application (solve): ∴

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Explaining Word Problem Solutions IVa *Answer Key*

1. Joyce took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 28 miles. If the trip was 108 miles long, how far did Joyce ride on the first day?

1. Analysis: • What is being asked? ***How far did Joyce ride on the first day?*** • What labels needed? ***Miles*** • What information do you need to solve the problem? ***How far was the total trip*** ***How many miles were travel on day 2 and day 3*** • What operations do your need to use? ***Addition and subtraction***	2. Representation: ***miles on day 1 + miles on day 2 + miles on day 3 = total miles traveled*** ***where n = miles travel day 1*** . 3. Application (solve): ***n + 36 + 28 = 108*** ***n = 108 - 64*** ***n = 44 miles*** • ***Joyce traveled 44 miles on day 1***

4. Explain how you found your solutions: ***I know the total miles is the sum of the miles traveled each day. She traveled 3 days. If I know two of the days, I subtract their sum from the total to find the distance traveled on day 1.***

Explaining Word Problem Solutions IVb *Answer Key*

2. Jordan took a 3-day bike trip. On the second day of the trip, she rode 36 miles. On the third day she rode 3 times as far as she did on the first day. If the trip was 108 miles long, how far did Jordan ride on the first day?

1. Analysis: • What is being asked? ***How far did Jordan ride on the first day?*** • What labels needed? ***Miles*** • What information do you need to solve the problem? ***How far was the total trip*** ***How many miles were travel on day 2 and day 3*** • What operations do your need to use? ***Addition, subtraction, and multiplication***	2. Representation: ***miles on day 1 + miles on day 2 + miles on day 3 = total miles traveled*** ***where n = miles travel day 1*** ***where 3n = miles on day 3*** 3. Application (solve): ***n + 36 + 3n = 108*** ***4n + 36 = 108*** ***4n = 72*** ***n = 18*** ∴ ***Jordan traveled 18 miles on the first day.***

4. Explain how you found your solutions:

I know the total miles is the sum of the miles traveled each day. Day 3 is dependent on how far she traveled on day 1. It is three times the distance for day 1. If I find the sum of day 1 and 3, I will have 4 n. Day 2 is 36 miles. Their total is 108 miles. I then performed algebra to isolate the variable n, and found it to be 18.