



Teaching Guide

For

New Distribution Center for DOT Foods Module

**Illinois Transportation, Distribution and Logistics
Math and Science Project**

2007

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Acknowledgements

We would like to recognize the following people for their contribution to this module:

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Problem Solving Activity

Overview of Module

- Scenario Focus (Pathway, Job Titles, Related Subject Matter)
- Description of the Problem to be solved
- TDL Cluster Knowledge and Skills and Performance Elements Addressed
- Illinois Learning Standards Addressed
- Objectives
- Measurement Criteria
- Teacher Notes
- Time Required to Complete Problem
- Support Materials and Resources Necessary for Completion of Scenario

Lesson 1 with Handout 1 and 2

Lesson 2 with Handout 3

Lesson 3 with Handout 4, 5, and 6

Lesson 4 with Handout 7, 8, and 9

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- Final Evaluation
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Appendix

Glossary of Terms

Scenario Focus

Primary Career Pathway: Logistics Planning and Management

Occupation/Job Titles Related to this Scenario: Logistics Manager, Logistics Analyst; Distribution Manager, Transportation Manager, and Warehouse Manager

Recommended Teaching Subject Areas: Math, Physics, Industrial Technology

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Scenario Problem Statement and Performance Elements

Dot Foods would like to add a new distribution center. It currently has distribution centers in Modesto CA, Dallas TX, Ardmore OK, Chesterfield MO, Vidalia GA, Williamsport MD, Liverpool NY, and Chicago IL, with the Corporate Headquarters in Mt. Sterling IL. This new distribution center will create a need to realign customer delivery areas. Your job will be to decide which customers will be supplied by each distribution center. The solution should be based on minimizing the transportation and distribution cost required to move the product.

TDL Cluster Knowledge and Skills and Performance Elements

- Determine customer needs and requirements.
- Select carriers for transportation mode/modes
- Determine the locations of facilities and services within logistics networks.
- Develop routes and schedules for transporting people/goods.

Illinois Learning Standards:

Math

- Solve problems involving scale drawings, models, maps, or blueprints. (H-7C.5)
- Solve problems involving rates and other derived measurements such as velocity and density (H-7C-1)

- Solve problems involving multiple rates, measures, and conversion. (I-7C.6)
- Solve problems using indirect measurement by choosing appropriate technology, instruments, and/or formulas. (I-7C.1)
- Solve problems involving multiple rates, measures, and conservation. (I-7C.7)

Language Arts

- Interpret tables, graphs and maps in conjunction with related text.
- Communicate information and ideas in narrative informative and persuasive writing with clarity and effectiveness.
- Deliver planned and impromptu oral presentations. (4.B.3a)

What I Want Students to Know	What I Want Students to be Able to Do
<ul style="list-style-type: none"> • Definitions for logistics and distribution. • Understand the role of logistics and distribution in retail industry. • Relationship of cost of distribution to Customer Service • Career Opportunities in logistics and distribution • Major types of distribution channels • Major costs of distributions • Understand the factors concerning route planning for moving products to more than one location. 	<ul style="list-style-type: none"> • Determine most appropriate type of transportation for specific products. • Calculate cost of transportation for specific products. • Calculate cost of storing products at distribution center and/or storage facilities. • Read Maps and plan routes between two or more destinations. • Use internet to plan routes between two or more destinations. • Write a business report • Make a presentation with visuals.

Objectives:

- Learn about the role of logistics and marketing within the retail industry.
- Acquire the skills needed to develop a distribution plan for promotional products and merchandise of a major retailer in their communities.
 - Describe the major types of distribution channels for the physical distribution of products.
 - Describe and calculate the major types of costs in the physical distribution of products.
 - Read and interpret industry charts to determine transportation rates.

- Read and interpret maps and estimate mileage between two locations.
- Use computers to estimate mileage between two locations.
- Identify and describe all possible routes between a location of origin and multiple locations to where you must travel and select the lowest cost route.
- Prepare a written business report.
- Deliver an oral presentation of the distribution plan.

Measurement Criteria for an acceptable solution:

1. Route selected represented the most cost effective means for delivering goods on scheduled dates
2. Identified on map potential locations.
3. Evaluate alternative locations and determined service level and cost differences.
4. All calculations were correct using formulas, maps, and charts provided.
5. Business report included a cover letter, introduction stating the purpose of the report, documentation to support recommendations, a detailed explanation of costs, and tables, charts and spreadsheets to more clearly communicate recommended distribution plan.
6. Presentation presented the information with visual aids and/or handouts.
7. The presentation met the 7 requirements of effective business presentations:
 - Evidence of preparedness and practice
 - Started on time
 - Dressed appropriately
 - Showed enthusiasm and confidence
 - Maintained eye contact, showed friendliness and respect
 - Spoke slowly and distinctly without grammatical errors or slang
 - Welcomed questions and answered completely; accepted reactions without being defensive.

Teacher Notes:

Students should have a good working knowledge of math and formulas. Additional content on transportation modes or routing, writing reports and making presentations may be necessary for some students. This can be done congruently with the scenario or prior to working on the scenario.

Please review the materials needed prior to starting the problem solving activity so that you can make copies or obtain items needed. Notify students of the date that presentations will be made. Give students the opportunity to make their own cause and effect connections as various consequences present it.

Use discretion in providing Dot Food Store and headquarters employee contact information. Only contact any employees you have been given company permission to contact. Direct students to the company website for basic information. (www.DotFoods.com)

Time Required to Complete Problem: 15 hours

Types of Materials included in this Module:

1. Lesson plans for each topic with discussion questions and student activities.
2. Copy of student handouts with activities for duplication.
3. Copy of material describing problem for students.
4. Evaluation with measurement criteria and scoring guide.
5. Teacher materials to assist in evaluation of problem and possible solution steps.
6. Glossary of terms related to this module.

Support Materials and Resources Necessary for Completion of Scenario:

- United States Maps
- Computer access to internet and map programs
- Excel or similar spreadsheet software
- Handouts (see each lesson)
- Websites (see each lesson)
- TI-84 plus or TI-86 calculators

Lesson 1

TOPIC	Overview of Logistics and Distribution	TIME ESTIMATE	1 hour (2 hour with optional activity)
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OBJECTIVES	
<ul style="list-style-type: none"> • Students will be able to define logistics and distribution. • Students will be able to explain how products get from the manufacturer to the store. 	

MATERIALS & RESOURCES	
<ul style="list-style-type: none"> • Handout #1, Memo from Dot Foods • Handout #2, Defining Logistics and Distribution • Websites: www.DotFoods.com www.earth.google.com 	

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	10	- Introduction to Project <ul style="list-style-type: none"> • Distribute copies of Handout 1, the Memo from Dot Foods. • Read with class and answer any immediate questions.
2	40	- Distribute Handout 2, Defining Logistics and ask students to read. - After students have reviewed the readings, <ul style="list-style-type: none"> • Ask students to define logistics. • Ask students to distinguish between material management and physical distribution management. • Ask the students to explain why physical distribution is the major priority for retail companies.
3	55	Optional Activity: Have students research on the computer how products are distributed from the supplier to the distribution center to the customer and develop a flowchart showing this process. (Optional websites are: TBA)

Dot Foods

Chicago, IL

To: Managers

From: David Smith, Transportation Manager

Dot Foods would like to add a new distribution center. It currently has distribution centers in Modesto CA, Dallas TX, Ardmore OK, Chesterfield MO, Vidalia GA, Williamsport MD, Liverpool NY, and Chicago IL, with the Corporate Headquarters in Mt. Sterling IL. This new distribution center will create a need to realign customer delivery areas.

We would like your input in helping us decide its location and to help decide which customers will be supplied by each distribution center. The solution should be based on optimizing the miles required to move the product from the supplier to the customer.

Please email me your response and recommendations by Friday. You will also be expected to prepare a written business report with details and present it at our meeting this month.

If you have any questions, please let me know.

Defining Logistics

What is logistics?

Logistics refers to the planning and management of the physical movement or distribution of products and merchandise from the producer to the consumer. Producers are the companies who make the product. Consumers are people who use the product.



Logistics and distribution plays a critical role in the economy because products are usually produced in one part of the country or the world and have to be transported many miles to where consumers live. Producers and consumers depend on logistics and distribution companies and professionals to get products to the right place at the right time when consumers want to buy them. This can be very costly without good planning and management.

When defining logistics remember the 7 R Principles: Logistics is delivering the **right** product, in the **right** quantity and the **right** condition at the **right** place, at the **right** time, for the **right** customer, at the **right** cost.

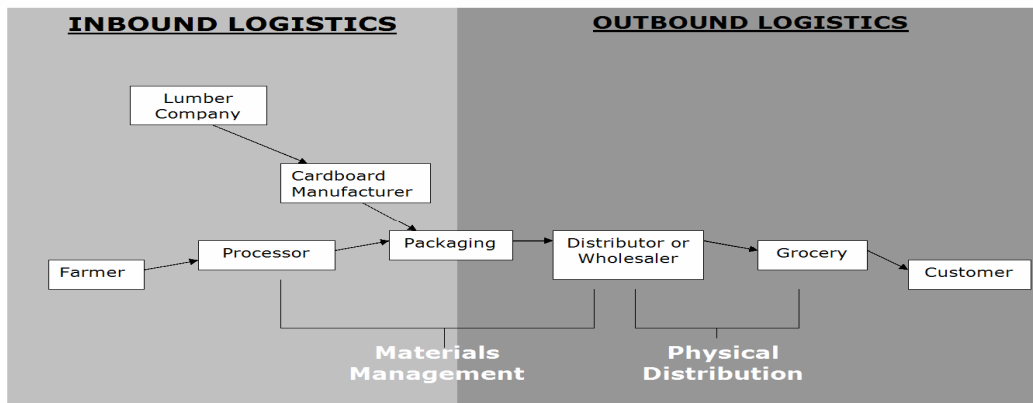
As shown in Figure 1.1, logistics management can be divided into two separate activities. Materials management involves the bringing of raw materials and supplies to where they are used to produce products and merchandise, usually a manufacturing company, and moving them through the company until they become finished products. Materials management is often referred to Inbound Logistics

Physical distribution management involves the movement of finished products and merchandise from the end of the production line to the consumer. This is also called Outbound Logistics.



Logistics and distribution professionals working for retail companies are involved in physical distribution activities. They are responsible for getting products and merchandise from the manufacturers or their wholesalers to stores and consumers.

Figure 1.1 Flow Chart for Defining Logistics and Distribution



Activity

Discuss with your group the following and write your answers on a separate sheet of paper:

1. List the 7 R's in the 7R Principle.
2. How do food products that you buy in the grocery store get to you? How do raw materials get to the manufacturer? How do the finished products or merchandise get to the store?
3. What are some of the major decisions that have to be made in getting the finished product to the store?
4. Consider the Dot Foods Scenario:



- a. How do the supplies get to the distribution center?
- b. What are some things we need to consider in getting these products to the stores? (apply the 7 R Principle)
- c. When moving the products to the stores, does this involve physical distribution management or materials management?

Lesson 2

TOPIC	Solving the Distribution and Logistics Sample Problem	TIME ESTIMATE	1 hour
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OBJECTIVES

- Students will be able to solve problem on distribution and logistics.
- Students will be able to present their solutions to the class.

MATERIALS & RESOURCES

- Handout #3, "Analyzing Logistics and Distribution Problem"
- Access to Computer
- Calculators

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	15	<p>- Lead a class discussion on the following questions.</p> <ol style="list-style-type: none"> 1. How do food products that you buy in your grocery store get to you? How do raw products get to the manufacturer? How do the finished products or merchandise get to your store? <ul style="list-style-type: none"> • <i>Examples: Fresh meat, produce, canned goods</i> • <i>Have students draw a flow diagram of a product based on Figure 1.1 in Handout 2.</i> 2. What are some of the major decisions that have to be made in getting the finished product to your store? <ul style="list-style-type: none"> • <i>Where will the product be produced for distribution?</i> • <i>How will products be distributed to consumers?</i> • <i>How will we ship the products—trucks, rail?</i> • <i>How long does it take the product to reach your store from the distribution center?</i> 3. Considering our scenario: <ol style="list-style-type: none"> a. How do the products get to the distribution center? b. What are some things we need to consider in getting these products to the stores? 4. When moving the products to the stores, does this involve physical distribution management or materials management?

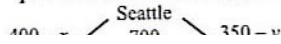
2	30	<ul style="list-style-type: none">- Distribute Handout 3 and have students read the problem.- Allow time for students to work on a solution to the problem.
3	15	<ul style="list-style-type: none">- Go over the solution to the problem. May want to use an overhead or PowerPoint to illustrate calculations.

Analyzing Logistics and Distribution Problem

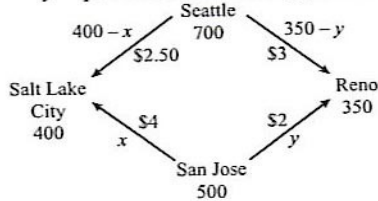
A major coffee supplier has warehouses in Seattle and San Jose. The coffee supplier receives orders from coffee retailers in Salt Lake City and Reno. The retailer in Salt Lake City needs 400 pounds of coffee, and the retailer in Reno needs 350 pounds of coffee. The Seattle warehouse has 700 pounds of coffee available, and the warehouse in San Jose has 500 pounds of coffee available. The cost of shipping from Seattle to Salt Lake City is \$2.50 per pound, from Seattle to Reno \$3 per pound from San Jose to Salt Lake City \$4 per pound, and from San Jose to Reno \$2 per pound. Find the number of pounds to be shipped from each warehouse to each retailer to minimize the cost. ¹

¹ Goldstein, Schneider, Siegel, *Finite Mathematics and Its Applications*, 8th edition, page 148.
Dot Foods Distribution Center Module
TDL Math Science Project 2007

Let x = pounds of coffee shipped from San Jose to Salt Lake City, and
 y = pounds of coffee shipped from San Jose to Reno.

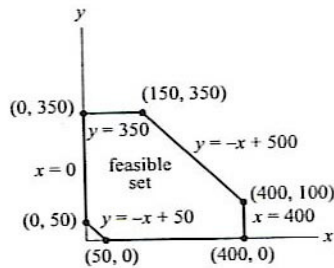


Let x = pounds of coffee shipped from San Jose to Salt Lake City, and
 y = pounds of coffee shipped from San Jose to Reno.



The required inequalities are:

$$\begin{cases} x + y \leq 500 \\ (400 - x) + (350 - y) \leq 700 \\ x \geq 0, y \geq 0 \\ 400 - x \geq 0, 350 - y \geq 0 \end{cases} \quad \text{or} \quad \begin{cases} y \leq -x + 500 \\ y \geq -x + 50 \\ x \geq 0, y \geq 0 \\ x \leq 400, y \leq 350 \end{cases}$$



Objective function: $[\text{cost}] = 4x + 2y + 2.5(400 - x) + 3(350 - y) = 2050 + 1.5x - y$

Vertex	Cost = 2050 + 1.5x - y
(0, 50)	2000
(0, 350)	1700
(150, 350)	1925
(400, 100)	2550
(400, 0)	2650
(50, 0)	2125

The minimum cost of \$1700 is at (0, 350).
 Ship 400 pounds of coffee from Seattle to Salt Lake City and 350 pounds from San Jose to Reno.

D.

Lesson 3

TOPIC	Distribution and What Customers Want	TIME ESTIMATE	2 hours
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OBJECTIVES	
<ul style="list-style-type: none"> • Students will understand the channels of distribution. • Students will understand how these channels are used to satisfy customers. 	

MATERIALS & RESOURCES	
<ul style="list-style-type: none"> • Handout #4, "Low Cost of Distribution" • Handout #5, "What Customers Want" • Handout #6, "Identifying Major Types of Distribution Channels" 	

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	20	<ul style="list-style-type: none"> - Distribute Handout 4, Lowest Cost of Distribution and allow time for students to read. - Allow time for students to work in groups to answer the questions in the Activity of Handout 4.
2	30	<ul style="list-style-type: none"> - Distribute Handout 5, What Customers Want and have students read first part. - Conduct class discussion emphasizing points made in the reading such as vocabulary terms used, chart that describes what people desire or think they desire in each category and the benefits of customer service. - Call on students to describe examples they have had with purchasing a product. <ul style="list-style-type: none"> • Did you buy what you wanted? If not, why not? • How did you feel about the customer service? How could it have been improved? - What customer wants do we need to consider when deciding where to locate the distribution center?
3	15	<ul style="list-style-type: none"> - Distribute Handout 6, Identifying Major Types of Distribution Channels, for students to read. - Have students work in groups to complete the questions in the

		Activity at the end of the Handout.
4	15	<ul style="list-style-type: none">- Discuss as a class the three major types of distribution channels.- Which distribution channel will apply to the scenario?
5	30	<ul style="list-style-type: none">- Have students research the best location for a new distribution center.

Lowest Cost of Distribution

Logistics and distribution is very important in retail companies because it is a major factor in keeping customers satisfied and in controlling costs.

Customer Service and Satisfaction. One key to customer satisfaction is having the right product available to customers when they want to buy it. Customers get very frustrated when they go to a store to buy a product and they are told that the product is out of stock and will not be available until later in the week. High levels of service exist when products are available in the stores when customers want the products. High levels of service are measured by the percentage of products carried by a store that are in stock during a buying period.

Costs of Distribution. Retail companies must provide high levels of service at a reasonable cost of distribution. Companies can always have products available by maintaining high levels of inventory. They also can use the most expensive types of transportation such as air transport and special services like overnight delivery. But, this costs money, and must be included in the price of the product. Customers want products available at the lowest price. Retailers must keep distribution costs down to levels at or below their competitors.

Managing Service and Cost. Retail companies are always trying to manage the tradeoff between high levels of service and low costs of distribution. The key is finding a way to get the highest levels of service the lowest cost of distribution in comparison to major competitors.

ACTIVITY

Discuss with your group the following:

1. Why is it important for retail companies to maintain high levels of service?
2. What can happen when customers find that products are out of stock?
3. Why is it important for retail companies to keep distribution costs low?
4. What would happen if retail stores had to raise prices to pay for higher distribution costs?

What Customers Want²

Customer service is the provision of labor and other resources, for the purpose of increasing the value that buyers receive from their purchases and from the processes leading up to the purchase. With the rising dominance of the service sector in the global economy, customer service has grown in importance, as its impact on individuals, households, firms, and societies has become widespread.

History of Customer Service

The modern concept of customer service has its roots in the craftsman economy of the 1800s, when individuals and small groups of manufacturers competed to produce arts and crafts to meet public demand. The advent of mass production in the early 20th century, followed by an explosion in the demand for goods after World War II, increased the power of suppliers at the expense of consumers, and thus reduced the importance of customer service. A shift in this balance began in the 1970s, as international competition increased, and the dominance of western manufacturers was challenged, first by Japan, then by Korea, China and other developing economies. Producers responded by improving the quality of their products and services.

The economic boom of the 1990s again increased the power of suppliers who, while not completely reverting to lower standards of service, were able to be more selective of which customers to serve, and of what levels of service to provide. The overall quality of customer service - in society and in specific industries - will continue to be determined by the relative balance of power between suppliers and consumers; it will improve as competition becomes more intense, and decline as competition decreases.

Strategic advantage through customer service

A company can outperform rivals only if it can establish a difference that it can preserve. Customer service can be such a difference. It is very difficult to control, and therefore difficult to imitate. It is difficult to control because of its variability. The level of service may vary greatly between two providers in the same organization. It may also vary from one moment to another, even as delivered by the same provider. The difficulty is compounded in multi-unit operations: in addition to variability *within* units, there is also variability *among* units.

² Information in this Handout from <http://en.wikipedia.org>, 2007.

That is both the challenge and the opportunity. The consistent delivery of superior service requires the careful design and execution of a whole system of activities that includes people, capital, technology, and processes. The few companies that can manage this system do stand out, and are sought out. This is the foundation of their sustainable competitive advantage.

Customer service culture

For an organization's members to deliver superior service consistently, they must be acculturated, i.e. instilled with the values, traits, patterns, and behaviors associated with a service culture. The mechanisms of this acculturation include recruitment, training, empowerment, and accountability, within the framework of an organization's ideology of service.

Service Ideology

An organization's ideology comprises its purpose (Why are we here?) and values (What do we stand for?). Organizations renowned for providing excellent customer service have typically defined their purpose in terms of service - to serve their customers, and to serve their members. Their values typically include integrity, trustworthiness, reliability, personal responsibility, industriousness, continuous improvement, respect, and consistency.

Recruitment, Training & Empowerment

Training is focused on enabling personnel to deliver service in manner that is beneficial to both the organization's customers, and to itself.

Accountability

Whereas outstanding service organizations allow their people to make mistakes and learn from their failures, there is little or no tolerance for violations of its core service values. People who do not fit into the culture are removed.

What customers want

Delivering customer service begins with understanding what customers want. And this understanding begins with the understanding that they do not always know what they want, or why they want it. Traditional market research assumes that they do. Newer methods recognize that as much as 95% of our decision making is subconscious.

Common research methods (e.g. surveys and focus groups) more often reveal what customers *think* their motivations are, rather than what their motivations truly are. When respondents do not comprehend their true motivations, they tend to state how they think they *ought* to be motivated. Recent progress in neuroscience and in observational technologies have yielded more reliable, less biased, results.

Regardless of how they arrived at their findings, most researchers agree on the factors listed in this table to the right. Suppliers that meet these requirements are likely to give their customers a satisfactory experience.

In a competitive environment, however, satisfaction may not be enough. To stay in business, firms must be at least as satisfactory as their competitors. Moreover, firms that aim to gain profitable growth must increase the number of their customers, while reducing the cost of customer acquisition. This is particularly true of companies that compete in mature industries. The objective then is not merely to satisfy customers, but to convert them into promoters (customers who recommend a company to others). Promoters serve to increase a firm's clientele, without increasing its cost of acquisition - i.e. with no additional marketing or promotional expense.

But customers do not make recommendations lightly. When they make a recommendation, they put their own reputations on the line. Firms must earn that recommendation through the consistent delivery of outstanding customer service.

Category	Description
Good People	Friendly, helpful, courteous Empathetic Knowledgeable, accurate, thorough Resourceful, empowered Able to recommend solutions Able to anticipate needs Efficient Trustworthy, authentic Reliable Responsible Appropriate appearance and demeanor
Good Offering	Good selection Good quality In stock Available demos Clear descriptions & pricing Competitive prices Financing, deferred payments
Convenience	Convenient locations Long hours Available help, fast service Signage that facilitates self-service Fast checkout Shipping/delivery Installation Phone/web support On-site repair Hassle-free returns Quick resolution of problems
Good Environment	Clean Organized Safe Low-pressure Energy level appropriate to clientele

Benefits of Customer Service

Beneficiary	Benefit
	Higher income (more sales, repeat business, referred business)
	Recognition
	Personal satisfaction & fulfillment
	Less stress
Providers	Higher self-awareness and self-control
	Greater authenticity
	Happier life at work
	Stronger social networks, family ties
	Happier life outside work
	Quality sales (more add-ons, more service sales)
	More repeat business
	More referred business
	Fewer returns
	Better reputation
	Higher morale, happier employees
Organizations	Lower employee turnover
	Higher caliber of job applicants
	Fewer complaints
	Higher productivity
	Better work environment
	Higher inventory turnover
	Higher profits
	Higher income from individuals and firms
Society	Higher productivity
	Stronger families and social networks
	Greater civility

Identifying the Major Types of Distribution Channels

As discussed in an earlier reading assignment, physical distribution involves the movement of products or merchandise from the producer to the consumer. Logistics and physical distribution professionals must develop plans to get products to the consumers at the right time in the right amount at the lowest possible costs. To understand the distribution channel we must understand the groups involved.

There is a **producer** who provides the goods. This may be a farmer, a food producer or a manufacturer of goods. In any sales situation there has to be **consumer**. That is you and me who buy the goods provided. If there is no consumer that wants the goods produced then there is no need to produce them.

In between these there is usually a group that buys the goods from the producer and sells them to the consumer. This is most often known as a retailer. However, a retailer may be a consumer and buy from a **wholesaler**. Some products are only available from a wholesaler. The wholesaler usually has many different products that they purchase from several producers and they resell the products to various retailers who resell them to you and me, the consumers. Therefore, physical distribution activities are carried out within one or more distribution channels. These distribution channels are developed and maintained by producers, wholesale companies, and retail companies.

There are many types of distribution channels:

- **Producer-Consumer Channels:** Producers distribute products directly to consumers through mail or direct delivery service.
- **Producer-Retailer-Consumer Channels:** Producers distribute products directly to retailers who then distribute product to consumers through retail stores or non-store sales operations such as telemarketing and catalogue sales. This type of distribution channel is common for large retailers who buy large amounts of products.
- **Producer-Wholesaler-Retailer-Consumer Channel.** Producers distribute to wholesalers who then distribute to many different retailers.

ACTIVITY

With your group, discuss the following:

1. What is the difference between a wholesaler and a retailer?
2. Identify an example of each type of distribution channel for products that you and members of your group buy on a regular basis.
3. Describe how common food products could be distributed to consumers using each of the three types of distribution channels.

Lesson 4

TOPIC	Understanding Distribution Centers	TIME ESTIMATE	2 hours
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OBJECTIVES

- Students will be able to describe a distribution center and its role providing products to the customer.
- Students will be able to determine local and regional distribution costs.
- Students will utilize formulas in determining distribution costs.

MATERIALS & RESOURCES

- Handout #7, "Two Major Costs of Distribution"
- Handout #8, "Distribution Centers"
- Handout #9, "Local and Regional Distribution Costs for Retail Companies"
- Access to Computers
- Calculators

LESSON DESCRIPTION & ACTIVITIES

Steps	No. of Minutes	ACTIVITIES
1	30	<ul style="list-style-type: none"> - Distribute Handout 7, Two Major Costs of Distribution and allow time for students to read. - As a class discuss the major points in the handout. - Go over the transportation cost formula and as a class work the example at the end of the handout.
2	50	<ul style="list-style-type: none"> - Distribute Handout 8, Distribution Centers, and allow time for students to read. - As a class discuss the major points in the handout. - Assign students to groups to work on activities at the end of Handout 8. - Check their work by selecting students to present their solutions on the board.
3	30	<ul style="list-style-type: none"> - Distribute Handout 9, Local and Regional Distribution Costs for Retail Companies and have students read. - As a class review the major costs and the formula for calculating these costs.

		<p>- Assign activities at the end of Handout 9 for students to complete and go over their answers as a class.</p>
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Two Major Costs of Distribution

The way that a business transports, stores and delivers its product to customers is critical to the ability to maintain and increase their profit. Outside of product costs, distribution expense is one of the largest cost of many businesses. This includes the cost of transporting, storing and delivering the product to the customer. There are two major types of distribution costs within a distribution channel—transportation and distribution center costs. Let's explore each type of cost.

Transportation

Mode(s) of Transportation. Distribution planners must first decide on which mode or modes of transportation to use in distributing products. The major transportation modes are:

- Air—airplanes
- Motor—trucks, delivery vans, and cars
- Rail—trains, railroad cars
- Water—ships and barges
- Pipeline—liquid, gas, slurry
- Intermodal—combination of two or more modes

Distribution planners must select the lowest cost mode that also can get the products there on time (speed), on a consistent basis (reliability), to many different locations (location access), and without major damage (quality).

Motor transportation (e.g., trucks) is the most common mode of transportation that retailers use to distribute products from distribution centers to their stores.

Transportation Supplier/Vendor. After selecting the mode of transportation, distribution planners must then decide which suppliers or vendors will transport their products. They sometimes must decide whether to use their own transportation equipment and employees (in-house) or contract with another company (contract out to supplier).

They usually make this choice based on a comparison of cost, reliability, location access, and damage history. The final choice is usually made on cost. Costs are usually calculated based on number of units shipped per mile. Here is an example of a transportation cost formula.

t = Transportation costs

n = Number of units (e.g., cases, pounds)

m = Number of miles transported

C = Cost per unit per mile

$$t = n \times m \times c$$

ACTIVITY

Use the transportation formula provided above to calculate the transportation costs for the following examples.

A distribution planner for a hardware store chain pays \$0.25 per mile for every case of bolts shipped from its distribution center to the company's stores. One store is located 53 miles from the distribution center. How much would it cost the company to ship 50 cases to this store?

Distribution Centers³

A distribution center for a set of products is a warehouse or other specialized building with refrigeration or air conditioning which are supplied by transport, such as aircraft, truck, rail or ship, and then re-distributed to retailers or wholesalers. The food distribution system of the United States is dominated by distribution centers, which have helped to cut the cost of supplying food in the United States, and make food only a small part of the cost of living there.

Distribution centers are foundation of a retailing network. They allow a retail location to stock vast numbers of products without incurring an explosion in transportation costs. The way a typical distribution network operates is to have centers setup throughout a commercial market. Each center will then service a number of stores. Large distributions centers for companies such as Wal-Mart service 50-125 stores. Suppliers will ship truckloads of products to the distribution center. The distribution center will then store the product until needed by the retail location and ship the proper quantity.

Because a large retailer might sell tens of thousands of products from thousands of vendors, it would be impossibly inefficient to try to ship each product directly from each vendor to each store. Many retailers own and run their distribution networks, while smaller retailers may outsource this function to dedicated logistics firms that coordinated the distribution of products for a number of companies.

Scale

Large distribution centers might receive and ship more than ten thousand truckloads each year, with an individual store receiving only a couple trucks per week up to 20, 30 or more per week. The distribution centers can range in size from less than 50,000 square feet up to the largest approaching 2 million square feet.

Storage

Although the primary role of a distribution center is to receive large quantities of products and ship small quantities to individual stores, an important secondary role is storage. Many retailers have prioritized having as many items in stock at one time as possible. To conserve space, minimize inventory costs and maximize the variety they offer, the retail might only stock one or a few items of a particular product. This requires the ability to ship a replacement quickly once an item is sold. By keeping

² Information in this Handout from http://en.wikipedia.org/wiki/Distribution_center

product on hand in the distribution center, the retailer can ship a replacement almost immediately after a product is sold.

In addition to shipping quickly, preparing for busy shopping seasons requires retailers to stock up on product ahead of time. For many retailers, the Christmas shopping season is the busiest of the year. Ahead of this time, a distribution center might double the amount of inventory on hand and then draw this level down through the shopping season. This strategy is especially important for imported items. With lead times measured in weeks or months, stocking these products in a distribution center is often the only way to maintain in-stocks at the store. New seasons, holidays or special promotions may also prompt a retailer to store specific items prior to a large rollout or demand forecast.

Costs

The most efficient method of distribution would be shipping a full truckload or railcar directly from the manufacturer to the retailer. After this, the next most efficient method would be to ship a full truckload to a distribution center, unload full pallets of products and immediately load the pallets onto trucks that are going to individual stores. Both of these methods can only be used on very high volume items. Most products cannot be delivered in this manner and pallets, or even individual boxes, must be broken down and divided.

Once a full pallet must be broken apart, the costs of handling the product can increase quickly. Many distribution centers use large sortation systems with miles of conveyor to move product through the facility and into a truck. They also may have automated equipment for de-palletizing and re-palletizing product. Some of the most sophisticated systems can convey product straight into storage racks and then convey out of the racks to trucks, all automatically. With a wide variety of product sizes and weights, these systems are designed to handle a specific range of products. Very large/small or heavy/light products require varying degrees of manual handling.

As the process of handling involves more steps and is more manual, the cost increases. Storing products instead of receiving and immediately shipping them, adds cost. Firms must determine where lost sales from not having product on the shelves are balanced by the increased handling and storage costs.

Products that cannot be handled by automatic equipment also add costs. Some of the largest products may require more than one person to manually unload and load these into trucks. This process can be very time consuming and costly, and must be offset by higher prices.

Distribution Center Organization

All distribution centers have three main areas and may have additional specialized areas. The three main areas are the receiving dock, the storage area and the shipping dock. In small organizations it is possible for the receiving and shipping functions to occur side by side, but in large centers, separating these areas simplifies the process. Often a distribution center will have dedicated dock doors for each store in its shipping area. The receiving area can also be specialized based on the handling characteristics of freight being received, whether the product is going into storage or is going straight to a store or by the type of vehicle delivering the product.

Other departments that a distribution center may have include:

- Transportation - arranges and coordinates shipments in and out of the DC
- Repackaging - breaks open bulk packages and repackages assortments for individual stores
- Dedicated Product Departments - divisions can be based on handling characteristics or storage characteristics. For example, refrigerated and non-refrigerator

Distribution Centers also have a variety of supporting departments. These include human resources, maintenance/facilities operations, production control and accounting.

Distribution Jobs

A distribution center will have a *General Manager* that manages the facility. This individual will then have a number of department managers that report directly to them. Each department is then composed of supervisors and warehouse workers. The jobs of a warehouse worker can include:

- Receiver - unloads trucks, either with or without equipment
- Pallet Mover - transports pallets with equipment from one area of a plant to another
- Stocker - puts product into racks, either on forklifts or by hand
- Order Picker - picks product from the racks to send to a store, either on forklifts or by hand
- Packer - repackaged product from bulk boxes into assortments for individual stores
- Shipper - loads trucks, either with equipment or by hand

In addition to these basic job functions, there are a number of other areas of employment in a DC. Inventory management, maintenance, training and housekeeping can all be dedicated job functions.

Handling and Storage at Distribution Centers

Distribution planners must decide which warehouses or distribution centers to use within the distribution channel.

Distribution planners must always be looking for ways to lower handling and storage costs at distribution centers. In some cases, distribution planners for major retail companies hire other companies to provide warehousing services for some of their products.

Sometimes, this is done when their own distribution centers cannot handle the volume of in-bound and out-bound shipments.

One major factor in deciding which warehouse or distribution center to use is how much they charge to handle and store the products. Here are some major types of handling and storage costs:

- Unloading in-bound shipments from the producer or wholesaler
- Moving products into and out from short-term storage
- Maintaining control of inventory in the facility
- Moving products from short-term storage and loading for out-bound shipments

In most cases, these handling and short-term storage costs are combined into a total handling and storage cost. An example formula for handling and storage costs is:

d = total handling and storage costs of a distribution center or warehouse

n = number units handled and stored

c = cost per unit handled and stored

$$d = n \times c$$

Use the formula to solve the following problem:

A distribution planner has 2500 cases of bolts to store for a big sale that is occurring next month. The warehouse charges \$0.49 per case handled and stored at the warehouse. How much will the planner have to pay to distribute the 2,500 cases through the warehouse?

ACTIVITY

With your group, do the following:

1. Discuss why motor transportation is the most common mode of transportation used by retail companies to move products from distribution centers to their stores? Give two major reasons.

2. Use the transportation formula ($t = n \times m \times c$) to calculate the transportation costs for the following examples.

A distribution planner for a wholesale distributor is selecting which trucking company to use to distribute holiday candy from their central warehouse to three distribution centers of a major retail customer. The round trip mileage from the wholesale distributor's warehouse and the retail distribution centers are:

Distribution Center 1 --- 132 miles

Distribution Center 2 --- 532 miles

Distribution Center 3 --- 432 miles

Advance Trucking charges \$0.25 per case per mile

Midwest Trucking charges \$0.28 per case per mile

How much money would the planner save by using the lowest cost trucking company?

3. Use the distribution center formula ($d = n \times c$) to calculate the costs for the following:

3.1 A distribution planner for a paint store chain is calculating the total handling and storage costs she will have to pay to use a temporary storage warehouse to distribute 2,300 cases of paint for a special promotion. The warehouse charges \$0.66 per case handled and stored at the warehouse. How much will the planner have to pay to distribute the 2,300 cases through the warehouse?

3.2 If the planner is charged \$0.54 per case by another warehouse, how much money would be saved by choosing the lowest cost warehouse?

Local and Regional Distribution Costs for Retail Companies

Logistics and distribution planners must control the total transportation and distribution center costs within a distribution channel such as the producer-retailer-consumer channel. As shown in Figure 3.1, there are four major sources of costs within this type of channel.

1. Producer distribution centers--costs for handling and storage.
2. Transportation costs for shipping from producer distribution centers to retailer distribution centers.
3. Retailer distribution centers—costs for handling and storage.
4. Transportation costs for shipping from retailer distribution centers to retail stores including cost of unloading at stores.

The major focus of many distribution planners working for retail companies is controlling the cost of local and regional distribution of products from their distribution centers to stores within a defined geographic area. These geographic areas are sometimes called service regions.

The total local or regional distribution costs for a geographic area or service region is a combination of total handling and storage costs at a distribution center and total transportation costs from the center to the stores. The formula for calculating these costs is

$$r = d + t$$

r = total local/regional distribution costs

d = total handling and storage costs of a distribution center

t = total transportation costs

This formula shows that planners can reduce their local or regional distribution costs by using three strategies:

- Use the lowest cost distribution centers that are closest to the stores being served.
- Use the lowest cost transportation supplier to transport products from distribution centers to stores.
- Plan the shortest routes from distribution centers to the stores to reduce the mileage charged by transportation suppliers

ACTIVITY

With your group, do the following:

1. Discuss the three major strategies that distribution planners can use to reduce local/regional distribution costs.
2. Use the formula to calculate the local/regional distribution costs for the following example.

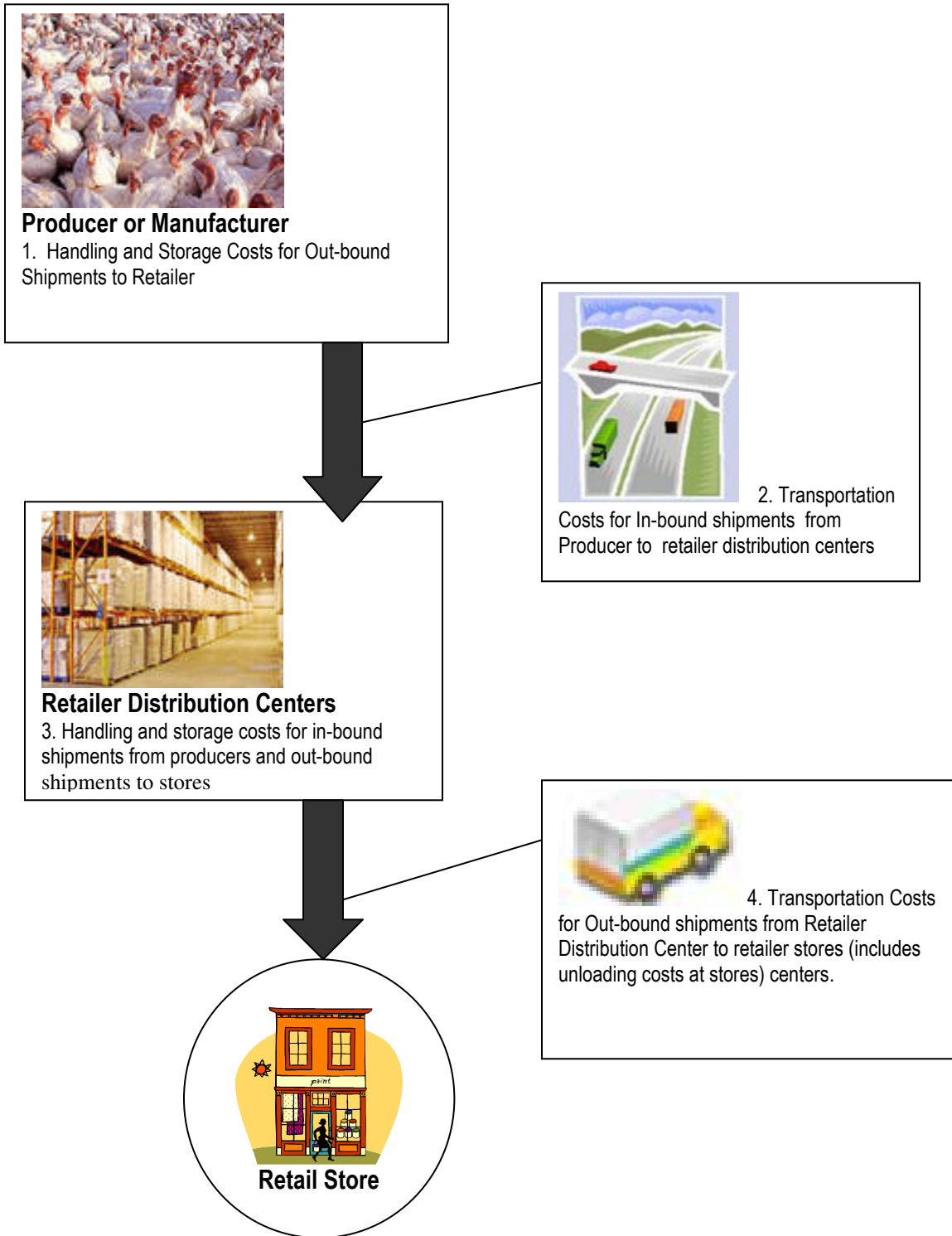
A distribution planner wants to calculate the total local distribution cost for distributing special promotion toys to her company's store in downtown Chicago. She wants to ship the toys from the company's regional distribution center, which is 23 miles away (round trip). She needs to make a delivery of 50 cases of toys each month for three months.

The regional distribution center charges \$0.25 per case shipped to the stores. The cost of shipping by truck to the stores is \$0.34 per case per mile (round trip).

What is the total distribution cost to distribute the toys over the three-month period?

Figure 4.1

Distribution Costs for Producer-Retailer-Consumer Distribution Channel



Reading Charts to Select Suppliers

As discussed above, distribution planners can reduce transportation costs if the:

- Use the lowest cost distribution centers that are closest to the stores being served
- Use the lowest cost transportation supplier to ship from distribution centers to stores

It is not always that easy to do. In many cases, distribution planners must examine and compare the rates of multiple suppliers. Usually, this information is provided in complex charts that display different rates for different conditions such as number of total miles in a route. Distribution planners must be able to read and interpret charts containing cost information.

ACTIVITY

Use the chart on the next page and answer the following questions.

1. What is the rate charged by Midwest Trucking to ship cases if the routes are between 3 and 4 miles?
2. What is the rate charged by Chicago Trucking if the routes are longer than 15 miles?
3. Which trucking company has the lowest rates for routes between 6 and 9 miles?
4. What would be the transportation costs for Advance Trucking to ship 50 cases of product with a route distance of 7 miles? How much could you save if you hired Midwest Trucking to do the same shipment?

Figure 4.2 Transportation Rates by Distance of Route
Route Distance Trucking Company

Miles	Company A	Company B	Company C	Company D
<5	.34	.25	.30	
5-9.99	.34	.25	.37	
10-19.99	.34	.35	.37	
20<	.34	.45	.37	

rates = Dollar(\$) cost per case shipped

Lesson 5

TOPIC	Maps and Routing	TIME ESTIMATE	2 hours
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OBJECTIVES
<ul style="list-style-type: none"> • Students will be able to use software or Internet to read information from maps. • Students will be able to pinpoint locations on maps. • Students will be able to use maps to plan multiple routes.

MATERIALS & RESOURCES
<ul style="list-style-type: none"> • Handout #10, "Using Maps and Computers to Estimate Distance Between Locations" • Handout #11, "Route Planning" • Copy of Handout 1 from Lesson 1 • Copies of maps of United States • Access to Computers • Calculators • Websites: http://www.earth.google.com http://www.dotfoods.com http://www.mapquest.com • GIS/GPS Software

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	5	- Discuss maps and their importance.
2	15	<ul style="list-style-type: none"> - Distribute Handout 10, Using Maps and Computers to Estimate Distance Between Locations. Ask students to read the first part of the handout. - After students finish reading, distribute maps and ask them to look at maps for information on direction, scale and roads.

3	15	- Ask students to pinpoint the distribution centers for Dot Foods on the map and answer the questions on Handout 10.
4	10	- Allow time for students to read the rest of Handout 10.
5	20	- Using computers, have students access mapquest.com and use it to estimate the distance from your school to the same location used in the map reading section. - Ask students to use mapquest.com to answer question on Handout 10.
6	30	- Discuss the importance of routing. - Distribute Handout 11, Route Planning and have students read and discuss the first part as a class. - With students working in groups, have them answer the first two questions of the activity on page 2 of Handout 11. - Allow time for them to report group results.
7	30	- Review Handout 1, Memo from Dot Foods, location of stores and distribution centers. - Allow time for students to work in groups to determine best routes from distribution centers to customers. - Read the rest of Handout 11 and complete the activities for determining multiple routes.

Using Maps and Computers Estimate Distance Between Locations

Using Maps to Estimate Distance Between Locations

As we discussed in Lesson 4, one major strategy for lowering local and regional distribution costs is to select the shortest routes between distribution centers and stores.

The first step in planning routes is to use maps to estimate the distance (i.e., number of miles) between locations. These locations are distribution centers and stores.

Look at the map provided for your project. Notice three types of information

- Direction—north, south, east, west
- Scale—miles to a standard measurement
- Roads—types and location
- Other Information—points of interest, retail centers

ACTIVITY

With your group, answer the following questions

1. Which direction is the Distribution Center from store # _____ ? Is it east, west, north or south from the center?
2. How far would a truck have to travel to go from the Distribution Center to store _____ if the truck used only major highways?
3. What is the route that would take the least amount of travel time and/or distance?

Using Computers to Estimate Distance Between Locations

Most distribution planners no longer use maps to estimate mileage between locations. They use computer programs that are based on geographic information systems. One way to show how these systems work is to use publicly available computer software systems on the Internet. One popular Internet site--*mapquest.com* ---can provide you with an example of how these systems work.

With help from your teacher and students in your group, access and explore this site. Select "Driving Directions" to use it to estimate point to point distances between locations. Just enter addresses for the Dot Food Distribution Center and the address of the stores in the area.

ACTIVITY

With your group, use *mapquest.com* to answer the following questions.

1. How far would a truck have to travel to go from the Dot Food Distribution Center at _____ to the stores at _____.
2. How far would a truck have to travel to go from the store at _____ in _____ to the Dot Foods Distribution Center?
3. How far would a truck have to travel to go from the store _____ to the Dot Foods Distribution center?

Route Planning

Selecting Routes for Shortest Distances

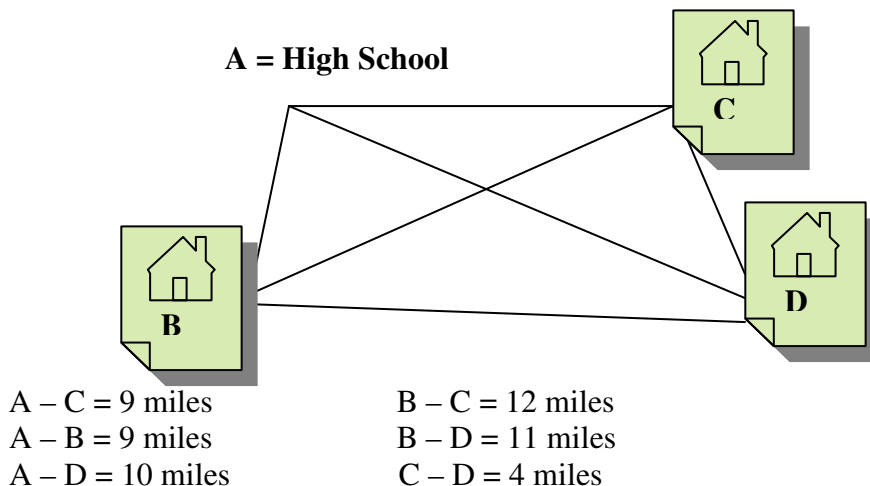
One of the most difficult tasks in distribution planning is selecting the shortest routes for trucks to take in distributing products from distribution centers to stores. In most cases, distribution planners can save money by having trucks deliver to more than one store in a single route.

One major key to route planning is making sure that you systematically explore every possible route and choose the route with the shortest total distance.

Let's illustrate the logic of route planning by thinking about decisions you make every day. As shown in Figure 4.1, you are at your high school and you have been asked to go pick up your three friends at their homes. To save time, you want to travel the shortest route that will get you to each house and then back to school. The location and distances between your high school and your friends' houses are shown on Figure 5.1.

Figure 5.1

Distances Between High School and Friends' Houses for 1 Best Route



Possible Routes: How many possible routes could you take?

You could simply brainstorm with your friends and try to come up with every possible route you can imagine. But, how do you know if you have thought of all possible routes. One way is to use a standard formula for calculating all possible permutations of the locations (your friend's houses) you need to travel to from the location of origin for your route (your high school).

Permutations are different orderings of a given set of objects or elements. In this case, these elements are locations of friends' houses. The formula is:

$r = n!$

r = number of routes

n = number of locations(not including origin location)

! = factorial (product of all positive integers between 1 and number)

Let's calculate how many different routes (permutations) you should be able to identify.

$$r = 3 \times 2 \times 1$$

$$r = 6$$

ACTIVITY

1. What would be the number of possible routes if you had to go to four houses before returning to your school?

2. Shortest Route: Which is the shortest route?

How do you know you have selected the shortest route? One method is to list out every possible permutation, add the distances, and select the route with the shortest distance. Let's try the list method for identifying your shortest route. Follow the example on Route 1 and list out every possible route. Remember "A" is the location of your high school and must be the first and last location listed.

Route 1: A - B - C - D - A = 9 + 12 + 4 + 10 = 35 miles

Route 2: _____ miles

Route 3: _____ miles

Route 4: _____ miles

Route 5: _____ miles

Route 6: _____ miles

3. Now, imagine that your high school is a Dot Foods Distribution Center and your friends' houses are Dot stores.

- a. Using a map or computer map program, chart the distances between each of the stores and the distribution center.
- b. Determine the shortest route for distributing products between a distribution center and the stores. You may want to use a spreadsheet such as Excel to enter and calculate your data. You have just identified the shortest route for distributing products between a distribution center and stores! **$r = n!$**

But, we are not done. Read below for a more complex planning problem!

Planning Multiple Routes for Shortest Distance

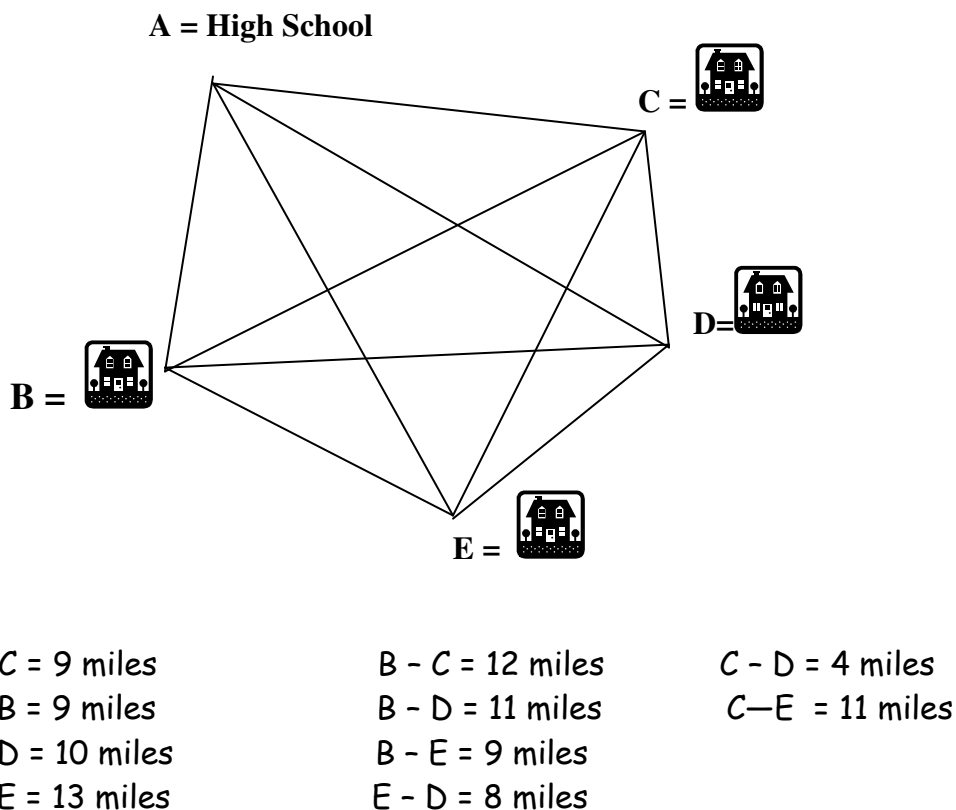
In some cases, distribution planners have to devise multiple routes for trucks so that these multiple routes add up to the shortest total distance. This is because trucks can only hold so many products and stores have limited storage capacity. As a result, planners must develop plans that involve multiple routes that only serve a few stores at a time.

The challenge is determining which stores should be grouped together for the shortest routes.

Let's go back to your route planning from your high school to your friend's houses. But, now look at Figure 5.2.

Figure 5.2

Distances Between High School and Friends' Houses for 2 Best Routes



Best Two Routes: What if I had to make two trips?

How many possible routes could I take if I could only get two friends in my car at the same time and had to make two trips to pick up four friends and take them back to school?

Again, you could simply brainstorm with your friends and try to come up with every possible combination of two routes you can imagine. But, how do you know if you have thought of all possible routes? Again, a formula can come be very helpful.

The formula is:

$r = n!/p!$

r = number of possible routes

n = number of locations(not including origin location)

! = factorial (product of all positive integers between 1 and number)

p = number of locations (n) included in each route

Let's calculate how different routes (permutations) you should be able to identify with four locations taking two at a time.

$$r = 24 / 2$$

$$r = 12$$

The next step is to select the two best routes that do not repeat locations. Use the list method to identify each of these routes and the total miles for each route. Then select the best two routes that do not involve the same friends.

<u>Route 1:</u>	=	<u>miles</u>
<u>Route 2:</u>	=	<u>miles</u>
<u>Route 3:</u>	=	<u>miles</u>
<u>Route 4:</u>	=	<u>miles</u>
<u>Route 5:</u>	=	<u>miles</u>
<u>Route 6:</u>	=	<u>miles</u>
<u>Route 7:</u>	=	<u>miles</u>
<u>Route 8:</u>	=	<u>miles</u>
<u>Route 9:</u>	=	<u>miles</u>
<u>Route 10:</u>	=	<u>miles</u>
<u>Route 11:</u>	=	<u>miles</u>
<u>Route 12:</u>	=	<u>miles</u>

ACTIVITY

1. What would be the number of possible routes you could take if you had to pick up 6 friends and had to make 3 trips with 2 friends picked up in each route before returning to your school?

2. Again, imagine that your high school is a Dot Foods Distribution Center and your friends' houses are the stores.
 - a. Chart the distances between each of the stores and the distribution center.
 - b. Determine the shortest two routes serving two stores in a single route. You may want to use a spreadsheet such as Excel to enter and calculate your data.

Table 1
Permutations for One Route (Three Friends Per Route)
(A = High School)

First Stop Friend B (A-B-x-x-A)

Route 1 -- $A-B-C-D-A = 9 + 12 + 4 + 10 = 35$

Route 2 -- $A-B-D-C-A = 9 + 11 + 4 + 9 = 33$

First Stop Friend C (A-C-x-x-A)

Route 3 -- $A-C-B-D-A = 9 + 12 + 11 + 10 = 42$

Route 4 -- $A-C-D-B-A = 9 + 4 + 11 + 9 = 33$

First Stop Friend D (A-D-x-x-A)

Route 5 -- $A-D-B-C-A = 10 + 11 + 12 + 9 = 42$

Route 6 -- $A-D-C-B-A = 10 + 4 + 12 + 9 = 35$

Table 2
Permutations for Two Routes (Two Friends Per Route)
(A = High School)

First Stop Friend B (A-B-x-A)

Route 1: $A-B-C-A = 9 + 12 + 9 = 30$

Route 2: $A-B-D-A = 9 + 11 + 10 = 30$

Route 3: $A-B-E-A = 9 + 9 + 13 = 31^*$

First Stop Friend C (A-C-x-A)

Route 4: $A-C-B-A = 9 + 12 + 9 = 30$

Route 5: $A-C-D-A = 9 + 4 + 10 = 23^*$

Route 6: $A-C-E-A = 9 + 11 + 13 = 33$

First Stop Friend D (A-D-x-A)

Route 7: $A-D-B-A = 10 + 11 + 9 = 30$

Route 8: $A-D-C-A = 10 + 4 + 9 = 23$

Route 9: $A-D-E-A = 10 + 8 + 13 = 31$

First Stop Friend E (A-E-x-A)

Route 10: $A-E-B-A = 13 + 9 + 9 = 31$

Route 11: $A-E-C-A = 13 + 11 + 9 = 33$

Route 12: $A-E-D-A = 13 + 8 + 10 = 31$

Lesson 6

TOPIC	Preparing and Presenting Reports	TIME ESTIMATE	3 hours
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OBJECTIVES	
<ul style="list-style-type: none"> • Students will be able to prepare reports. • Students will be able to make presentation of report. 	

MATERIALS & RESOURCES	
<ul style="list-style-type: none"> • Handout #12, "Rubric for Evaluating Student Presentation" • Handout #13, "Preparing the Plan" • Copy of Handout 1 from Lesson 1, Dot Foods Memo • Access to Computers • Calculators 	

LESSON DESCRIPTION & ACTIVITIES		
Steps	No. of Minutes	ACTIVITIES
1	5	- Review the Handout 1, Memo from Dot Foods and discuss any questions students may have.
2	10	- Distribute Handout 12, Rubric for Evaluating Student Presentation. - Discuss and answer any questions that students may have.
3	20	- Distribute Handout 13, Preparing the Plan. Have students read and complete information needed for the report.
4	40	- Allow time for student to work on preparing reports and presentations.
5	60	- Have students make presentations to the class. - Discuss the things students learned while working on the presentation.
6	50	- Conduct a class discussion on the various careers associated with TDL - Ask students to research and write about one job or position related to TDL that they find interesting. - Have students share their reports.

Evaluating Student Presentations⁴					
	1	2	3	4	Total
Organization	Audience cannot understand presentation because there is no sequence of information.	Audience has difficulty following presentation because student jumps around.	Student presents information in logical sequence which audience can follow.	Student presents information in logical, interesting sequence which audience can follow.	
Subject Knowledge	Student does not have grasp of information; student cannot answer questions about subject.	Student is uncomfortable with information and is able to answer only rudimentary questions.	Student is at ease with expected answers to all questions, but fails to elaborate.	Student demonstrates full knowledge (more than required) by answering all class questions with explanations and elaboration.	
Graphics	Student uses superfluous graphics or no graphics	Student occasionally uses graphics that rarely support text and presentation.	Student's graphics relate to text and presentation.	Student's graphics explain and reinforce screen text and presentation.	
Mechanics	Student's presentation has four or more spelling errors and/or grammatical errors.	Presentation has three misspellings and/or grammatical errors.	Presentation has no more than two misspellings and/or grammatical errors.	Presentation has no misspellings or grammatical errors.	
Eye Contact	Student reads all of report with no eye contact.	Student occasionally uses eye contact, but still reads most of report.	Student maintains eye contact most of the time but frequently returns to notes.	Student maintains eye contact with audience, seldom returning to notes.	
Elocution	Student mumbles, incorrectly pronounces terms, and speaks too quietly for students in the back of class to hear.	Student's voice is low. Student incorrectly pronounces terms. Audience members have difficulty hearing presentation.	Student's voice is clear. Student pronounces most words correctly. Most audience members can hear presentation.	Student uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation.	
				Total Points:	

⁴ Adapted from Evaluating Student Presentations, Information Technology Evaluation Services, NC Department of Public Instruction
Dot Foods Distribution Center Module
TDL Math Science Project 2007

Planning a Presentation

I. Decide on type of presentation your group will be doing.

- a. Poster board presentation
- b. Power-point presentation
- c. Other

II. Material to include

- a. Graphics
- b. Calculations
- c. Problem Statement
- d. Steps in solution
- e. Solution Statement

III. Gather all necessary materials

- a. Visual aides
- b. Media source

IV. Presenting

- a. Practice your presentation
- b. Decide what the job will be for each member of the group during the presentation.

Teacher

Assessment Materials

FINAL EVALUATION

Problem Statement to be Solved:

Dot Foods would like to add a new distribution center. It currently has distribution centers in Modesto CA, Dallas TX, Ardmore OK, Chesterfield MO, Vidalia GA, Williamsport MD, Liverpool NY, and Chicago IL, with the Corporate Headquarters in Mt. Sterling IL. This new distribution center will create a need to realign customer delivery areas. Your job will be to decide which customers will be supplied by each distribution center. The solution should be based on minimizing the transportation and distribution cost required to move the product.

Measurement Criteria that would describe an acceptable solution

1. Route selected represented the most cost effective means for delivering goods on scheduled dates
2. Identified on map potential locations.
3. Evaluate alternative locations and determined service level and cost differences.
4. All calculations were correct using formulas, maps, and charts provided.
5. Business report included a cover letter, introduction stating the purpose of the report, documentation to support recommendations, a detailed explanation of costs, and tables, charts and spreadsheets to more clearly communicate recommended distribution plan.
6. Presentation presented the information with visual aids and/or handouts.
7. The presentation met the 7 requirements of effective business presentations:
 - Evidence of preparedness and practice
 - Started on time
 - Dressed appropriately
 - Showed enthusiasm and confidence
 - Maintained eye contact, showed friendliness and respect
 - Spoke slowly and distinctly without grammatical errors or slang
 - Welcomed questions and answered completely; accepted reactions without being defensive.

Suggested Scoring Guide

1. Solving the Problem—55 points

- Carrier selected represented the most cost effective means for delivering goods on scheduled dates (10 points)
- Read map correctly in Identifying potential locations and calculating best route. (10 points)
- Evaluate alternative locations and determined service level and cost differences. (15 points)
- All calculations were correct using formulas, maps, and charts provided. (20 points)

2. Business Report—25 points

3. Presentation--20 points

Solution Checker

New Distribution Center Location for Dot Foods Module

STEP 1: Answer the questions below:

- Did you take into account the location of the new distribution center?
- How did you decide on the best routes from the distributor to the customers?
- If yes, how did this effect your route planning? After answering the question, proceed to Step 2.

STEP 2: Complete the table below:

Route Description	# of Times Route is Repeated	Trucking Option	Mileage for One Route	Mileage Cost	Total Mileage	Total Mileage Cost	Total Handling Cost

STEP 3: Complete the calculation below:

What is the total cost of your solution?

A P P E N D I X

GLOSSARY of TERMS Related to this Scenario

Carrying Costs

The costs that are a result of keeping the inventory housed. This includes interest, taxes, warehousing, warehousing, damage and obsolescence.

Consumers

End users of retail products

Distribution

The delivery or giving out of an item or items to the intended recipients

Distribution channel

The complete sequence of producers, wholesaler, and retailers involved in bringing a product from the producer to the consumers

Distribution costs

The direct costs for handling and storing products at distribution centers and transporting products from manufacturers to stores and consumers.

High levels of service

A situation in which retail companies consistently have all of their products available in stores when customers want to buy them. High levels of service are measured by the percentage of products carried by a store that are in stock during a buying period (no stock outs).

Inventory

The word used to describe all the goods and materials kept on hand to perform work.

Logistics:

The overall management of the way resources is moved to the areas where they are required.

Materials management

The planning and management of the distribution of raw materials and supplies to where they are used to produce products and merchandise, usually a manufacturing facility, and moving them through the company until these materials become finished products.

Physical distribution management

The planning and management of the distribution of finished products and merchandise from manufacturers or their wholesalers to stores and consumers.

Obsolescence

Becoming obsolete

Producers

Those companies that convert raw materials into products and merchandise to be distributed and sold to the consumer. Producers are usually manufacturing companies.

Suppliers

Companies that provide raw materials and components to manufacture.

Warehouses

A building or sections within a building where the primary use of the space is to store inventory