Industry: Transportation, Distribution, & Logistics (TDL)

Content Area: Mathematics

Core Topics: Using formulas, calculating volume and dimensional weight, solving multi-step problems

Objective: Students will be able to calculate dimensional (volumetric) weight in order to determine the billable weight of shipments and solve multi-step shipping problems.

Materials included:
Instructor’s notes
Scenario: Warehouse Shipping
Student worksheets
Quiz
Answer Keys

Industry Overview:
According to the U.S. Department of Labor, employment in the transportation and material movers industry is expected to grow approximately 8.6% between 2012 and 2022.* The transportation, distribution, and logistics (TDL) industry is comprised of a vast array of jobs, ranging from dock workers and delivery drivers to warehouse managers and logisticians. Mathematics and literacy skills are essential for students who plan to pursue a career in this field. TDL employees, including warehouse and distribution workers, must have the ability to use formulas and perform accurate mathematical calculations in their daily work.

The purpose of this module is to help students develop and apply math skills in a TDL workplace setting. The learning activities were designed to be incorporated throughout multiple instructional periods as math concepts are taught in a TDL context.

After completing the module, students should be able to:
- Calculate the volume of packages and loaded pallets
- Calculate the dimensional weight of packages and loaded pallets
- Calculate the billable weight for shipping orders

Setting the stage: Provide students with background information about the typical responsibilities of warehouse and distribution center employees. You may want to have students use the occupational outlook handbook, O*NET and/or other relevant websites to research the job responsibilities, educational/training requirements, salary, etc. for TDL positions that interest them. In addition, you could have students view videos depicting typical warehouse and distribution center operations. (See links below)

http://www.bls.gov/ooh/

Occupational Information Network (O*NET)
http://www.onetonline.org/link/summary/43-3021.02
http://www.onetonline.org/link/summary/43-5111.00

Distribution Center Operations:
https://www.youtube.com/watch?v=e9RR17JDdSI

For Activity 1: Explain the formula used to calculate volume. Work the scenario examples with the class. Have students work the practice problems independently. Provide additional practice as needed. Have students complete Worksheet 1.

For Activity 2: Explain the formula used to calculate dimensional weight. You may want to show this short video outlining the steps to calculate dimensional weight. https://www.youtube.com/watch?v=V05Wk4rkWok Work the scenario examples with the class. Have students complete the practice problems independently. Provide additional practice as needed. Have students complete Worksheet 2.

For Activity 3: Explain the steps to determine the billable weight for shipments. Work the scenario examples with the class. Have students complete the practice problems independently. Provide additional practice as needed. Have students complete Worksheet 3.

Assessment: Quiz – Warehouse Shipping Calculations
Workplace Scenario:
You are a billing clerk at BSP Warehouse & Distribution, Inc. Your company provides storage and shipping services for several vendors throughout the Midwest. Like many delivery companies, BSP uses dimensional (volumetric) weight to determine the billable weight for the products it transports. One of your responsibilities is to calculate the dimensional weight of shipments and then compare this amount to the actual weight in order to determine the billable weight for orders.

Activity 1: Calculating Volume
The first step in determining the dimensional weight of a shipment is to calculate the volume of the order. Each time you receive a shipping order, you obtain the length, width, and height of the packages or pallets from the warehouse packer. You use these dimensions to calculate the volume of the shipment.

The formula to calculate volume is: \( \text{Volume} = \text{Length} \times \text{Width} \times \text{Height} \)

Note: Volume is always written in cubic units

Example 1: Calculate the volume for the following package.

\[
18" \text{ L} \times 10" \text{ W} \times 8" \text{ H} \rightarrow \text{V} = \text{L} \times \text{W} \times \text{H} \rightarrow 18 \times 10 \times 8 = 1440 \text{ cubic inches or (in}^3\text{)}
\]

Practice 1: Calculate the volume for the following packages.

- 20" L x 14" W x 12" H
- 24" L x 18" W x 15" H

Most of your customers order large quantities of products that are shipped on pallets. For these orders, you calculate the volume of an entire loaded pallet.

Example 2: Calculate the volume for the following pallet.

\[
48" \text{ L} \times 40" \text{ W} \times 60" \text{ H} \rightarrow \text{V} = \text{L} \times \text{W} \times \text{H} \rightarrow 115,200 \text{ in}^3
\]

Practice 2: Calculate the volume for the following pallets.

- 48" L x 40" W x 65" H
- 36"L x 36" W x 80" H
Worksheet 1: Calculating Volume

You received the following customer orders. Calculate the volume of each package.

1. Item #1001 with case dimensions of 12” L x 15” W x 10” H.
2. Item #1002 with case dimensions of 20” L x 13” W x 12” H.
3. Item #1003 with case dimensions of 15” L x 10” W x 8” H.
4. Item #1004 with case dimensions of 18” L x 14” W x 6” H.

Calculate the volume for each of the following loaded pallets.

5. Item #1005 with pallet dimensions of 48” L x 40” W x 75” H.
6. Item #1006 with pallet dimensions of 48” L x 40” W x 84” H.
7. Item #1007 with pallet dimensions of 36” L x 36” W x 72” H.
8. Item #1008 with pallet dimensions of 42” L x 42” W x 76” H.
9. Item #1009 with pallet dimensions of 48”L x 40” W x 70” H.
10. Item #1010 with pallet dimensions of 48” L x 40” W x 66” H.
Activity 2: Calculating Dimensional Weight

Dimensional weight is based on volume; that is, the amount of space a package or pallet occupies in relation to its actual weight. The formula to calculate the dimensional weight of a shipment is to divide the volume in cubic inches by the \textbf{dimensional factor of 166} to obtain the dimensional weight in pounds.

\textbf{Note:} The result is always rounded up to the next whole pound.

Dimensional weight formula: \[
\frac{L \times W \times H}{166} = \text{Dimensional weight in pounds}
\]

**Example 1:** Calculate the dimensional weight of the following package.

Package with the dimensions 16” L x 14” W x 12” H

\begin{align*}
\text{Step 1: Calculate the volume:} & \quad 16 \times 14 \times 12 = 2688 \text{ in}^3 \\
\text{Step 2: Divide the volume by 166:} & \quad 2688 \div 166 = 16.2 \text{ lbs.} \\
\text{Step 3: Round up to the next whole unit:} & \quad 16.2 \rightarrow 17 \text{ lbs.}
\end{align*}

**Practice 1:** Calculate the dimensional weight of the following package.

Package with the dimensions of 18” L x 15” W x 10” H

**Example 2:** Calculate the dimensional weight of the following pallet.

Pallet with the dimensions 48” L x 40” W x 62” H

\begin{align*}
\text{Step 1: Calculate the volume:} & \quad 48 \times 40 \times 62 = 119,040 \text{ in}^3 \\
\text{Step 2: Divide the volume by 166:} & \quad 119,040 \div 166 = 717.1 \\
\text{Step 3: Round up to the next whole unit, if necessary:} & \quad 717.1 \rightarrow 718 \text{ lbs.}
\end{align*}

**Practice 2:** Calculate the dimensional weight of the following pallet.

Pallet with the dimensions of 42” L x 42” W x 80” H
Worksheet 2: Calculating Dimensional Weight

Name __________________________

You received the following orders this morning. Calculate the dimensional weight for each order as indicated.

1. Item #2001 with case dimensions of 15” L x 12” W x 10” H.

2. Item #2002 with case dimensions of 19” L x 14” W x 12” H.

3. Item #2003 with case dimensions of 18” L x 10” W x 8” H.

4. Item #2004 with case dimensions of 16” L x 13” W x 11” H.

5. Item #2005 with pallet dimensions of 48” L x 40” W x 65” H.

6. Item #2006 with pallet dimensions of 48” L x 40” W x 80” H.

7. Item #2007 with pallet dimensions of 36” L x 36” W x 76” H.

8. Item #2008 with pallet dimensions of 42” L x 42” W x 70” H.

9. Item #2010 with pallet dimensions of 48” L x 40” W x 68” H.

10. Item #2009 with pallet dimensions of 42” L x 42” W x 65” H.
**Activity 3: Calculating Billable Weight**

Billable weight is the weight used to charge a customer for a shipment. The dimensional weight is calculated and compared to the actual weight of a shipment to determine which is greater; the higher weight is the billable weight, and is used to calculate the shipping cost of an order.

**Example 1:** A customer orders 50 cases of item #1300. The order is loaded onto one pallet. Each case weighs 15 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” L x 40” W x 72” H. Calculate the actual weight and the dimensional weight, and identify the billable weight for this order.

Step 1: Calculate the actual weight: 50 x 15 + 45 = 795 lbs.

Step 2: Calculate the dimensional weight: 48 x 40 x 72 ÷ 166 = 833 lbs.

**Practice 1:** A customer orders 80 cases of item #1301. The order is loaded onto one pallet. Each case weighs 10.5 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” L x 40” W x 84” H. Calculate the actual weight and the dimensional weight, and identify the billable weight for this order.

**Example 2:** A customer has a shipment of 3 pallets. Pallet #1 contains 40 cases. Each case weighs 22 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 75”. Pallets #2 and #3 contain 60 cases each. Each case weighs 10 lbs. and each pallet weighs 45 lbs. Both of these loaded pallets are 48” x 40” x 60”. Calculate the actual weight and the dimensional weight for each pallet, and the actual weight and the billable weight for the entire order.

Pallet 1: Actual weight: 40 x 22 + 45 = 925 lbs.
    Dimensional weight: 48 x 40 x 75 ÷ 166 = 868 lbs.

Pallets 2 & 3: Actual weight: 60 x 10 + 45 = 645 lbs.
    Dimensional weight: 48 x 40 x 60 ÷ 166 = 694 lbs.

Actual weight of the order: 925 + 645 + 645 = 2215 lbs.

Billable weight of the order: 925 + 694 + 694 = 2313 lbs.

**Practice 2:** A customer has a shipment of 3 pallets weighing 650 lbs., 640 lbs., and 820 lbs. All 3 pallets have the same dimensions of 48” x 40” x 62”. Calculate the actual weight, the dimensional weight, and the billable weight for this order.
You received the following orders this morning. Perform all the calculations necessary to determine the billable weight for each shipment.

1. A customer orders 100 cases of item #3001. The order is loaded onto one pallet. Each case weighs 8 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48" L x 40" W x 80" H. What is the actual weight, the dimensional weight, and the billable weight for this shipment?

2. A customer has a shipment of 4 pallets weighing 750 lbs., 740 lbs., 780 lbs., and 820 lbs. All 4 pallets have the same dimensions of 42" x 42" x 76". Calculate the actual weight, the dimensional weight, and the billable weight for this order.

3. A customer has a shipment of 2 pallets. Pallet #1 contains 25 cases; each case weighs 28 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48" x 40" x 72". Pallet #2 contains 40 cases; each case weighs 16.5 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48" x 40" x 70". What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?

4. A customer orders 300 cases of item #3004. The order is loaded onto 6 pallets of 50 cases each. Each case weighs 14.5 lbs. and each pallet weighs 45 lbs. The dimensions of the loaded pallets are 48" x 40" x 78". Calculate the actual weight, the dimensional weight, and the billable weight for this shipment.

5. A customer has a shipment of 3 pallets. Pallet #1 contains 30 cases; each case weighs 24 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48" x 40" x 65". Pallet #2 contains 60 cases; each case weighs 12 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallets are 48" x 40" x 79". Pallet #3 contains 40 cases; each case weighs 18 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48" x 40" x 82". What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?
Quiz: Warehouse Shipping Calculations

You received the following customer orders today. Perform all the calculations necessary to determine the billable weight for each shipment.

1. A customer ordered 1 case of item #4001. The package weighs 68 lbs. and has dimensions of 32” L x 26” W x 21” H. Calculate the dimensional weight and identify the billable weight for this order.

2. A customer orders 80 cases of item #4002. The order is loaded onto one pallet. Each case weighs 9 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” L x 40” W x 84” H. What is the actual weight, the dimensional weight, and the billable weight for this shipment?

3. A customer has a shipment of 5 pallets weighing 786 lbs., 795 lbs., 832 lbs., and 820 lbs. 843 lbs., All 5 pallets have the same dimensions of 48” x 40” x 80”. Calculate the actual weight, the dimensional weight, and the billable weight for this order.

4. A customer has a shipment of 2 pallets. Pallet #1 contains 30 cases; each case weighs 22 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 72”. Pallet #2 contains cases 64; each case weighs 13 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 78”. What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?

5. A customer has a shipment of 3 pallets. Pallet #1 contains 70 cases; each case weighs 11 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 73”. Pallet #2 contains 55 cases; each case weighs 15 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallets are 48” x 40” x 79”. Pallet #3 contains 40 cases; each case weighs 21 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 83”. What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?
**Activity 1**

Practice 1:  \( \text{Volume} = 3360 \text{ in}^3 \)
\[ \text{Volume} = 6480 \text{ in}^3 \]

Practice 2:  \( \text{Volume} = 124,800 \text{ in}^3 \)
\[ \text{Volume} = 103,680 \text{ in}^3 \]

**Activity 2**

Practice 1:  \( 20 \times 15 \times 10 = 3000 \text{ in}^3 \)
\[ 3000 \div 166 = 18.1 \rightarrow 19 \text{ lbs.} \]

Practice 2:  \( 42 \times 42 \times 80 = 141,120 \text{ in}^3 \)
\[ 141,120 \div 166 = 850.1 \rightarrow 851 \text{ lbs.} \]

**Activity 3**

Practice 1:  Actual weight:  \( 80 \times 10.5 + 45 = 885 \text{ lbs.} \)
\[ \text{Dimensional weight: } 48 \times 40 \times 84 \div 166 = 971.6 \rightarrow 972 \text{ lbs.} \]
\[ \text{Billable weight: } 972 \text{ lbs.} \]

Practice 2:  Actual weight:  \( 650 + 640 + 820 = 2110 \text{ lbs.} \)
\[ \text{Dimensional weight: } 48 \times 40 \times 62 \div 166 = 717.1 \rightarrow 718 \text{ lbs.} \]
\[ \text{Billable weight: } 718 + 718 + 820 = 2256 \text{ lbs.} \]
You received the following customer orders. Calculate the volume of each package.

1. Item #1001 with case dimensions of 12” L x 15” W x 10” H. = \(1800\text{ in}^3\)

2. Item #1002 with case dimensions of 20” L x 13” W x 12” H = \(3120\text{ in}^3\)

3. Item #1003 with case dimensions of 15” L x 10” W x 8” H. = \(1200\text{ in}^3\)

4. Item #1004 with case dimensions of 18” L x 14” W x 6” H = \(1512\text{ in}^3\)

Calculate the volume for each of the following loaded pallets.

5. Item #1005 with pallet dimensions of 48” L x 40” W x 75” H = \(144,000\text{ in}^3\)

6. Item #1006 with pallet dimensions of 48” L x 40” W x 84” H = \(161,280\text{ in}^3\)

7. Item #1007 with pallet dimensions of 36” L x 36” W x 72” H = \(93,312\text{ in}^3\)

8. Item #1008 with pallet dimensions of 42” L x 42” W x 76” H = \(134,064\text{ in}^3\)

9. Item #1009 with pallet dimensions of 48”L x 40” W x 70”H = \(134,400\text{ in}^3\)

10. Item #1010 with pallet dimensions of 48” L x 40” W x 66” H = \(126,720\text{ in}^3\)
You received the following orders this morning. Calculate the dimensional weight for each order as indicated.

1. Item #2001 with case dimensions of 15” L x 12" W x 10” H.
   \[15 \times 12 \times 10 \div 166 = 10.8 \rightarrow 11 \text{ lbs.}\]

2. Item #2002 with case dimensions of 19” L x 14” W x 12”H
   \[19 \times 14 \times 12 \div 166 = 19.2 \rightarrow 20 \text{ lbs.}\]

3. Item #2003 with case dimensions of 18” L x 10” W x 8” H.
   \[18 \times 10 \times 8 \div 166 = 8.7 \rightarrow 9 \text{ lbs.}\]

4. Item #2004 with case dimensions of 16” L x 13” W x 11” H
   \[16 \times 13 \times 11 \div 166 = 13.8 \rightarrow 14 \text{ lbs.}\]

5. Item #2005 with pallet dimensions of 48” L x 40” W x 65” H
   \[48 \times 40 \times 65 \div 166 = 751.8 \rightarrow 752 \text{ lbs.}\]

6. Item #2006 with pallet dimensions of 48” L x 40” W x 80” H
   \[48 \times 40 \times 80 \div 166 = 925.3 \rightarrow 926 \text{ lbs.}\]

7. Item #2007 with pallet dimensions of 36” L x 36” W x 76” H
   \[36 \times 36 \times 76 \div 166 = 593.3 \rightarrow 594 \text{ lbs.}\]

8. Item #2008 with pallet dimensions of 42” L x 42” W x 70” H
   \[42 \times 42 \times 70 \div 166 = 743.9 \rightarrow 744 \text{ lbs.}\]

9. Item #2010 with pallet dimensions of 48” L x 40” W x 68” H
   \[48 \times 40 \times 68 \div 166 = 786.5 \rightarrow 787 \text{ lbs.}\]

10. Item #2009 with pallet dimensions of 42” L x 42” W x 65” H
    \[42 \times 42 \times 65 \div 166 = 690.7 \rightarrow 691 \text{ lbs.}\]
Worksheet 3: Calculating Billable Weight

You received the following orders this morning. Perform all the calculations necessary to determine the billable weight for each shipment.

1. A customer orders 100 cases of item #3001. The order is loaded onto one pallet. Each case weighs 8 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” L x 40” W x 80” H. What is the actual weight, the dimensional weight, and the billable weight for this shipment?
   - Actual: 100 x 8 + 45 = 845 lbs.
   - Dimensional: 48 x 40 x 80 ÷ 166 = 925.3 → 926 lbs.
   - Billable weight = 926 lbs.

2. A customer has a shipment of 4 pallets weighing 750 lbs., 740 lbs., 780 lbs., and 820 lbs. All 4 pallets have the same dimensions of 42” x 42” x 76”. Calculate the actual weight, the dimensional weight, and the billable weight for this order.
   - Actual: 750 + 740 + 780 + 820 = 3090 lbs.
   - Dimensional: 42 x 42 x 76 ÷ 166 = 807.6 → 808; 808 x 4 = 3232 lbs.
   - Billable: 808 + 808 + 808 + 820 = 3244 lbs.

3. A customer has a shipment of 2 pallets. Pallet #1 contains 25 cases; each case weighs 28 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 72”. Pallet #2 contains 40 cases; each case weighs 16.5 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 70”. What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?
   - Pallet 1 Actual: 25 x 28 + 45 = 765 lbs.
   - Dimensional: 48 x 40 x 72 ÷ 166 = 751.8 → 752 lbs.
   - Pallet 2 Actual: 40 x 16.5 + 45 = 705 lbs.
   - Dimensional: 48 x 40 x 70 ÷ 166 = 913.7 → 914 lbs.
   - Total Actual: 765 + 705 = 1450 lbs.
   - Total Billable: 765 + 808 + 808 + 820 = 2628 lbs.

4. A customer orders 300 cases of item #3004. The order is loaded onto 6 pallets of 50 cases each. Each case weighs 14.5 lbs. and each pallet weighs 45 lbs. The dimensions of the loaded pallets are 48” x 40” x 78”. Calculate the actual weight, the dimensional weight, and the billable weight for this shipment.
   - Actual: 50 x 14.5 + 45 = 770 lbs.
   - Dimensional: 48 x 40 x 78 ÷ 166 = 902.2 → 903 lbs.
   - Billable: 5418 lbs.

5. A customer has a shipment of 3 pallets. Pallet #1 contains 30 cases; each case weighs 24 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 65”. Pallet #2 contains 60 cases; each case weighs 12 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallets are 48” x 40” x 79”. Pallet #3 contains 40 cases; each case weighs 18 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 82”. What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?
   - Actual #1: 30 x 24 + 45 = 765 lbs.
   - Dimensional: 48 x 40 x 65 ÷ 166 = 751.8 → 752 lbs.
   - Actual #2: 60 x 13 + 45 = 825 lbs.
   - Dimensional: 48 x 40 x 79 ÷ 166 = 913.7 → 914 lbs.
   - Actual #3: 40 x 21 + 45 = 885 lbs.
   - Dimensional: 48 x 40 x 82 ÷ 166 = 948.4 → 949 lbs.
   - Total Actual: 765 + 825 + 885 = 2575 lbs.
   - Total Billable: 765 + 914 + 949 = 2628 lbs.
Quiz: Warehouse Shipping Calculations

You received the following customer orders today. Perform all the calculations necessary to determine the billable weight for each shipment.

1. A customer ordered 1 case of item #4001. The package weighs 68 lbs. and has dimensions of 32” L x 26” W x 21” H. Calculate the dimensional weight and identify the billable weight for this order. 
   \[32 \times 26 \times 21 \div 166 = 105.3 \rightarrow 106 \text{ lbs.}\] 
   Billable: 106 lbs.

2. A customer orders 80 cases of item #4002. The order is loaded onto one pallet. Each case weighs 9 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” L x 40” W x 84” H. What is the actual weight, the dimensional weight, and the billable weight for this shipment? 
   Actual: \[80 \times 9 + 45 = 765 \text{ lbs.}\]
   Dimensional: \[48 \times 40 \times 84 \div 166 = 971.6 \rightarrow 972 \text{ lbs.}\] 
   Billable: 972 lbs.

3. A customer has a shipment of 5 pallets weighing 786 lbs., 795 lbs., 832 lbs., and 820 lbs. 843 lbs., All 5 pallets have the same dimensions of 48” x 40” x 80”. Calculate the actual weight, the dimensional weight, and the billable weight for this order.
   Actual: \[786 + 795 + 832 + 820 + 843 = 4076 \text{ lbs.}\]
   Dimensional: \[48 \times 40 \times 80 \div 166 = 925.3 \rightarrow 926\]
   Billable: 4630 lbs.

4. A customer has a shipment of 2 pallets. Pallet #1 contains 30 cases; each case weighs 22 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 72”. Pallet #2 contains cases 64; each case weighs 13 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 78”. What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?
   Pallet #1: \[30 \times 22 + 45 = 705 \text{ lbs.}\] 
   Dimensional: \[48 \times 40 \times 72 \div 166 = 832.8 \rightarrow 833 \text{ lbs.}\]
   Pallet #2: \[64 \times 13 + 45 = 877 \text{ lbs.}\] 
   Dimensional: \[48 \times 40 \times 78 \div 166 = 913.7 \rightarrow 914 \text{ lbs.}\]
   Actual Total: \[705 + 877 = 1582 \text{ lbs.}\]
   Total Billable: \[833 + 903 = 1736 \text{ lbs.}\]

5. A customer has a shipment of 3 pallets. Pallet #1 contains 70 cases; each case weighs 11 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 73”. Pallet #2 contains 55 cases; each case weighs 15 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallets are 48” x 40” x 79”. Pallet #3 contains 40 cases; each case weighs 21 lbs. and the pallet weighs 45 lbs. The dimensions of the loaded pallet are 48” x 40” x 83”. What is the actual weight and the dimensional weight for each pallet? What is the actual weight and the billable weight for the entire order?
   Pallet #1: \[70 \times 11 + 45 = 815 \text{ lbs.}\] 
   Dimensional: \[48 \times 40 \times 73 \div 166 = 844.3 \rightarrow 845 \text{ lbs.}\]
   Pallet #2: \[55 \times 15 + 45 = 870 \text{ lbs.}\] 
   Dimensional: \[48 \times 40 \times 79 \div 166 = 913.7 \rightarrow 914 \text{ lbs.}\]
   Pallet #3: \[40 \times 21 + 45 = 885 \text{ lbs.}\] 
   Dimensional: \[48 \times 40 \times 75 \div 166 = 867.5 \rightarrow 868 \text{ lbs.}\]
   Total Actual: \[815 + 870 + 885 = 2570 \text{ lbs.}\]
   Total Billable: \[845 + 914 + 885 = 2644 \text{ lbs.}\]