

Activities/ Resources for Outcomes

Activities/Resources for Outcome #1

MATH ANXIETY SELF-IDENTIFICATION EXERCISE

People with math anxiety often experience difficulty and frustration while learning, taking a test or answering questions in math class. Many of these people don't know they have math anxiety even though they suffer from it and its effects. Many math anxious people don't even want to know they have math anxiety. They are often too busy avoiding what might become upsetting to them. Math anxiety can sometimes affect one or more areas of a person's life. For some people, taking a math course is enough to upset them, and for some people any type of a test is a potential threat.

A main symptom of math anxiety of getting very uptight when it comes to going to math class, taking a test or possibly encountering some other very unpleasant situation. Another symptom is avoiding contact with the potentially unpleasant situation as much as possible. Regardless of how the math anxious person reacts, some can perform very well, but most don't do well. The ones who don't do well have often established a strongly formed habit of giving up or avoiding. This avoiding or giving up often mistakenly leads to the assumption that the anxious person lacks some ability to perform a task or reach some goal. If this assumption is not tested and corrected, these anxious people are condemning themselves to function at a level much below their actual ability.

This self-evaluation exercise is designed to help you look at yourself to see if you do or do not have math anxiety. If you find that you have math anxiety, then you are in a very lucky position. You are lucky because you will have the opportunity to do something about it now. By working on your math anxiety, you can rid yourself of that uptight feeling which you associate with some task or area of your life. Those people who learn how to better deal with their math anxiety find that they not only feel better, but they often do much better than they ever expected.

REVISED MATH ATTITUDE SCALE **(Dutton)**

Please mark the following statements to show how you feel about each one. The five points are: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), Strongly Agree (SA).

- 1) I am always under a terrible strain in a math class.

SD D U A SA

- 2) Mathematics is very interesting to me, and I enjoy math courses.

SD D U A SA

- 3) I do not like mathematics, and it scares me to have to take it.

SD D U A SA

- 4) Mathematics is fascinating and fun.

SD D U A SA

- 5) Mathematics makes me feel secure, and at the same time it is stimulating.

SD D U A SA

- 6) My mind goes blank, and I am unable to think clearly when working math.

SD D U A SA

- 7) I feel a sense of insecurity when attempting mathematics.

SD D U A SA

- 8) Mathematics makes me feel uncomfortable, restless, irritable, and impatient.

SD D U A SA

9) The feeling that I have toward mathematics is a good feeling.

SD D U A SA

10) Mathematics makes me feel as though I'm lost in a jungle of numbers and cannot find my way out.

SD D U A SA

11) Mathematics is something that I enjoy a great deal.

SD D U A SA

12) When I hear the word math, I have a feeling or dislike.

SD D U A SA

13) I approach math with a feeling of hesitation, resulting from a fear of not being able to do math.

SD D U A SA

14) I really like mathematics.

SD D U A SA

15) Mathematics is a course in school that I have always enjoyed.

SD D U A SA

16) It makes me nervous to even think about having to do a math problem.

SD D U A SA

17) I have never liked math, and it is my most dreaded subject.

SD D U A SA

18) I am happier in a math class than in any other class.

SD D U A SA

19) I feel at ease in mathematics, and I like it very much.

SD D U A SA

20) I feel a definite positive reaction to mathematics; it is enjoyable.

SD D U A SA

REVISED MATH ATTITUDE SCALE (DUTTON) SCORING

Read each item and decide if agreement with it expresses a positive or negative attitude. (see chart below)

If positive, score SA = +2, A = +1, U = 0, D = -1, SD = -2.

If negative, score SA = -2, A = -1, U = 0, D = +1, SD = +2.

Total the number values for the items and divide by 20.

This number should lie between 2 and -2, expressing, respectively, a negative to positive attitude.

0 indicates a neutral attitude.

Do not show scoring rules to student prior to responding.

Item #	Score	Item #	Score
1 – neg		11 – pos	
2 – pos		12 – neg	
3 – neg		13 – neg	
4 – pos		14 – pos	
5 – pos		15 – pos	
6 – neg		16 – neg	
7 - neg		17 – neg	
8 – neg		18 – pos	
9 – pos		19 – pos	
10 – neg		20 – pos	

Ten Ways To Reduce Math Anxiety

- 1. Overcome negative self-talk.**
- 2. Ask questions.**
- 3. Consider math a foreign language -- it must be practiced.**
- 4. Don't rely on memorization to study mathematics.**
- 5. READ your math text.**
- 6. Study math according to YOUR LEARNING STYLE.**
- 7. Get help the same day you don't understand.**
- 8. Be relaxed and comfortable while studying math.**
- 9. "TALK" mathematics.**
- 10. Develop responsibility for your own successes and failures.**

Source: <http://www.mathpower.com/reduce.htm>

Math Anxiety Code of Responsibilities

1. I have the responsibility to attend all classes and do all homework as assigned.
2. I have the responsibility to recognize the rights of others to learn at their own pace.
3. I have the responsibility to seek extra help when necessary.
4. I have the responsibility to see the teacher during office hours or to schedule an appointment for assistance.
5. I have the responsibility to come to class prepared; homework finished and/or questions to ask.
6. I have the responsibility to speak up when I don't understand.
7. I have the responsibility to give math at least the same effort I give to other subjects.
8. I have the responsibility to begin my math study at my current skill level.
9. I am responsible for my attitudes about my abilities.
10. I have the responsibility to learn about instructors prior to registering for class.
11. I have the responsibility for learning and practicing relaxation skills.
12. I have the responsibility to act as a competent adult.
13. I have the responsibility to approach math with an open mind rather than fighting it.
14. I have the responsibility to be realistic about my goals and expectations.

Source: <http://home.capecod.net/~tpanitz/ccchtml/responsibilities.html>

Activities/Resources for Outcomes 2, 3, 4, 5

TDL Math Learning Project 1: Trucking

TDL Math: Learning Project 1

Title: Trucking

Career Cluster: Transportation, Distribution, and Logistics

Objective: Students will apply math skills to solve problems in a TDL workplace setting

For use with **TDL Math Module Outcomes 2, 3, 4, 5**

TDL Context Scenario

You are a professional truck driver for XYZ Company. During the week, you will be transporting merchandise from the company's main distribution center in Springfield, Illinois, to various retail locations throughout the state. Truck drivers are required to use a variety of math skills to accurately complete trucker's logs and company reports. You will use the Trip Planning Map (Handout #1) and the information provided in each activity to answer the questions and complete the Trip Planning Forms (Handout #2) and Trucker's Log (Handout #3) for your employer.

Materials included:

Project overview

Student worksheets 1, 2, & 3

Handout #1 – Trip Planning Map

Handout #2 – Trip Planning Forms

Handout #3 – Trucker's Log

Answer Keys

Instructor notes:

- The purpose of this learning project is to help students develop and apply math skills in a TDL workplace setting.
- The activities in this learning project were designed to be incorporated throughout multiple instructional periods as concepts from module outcomes 2, 3, 4, & 5 are taught in a TDL context. However, the lessons may also be used as a culminating activity for these learning outcomes.
- You may eliminate some of the exercises or incorporate your own variations into the activities to make the learning project more or less challenging for your students. For example, due to road construction or bad weather, the driver could only travel at 35mph between Naperville and Champaign on Day 2; use this information to recalculate the driving time, total hours worked, etc. Another option would be to have students use a paper map and ruler to measure the distances between locations and then use the map scale to convert the measurements into miles.
- Integration of technology: Instead of using the trip planning map provided, have students use an internet map program, such as Google Maps or MapQuest, to find the distance between the various locations, or alternate locations of the instructor's choice. You could also have students use Word or Excel to create their own trip planning charts.

TDL Math 1: Trucking - Student Worksheet 1**TDL Context Scenario**

You are a professional truck driver for XYZ Company. During the week, you will be transporting merchandise from the company's main distribution center in Springfield, Illinois, to various retail locations throughout the state. Truck drivers are required to use a variety of math skills to accurately complete trucker's logs and company reports. You will use the Trip Planning Map (Handout #1) and the information provided in each exercise to answer the questions and complete the Trip Planning Forms (Handout #2) and Trucker's Log (Handout #3) for your employer.

Activity 1

Your supervisor has given you four Trip Planning Forms with the locations of the deliveries you will be making each day this week. You are required to complete and submit these forms before beginning your deliveries tomorrow morning. You are also required to submit your Trucker's Log at the end of the week. Use the Trip Planning Map to find the distance between the locations for each day and record this number in the correct column of each trip planning form. The first one has been completed for you. After completing this task, answer the following questions:

1. How many miles will you drive each day?

Day 1 _____

Day 2 _____

Day 3 _____

Day 4 _____

2. On which day will you drive the most miles?
3. On which day will you drive the least number of miles?
4. What is the difference between the miles driven on Day 4 and Day 1?
5. On day 1, how many miles will you have driven when you arrive in Effingham? Write this number as a fraction of the total miles for day 1 and reduce your answer to lowest terms. What fraction of the trip will you have left to drive that day? Convert this fraction to a decimal and round to the thousandths place.

6. On day 4, how many miles will you have driven after you arrive in Bloomington? Write this number as a fraction of the total miles for day 4 and reduce your answer to lowest terms. What fraction of the trip will you have left to drive that day? Convert this fraction to a decimal and round to the hundredths place.
7. What is the total number of miles you will drive this week?
8. What fraction of the total miles for the week will you drive on day 1? Reduce your answer to lowest terms.
9. What is the total number of miles you will drive on days 1 and 2? Write this number as a fraction of the total miles you will drive for the week and reduce your answer to lowest terms.
10. What is the total number of miles you will drive on days 3 and 4? Write this number as a fraction of the total miles you will drive for the week and reduce your answer to lowest terms.
11. What is the average number of miles per day that you will drive this week? Round your answer to the nearest whole number.
12. Truck drivers are required to maintain accurate records of their driving locations, miles, and driving times. For the purpose of this activity, you will use the locations and miles driven from your TripPlanning Forms to complete your Trucker's Log. First, enter your name in the Driver's Name box. In the Trip Record section, write the origin cities, destination cities, and miles driven in the correct columns. Add the numbers in the Miles column and record the total miles for the week in the correct space at the bottom of the column. This number should match your answer in question #_____.

TDL Math: Trucking - Student Worksheet 2**Activity 2**

Use an average speed of **60 mph** to calculate your estimated driving time for each leg of each daily trip. Round your answer to the nearest hundredths place, if necessary. Record your answers in the driving time column of your Trip Planning Forms. The first one has been completed for you.

1. How many hours you will spend driving each day?

Day 1 _____

Day 2 _____

Day 3 _____

Day 4 _____

2. What is the total number of hours you will spend driving this week?
3. Using the information from your trip planning forms, record the driving time for each trip for each day in the driving time column on your Trucker's Log. The first one has been entered for you.
4. Each delivery stop on your route takes approximately 1 hour to unload the truck. How many hours will you need to add to each day to determine the total hours worked for that day?
5. On day 2, you leave Springfield at 7:00 a.m., approximately what time will you return to the distribution center at the end of the day?
6. On day 2, what time should you expect to leave Naperville for your next stop in Champaign?
7. On day 4, you leave Springfield at 7:15 a.m., approximately what time will you arrive at your first stop in Peoria?

8. On day 1, you leave Springfield at 7:00 a.m. If you take a 30 minute lunch break, what time will you arrive back at the distribution center?
9. On day 3, you leave the Springfield at 7:30 a.m., approximately what time will you return at the end of the day if you take a 45 minute lunch break?
10. In addition to your drive time and unloading time at your delivery stops, you spend 1 hour each day completing your reports and logs when you return to the distribution center. What is the total number of hours you will work each day?

Day 1 _____

Day 2 _____

Day 3 _____

Day 4 _____

11. If day 5 is a holiday and you are paid for 8 hours, what is the total number of hours for which you will be paid this week?
12. Your hourly pay as a truck driver with XYZ Company is \$22.50 per hour. What are your gross wages for this week? Round your answer to the nearest cent.
13. The following deductions are made from your check this week. What is the total amount of the deductions on your paycheck this week?

Federal income taxes	93.84
State income taxes	39.15
FICA withholding	54.00
Health insurance	31.00
Union dues	10.20

14. What is your net pay for the week?

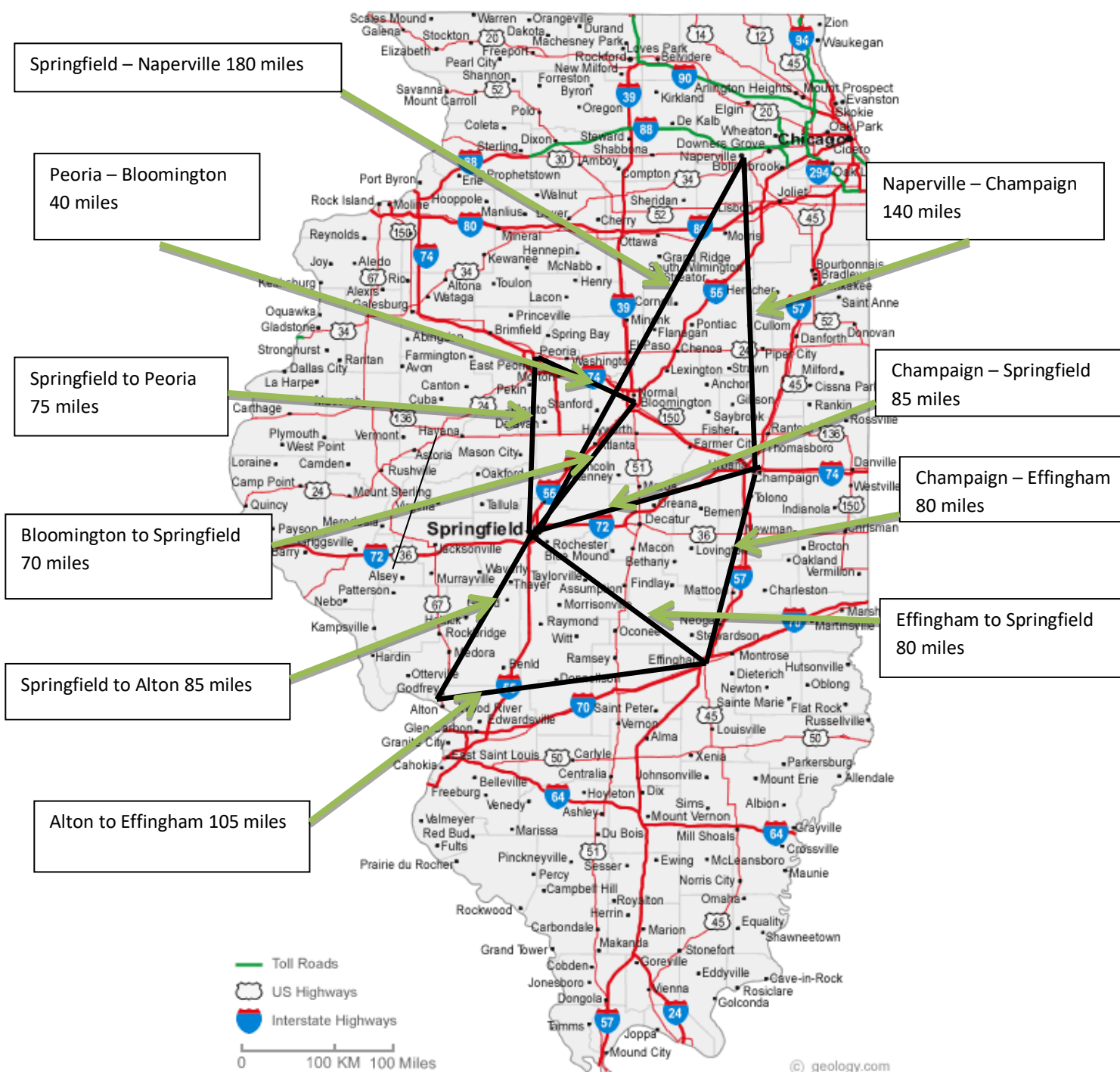
TDL Math: Trucking - Student Worksheet 3**Activity 3**

1. At the beginning of the week, the truck odometer reading is 52,500. What will the odometer reading be at the end of:
Day 1 _____
Day 2 _____
Day 3 _____
Day 4 _____
2. Record the ending odometer reading in the appropriate space on your Trucker's Log. Calculate the total distance driven using the truck's beginning and ending odometer readings. Show your work here and record your answer in the Total Distance box on your trucker's log.
3. Your answer in question #2 should match the answer to question # _____ from Activity 2.
4. Your truck has a 100 gallon fuel tank capacity. The tank is full at the start of your first delivery day. Assume that your truck gets **10 mpg**. How many miles can you expect to drive on one tank of fuel?
5. Approximately how many gallons of gas will you use to make the deliveries for all 4 days?
6. If you drive 280 miles on day 1, approximately how many gallons of gas will you use?

7. What are the total miles you will drive for days 1 and 2? Approximately how many gallons of gas will be left in your tank at the end of day 2?
8. At the end of day 2, you fill your tank. How many gallons of fuel will you need to purchase?
9. The price of fuel is \$3.83 per gallon. What will it cost to fill the tank? Round your answer to the nearest cent. Record this information in the fuel purchase record section of your Trucker's Log.
10. What are total miles you will drive for days 3 and 4? Approximately how many gallons of gas will you have left in your tank at the end of day 4?
11. At the end of day 4, you fill your tank again. How many gallons of fuel will you need to purchase?
12. If the price of fuel is \$3.79 per gallon, what will it cost to fill your tank? Record this information in the fuel purchase record section of your Trucker's Log.
13. What is the total cost of the two fuel purchases?
14. Using the total miles driven from your Trucker's Log and the total cost of the two fuel purchases, calculate the cost per mile of your deliveries this week.

TDL Math: Trucking - Handout #1

Trip Planning Map



TDL Math: Trucking - Handout #2**Name:** _____**Day 1 Trip Planning Form**

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Alton	85	1.42
Alton - Effingham		
Effingham - Springfield		

Day 2 Trip Planning Form

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Naperville		
Naperville - Champaign		
Champaign - Springfield		

Day 3 Trip Planning Form

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Effingham		
Effingham - Champaign		
Champaign - Springfield		

Day 4 Trip Planning Form

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Peoria		
Peoria - Bloomington		
Bloomington - Springfield		

Trucker's Log

Drivers Name		Company	Week
		XYZ Company	
Truck number	Starting Odometer Reading	Ending Odometer Reading	Total Distance
#456	52,500		

Trip Record					
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Date	Trailer	OriginCity	DestinationCity	Miles	Driving Time (in hours)
	001	Springfield	Alton	85	1.42
	001				
	001				
	001				
	001				
	001				
	001				
	001				
	001				
	001				
	001				
	001				
	001				
	001				
Totals:Trips, Miles & Drive Time					

Fuel Purchase Record							
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Date	Odometer	Miles Driven	Gallons	MPG	Rate per Gallon	Total Cost	Notes
Average Miles Per Gallon					Average Cost of Fuel Per Gallon		

Student Worksheet 1

TDL Context Scenario

You are a professional truck driver for XYZ Company. During the week, you will be transporting merchandise from the company's main distribution center in Springfield, Illinois, to various retail locations throughout the state. Truck drivers are required to use a variety of math skills to accurately complete trucker's logs and company reports. You will use the Trip Planning Map (Handout #1) and the information provided in each exercise to answer the questions and complete the Trip Planning Forms (Handout #2) and Trucker's Log (Handout #3) for your employer.

Activity 1

Your supervisor has given you four Trip Planning Forms with the locations of the deliveries you will be making each day this week. You are required to complete and submit these forms before beginning your deliveries tomorrow morning. You are also required to submit your Trucker's Log at the end of the week. Use the Trip Planning Map to find the distance between the locations for each day and record this number in the correct column of each trip planning form. The first one has been completed for you. After completing this task, answer the following questions:

1. How many miles will you drive each day?

Day 1: $85 + 105 + 80 = \underline{270}$

Day 2: $180 + 140 + 85 = \underline{405}$

Day 3: $90 + 80 + 85 = \underline{255}$

Day 4: $75 + 40 + 70 = \underline{185}$

2. On which day will you drive the most miles? Day 2

3. On which day will you drive the least number of miles? Day 4

4. What is the difference between the miles driven on Day 3 and Day 1?

$270 - 255 = \underline{15 \text{ miles}}$

5. On day 1, how many miles will you have driven when you arrive in Effingham? Write this number as a fraction of the total miles for day 1 and reduce your answer to lowest terms. What fraction of the trip will you have left to drive that day? Convert this fraction to a decimal and round to the thousandths place.

$85 + 105 = \underline{190}$

$190/270 = \underline{19/27}$

$80/270 = \underline{8/27}$

$8 \div 27 = \underline{.296}$

6. On day 4, how many miles will you have driven after you arrive in Bloomington? Write this number as a fraction of the total miles for day 4 and reduce your answer to lowest terms. What fraction of the trip will you have left to drive that day? Convert this fraction to a decimal and round to the hundredths place.

$$70 + 40 = \underline{115}$$

$$115/185 = \underline{23/37}$$

$$70/185 = \underline{14/37}$$

$$14 \div 37 = \underline{.38}$$

7. What is the total number of miles you will drive this week?

$$270 + 405 + 255 + 185 = \underline{1115}$$

8. What fraction of the total miles for the week will you drive on day 1? Reduce your answer to lowest terms.

$$270/1115 = \underline{54/223}$$

9. What is the total number of miles you will drive on days 1 and 2? Write this number as a fraction of the total miles you will drive for the week and reduce your answer to lowest terms.

$$270 + 405 = \underline{675}$$

$$675/1115 = \underline{135/223}$$

10. What is the total number of miles you will drive on days 3 and 4? Write this number as a fraction of the total miles you will drive for the week and reduce your answer to lowest terms.

$$255 + 185 = \underline{440}$$

$$440/1115 = \underline{88/223}$$

11. What is the average number of miles per day that you will drive this week? Round your answer to the nearest whole number.

$$1115 \div 4 = 278.75 \rightarrow \underline{279}$$

12. Truck drivers are required to maintain accurate records of their driving locations, miles, and driving times. For the purpose of this activity, you will use the locations and miles driven from your TripPlanning Forms to complete your Trucker's Log. First, enter your name in the Driver's Name box. In the Trip Record section, write the origin cities, destination cities, and miles driven in the correct columns. Add the numbers in the Miles column and record the total miles for the week in the correct space at the bottom of the column. This number should match your answer in question # 7.

Student Worksheet 2

Activity 2

Use an average speed of **60 mph** to calculate your estimated driving time for each leg of each daily trip. Round your answer to the nearest hundredths place, if necessary. Record your answers in the driving time column of the Trip Planning Forms. The first one has been completed for you.

1. What is the total number of hours you will spend driving each day?

Day 1: $85 \div 60 = \underline{1.42}$ $105 \div 60 = \underline{1.75}$ $80 \div 60 = \underline{1.33}$ $1.42 + 1.75 + 1.33 = \underline{4.5}$

Day 2: $180 \div 60 = \underline{3}$ $140 \div 60 = \underline{2.33}$ $85 \div 60 = \underline{1.42}$ $3 + 2.33 + 1.42 = \underline{6.75}$

Day 3: $90 \div 60 = \underline{1.5}$ $80 \div 60 = \underline{1.33}$ $85 \div 60 = \underline{1.42}$ $1.5 + 1.33 + 1.42 = \underline{4.25}$

Day 4: $75 \div 60 = \underline{1.25}$ $40 \div 60 = \underline{.67}$ $70 \div 60 = \underline{1.17}$ $1.25 + .67 + 1.17 = \underline{3.09}$

2. What is the total number of hours you will spend driving this week?

$4.5 + 6.75 + 4.25 + 3.09 = \underline{18.59}$

3. Using the information from your Trip Planning Forms, record the driving time for each trip for each day in the driving time column on your Trucker's Log. The first one has been entered for you.

Student records driving times on the Trucker's Log

4. Each delivery stop on your route takes approximately 1 hour to unload the truck. How many hours will you need to add to each day to determine the total hours worked for that day?

$1 \text{ hour} \times 2 \text{ stops per day} = \underline{2 \text{ hours}}$

5. On day 2, you leave Springfield at 7:00 a.m., approximately what time will you return to the distribution center at the end of the day?

$6.75 \text{ hours (drive time)} + 2 \text{ hours (unload time)} = 8.75 \text{ hours}$ 3:45 p.m.

6. On day 2, what time should you expect to leave Naperville for your next stop in Champaign?

$3 \text{ hours (drive time)} + 1 \text{ hour unload time} = 4 \text{ hours}$ 11:00 a.m.

7. On day 4, you leave Springfield at 7:15 a.m., approximately what time will you arrive at your first stop in Peoria?

$1.25 \text{ hours (drive time)} = 1 \text{ hour } 15 \text{ minutes}$ 8:30 a.m.

8. On day 1, you leave Springfield at 7:00 a.m. If you take a 30 minute lunch break, what time will you arrive back at the distribution center?

4.5 hours (drive time) + 2 hours (unload time) + .5 hour (30 minute lunch) = 7 hours 2:00 p.m.

9. On day 3, you leave Springfield at 7:30 a.m., approximately what time will you return at the end of the day if you take a 45 minute lunch break?

4.25 hours (drive time) + 2 hours (unload time) + .75 (45 minute lunch) = 7 hours 2:30 p.m.

10. In addition to your drive time and unloading time at your delivery stops, you spend 1 hour each day completing your reports and logs when you return to the distribution center. What is the total number of hours you will work each day?

Day 1: $4.5 + 2 + 1 = 7.5$

Day 2: $6.75 + 2 + 1 = 9.75$

Day 3: $4.25 + 2 + 1 = 7.25$

Day 4: $3.09 + 2 + 1 = 6.09$

Total:

11. If day 5 is a holiday and you are paid for 8 hours, what is the total number of hours for which you will be paid this week?

$30.59 \text{ (hours worked)} + 8 \text{ hours (paid holiday)} = 38.59 \text{ hours}$

12. Your hourly pay as a truck driver with XYZ Company is \$22.50 per hour. What are your gross wages for this week? Round your answer to the nearest cent.

$38.59 \times 22.50 = \$868.28$

13. The following deductions are made from your check this week. What is the total amount of the deductions on your paycheck this week?

Federal income taxes	93.84
State income taxes	39.15
FICA withholding	54.00
Health insurance	31.00
Union dues	<u>10.20</u>
Total:	<u>\$228.19</u>

14. What is your net pay for the week?

$868.28 - 228.19 = \$640.09$

TDL Math: Learning Project - Trucking

Student Worksheet 3

Activity 3

1. At the beginning of the week, the truck odometer reading is 52,500. What will the odometer reading be at the end of:

Day 1: $52500 + 270 = \underline{52770}$

Day 2: $52770 + 405 = \underline{55317}$

Day 3: $53175 + 255 = \underline{53430}$

Day 4: $53430 + 185 = \underline{53615}$

2. Record the ending odometer reading in the appropriate space on your Trucker's Log. Calculate the total distance driven using the truck's beginning and ending odometer readings. Show your work here and record your answer in the Total Distance box on your trucker's log.

$53615 - 52500 = \underline{1115}$

3. Your answer in question #2 should match the answer to question # 7 from Activity 1.
4. Your truck has a 100 gallon fuel tank capacity. The tank is full at the start of your first delivery day. Assume that your truck gets **10 mpg**. How many miles can you expect to drive on one tank of fuel?

$10 \text{ miles} / 1 \text{ gal.} = ? \text{ miles} / 100 \text{ gals.} \quad \underline{1000 \text{ miles}}$

5. Approximately how many gallons of gas will you use to make the deliveries for all 4 days?

$10 \text{ miles} / 1 \text{ gal.} = 1115 \text{ miles} / ? \text{ gals.} \quad \underline{111.5 \text{ gallons}}$

6. If you drive 280 miles on day 1, approximately how many gallons of gas will you use?

$10 \text{ miles} / 1 \text{ gal.} = 280 \text{ miles} / ? \text{ gals.} \quad \underline{28 \text{ gallons}}$

7. What are the total miles you will drive for days 1 and 2? Approximately how many gallons of gas will be left in your tank at the end of day 2?
 $270 + 405 = \underline{675 \text{ miles}}$ $10 \text{ miles}/1 \text{ gal.} = 675/? \text{ gals.} = 67.5 \text{ gals. used}$ $100 - 67.5 = \underline{32.5 \text{ gals. left}}$
8. At the end of day 2, you fill your tank. How many gallons of fuel will you need to purchase?
 $100 - 32.5 = \underline{67.5 \text{ gallons to purchase}}$
9. The price of fuel is \$3.83 per gallon. What will it cost to fill the tank? Round your answer to the nearest cent. Record this information in the fuel purchase record section of your Trucker's Log.
 $67.5 \text{ gallons} \times 3.83 = 258.525 \rightarrow \underline{\$258.53}$
10. What are total miles you will drive for days 3 and 4? Approximately how many gallons of gas will you have left in your tank at the end of day 4?
 $255 + 185 = \underline{440}$ $10 \text{ miles}/1 \text{ gal.} = 440/? \text{ gals.} = 44 \text{ gals. used}$ $100 - 44 = \underline{56 \text{ gallons left.}}$
11. At the end of day 4, you fill your tank again. How many gallons of fuel will you need to purchase?
 $100 - 56 = \underline{44 \text{ gallons to purchase}}$
12. If the price of fuel is \$3.79 per gallon, what will it cost to fill your tank? Record this information in the fuel purchase record section of your Trucker's Log.
 $44 \text{ gallons} \times 3.79 = \underline{\$166.76}$
13. What is the total cost of the two fuel purchases?
 $258.53 + 166.76 = \underline{\$425.29}$
14. Using the total miles driven from your Trucker's Log and the total cost of the two fuel purchases, calculate the cost per mile of your deliveries this week. Round your answer to the nearest cent.
 $\$425.29 / 1115 \text{ miles} = ? / 1 \text{ mile} \quad \underline{.38}$

Day 1 Trip Planning Form

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Alton	85	1.42
Alton - Effingham	105	1.75
Effingham - Springfield	80	1.33

Day 2 Trip Planning Form

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Naperville	180	3
Naperville - Champaign	140	2.33
Champaign - Springfield	85	1.42

Day 3 Trip Planning Form

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Effingham	90	1.5
Effingham - Champaign	80	1.33
Champaign - Springfield	85	1.42

Day 4 Trip Planning Form

Origin City – Destination City	Distance Between (Miles)	Estimated Driving Time (Hours)
Springfield - Peoria	75	1.25
Peoria - Bloomington	40	.67
Bloomington - Springfield	70	1.17

Trucker's Log

Drivers Name Answer Key		Company XYZ Company	Week
Truck number #456	Starting Odometer Reading 52,500	Ending Odometer Reading 53615	Total Distance 1115

Trip Record

Date	Trailer	OriginCity	DestinationCity	Miles	Driving Time (in hours)
Day 1	001	Springfield	Alton	85	1.42
Day 1	001	Alton	Effingham	105	1.75
Day 1	001	Effingham	Springfield	80	1.33
Day 2	001	Springfield	Naperville	180	3
Day 2	001	Naperville	Champaign	140	2.33
Day 2	001	Champaign	Springfield	85	1.42
Day 3	001	Springfield	Effingham	90	1.5
Day 3	001	Effingham	Champaign	80	1.33
Day 3	001	Champaign	Springfield	85	1.42
Day 4	001	Springfield	Peoria	75	1.25
Day 4	001	Peoria	Bloomington	40	.67
Day 4	001	Bloomington	Springfield	70	1.17
	001				
	001				
	001				
	001				
Totals: Trips, Miles & Drive Time			12	1115	18.59

Fuel Purchase Record

Date	Odometer	Miles Driven	Gallons	MPG	Rate per Gallon	Total Cost	Notes	
Day 2	53175	675	67.5	10	3.83	258.53		
Day 4	53615	440	44	10	3.79	166.76		
			111.5			425.29	425.29 ÷ 111.5 =	
Average Miles Per Gallon				10	Average Cost of Fuel Per Gallon			3.81

Activities/Resources for Outcomes 2, 3, 4, 6, 8, 10

**TDL Math Learning Project 2:
Warehousing & Distribution Operations**

TDL Math: Learning Project 2

Title: Warehousing and Distribution Center Operations

Career Cluster: Transportation, Distribution, and Logistics

Objective: Students will apply math skills to solve problems in a TDL workplace setting

For use with **TDL Math Module Outcomes 2, 3, 4, 6, 8, 10**

TDL Context Scenario

You are a professional assigned to a warehouse distribution center. You are responsible for planning the loading and unloading of supplies. Understanding space requirements of your load and of your truck is essential. In order to interpret your space requirements, you will be required to understand the importance of multiplication and division, fractions, and volume. Understanding these concepts will be clearer using a 3-D model. Use the LEGO examples to understand the math concept and then move to application of this concept in a warehouse distribution center. You may find it helpful to work through the loading scenarios using the LEGOS as concrete examples of your task.

Materials included:

Lesson overview

Exploring Multiplication and Division with LEGOS

Exploring Equivalent Fractions with LEGOS

Exploring Mean, Median, Mode, and Range with LEGOS

Loading Scenario #1 – Multiplication and Division

Loading Scenario #2 – Fractions

Loading Scenario #3 - Volume

Answer Keys

Instructor notes:

- The purpose of this learning project is to help students develop and apply math skills in a TDL workplace setting.
- The activities in this learning project were designed to be incorporated throughout multiple instructional periods as the concepts from module outcomes 2, 3, 8, & 10 are taught. However, the lessons may also be used as a culminating activity for these learning outcomes.
- You may eliminate some of the exercises or incorporate your own variations into the activities to make the learning project more or less challenging for your students.
- Integration of technology:

Warehousing and Distribution Center Operations Math: Student Worksheet 1: Multiplication and Division**TDL Context Scenario**

You are a professional assigned to a warehouse distribution center. You are responsible for planning the loading and unloading of supplies/boxes. Understanding space requirements of your load and of your truck is essential. In order to interpret your space requirements, you will be required to understand the importance of multiplication and division, fractions, and volume. Understanding these concepts will be clearer using a 3-D model. Use the LEGO examples to understand the math concept and then move to application of this concept in a warehouse distribution center. **You may find it helpful to work through the loading scenarios using the LEGOS as concrete examples of your task.**

Activity 1

Your supervisor has given you seven trucks to load each day. Use the different loading instructions to decide how many boxes you will load.

Truck #1

All boxes are the same size. Load them 12 high and 8 across. How many boxes will you need to pull out of your inventory to load this truck?

Truck #2

Smaller distribution trucks arrive which you must first unload in order to fulfill the requirements of loading truck #2. Your larger truck has a capacity to carry 500 crates. Small truck A is loaded with crates 4 high and 3 across and 10 deep. Truck B has 6 high and 3 across and 10 deep. Truck C has 6 high and 4 across and 12 deep. Will all the crates from trucks A, B, and C fit in your large truck #2? What is the total number of crates from the three small trucks?

Truck #3

This truck has the capacity to hold 24 pallets. If each pallet can hold 12 boxes, how many boxes can be loaded on this truck in all? Assuming the boxes from truck #1 and the boxes from truck #3 are the same size, which truck can hold more boxes?

Truck #4

The freight for this truck is fragile and you may not load the boxes any higher than 3. You are pulling your boxes from pallets holding 3 across, 3 high and 4 deep. If the boxes fit on the truck 4 across and 10 deep, how many pallets will you use to fill your truck? Will there be any left on one of the pallets?

Truck #5

There are two sizes of boxes to load on truck #5. The smaller size boxes are half the size of the larger boxes. (Use your LEGOS to visualize these two sizes). Fill the bottom half of the truck stacking the larger boxes 2 high, 4 across, and 8 deep. Using this base as your platform for the smaller boxes, how many smaller boxes will fit on the next row?

Truck #6

The crates for this truck are very heavy weighing 725 lbs each. Truck #6 can only carry a total of 20 tons. How many crates can you load with your forklift into truck #6?

Truck #7

You are a very fast worker and usually can load a truck in 1 hour. If truck #7 needs to be loaded with 350 boxes, how many boxes do you need to load each minute to finish loading in 1 hour?

Warehousing and Distribution Center Operations' Math: Student Worksheet 2: Fractions and Percents**Activity 2**

Use fractions to help you understand the number of freight needed and the amount of time you need to fulfill your daily truck loading goals.

Truck #1

Your truck is $\frac{1}{4}$ full with 110 boxes. How many boxes does truck #1 hold when it is full?

Truck #2

Your truck has a weight limit of 20 tons. Your truck needs to be unloaded in four different stops so you load the truck in reverse order for the delivery person. The last stop (first to load) weighs 10,500 lbs. what fraction is this of the total you need to load? What percent is it?

Truck #3

Truck #3 has 3 stops and also has a weight limit of 20 tons. After loading for the last stop (first to load), your truck has a load weight of 18,000 lbs. You know the second stop weighs only 5,000 lbs. What percent of the total are the first two stops? If the first stop (last to load) is going to be 45% of the total, are you going to meet the weight limit for this load?

Truck #4

Your work day is 6:30am to 2:30pm. You have one hour for lunch and two 15 minute breaks. What percentage of your work time will be spent loading truck #4 (assuming time for each of your 7 total trucks is evenly spread)?

Truck #5

You have already loaded truck #5 with 64 pallets which is half of the load. The second half of the load is made up of pallets twice as big as the first half. How many pallets can fit in the second half? (Use your LEGOS to visualize these two sizes).

Truck #6

Truck #6 needs to be loaded quickly so your supervisor assigns another co-worker to help you. Assuming the two of you work at the same speed, how long will it take for truck #6 to be loaded? Refer to truck #4 for your average time and percentage of your work day spent loading each truck.

Truck #7

Your truck is $\frac{3}{4}$ full with 450 boxes. How many boxes will truck #7 hold when it is full?

Warehousing and Distribution Center Operations' Math: Student Worksheet 3: Volume**Activity 3**

Use volume to help you understand the number of freight needed and the amount of time you need to fulfill your daily truck loading goals. Remember to use Legos if this will help you visualize

Background:

Watch the video link here to help you gain an understanding of volume as related to a truck and the concept used in TDL of "cubes": <https://www.youtube.com/watch?v=IJt4RgvDyoI> Moving Truck... Volume of a Rectangular Prism

Volume – What is a Cube?**Cube**

A measure of the volume of rectangular shaped three-dimensional objects or spaces. Cube is calculated by multiplying the length times the width times the height of the object or space.

Cube Out

This occurs when a container or vessel has reached its volumetric capacity before its permitted weight limit. The situation when a piece of equipment has reached its volumetric capacity before reaching the permitted weight limit.

Cube utilization

In warehousing and logistics, cube utilization refers to the use of space within storage area, trailer, or container. Cube utilization is generally calculated as a percentage of total space or of total "usable" space.

Cubic Capacity

The carrying capacity of a piece of equipment according to measurement in cubic feet.

Cubic Foot

1,728 cubic inches. A volume contained in a space measuring one foot high, one foot wide and one foot long.

Truck #1

The interior of your truck to load measures 8 feet wide, 13 feet high, and 28 feet long. How many cubic feet (cubes) do you have available?

Truck #2

Truck #2 has the following measurements: 8 feet wide, 13 feet high, and 36 feet long. Your boxes measure 2 feet wide, 2 feet high, and 2 feet long. How high will you be able to stack your boxes in this truck? Why?

Truck #3

Truck #3 has the following measurements: 8 feet wide, 13 feet high, and 36 feet long. Your boxes measure 2 feet wide, 2 feet high, and 2 feet long. How many boxes can you plan to pack in your truck? (note: you'll only be able to load 6 boxes high)

Truck #4

Truck #4 pulled in with 2200 boxes measuring one cubic foot each. The load needs to be transferred to smaller trucks for delivery within your local area. Since each truck added to the delivery route means additional cost, your goal is to use only the trucks you really need. However, if you start loading and the load doesn't fit, that costs you time and wasted labor cost. So which combination of trucks is the best choice for you to send out for local delivery?

Truck A – 7.5 feet wide, 8 feet high, and 21 feet long

Truck B - 7.5 feet wide, 6.5 feet high, and 16.5 feet long

Truck C - 7.5 feet wide, 8 feet high, and 25 feet long

Truck D – 6.5 feet wide, 6 feet high, and 12 feet long

Truck #5

Truck #5's measurements are: 8 feet wide, 13 feet high, and 28 feet long. If this truck pulls in full of cargo, which trucks from your small fleet should you use to distribute this cargo locally?

Truck A – 7.5 feet wide, 8 feet high, and 21 feet long

Truck B - 7.5 feet wide, 6.5 feet high, and 16.5 feet long

Truck C - 7.5 feet wide, 8 feet high, and 25 feet long

Truck D – 6. 5 feet wide, 6 feet high, and 12 feet long

Truck #6

Truck # 6 has the following measurements: 8 feet wide, 13 feet high, and 36 feet long. Your cargo is 2900 cubes. Will it fit in truck #6?

Truck #7

Truck #7 also measures 8 feet wide, 13 feet high and 36 feet long. Two smaller trucks arrive. Will both trucks' cargo fit on truck #7?

Truck E = 7.5 feet wide, 8 feet high, and 25 feet long

Truck F– 6. 5 feet wide, 6 feet high, and 12 feet long

Warehousing and Distribution Center Operations Math: Student Worksheet 1: Multiplication and Division

TDL Context Scenario

You are a professional assigned to a warehouse distribution center. You are responsible for planning the loading and unloading of supplies/boxes. Understanding space requirements of your load and of your truck is essential. In order to interpret your space requirements, you will be required to understand the importance of multiplication and division, fractions, and volume. Understanding these concepts will be clearer using a 3-D model. Use the LEGO examples to understand the math concept and then move to application of this concept in a warehouse distribution center. **You may find it helpful to work through the loading scenarios using the LEGOS as concrete examples of your task.**

Activity 1

Your supervisor has given you seven trucks to load each day. Use the different loading instructions to decide how many boxes you will load.

Truck #1

All boxes are the same size. Load them 12 high and 8 across. How many boxes will you need to pull out of your inventory to load this truck?

$$12 \times 8 = 96$$

Truck #2

Smaller distribution trucks arrive which you must first unload in order to fulfill the requirements of loading truck #2. Your larger truck has a capacity to carry 500 crates. Small truck A is loaded with crates 4 high and 3 across and 10 deep. Truck B has 6 high and 3 across and 10 deep. Truck C has 6 high and 4 across and 12 deep. Will all the crates from trucks A, B, and C fit in your large truck #2? What is the total number of crates from the three small trucks?

$$\text{Truck A} = 4 \times 3 \times 10 = 120 \quad \text{Truck B} = 6 \times 3 \times 10 = 180 \quad \text{Truck C} = 6 \times 4 \times 12 = 288$$

$$120 + 180 + 288 = 588 \text{ (total of Trucks A, B, C) No, all three trucks won't fit in Truck \#2}$$

Truck #3

This truck has the capacity to hold 24 pallets. If each pallet can hold 12 boxes, how many boxes can be loaded on this truck in all? Assuming the boxes from truck #1 and the boxes from truck #3 are the same size, which truck can hold more boxes?

$$24 \times 12 = 288$$

Truck #3 can hold more

Truck #4

The freight for this truck is fragile and you may not load the boxes any higher than 3. You are pulling your boxes from pallets holding 3 across, 3 high and 4 deep. If the boxes fit on the truck 4 across and 10 deep, how many pallets will you use to fill your truck? Will there be any left on one of the pallets?

Total capacity of Truck #4 = $4 \times 10 \times 3 = 120$

Pallet capacity = $3 \times 3 \times 4 = 36$

Total pallets for Truck #4 = $120 \div 36 = 3$ pallets plus 12 from pallet 4 leaving 24 boxes leftover on pallet 4

Truck #5

There are two sizes of boxes to load on truck #5. The smaller size boxes are half the size of the larger boxes. (Use your LEGOS to visualize these two sizes). Fill the bottom half of the truck stacking the larger boxes 2 high, 4 across, and 8 deep. Using this base as your platform for the smaller boxes, how many smaller boxes will fit on the next row?

$4 \times 8 = 32$ bottom level covering the truck

$32 \times 2 = 64$ smaller boxes fit over this platform

Truck #6

The crates for this truck are very heavy weighing 725 lbs each. Truck #6 can only carry a total of 20 tons. How many crates can you load with your forklift into truck #6?

20 tons = 40,000 lbs

$40,000 \div 725 = 55.17$ so 55 crates can be loaded

Truck #7

You are a very fast worker and usually can load a truck in 1 hour. If truck #7 needs to be loaded with 350 boxes, how many boxes do you need to load each minute to finish loading in 1 hour?

1 hour = 60 minutes

$350 \div 60 = 5.8$ (almost 6 a minute)

Warehousing and Distribution Center Operations' Math: Student Worksheet 2: Fractions and Percents

Activity 2

Use fractions to help you understand the number of freight needed and the amount of time you need to fulfill your daily truck loading goals.

Truck #1

Your truck is $\frac{1}{4}$ full with 110 boxes. How many boxes does truck #1 hold when it is full?

$$110 \times 4 = 440$$

Truck #2

Your truck has a weight limit of 20 tons. Your truck needs to be unloaded in four different stops so you load the truck in reverse order for the delivery person. The last stop (first to load) weighs 10,500 lbs. what fraction is this of the total you need to load? What percent is it?

$$20 \text{ tons} = 40,000 \text{ lbs}$$

$$10,500 \div 40,000 = \text{estimated math} = \text{about } \frac{1}{4} \quad \text{actual math } \frac{26}{100} \text{ reduces to } \frac{13}{50} \quad 26\%$$

Truck #3

Truck #3 has 3 stops and also has a weight limit of 20 tons. After loading for the last stop (first to load), your truck has a load weight of 18,000 lbs. You know the second stop weighs only 5,000 lbs. What percent of the total are the first two stops? If the first stop (last to load) is going to be 45% of the total, are you going to meet the weight limit for this load?

$$20 \text{ tons} = 40,000 \text{ lbs}$$

$$18,000 + 5,000 = 23,000 \text{ lbs} \quad 23,000 \div 40,000 \quad 57.5\%$$

$$57.5\% + 45\% = 102.5\% \text{ TOO HEAVY}$$

Truck #4

Your work day is 6:30am to 2:30pm. You have one hour for lunch and two 15 minute breaks. What percentage of your work time will be spent loading truck #4 (assuming time for each of your 7 total trucks is evenly spread)?

6:30- 2:30 = 8 hours 60 + 15 + 15 = 90 minutes breaks (1 ½ hours) 8 – 1 ½ = 6 ½ or 6.5 hours or 390 minutes

390 minutes ÷ 7 trucks = 55.71 minutes per truck

55.71 ÷ 390 minutes = 0.1428 X 100% = 14.28% of time for each truck

Truck #5

You have already loaded truck #5 with 64 pallets which is half of the load. The second half of the load is made up of pallets twice as big as the first half. How many pallets can fit in the second half? (Use your LEGOS to visualize these two sizes).

½ of 64 = 32 or 64 ÷ 2 = 32

Truck #6

Truck #6 needs to be loaded quickly so your supervisor assigns another co-worker to help you. Assuming the two of you work at the same speed, how long will it take for truck #6 to be loaded? Refer to truck #4 for your average time and percentage of your work day spent loading each truck.

6:30- 2:30 = 8 hours 60 + 15 + 15 = 90 minutes breaks (1 ½ hours) 8 – 1 ½ = 6 ½ or 6.5 hours or 390 minutes

390 ÷ 7 = 14.28% of time for each truck

14.28% ÷ 2 = 7.14% 390 x 7.14% (which is 0.0714) = 27.84 or, with rounding, about 28 minutes of your day

Truck #7

Your truck is ¾ full with 450 boxes. How many boxes will truck #7 hold when it is full?

450 ÷ ¾ so.... 450 ÷ .75 = 600

Warehousing and Distribution Center Operations' Math: Student Worksheet 3: Volume

Activity 3

Use volume to help you understand the number of freight needed and the amount of time you need to fulfill your daily truck loading goals. Remember to use Legos if this will help you visualize

Background:

Watch the video link here to help you gain an understanding of volume as related to a truck and the concept used in TDL of "cubes": <https://www.youtube.com/watch?v=IJt4RgvDyoI> Moving Truck... Volume of a Rectangular Prism

Volume – What is a Cube?

Cube

A measure of the volume of rectangular shaped three-dimensional objects or spaces. Cube is calculated by multiplying the length times the width times the height of the object or space.

Cube Out

This occurs when a container or vessel has reached its volumetric capacity before its permitted weight limit. The situation when a piece of equipment has reached its volumetric capacity before reaching the permitted weight limit.

Cube utilization

In warehousing and logistics, cube utilization refers to the use of space within storage area, trailer, or container. Cube utilization is generally calculated as a percentage of total space or of total "usable" space.

Cubic Capacity

The carrying capacity of a piece of equipment according to measurement in cubic feet.

Cubic Foot

1,728 cubic inches. A volume contained in a space measuring one foot high, one foot wide and one foot long.

Truck #1

The interior of your truck to load measures 8 feet wide, 13 feet high, and 28 feet long. How many cubic feet (cubes) do you have available?

$$8 \times 13 \times 28 = 2912 \text{ cubic feet (cubes)}$$

Truck #2

Truck #2 has the following measurements: 8 feet wide, 13 feet high, and 36 feet long. Your boxes measure 2 feet wide, 2 feet high, and 2 feet long. How high will you be able to stack your boxes in this truck? Why?

Each box is 2 feet high so you'll only be able to load 6 boxes high. At that point you'll be 12 feet high and won't be able to add any more 2 feet tall boxes.

Truck #3

Truck #3 has the following measurements: 8 feet wide, 13 feet high, and 36 feet long. Your boxes measure 2 feet wide, 2 feet high, and 2 feet long. How many boxes can you plan to pack in your truck? (note: you'll only be able to load 6 boxes high)

Cubic capacity of truck = $8 \times 12 \times 36 = 3456$ cubic feet (note that 13 high was changed to 12 high for the purposes of calculation because each box is 2 feet high so you'll only be able to load 6 boxes high)

$2 \times 2 \times 2 = 8$ cubic feet for each box (cubes) $3456 \div 8 = 432$ boxes

Truck #4

Truck #4 pulled in with 2200 boxes measuring one cubic foot each. The load needs to be transferred to smaller trucks for delivery within your local area. Since each truck added to the delivery route means additional cost, your goal is to use only the trucks you really need. However, if you start loading and the load doesn't fit, that costs you time and wasted labor cost. So which combination of trucks is the best choice for you to send out for local delivery?

Truck A – 7.5 feet wide, 8 feet high, and 21 feet long

Truck B - 7.5 feet wide, 6.5 feet high, and 16.5 feet long

Truck C - 7.5 feet wide, 8 feet high, and 25 feet long

Truck D – 6.5 feet wide, 6 feet high, and 12 feet long

Truck A holds 1260 cubic feet (cubes)

Truck B holds 804 cubic feet (cubes)

Truck C holds 1500 cubic feet (cubes)

Truck D holds 468 cubic feet (cubes)

Trucks B and C can hold 2304 cubic feet which is large enough for all the cargo using the smallest trucks and the least number of trucks.

Truck #5

Truck #5's measurements are: 8 feet wide, 13 feet high, and 28 feet long. If this truck pulls in full of cargo, which trucks from your small fleet should you use to distribute this cargo locally?

Truck A – 7.5 feet wide, 8 feet high, and 21 feet long

Truck B - 7.5 feet wide, 6.5 feet high, and 16.5 feet long

Truck C - 7.5 feet wide, 8 feet high, and 25 feet long

Truck D – 6.5 feet wide, 6 feet high, and 12 feet long

Truck A holds 1260 cubic feet (cubes)

Truck B holds 804 cubic feet (cubes)

Truck C holds 1500 cubic feet (cubes)

Truck D holds 468 cubic feet (cubes)

Truck #5 = $8 \times 13 \times 28 = 2912$ cubic feet (cubes)

Trucks A, C, and D = 3228 which will accommodate truck #5's load

Truck #6

Truck # 6 has the following measurements: 8 feet wide, 13 feet high, and 36 feet long. Your cargo is 2900 cubes. Will it fit in truck #6?

Yes

Truck #6 - 8 feet wide, 13 feet high, and 36 feet long = 3744 cubic feet (cubes)

Truck #7

Truck #7 also measures 8 feet wide, 13 feet high and 36 feet long. Two smaller trucks arrive. Will both trucks' cargo fit on truck #7?

Truck E = 7.5 feet wide, 8 feet high, and 25 feet long

Truck F– 6.5 feet wide, 6 feet high, and 12 feet long

Yes

Truck E = 1500 cubic feet (cubes)

Truck F– 468 cubic feet (cubes)

Activities/Resources for Outcomes 5, 6, 7

TDL Math Learning Project 3: Staffing Logistics

TDL Math: Learning Project 3

Title: Staffing Logistics

Career Cluster: Transportation, Distribution, and Logistics

Objective: Students will apply math skills to solve problems in a TDL workplace setting

For use with **TDL Math Module Outcomes 5, 6, 7**

TDL Context Scenario

As the staffing logistics manager for BSP Delivery Company, you are responsible for staffing three major delivery centers. You received a memo from the vice president of the logistics management department informing you that the company has signed new contracts from online retail vendors that will increase the quantity of packages these delivery hubs will handle each month. She has asked you to calculate the number of employees that will be needed to operate each delivery hub with this increase in business. You will use the information provided in the BSP Interoffice Memorandum (Handout #1), and each activity to solve the math problems involved in this project and prepare a written Staffing Logistics Report (Handout #2) for the next logistics management meeting.

Materials included:

Project overview

Student worksheets 1, 2, 3, & 4

Handout #1 – BSP Delivery Company Memo

Handout #2 – BSP Delivery Company Staffing Report

Answer Keys

Instructor notes:

- The purpose of this learning project is to help students develop and apply math skills in a TDL workplace setting.
- The activities in this learning project were designed to be incorporated throughout multiple instructional periods as concepts from module outcomes 5, 6 and 7 are taught in a TDL context. The lessons may also be used as a culminating activity for these learning outcomes.
- You may eliminate some of the exercises or incorporate your own variations into the activities to make the learning project more or less challenging for your students.
- Integration of technology: You may want to have students use Excel, Word, or PowerPoint programs to create and/or present their reports for this project.

TSL Math: Staffing Logistics - Student Worksheet 1**TDL Context Scenario**

As the staffing logistics manager for BSP Delivery Company, you are responsible for staffing three major delivery centers. You received a memo from the vice president of the logistics management department informing you that the company has signed new contracts from online retail vendors that will increase the quantity of packages these delivery hubs will handle each month. She has asked you to calculate the number of employees that will be needed to operate each delivery hub with this increase in business. You will use the information provided in the BSP Interoffice Memorandum (Handout #1), and each activity to solve the math problems involved in this project and prepare a written Staffing Logistics Report (Handout #2) for the next logistics management meeting.

Activity 1

Your first step in this project will be to calculate the amount and percent of increase for each delivery hub and the total amount of increase and percent of increase for all three delivery centers together. Use the information provided in the handouts and the exercises to complete all the tasks and answer all the questions.

1. Read the BSP Interoffice Memorandum (**Handout #1**). Enter the current number of packages handled and the new number of packages to be handled at each delivery hub on the Staffing Logistics Report (**Handout #2**). Calculate the amount of increase and the percent of increase for each delivery hub. Round your answer to the nearest tenths place, if necessary. Record your answers in the appropriate columns of the staffing logistics report.
2. Calculate the total amount of packages currently handled at all three delivery hubs. Enter this total on the staffing logistics report.
3. Compute the total number of new packages to be handled and delivered at the three delivery hubs altogether. Enter this total on the staffing logistics report.

4. What is the total amount of increase in the number of packages for all three delivery hubs together? Record your answer on the staffing logistics report.
5. What is the total percent of increase for all three delivery hubs together? Round your answer to the nearest tenths place and enter it on the report.
6. Which delivery hub currently handles and delivers the largest number of packages each month?
7. Which delivery hub currently handles and delivers the smallest number of packages each month?
8. Which delivery hub will have the largest percent increase in the number of packages per month?
9. Which delivery will have the smallest percent increase in the number of packages per month?
10. Which delivery hub will have the same percent of increase per month as all three hubs together?

TDL Math: Staffing Logistics - Student Worksheet 2**Activity 2**

Each delivery hub employs dock workers to unload packages from freight trucks. For the next step in your project, you will need to calculate the current productivity rates for the dock workers employed at each hub. You will then figure the average productivity rate for a dock worker at all three delivery hubs. This average rate will be used to compute the number of new dock workers that the company will need to hire at each location. Make sure you record your answers in the Staffing Logistics Report (Handout #2).

1. At the northern hub, 3 dock workers unload 410 freight trucks per month. How many freight trucks does 1 dock worker unload per month? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.
2. At the central hub, 4 dock workers unload 500 freight trucks per month. How many freight trucks does 1 dock worker unload per month? Round your answer to the nearest whole number and record it in the correct space on the staffing logistics report
3. At the southern hub, 3 dock workers unload 400 freight trucks per month. How many freight trucks does 1 dock worker unload per month? Round your answer to the nearest whole number and record it in the correct space on the staffing logistics report.
4. Which delivery hub has the highest productivity rate per dock worker? Which delivery hub has the lowest productivity rate per dock worker?
Highest rate _____
Lowest rate _____
5. What is total number of freight trucks unloaded at all three hubs together? What is the total number of dock workers employed at all three hubs together? Use this information to calculate the average unload rate per dock worker for all three delivery hubs together. Enter your answers on the staffing logistics report.

6. With the increased business, the northern hub will have about 550 freight trucks to unload per month. Use the average unload rate per dock worker from question #5 to calculate how many dock workers will be needed to unload the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
7. The central hub will have about 575 freight trucks to unload per month. Use the average unload rate per dock worker from question #5 to calculate how many dock workers will be needed to unload the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
8. The southern hub will have about 520 freight trucks to unload per month. Use the average unload rate per dock worker from question #5 to calculate how many dock workers will be needed to unload the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
9. Calculate the number of dock workers you will need to hire for each delivery hub and record your answers in the staffing logistics report. At which hub will you NOT have to hire any dock workers?
10. What is the percent of increase in dock workers for the other two delivery hubs? Round your answers to the nearest tenths place, if necessary. Record these numbers on the staffing logistics report.
11. What is the total number of dock workers BSP will have to hire? Record this number on the staffing logistics report.
12. What is the percent of increase in dock workers for all three hubs together? Record your answer on the staffing logistics report.

TDL Math: Staffing Logistics - Student Worksheet 3**Activity 3**

Each delivery hub employs package handlers to sort and load packages onto the outgoing delivery trucks. The next task for your project will be to calculate the current productivity rates for the package handlers working at each hub. You will then compute the average productivity rate for a package handler at all three delivery hubs. This average rate will be used to figure the number of new package handlers that the company will need to hire at each location. Make sure you record your answers in the Staffing Logistics Report (Handout #2).

1. At the northern hub, 15 package handlers sort and load 175,000 packages per month. What is the monthly rate of packages sorted and loaded for 1 package handler? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

2. At the central hub, 16 package handlers sort and load 190,000 packages per month. What is the monthly rate of packages sorted and loaded for 1 package handler? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

3. At the southern hub, 13 package handlers sort and load 160,000 packages per month. What is the monthly rate of packages sorted and loaded for 1 package handler? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

4. Which delivery hub has the highest productivity rate per package handler?

5. What is total number of packages sorted and loaded at all three hubs together? What is the total number of package handlers employed at all three hubs together? Use this information to compute the average productivity rate per package handler at BSP Delivery. Enter your answers on the staffing logistics report.

6. With the increased business, the northern hub will have about 220,000 packages to sort and load per month. Use the average rate per package handler from question #5 to calculate how many package handlers will be needed to sort and load the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
7. With the increased business, the central hub will have about 230,000 packages to sort and load per month. Use the average rate per package handler from question #5 to calculate how many package handlers will be needed to sort and load the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
8. With the increased business, the southern hub will have about 210,000 packages to sort and load per month. Use the average rate per package handler from question #5 to calculate how many package handlers will be needed to sort and load the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
9. How many package handlers will you need to hire for each delivery hub? Record your answers in the staffing logistics report. At which hub will you have to hire the largest number of package handlers?
10. What is the percent of increase in package handlers for each delivery hub? Record your answers on the staffing logistics report.
11. What is the total number of package handlers BSP will have to hire? Record this number on the staffing logistics report.
12. What is the percent of increase in package handlers for all three hubs together? Record your answer on the staffing logistics report.

TDL Math: Staffing Logistics - Student Worksheet 4**Activity 4**

Each delivery hub employs drivers to deliver the packages to customers. For this task, you will need to calculate the current productivity rates for the delivery drivers employed at each hub. You will then compute the average productivity rate for a driver at all three delivery hubs. This average rate will be used to determine the number of new drivers that the company will need to hire at each location. Make sure you record your answers in the **staffing logistics report** (Handout #2).

1. At the northern hub, 35 drivers deliver 175,000 packages per month. What is the monthly rate of packages delivered for 1 driver? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.
2. At the central hub, 40 drivers deliver 190,000 packages per month. What is the monthly rate of packages delivered for 1 driver? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.
3. At the southern hub, 30 drivers deliver 160,000 packages per month. What is the monthly rate of packages delivered for 1 driver? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.
4. Which hub has the highest productivity rate per delivery driver? Which hub has the lowest productivity rate? What is the difference between the productivity rates at these two locations?
5. What is total number of packages delivered for all three hubs together? What is the total number of delivery drivers employed at all three hubs together? Use this information to calculate the average productivity rate per driver at BSP Delivery. Enter your answers on the staffing logistics report.

6. With the increased business, the northern hub will have about 220,000 packages to deliver each month. Use the average rate per driver from question #5 to calculate how many drivers will be needed to deliver the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
7. With the increased business, the central hub will have about 230,000 packages to deliver each month. Use the average rate per driver from question #5 to calculate how many drivers will be needed to deliver the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
8. With the increased business, the southern hub will have about 210,000 packages to deliver each month. Use the average rate per driver from question #5 to calculate how many drivers will be needed to deliver the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
9. How many drivers will you need to hire for each delivery hub? Record your answers in the staffing logistics report. At which hub will you have to hire the largest number of delivery drivers?
10. What is the percent of increase in drivers for each delivery hub? Record your answers on the staffing logistics report.
11. What is the total number of delivery drivers BSP will have to hire? What is the percent of increase in drivers for all three hubs together? Record your answers on the staffing logistics report.
12. What is the total number of new employees BSP will have to hire? What is the percent of increase in the total number of employees?

BSP Delivery Company

Staffing Logistics Department

123 BPS Street
Central City, IL 12345

Interoffice Memorandum

To: Hal Street, Staffing Logistics Manager

From: Samatha Gold, VP Logistics Management Department

Problem:

The company has just signed new contracts with online retail vendors that will increase the number of packages handled at our delivery centers as outlined below. As the Staffing Logistics Manager, you are responsible for determining the number of employees we will need to operate these delivery hubs. After you have completed your calculations, you will need to present your staffing logistics report at our next department meeting.

	<u>Current # of Packages</u>	<u>New # of Packages</u>
Northern Center	175,000	220,000
Central Center	190,000	230,000
Southern Center	160,000	210,000

Please contact me if you have any questions.

BSP Delivery Service Staffing Logistics Report

Overall Increase in Package Handling and Delivery

Delivery Center	Current Amount of Packages Handled and Delivered per Month	New Amount of Packages to be Handled and Delivered per Month	Amount of increase	Percent of Increase
Northern Hub				
Central Hub				
Southern Hub				
Totals				

Dock Workers

Delivery Center	Dock Workers	Freight Trucks per Month	Productivity Rate: Freight Trucks per month/per Dock Worker	Freight Trucks per Month after the increase in business	Total number of Dock Workers needed after the increase in business	Total number of Dock Workers to be Hired	Percent of Increase
Northern Hub	3	410		550			
Central Hub	4	500		575			
Southern Hub	3	400		520			
Totals							

Package Handlers

Delivery Center	Package Handlers	Packages Handled per Month	Productivity Rate: Packages per month/per Package Handler	Packages Handled per Month after the increase in business	Total number of Package Handlers needed after the increase in business	Total number of Package Handlers to be Hired	Percent of Increase
Northern Hub	15	175,000		220,000			
Central Hub	16	190,000		230,000			
Southern Hub	13	160,000		210,000			
Totals							

Delivery Drivers

Delivery Center	Delivery Drivers	Packages Delivered per month	Productivity Rate: Packages Delivered per month/per Driver	Packages Delivered per Month after the increase in business	Total number of Drivers needed after the increase in business	Total number of Drivers to be Hired	Percent of Increase
Northern Hub	35	175,000		220,000			
Central Hub	40	190,000		230,000			
Southern Hub	30	160,000		210,000			
Totals							

TDL Math: Learning Project 3

Staffing Logistics - Student Worksheet 1

TDL Context Scenario

As a staffing logistics manager for BSP Delivery Company, you are responsible for staffing three major delivery centers. You received a memo from the vice president of the logistics management department informing you that the company has signed new contracts from online retail vendors that will increase the quantity of packages these delivery hubs will handle each month. She has asked you to calculate the number of employees that will be needed to operate each delivery hub with this increase in business. You will use the information provided in the BSP Interoffice Memorandum (Handout #1), and each activity to solve the math problems involved in this project and prepare a written Staffing Logistics Report (Handout #2) for the next logistics management meeting.

Activity 1

Your first step in this project will be to calculate the amount and percent of increase for each delivery hub and the total amount of increase and percent of increase for all three delivery centers together. Use the information provided in the handouts and the exercises to complete all the tasks and answer all the questions.

1. Read the BSP Interoffice Memorandum (**Handout #1**). Enter the current number of packages handled and the new number of packages to be handled at each delivery hub on the Staffing Logistics Report (**Handout #2**). Calculate the amount of increase and the percent of increase for each delivery hub. Round your answer to the nearest tenths place, if necessary. Record your answers in the appropriate columns of the report.

$$\text{Northern Hub increase: } 220,000 - 175,000 = \underline{45,000} \qquad 45,000 / 175,000 = \underline{25.7\%}$$

$$\text{Central Hub increase: } 230,000 - 190,000 = \underline{40,000} \qquad 40,000 / 190,000 = \underline{21.1\%}$$

$$\text{Southern Hub increase: } 210,000 - 160,000 = \underline{50,000} \qquad 50,000 / 160,000 = \underline{31.3\%}$$

2. Calculate the total amount of packages currently handled at all three delivery hubs? Enter this total on the staffing logistics report.

$$175,000 + 190,000 + 160,000 = \underline{525,000}$$

3. Compute the total number of new packages to be handled and delivered at the three delivery hubs altogether. Enter this total on the staffing logistics report.

$$220,000 + 230,000 + 210,000 = \underline{660,000}$$

4. What is the total amount of increase in the number of packages for all three delivery hubs together? Record your answer on the staffing logistics report.

$$660,000 - 525,000 = \underline{135,000}$$

5. What is the total percent of increase for all three delivery hubs together? Round your answer to the nearest tenths place and enter it on the report.

$$135,000/525,000 = \underline{25.7\%}$$

6. Which delivery hub currently handles and delivers the largest number of packages each month?

Central

7. Which delivery hub currently handles and delivers the smallest number of packages each month?

Southern

8. Which delivery hub will have the largest percent increase in the number of packages per month?

Southern

9. Which delivery will have the smallest percent increase in the number of packages per month?

Central

10. Which delivery hub will have the same percent of increase per month as all three hubs together?

Northern

TDL Math: Staffing Logistics - Student Worksheet 2

Activity 2

Each delivery hub employs dock workers to unload packages from freight trucks. For the next step in your project, you will need to calculate the current productivity rates for the dock workers employed at each hub. You will then figure the average productivity rate for a dock worker at all three delivery hubs. This average rate will be used to compute the number of new dock workers that the company will need to hire at each location. Make sure you record your answers in the Staffing Logistics Report (Handout #2).

1. At the northern hub, 3 dock workers unload 410 freight trucks per month. How many freight trucks does 1 dock worker unload per month? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

$$410/3 = n/1 \quad \underline{137}$$

2. At the central hub, 4 dock workers unload 500 freight trucks per month. How many freight trucks does 1 dock worker unload per month? Round your answer to the nearest whole number and record it in the correct space on the staffing logistics report

$$500/4 = n/1 \quad \underline{125}$$

3. At the southern hub, 3 dock workers unload 400 freight trucks per month. How many freight trucks does 1 dock worker unload per month? Round your answer to the nearest whole number and record it in the correct space on the staffing logistics report.

$$400/3 = n/1 \quad \underline{133}$$

4. Which delivery hub has the highest productivity rate per dock worker? Which delivery hub has the lowest productivity rate per dock worker?

Highest rate: Northern 137 per month

Lowest rate: Central 125 per month

5. What is total number of freight trucks unloaded at all three hubs together? What is the total number of dock workers employed at all three hubs together? Use this information to calculate the average unload rate per dock worker for all three delivery hubs together. Enter your answers on the staffing logistics report.

$$\text{Freight trucks: } 410 + 500 + 400 = \underline{1310}$$

$$\text{Dock workers: } 3 + 4 + 3 = \underline{10}$$

$$\text{Productivity rate: } 1310/10 = n/1 \quad \underline{131}$$

6. With the increased business, the northern hub will have about 550 freight trucks to unload per month. Use the average unload rate per dock worker from question #5 to calculate how many dock workers will be needed to unload the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.

$$131/1 = 550/n \quad 4.19 \rightarrow \underline{4}$$

7. The central hub will have about 575 freight trucks to unload per month. Use the average unload rate per dock worker from question #5 to calculate how many dock workers will be needed to unload the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.

$$131/1 = 575/n \quad 4.39 \rightarrow \underline{4}$$

8. The southern hub will have about 520 freight trucks to unload per month. Use the average unload rate per dock worker from question #5 to calculate how many dock workers will be needed to unload the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.

$$131/1 = 520/n \quad 3.97 \rightarrow \underline{4}$$

9. Calculate the number of dock workers you will need to hire for each delivery hub and record your answers in the staffing logistics report. At which hub will you NOT have to hire any dock workers?

Central

10. What is the percent of increase in dock workers for the other two delivery hubs? Round your answer to the nearest tenths place, if necessary. Record these numbers on the staffing logistics report.

$$\text{Northern } 1/3 = \underline{33.3\%} \quad \text{Southern } 1/3 = \underline{33.3\%}$$

11. What is the total number of dock workers BSP will have to hire? Record this number on the staffing logistics report.

$$\underline{2}$$

12. What is the percent of increase in dock workers for all three hubs together? Record your answer on the staffing logistics report.

$$2/10 = \underline{20\%}$$

TDL Math: Staffing Logistics - Student Worksheet 3

Activity 3

Each delivery hub employs package handlers to sort and load packages onto the outgoing delivery trucks. The next task for your project will be to calculate the current productivity rates for the package handlers working at each hub. You will then compute the average productivity rate for a package handler at all three delivery hubs. This rate will be used to figure the number of new package handlers that the company will need to hire at each location. Make sure you record your answers in the Staffing Logistics Report (Handout #2).

1. At the northern hub, 15 package handlers sort and load 175,000 packages per month. What is the monthly rate of packages sorted and loaded for 1 package handler? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

$$175,000/15 = n/1 \quad \underline{11667}$$

2. At the central hub, 16 package handlers sort and load 190,000 packages per month. What is the monthly rate of packages sorted and loaded for 1 package handler? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

$$190,000/16 = n/1 \quad \underline{11875}$$

3. At the southern hub, 13 package handlers sort and load 160,000 packages per month. What is the monthly rate of packages sorted and loaded for 1 package handler? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

$$160,000/13 = n/1 \quad \underline{12308}$$

4. Which delivery hub has the highest productivity rate per package handler?

Southern

5. What is total number of packages sorted and loaded at all three hubs together? What is the total number of package handlers employed at all three hubs together? Use this information to compute the average productivity rate per package handler at BSP Delivery. Enter your answers on the staffing logistics report.

$$\text{Total packages} = \underline{525,000} \quad \text{Total handlers} = \underline{44}$$

$$\text{Productivity rate: } 525,000/44 = n/1 \quad \underline{11932}$$

6. With the increased business, the northern hub will have about 220,000 packages to sort and load per month. Use the average rate per package handler from question #5 to calculate how many package handlers will be needed to sort and load the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
 $11932/1 = 220,000/n$ $18.44 \rightarrow \underline{18}$
7. With the increased business, the central hub will have about 230,000 packages to sort and load per month. Use the average rate per package handler from question #5 to calculate how many package handlers will be needed to sort and load the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
 $11932/1 = 230,000/n$ $19.27 \rightarrow \underline{19}$
8. With the increased business, the southern hub will have about 210,000 packages to sort and load per month. Use the average rate per package handler from question #5 to calculate how many package handlers will be needed to sort and load the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.
 $11932/1 = 210,000/n$ $17.6 \rightarrow \underline{18}$
9. How many package handlers will you need to hire for each delivery hub? Record your answers in the staffing logistics report. At which hub will you have to hire the largest number of package handlers?
 Northern: 3 Central: 3 Southern: 5 largest number to be hired: Southern hub
10. What is the percent of increase in package handlers for each delivery hub? Round your answer to the nearest tenths place and record your answers on the staffing logistics report.
 Northern: $3/15 = \underline{20\%}$ Central: $3/16 = \underline{18.8\%}$ Southern: $5/13 = \underline{38.5\%}$
11. What is the total number of package handlers BSP will have to hire? Record this number on the staffing logistics report.
 $3 + 3 + 5 = \underline{11}$ or $55 - 44 = \underline{11}$
12. What is the percent of increase in package handlers for all three hubs together? Record your answer on the staffing logistics report.
 $11/44 = \underline{25\%}$

TDL Math: Staffing Logistics - Student Worksheet 4

Activity 4

Each delivery hub employs drivers to deliver the packages to customers. For this task, you will need to calculate the current productivity rates for the delivery drivers employed at each hub. You will then compute the average productivity rate for a driver at all three delivery hubs. This rate will be used to determine the number of new drivers that the company will need to hire at each location. Make sure you record your answers in the **staffing logistics report** (Handout #2).

1. At the northern hub, 35 drivers deliver 175,000 packages per month. What is the monthly rate of packages delivered for 1 driver? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

$$175,000/35 = n/1 \quad \underline{5000}$$

2. At the central hub, 40 drivers deliver 190,000 packages per month. What is the monthly rate of packages delivered for 1 driver? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

$$190,000/40 = n/1 \quad \underline{4750}$$

3. At the southern hub, 30 drivers deliver 160,000 packages per month. What is the monthly rate of packages delivered for 1 driver? Round your answer to the nearest whole number and enter it in the correct space on the staffing logistics report.

$$160,000/30 = n/1 \quad \underline{5333}$$

4. Which hub has the highest productivity rate per delivery driver? Which hub has the lowest productivity rate? What is the difference between the productivity rates at these two locations?

$$\text{Highest: } \underline{\text{Southern}} \quad \text{Lowest: } \underline{\text{Central}} \quad \text{Difference: } 5333 - 4750 = \underline{583}$$

5. What is total number of packages delivered for all three hubs together? What is the total number of delivery drivers employed at all three hubs together? Use this information to calculate the average productivity rate per driver at BSP Delivery. Enter your answers on the staffing logistics report.

$$\text{Total packages: } \underline{525,000} \quad \text{Total \# of Drivers: } 35 + 40 + 30 = \underline{105}$$

$$\text{Average productivity rate: } 525,000/105 = n/1 \quad \underline{5000}$$

6. With the increased business, the northern hub will have about 220,000 packages to deliver each month. Use the average rate per driver from question #5 to calculate how many drivers will be needed to deliver the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.

$$5000/1 = 220,000/n \quad \underline{44}$$

7. With the increased business, the central hub will have about 230,000 packages to deliver each month. Use the average rate per driver from question #5 to calculate how many drivers will be needed to deliver the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.

$$5000/1 = 230,000/n \quad \underline{46}$$

8. With the increased business, the southern hub will have about 210,000 packages to deliver each month. Use the average rate per driver from question #5 to calculate how many drivers will be needed to deliver the packages. Round your answer to the nearest whole number and record it on the staffing logistics report.

$$5000/1 = 210,000/n \quad \underline{42}$$

9. How many drivers will you need to hire for each delivery hub? Record your answers in the staffing logistics report. At which hub will you have to hire the largest number of delivery drivers?

$$\text{Northern: } 44 - 35 = \underline{9} \quad \text{Central: } 46 - 40 = \underline{6} \quad \text{Southern: } 42 - 30 = \underline{12}$$

Largest # of drivers to be hired: Southern hub

10. What is the percent of increase in drivers for each delivery hub? Record your answers on the staffing logistics report.

$$\text{Northern: } 9/35 = \underline{25.7\%} \quad \text{Central: } 6/40 = \underline{15\%} \quad \text{Southern: } 12/30 = \underline{40\%}$$

11. What is the total number of delivery drivers BSP will have to hire? What is the percent of increase in drivers for all three hubs together? Record your answers on the staffing logistics report.

$$9 + 6 + 12 = \underline{27} \quad \text{or} \quad 132 - 105 = \underline{27} \quad 27/105 = \underline{25.7\%}$$

12. What is the total number of new employees BSP will have to hire? What is the percent of increase in the total number of employees?

$$2 + 11 + 27 = \underline{40} \quad 40/159 = \underline{25.2\%}$$

BSP Delivery Service Staffing Logistics Report

Overall Increase in Package Handling and Delivery

Delivery Center	Current Amount of Packages Handled and Delivered per Month	New Amount of Packages to be Handled and Delivered per Month	Amount of increase	Percent of Increase
Northern Hub	175,000	220,000	45,000	25.7%
Central Hub	190,000	230,000	40,000	21.1%
Southern Hub	160,000	210,000	50,000	31.3%
Totals	525,000	660,000	135,000	25.7%

Dock Workers

Delivery Center	Dock Workers	Freight Trucks per Month	Productivity Rate: Freight Trucks per month/per Dock Worker	Freight Trucks per Month after the increase in business	Total number of Dock Workers needed after the increase in business	Total number of Dock Workers to be Hired	Percent of Increase
Northern Hub	3	410	137/1	550	4	1	33.3%
Central Hub	4	500	125/1	575	4	0	0%
Southern Hub	3	400	133/1	520	4	1	33.3%
Totals	10	1310	131/1	1645	12	2	20%

Package Handlers

Delivery Center	Package Handlers	Packages Handled per Month	Productivity Rate: Packages per month/per Package Handler	Packages Handled per Month after the increase in business	Total number of Package Handlers needed after the increase in business	Total number of Package Handlers to be Hired	Percent of Increase
Northern Hub	15	175,000	11667/1	220,000	18	3	20%
Central Hub	16	190,000	11875/1	230,000	19	3	18.8%
Southern Hub	13	160,000	12308/1	210,000	18	5	38.5%
Totals	44	525,000	11932/1	660,000	55	11	25%

Delivery Drivers

Delivery Center	Delivery Drivers	Packages Delivered per month	Productivity Rate: Packages Delivered per month/per Driver	Packages Delivered per Month after the increase in business	Total number of Drivers needed after the increase in business	Total number of Drivers to be Hired	Percent of Increase
Northern Hub	35	175,000	5000/1	220,000	44	9	25.7%
Central Hub	40	190,000	4750/1	230,000	46	6	15%
Southern Hub	30	160,000	5333/1	210,000	42	12	40%
Totals	105	525,000	5000/1	660,000	132	27	25.7%