Success Center
Directed Learning Activity (DLA)

Word Problems:
Translations

M106.1
Directed Learning Activity – Word Problems: Translations

Description: *In this Directed Learning Activity (DLA), you will learn about word problems with translations.*

Prior Knowledge: *In order to complete this DLA, you will need to know how to solve a linear equation.*

Solve for \( x \):

\[
4x + 650 - 5x = 562 \\
-x + 650 = 562 \\
-x = -88 \\
x = 88
\]

*You will also need to know how to translate an algebraic expression. If you want some more practice with this skill, the Success Center recommends completing the DLA “Translating Algebraic Expressions.”*

Four times the sum of five and \( x \). 

\[4 \cdot (5 + x)\]

A number is five times ten.

\[x = 5 \cdot 10\]

Materials: *A scientific calculator may be needed.*

Directions: *Please read the examples and answer the questions that follow carefully – and in order. Please do not skip ahead. If you have a question, please ask for help.*

- After reading the problem, spend some time thinking about what is being presented. After you feel you understand the problem, try to answer the practice questions by filling in the gray-shaded regions. The questions are sequential, and the answers you obtain may be used in the following questions.
- When you are finished, review the DLA with a tutor. Don’t worry, you are not being graded. This is a learning activity, and you are not expected to know everything.

Part One: Setting up a Word Problem Involving Translations

There are five steps in solving a word problem involving translations:

a) **Define your variable.**
   - i) Write down the names of the subjects or the quantities used in the word problem.
   - ii) Assign a variable to one of the subjects and algebraic expressions to the others.

b) **Form an equation.**

c) **Solve the equation.**

d) **State your answers using a complete sentence. Include units.**

e) **Make sure your answer makes sense in the context of the word problem.**
Part Two: Assigning a Variable

Look for a translation that is describing a subject in terms of another subject. OR
Look for a common subject that is used to describe other subjects.

Problem 1: If the length is 4 feet more than the width, express the length and width using one variable.

The length is being described in terms of the width, so the width = W.

The length is 4 ft. more than the width.
The length = 4 + \text{the width.}

Answer:
The width = W \quad \text{AND} \quad \text{The length} = 4 + W

Problem 2: There are 4 times as many apples as pears in a bowl. Express the number of apples and pears using one variable.

The number of apples is being described in terms of the number of pears, so the number of pears = P.

There are 4 times as many apples as pears. → The number of apples is 4 times the number of pears.

Answer:
The number of pears = P \quad \text{The number of apples} = 4P

The descriptions of our subjects must be very thorough. Notice that I did not use just pears, but the number of pears. For example, if we are asked to find the speed of the car, then we must define our variable to be the speed of the car and not just the car.

Practice 1: The daily listening audience of an AM radio station is four times as large as that of its FM sister station. Express the number of daily listeners of the AM and FM stations in terms of one variable.

The number of daily listeners of the FM station = X

Practice 2: (Three or more subjects.) A fertilizer for avocado trees uses iron, nitrogen, and mulch. If the amount of mulch is 20 lbs. more than the amount of iron, and the amount of nitrogen is three times the amount of iron, express the amount of mulch, nitrogen, and iron in terms of one variable?

The amount of iron is being used to describe the amount of the other two subjects, so the amount of iron = X.

The amount of mulch is 20 lbs. more than the amount of iron.
The amount of mulch = X + 20.

The amount of nitrogen is three times the amount of iron.
The amount of nitrogen = 3X.
Part Three: Forming an Equation

Problem 3: The number of listeners of an AM radio station is four times as large as that of its FM sister station. If 100,000 people listen to these two radio stations, how many listeners does the FM station have?

a) Define your variable.
   i) Write down the names of the subjects or the quantities used in the word problem.
   ii) Assign a variable to one of the subjects and algebraic expressions to the others.

   The number of FM station listeners = ___________.

   The number of listeners of an AM radio station is four times as large as that of its FM sister station

   The number of AM station listeners = _____________________.

b) Form an equation.

   If 100,000 people listen to these two radio stations, how many listeners does the FM station have?

   The number of AM station listeners + the number of FM station listeners = 100,000

   (________________________) + (__________) = ______________

c) Solve the equation.

Answer:
The number of FM station listeners = \( x = \) ___________

The number of AM station listeners = \( 4x = 4(\ )\) = ___________

d) State your answers using a complete sentence. Include units.

Complete sentence: The number of AM station listeners is _______________.

Complete sentence: The number of FM station listeners is _______________.

e) Make sure your answer makes sense in the context of the word problem.

Is the number of listeners of an AM radio station four times as large as that of its FM sister station?

Are there a total of 100,000 people listening to these two radio stations?
Problem 4: A bag of fertilizer for avocado trees uses iron, nitrogen, and mulch. The amount of mulch is 20 lbs. more than the amount of iron, and the amount of nitrogen is three times the amount of iron. If the bag of fertilizer weighs 50 lbs., then how many pounds of each ingredient are there?

a) Define your variable.
   i) Write down the names of the subjects or the quantities used in the word problem.
   ii) Assign a variable to one of the subjects and algebraic expressions to the other subjects.

   The amount of iron is being used to describe the amount of the other two subjects, so
   \( \text{the amount of iron} = X \).

   The amount of mulch is 20 lbs. more than the amount of iron.
   The amount of mulch = \( X + 20 \) lbs.

   The amount of nitrogen is three times the amount of iron.
   The amount of nitrogen = \( 3X \) lbs.

b) Form an equation.
   \( \text{If the bag of fertilizer weighs 50 lbs., then how many pounds of each ingredient are there?} \)

   The amount of iron + the amount of mulch + the amount of nitrogen = 50 lbs.
   \( (X) + (X + 20) + (3X) = 50 \)

   c) Solve the equation.

   \( X + X + 20 + 3X = 50 \)
   \( 5X + 20 = 50 \)
   \( 5X = 30 \)
   \( X = 6 \) lbs.

   The amount of mulch = \( X + 20 = 26 \) lbs.

   The amount of nitrogen = \( 3X = 18 \) lbs.

d) State your answers using a complete sentence. Include units.

   The amount of iron = 6 lbs.
   The amount of mulch = 26 lbs.
   The amount of nitrogen = 18 lbs.

   d) State your answers using a complete sentence. Include units.

   e) Make sure your answer makes sense in the context of the word problem.

   Is there a total of 50 lbs. of ingredients?
   Yes, the total is 50 lbs.

   Is the amount of mulch 20 lbs. more than the amount of iron?
   Yes, the amount of mulch is 26 lbs., which is 20 lbs. more than the amount of iron.

   Is the amount of nitrogen three times the amount of iron?
   Yes, the amount of nitrogen is 18 lbs., which is three times the amount of iron.
Part Four: Putting It All Together

Practice 3: In a biology course, students spend a total of 250 minutes in lab and lecture each week. The lab time is 50 minutes shorter than the lecture time. How many minutes do the students spend in lecture per week?

a) Define your variable.

__________________ = ________

The lab time is 50 minutes shorter than the lecture time.

__________________ = __________________

b) Form an equation.

In a biology course, students spend a total of 250 minutes in lab and lecture each week.

__________________

c) Solve the equation.

Answer:

__________________ = __________________ = __________________

__________________ = ________

d) State your answers using a complete sentence. Include units.

__________________

e) Make sure your answer makes sense in the context of the word problem.

__________________

__________________
Practice 4: The width of a rectangular garden is one-third its length, and its perimeter is 32 m. Find the dimensions of the garden.

a) Define your variable.

\[ \text{width} = \text{ } \]

The width of a rectangular garden is one-third its length.

\[ \text{ width } = \text{ } \]

b) Form an equation.

The perimeter is 32 m.

(Perimeter = 2 \cdot \text{length} + 2 \cdot \text{width})

\[ \text{ } = \text{ } \]

c) Solve the equation.

Answer:

\[ \text{ } = \text{ } \]
[Blank space for calculations]

\[ \text{ } = \text{ } \]

d) State your answers using a complete sentence. Include units.

[Blank space for final answer]

[Blank space for final answer]

[Blank space for final answer]

e) Make sure your answer makes sense in the context of the word problem.

[Blank space for verification]
[Blank space for verification]
[Blank space for verification]
Practice 5: The sum of two numbers is 83. One of the numbers is 11 more than the other. What are the numbers?

a) Define your variable.

_____________________________ = ______

_____________________________ = __________________

b) Form an equation.

____________________________________________________________________

____________________________________________________________________

c) Solve the equation.

Answer:

_____________________________ = ______________ = ______________

_____________________________ = ______

d) State your answers using a complete sentence. Include units.

____________________________________________________________________

____________________________________________________________________

e) Make sure your answer makes sense in the context of the word problem.

____________________________________________________________________

____________________________________________________________________

Part Five: Reflection

a) Name one thing that you understand better about word problems involving translations as a result of completing this activity.
b) Name one thing that you still do not understand about word problems involving translations.

c) Do you feel more or less confident with word problems involving translations? Why?

STOP. Please go over your work with a tutor at this time.
Tutor Feedback:

_______ The student completed the entire activity.

_______ The student attempted to answer every question.

_______ The student demonstrated an understanding of the processes of solving word problems that involve translations during the discussion of his/her work.

Additional Comments:

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

To complete this DLA, you must turn this sheet into the front desk receptionist.