Freight Worksheet: Apples

Rail car: Refrigerated Box Car

What are the dimensions of the rail car? 72'2" L x 9' W x 11"9' H

What is the cost per leg for this rail car? $750

Product Shipping Information

7,500 cases
Case: 23 ½" L x 15 ½" W x 11" H
Pallet Dimensions: 40" L x 48" W
Cases per pallet: 30
Cases per layer: 6

Conversions
1 oil drum = 42 gallons
1 cubic foot = 7.5 gallons
1 cubic yard = 202 gallons
1 cubic yard = 27 cubic feet
1 cubic foot = 1728 cubic inches
1 standard pallet (loaded) = 40' L x 48" W x 48" H (some products may be stacked higher)

What are the dimensions of a pallet with six layers of cases? (Note: The cases fit onto the pallet without overhang. The length and width of a pallet do not change when it is loaded with freight.)

> 40" L x 48" W x 66" H

How many pallets will fit into a rail car? (Hint: First convert the dimensions of the rail car to inches.)

> How many pallets will fit lengthwise? (The pallets can be loaded in two ways. Be certain to figure out which configuration will fit the most pallets.) 18 or 21
>
> > 866" ÷ 48" = 18.04 (18 pallets) or 866 ÷ 40 = 21.65 (21 pallets)
>
> How many pallets will fit widthwise? 2
>
> > 108" ÷ 48" = 2.25. or 108 ÷ 40 = 2.7
>
> How many pallets can be stacked one on the other? 2
>
> > 141" ÷ 66" = 2.14.
>
> How many pallets will fit into a rail car? 84 or 72
>
> > 21 x 2 x 2 = 84 or 18 x 2 x 2 = 72

How many pallets of Apples must be shipped? 250

> 7,500 cases ÷ 30 per pallet = 250 pallets

How many rail cars will be needed to ship all the pallets? 3

> 250 pallets ÷ 84 pallets per car = 2.97 cars

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

How many legs will each car of Apples travel? (A leg is one trip between stops. The first leg is from Boston to Newark. This information is provided in the Train Route.)   4

What is the cost to ship the Apples? $9,000

3 cars x 4 legs x $750

Freight Worksheet: Molded Dashboard Covers

Rail Car: Covered Box Car

What are the dimensions of the rail car? (This car comes in two sizes. You will need to do the math for both to decide which is less expensive to use.)

 60' Car: 60'9" L x 9'6" W x 13' H

 50' Car: 50'6" L x 9'6" W x 13' H

What is cost per leg for this rail car?

 60' Car: $750

 50' Car: $600

Product Shipping Information

500 pallets
Dimensions of loaded pallet: 40" L x 48" W x 48 H"

Conversions
1 oil drum = 42 gallons
1 cubic foot = 7.5 gallons
1 cubic yard = 202 gallons
1 cubic yard = 27 cubic feet
1 cubic foot = 1728 cubic inches
1 standard pallet (loaded) = 40' L x 48" W x 48" H (some products may be stacked higher)

How many pallets will fit into a rail car? (The pallets can be loaded in two ways. Be certain to figure out which configuration will fit the most pallets.)

 How many pallets will fit lengthwise? (Remember to show your work.)

 60' Car: 729" ÷ 48" = 15.19 (15 pallets) or 729" ÷ 40" = 18.23 (18 pallets)

 50' Car: 606" ÷ 48" = 12.63 (12 pallets) or 606" ÷ 40" = 15.15 (15 pallets)

 How many pallets will fit widthwise?

 60' Car: 114" ÷ 40" = 2.85 (2 pallets) or 114" ÷ 48" = 2.38 (2 pallets)

 50' Car: 114" ÷ 40" = 2.85 (2 pallets) or 114" ÷ 48" = 2.38 (2 pallets)

 How many pallets can be stacked one on the other?

 60' Car: 156" ÷ 48" = 3.25 (3 pallets)

 50' Car: 156" ÷ 48" = 3.25 (3 pallets)

What is the total number of pallets that will fit into a rail car?

 60' Car: 18 x 2 x 3 = 108 pallets

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

50' Car: 15 x 2 x 3 = 90 pallets

How many rail cars will be needed to ship all the pallets?

60'Car: 500 pallets ÷ 108 per car = 4.6 (5 cars)

50' Car: 500 pallets ÷ 90 per car = 5.55 cars (6 cars)

How many legs will each car travel? (A leg is one trip between stops. The first leg is from Boston to Newark. This information is provided in the Train Route.)   5

What is the cost to ship the Molded Dashboard Covers?

60' Car: 5 cars x 5 legs x $750 = $18,750

50' Car: 6 cars x 5 legs x $600 = $18,000

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.
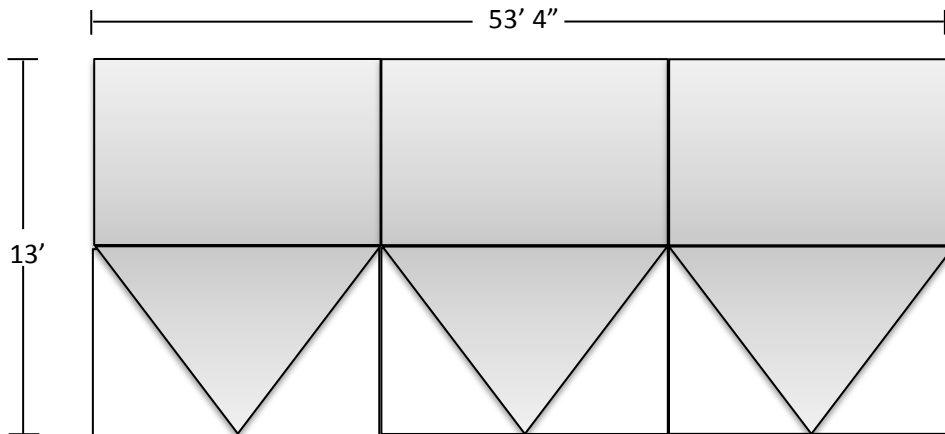
Freight Worksheet: Road Salt

Railcar Used: Covered Hopper

What are the dimensions of the rail car? 53'4"L x 10'8"W x 13'H

The diagram shows the compartments in a Covered Hopper Car.

What are the total dimensions of all three top compartments? (Assume that the space taken by the dividers is too small to consider.)

Length = 53' 4" (640'' or 53.33')

Width = 10'8" (128" or 10.67')

Height = 6'6" (78" or 6.5')

What is the volume, in cubic feet, of the top compartments? (Hint: First convert all measurements to decimals, in feet.)

53.33' x 10.67' x 6.5' = 3,698.70 ft^3

Because the product shipping information deals in cubic yards, you will need to convert cubic feet to cubic yards. What is the volume, in cubic yards, of the top compartments? 136.99 yd^3

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

What is the volume, in cubic feet, of ONE bottom compartment?   (Hint: First convert all measurements to decimals, in feet.)

$$\frac{17.78' \text{ x } 10.67' \text{ x } 6.5'}{3} = \frac{1233.13'}{3} = 411.04 \text{ cu. ft.}$$

What is the volume, in cubic yards, of ONE bottom compartment?

15.22 yd^3

What is the volume, in cubic yards, of all three bottom compartments?

45.67 yd^3

What is the total volume, in cubic yards, of all compartments (top and

bottom)?

136.99 + 45.67 = 182.66 yd^3

What is the shipping cost per leg for this Hopper Car? $1,000

Product Shipping Information
200 tons
2,160 lbs. per yd^3 of salt

What is the volume of Road Salt being shipped?

200 tons x 2,000 lbs. per ton = 400,000 lbs.

400,000 lbs. ÷ 2,160 lbs. per yd^3 = 185.19 yd^3

On the basis of volume, how many Hopper Cars are needed to transport the Road Salt?

 185.19 yd^3/ 182.66 yd^3 = 1.02 cars; rounded up 2 cars

What is the weight of the freight? 200 tons

What is the rail car weight limit? 223,500 lbs. = 223,500 ÷ 2000 = 111.75 tons

On the basis of weight, how many Hopper Cars are needed to transport the freight?

200 tons ÷ 112 limit = 1.79 cars (2 cars)

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

How many legs will each car travel? (A leg is one trip between stops. This information is provided in the Train Route.) 1 leg

What is the cost of shipping the Road Salt?

2 cars x 1 leg x $1,000 = $2,000

Freight Worksheet: Liquid Fertilizer

Railcar Used: Tanker

What are the dimensions of the rail car?

53'10" L x 10'8" diameter

What is the volume of the car?

$V = \pi r^2 h = \pi (10.67/2)^2\, 53.83 = 3.14 \times 5.34^2 \times 53.83 = 3.14 \times 28.51 \times 53.83 = 4,820.63$ cu. ft.

What is the cost per leg for this rail car? $1,000

Product Shipping Information

140,000 gallons
1 cubic foot = 7.5 gallons

How many cubic feet of Liquid Fertilizer must be shipped?

140,000 gallons ÷ 7.5 gallons per ft^3 = 18,666.67 ft^3

On the basis of volume, how many Tanker cars are needed to transport the Liquid Fertilizer?

18,666.67 ft^3 ÷ 4,820.63 ft^3 = 3.87; rounded up 4 cars.

How many legs will each car travel? 1 leg

What is the cost of shipping the Liquid Fertilizer?

4 car x 1 leg x $1,000 = $4,000

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

Freight Worksheet: Fresh-Cut Logs

Railcar Used: Plain Gondola

What are the dimensions of the rail car?

 65'6" L x 9' W x 8'6" H

What is cost per leg for this rail car?

$750

Product Shipping Information

20 fresh-cut logs
65'7" L x 3' Diameter

Conversions
1 oil drum = 42 gallons
1 cubic foot = 7.5 gallons
1 cubic yard = 202 gallons
1 cubic yard = 27 cubic feet
1 cubic foot = 1,728 cubic inches
1 standard pallet (loaded) = 40' L x 48" W x 48" H (some products may be stacked higher)

The logs are too long to lie flat in the car. The logs cannot extend above the top of the car. Will the logs fit? (Hint: Change the measurements to decimals, in feet, and use the Pythagorean Theorem. Make a diagram.)
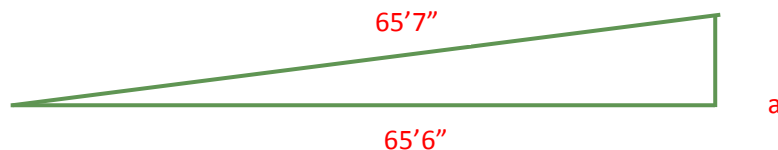
$$65.58^2 = 65.5^2 + a^2$$

$$4{,}300.74 = 4{,}290.25 + a^2$$

$$a^2 = 4{,}300.74 - 4{,}290.25 = 10.49$$

$$\sqrt{a^2} = \sqrt{10.49}$$

a = 3.24 ≈3.25

How many rows of logs fit without extending above the top of the car? 1 layer

1 layer: 3.25' + 3' per log = 6.25

2 layers: 3.25' + (2 X 3' per log) = 3.25 + 6 = 9.25; too high to fit in car

How many logs can fit in each layer? 3

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

How many logs can fit into each car? 3

How many cars will be needed to transport the logs?

20 logs ÷ 3 logs per car = 6.67; rounded up 7 cars

How many legs will each car travel? 1 leg

How much will shipping cost?

7 cars x 1 leg x $750 = $5,250

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

Freight Worksheet: Plastic Chemicals

Railcar Used: Tanker

What are the dimensions of the rail car?

53'10" L x 10'8" diameter

What is the volume of the car?

$V = \pi r^2 h = \pi (10.67/2)^2\, 53.83 = 3.14 \times 5.34^2 \times 53.83 = 3.14 \times 28.51 \times 53.83 = 4{,}820.63$ cu. ft.

What is the cost per leg for this rail car? $1,000

Product Shipping Information

160,000 gallons
1 cubic foot = 7.5 gallons

How many cubic feet of Plastic Chemicals must be shipped?

160,000 gallons ÷ 7.5 gallons per ft^3 = 21,333.3 ft^3

On the basis of volume, how many rail cars are needed to transport the Plastic Chemicals?

21,333.3 ft^3 ÷ 4,820.63 ft^3 = 4.43 (5 cars)

How many legs will each car travel? 2 legs

What is the cost of shipping the Plastic Chemicals?

5 cars x 2 legs x $1,000 = $10,000

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

Freight Worksheet: Barley

Railcar Used: Covered Hopper

What are the dimensions of the rail car?

53'4" L x 10'8" W x 13' H

The diagram shows the compartments in a Covered Hopper Car.
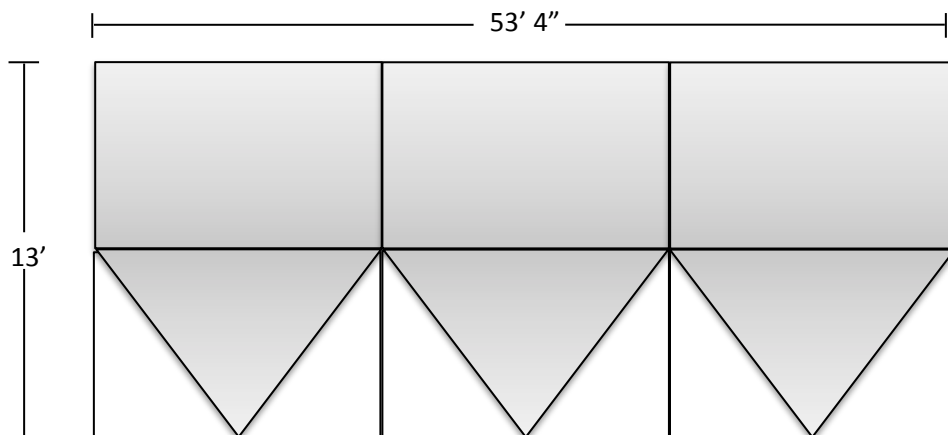
What are the total dimensions of all three top compartments? (Assume that the space taken by the dividers is too small to consider.)

Length = 53' 4" (640'' or 53.33')

Width = 10'8" (128" or 10.67')

Height = 6'6" (78" or 6.5')

What is the volume, in cubic feet, of the top compartments? (Hint: First convert all measurements to decimals, in feet.)

53.33' x 10.67' x 6.5' = 3,698.70 ft^3

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.

What is the volume, in cubic feet, of ONE bottom compartment?   (Hint: First convert all measurements to decimals, in feet.)

$$\frac{17.78' \text{ x } 10.67' \text{ x } 6.5'}{3} = \frac{1233.13'}{3} = 411.04 \text{ cu. ft.}$$

What is the volume, in cubic feet, of all three bottom compartments?

1233.12 ft^3

What is cost per leg for this rail car? $1,000

Product Shipping Information

| 2 full grain silos |
| Dimensions of grain silo: 26'9" H x 30' Diameter |

How many cubic feet of Barley are in each silo?

$V = \pi r^2 h = \pi(30/2)^2 26.75 = 3.14 \text{ x } 15^2 \text{x } 26.75 = 3.14 \text{ x } 225 \text{ x } 26.75 = 18,898.88 \text{ cu. ft.}$

How many cubic feet of Barley must be shipped?

18,898.88 ft^3 x 2 silos = 37,797.76 ft^3

How many rail cars are needed to transport the Barley?

37,797.76 ft^3 ÷ 4,931.82 ft^3 = 7.7 (8 cars)

How many legs will each car travel? 2 legs

What is the cost of shipping the Barley?

8 cars x 2 legs x $1,000 = $16,000

NOTE: Answers will vary slightly, due to rounding. The variation is acceptable, as all calculations are considered estimates.