



# Energy Prices and the Laws of Supply and Demand

By using the laws of supply and demand, students demonstrate how the marketplace sets energy prices and show how these prices change.

**Grade Level:** 9–12

**Subject Areas:** English Language Arts, Family and Consumer Science, Mathematics, Science, Social Studies

**Setting:** Classroom

**Time:**

**Preparation:** 30 minutes

**Activity:** Two 50-minute periods

**Vocabulary:** Demand schedule, Equilibrium price, Equilibrium quantity, Law of demand, Law of supply, Shortage, Supply schedule, Surplus

**Major Concept Areas:**

- Consumption of energy resources
- Quality of life

**Getting Ready:** Obtain the current price of gasoline from a local gasoline service station.

## Objectives

Students will be able to

- define demand, supply, and equilibrium price and quantity;
- read, interpret, and draw graphs depicting demand and supply curves, and determine energy prices from these curves; and
- identify the conditions that cause a shortage or surplus of an energy resource.

## Rationale

Investigating the relationship between the supply, demand, and price of energy resources helps students understand how energy prices are set, how different conditions cause prices to change, and how changes in energy prices affect the household budgets of Wisconsin citizens.

## Materials

- Graph paper
- Markers (optional)
- Copies of the following pages:
  - *Demand Curve for Gasoline*
  - *Supply Curve for Gasoline*
  - *Copies of Supply and Demand*
  - *Copies of Ms. Sene's Dilemma* (optional)
- Find additional resources related to this activity on [keepprogram.org](http://keepprogram.org) > Curriculum & Resources

## Background

The corner service station posts a large sign that reads “\$2.50 per gallon” for regular unleaded gasoline. A utility bill lists a rate of 11.5 cents per kilowatt-hour for electricity and 58 cents per therm for natural gas. An ad in a local newspaper offers firewood for sale at a cost of \$150 per cord. Energy prices, like the prices of other goods and services, are pieces of information that tell people how much money they must pay for a certain amount of fuel or other energy source.

How are energy prices determined? Clues that help answer this question often come in the form of environmental and sociopolitical events associated with changes in energy prices. An unusually cold winter drives up the cost of heating oil, natural gas, and propane. An economic embargo against a foreign oil-producing nation is lifted, and gasoline

prices decrease some months later. Events like these indicate how market forces cause changes in energy prices. From such changes, economists have discovered two fundamental relationships that describe how energy prices (and the prices of other goods and services) are set. These relationships are known as the laws of demand and supply.

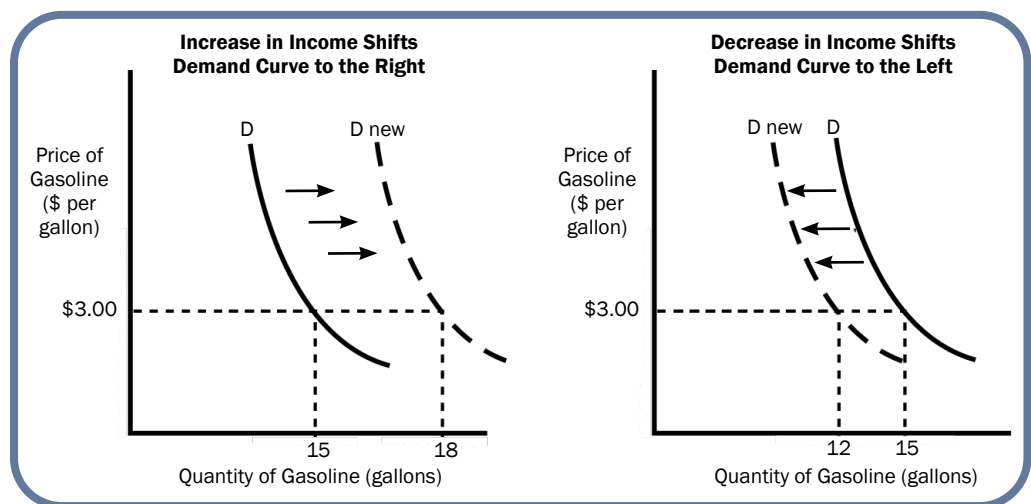
The law of demand states that, other things being equal or constant, decreasing the price of a good or service increases the quantity purchased of the good or service demanded by consumers. In other words, the price of a good or service is inversely related to the quantity demanded. For instance, if gasoline prices decrease, the quantity of gasoline demanded increases, and vice versa. This relationship can be demonstrated by showing drivers a range of gasoline prices and then asking them how much gasoline they would be willing to buy each week at each price. Drivers would likely respond by saying that the lower the price of gasoline, the more gasoline they would buy. This information can be summarized in a table called a demand schedule (see example chart right) or on a graph called a demand curve (see [Demand Curve for Gasoline](#)). The law of demand holds true not only for drivers buying gasoline, but also for consumers buying any kind of goods or services, including other energy sources.

In some cases, the quantity of gasoline purchased by customers may not vary much with changes in gasoline prices. For instance, customers who must commute to school or work during the week may buy approximately the same amounts of gasoline over a certain range of prices. In these cases, the customers' demand for gasoline is said to be inelastic. However, the quantity of gasoline demanded by customers will change if the range of gasoline prices is large enough. Many customers who must commute will drive less or use alternative transportation if they cannot afford high gasoline prices. On the other hand, the demand for certain goods and services

<b>Demand Schedule for Gasoline</b>	
<b>Price of Gasoline (\$/gallon)</b>	<b>Quantity of Gasoline Purchased Each Week per Driver (gallons)</b>
\$8.00	5
\$6.00	8
\$4.00	12
\$3.00	15
\$2.00	19
\$1.00	25

may vary greatly with changes in prices. In such cases, demand is said to be elastic. An item that may exhibit elastic demand is breakfast cereal, where the quantity of a particular type of cereal purchased depends on changes in prices.

The phrase "other things being equal or constant" is stated as part of the law of demand so that variations only in price and quantity are considered rather than prices of related goods or services or consumer tastes over a short period of time. All these factors may complicate or obscure the relationship between the price and the quantity demanded. Yet these factors also change demand. How? They shift the entire demand curve to the right or left of its original position. For example, a rise in the income of drivers will usually shift the demand curve for gasoline to the right. Drivers may then buy 30 gallons of gasoline



per week instead of 25 gallons at \$1.00 per gallon, 24 gallons instead of 19 at \$2.00 per gallon, and so on. On the other hand, a decrease in drivers' income will usually shift the demand curve to the left, meaning that drivers would buy less gasoline at each price than they did before.

The demand for goods and services is not enough to set prices at a single value; producers or suppliers of goods and services are also involved. Like in the law of demand, in the law of supply a relationship exists between the price of a good or service and the quantity that suppliers are willing to produce. This law of supply states that, other things being equal or constant, increasing the price of a good or service increases the quantity produced. In other words, the price of a good or service is directly related to the quantity supplied. For example, a service station owner would be willing to sell more gasoline at a higher price. This behavior can be summarized in a table called a supply schedule (right) or on a graph called a supply curve (see [Supply Curve for Gasoline](#)).

The law of supply is not as obvious as the law of demand. For instance, large manufacturers can produce products more cheaply at higher quantities than smaller manufacturers can. However, in this case other things are not equal or constant. Large manufacturers are able to offer products at large quantities and lower prices by investing in new and improved equipment, retraining their workforce, and improving production processes. The law of supply holds these factors constant over a short period of time. This means manufacturers must use their present equipment, employees, and production processes to supply goods and services. Producing greater quantities while keeping these factors constant increases the costs that manufacturers must bear and causes them to increase prices. Like changes in the factors affecting demand, changes in these and other factors, such as the cost of production or the number of manufacturers producing the same product, cause the entire supply curve to shift to the right or left of its original position.

Working together, the laws of demand and supply show how prices are set when consumers and producers interact. An equilibrium price and quantity arises when, for a given price, the quantity demanded by consumers is equal to the quantity supplied by producers. This relationship can be seen by placing the [Demand Curve for](#)

Supply Schedule for Gasoline	
Price of Gasoline (\$/gallon)	Quantity of Gasoline Purchased Each Week per Driver (gallons)
\$8.00	23
\$6.00	21
\$4.00	17
\$3.00	15
\$2.00	12
\$1.00	8

[Gasoline](#) graph over the [Supply Curve for Gasoline](#) graph. The demand and supply curves for gasoline meet at an equilibrium price of \$3.00 per gallon and an equilibrium quantity of 15 gallons each week per driver. Changes in the factors affecting demand and supply result in changes in the equilibrium price and quantity. See [Examples of Supply and Demand Curve Shifts](#).

A surplus arises when the supply of a good or service exceeds its demand at a given price. In the gasoline example, a surplus of five gallons per driver occurs at a price of \$4.00 per gallon. Larger surpluses occur at higher prices. Temporary surpluses may occur because of overproduction and may be alleviated by cutting prices, reducing the quantity of goods and services being produced, or reducing the number of suppliers.

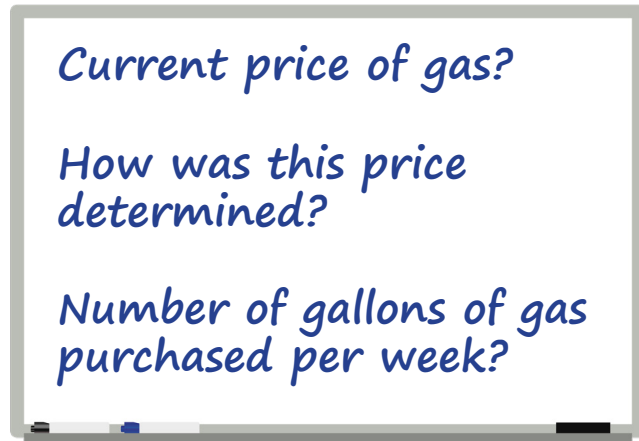
When demand exceeds supply, a shortage of a good or service arises. In the gasoline example, a shortage of seven gallons per customer occurs at a price of \$2.00 per gallon. Larger shortages occur at lower prices. Shortages may occur because of underproduction and may be alleviated by raising prices, increasing the quantity of goods and services being produced, or increasing the number of suppliers. When shortages persist, suppliers may be forced to limit the quantity of the product being sold by rationing it, or they may be forced to sell their product on a first-come, first-served basis.

The laws of supply and demand provide a straightforward yet powerful way to explain how energy prices are set and how they change. Think about them the next time you see the price of gasoline on a sign posted by the corner service station.

## Procedure

### Orientation

Ask students if they know the current price of gasoline in dollars per gallon. Then ask them how this price was determined. If any students drive, ask them to estimate how many gallons of gasoline they buy each week at the current price. List their responses on the board.



### Steps

1. Recreate the table below on the board. Include the current price of gasoline in the table and the quantity of gasoline students generally buy at that price (from **Orientation**). Write 10 gallons if students do not know how much they buy.
2. In the table, using current price and quantity of gasoline as reference points, ask students how much gasoline they would purchase per week at each price. Place this information in the quantity column. You may prefer to ask students who drive to provide

Price of Gasoline (\$/gallon)	Quantity of Gasoline Purchased per Week (gallons)
\$8.00	
\$6.00	
\$4.00	
Current price (example \$3.00)	
\$2.00	
\$1.00	

quantity information, although most students should be able to provide estimates that decrease as the price increases. NOTE: Some students may say that they purchase about the same amount of gasoline per week for the range of prices shown on the table. If so, point out that their demand is inelastic. Then ask these students if they would purchase the same amount of gasoline for prices higher than \$8.00 per gallon. Note their responses.

3. Tell students that the table you're using is called a "demand schedule" and have them state the relationship between the price and the quantity of gasoline purchased per week. Have students plot a curve on graph paper using the data from the demand schedule table.
4. Show students a copy of the *Demand Curve for Gasoline* and have them compare this curve to the one they plotted. Point out that these curves are called "demand curves." Have students become familiar with the *Demand Curve for Gasoline* by having them read a few prices corresponding to chosen quantities of purchased gasoline, and vice versa. As an option, you may want to have students create a demand schedule table on paper using data from the *Demand Curve for Gasoline* and compare their demand schedule to the one on the board.
5. Ask students if demand curves like the *Demand Curve for Gasoline* could be used to describe the demand for other fuels, other energy sources, or other goods and services. Have students sketch graphs of demand curves of energy sources such as wood, electricity, natural gas, propane, heating oil, or other goods and services as examples.
6. Challenge students to summarize the law of demand. Discuss the law of demand with students and point out that the law assumes that all factors (such as income, availability of substitutes, etc.) except price remain unchanged over a short period of time (see **Background**).
7. Ask students to predict factors that could change the demand for gasoline. Some factors are listed below:
  - Changes in income
  - Changes in automobile efficiency
  - Substitution of other forms of transportation for driving, such as taking a bus or a commuter train, walking, bicycling, or joining a car pool
  - Substitution of automobiles that use other fuels or

energy sources, such as diesel, propane, or electricity

Discuss with students whether these factors would shift the demand curve to the right or left of its original position.

8. Show students the **Supply Curve for Gasoline**. Have students become familiar with it by having them read a few gasoline prices corresponding to chosen quantities of supplied gasoline, and vice versa. As an option, you may want to have students create a supply schedule table on paper using data from the **Supply Curve for Gasoline**.
9. Define the law of supply. Ask students if supply curves like the one shown on the **Supply Curve for Gasoline** be used to describe the supply of other fuels, other energy resources, or other goods and services. Discuss the law of supply with students and point out that the law assumes that all factors (such as changes in the cost of production, changes in the number of producers, etc.) except price remain unchanged over a short period of time (see **Background**).
10. Ask students to predict factors that could change the supply of gasoline. Some factors are listed below:
  - New discoveries of crude oil
  - A decline in the amount of oil produced from oil fields
  - Adoption of new technologies to produce gasoline more efficiently
  - Changes in the number of companies producing gasoline
  - Changes in the number of oil-producing nations
  - Wars or economic embargoes involving oil-producing nations

Discuss with students whether these factors would shift the supply curve to the right or left of its original position. NOTE: Some students may mistakenly mention factors that change the demand instead of the supply for gasoline. Point out the difference between these factors. It may also help to ask students to imagine that they are service station owners or producers of gasoline before asking them to consider factors that could change the supply of gasoline.

11. Ask students if either the demand curve or the supply curve alone is sufficient to determine the price of gasoline. Point out that demand and supply

must interact in some way to create an equilibrium (market) price and quantity. Have students suggest ways that the **Demand Curve for Gasoline** and the **Supply Curve for Gasoline** can be arranged to arrive at the equilibrium price and quantity for gasoline. (The equilibrium price and quantity occurs at the point where the two curves intersect.)

12. Direct students to find the quantities of gasoline demanded and supplied at a price above the equilibrium price (\$5.00, for example). Have students define the term surplus using this example and determine the surplus quantity of gasoline (quantity supplied minus quantity demanded). Ask students for reasons why surpluses occur and how they may be alleviated (see **Background**).
13. Direct students to find the quantities of gasoline demanded and supplied at a price below the equilibrium price (\$2.00, for example). Have students define the term shortage using this example and determine the amount of the shortage of gasoline (quantity demanded minus quantity supplied). Ask students for reasons why shortages occur and how they may be alleviated (see **Background**).

## Closure

Hand out the **Supply and Demand** activity sheet. Discuss answers to the questions with the class after students have completed the activity sheet.

Ask students to gather recent news articles that have reported on changes in energy prices. Have them identify the reasons given for the price changes, and discuss how these reasons might affect the demand and supply curves for the fuels or energy sources mentioned in the articles.

## Assessment

### Formative

- Were students able to find a general relationship between price and quantity demanded (the law of demand)?
- Can students state the law of supply?
- Can students show how factors affecting demand and supply result in changes in price and quantity?
- Can students explain what is meant by an equilibrium price and quantity?
- Can students explain how shortages and surpluses arise between buyers and sellers, and how they may be alleviated?

## Summative

- Have students apply their understanding of supply and demand curves to the price and quantity of other energy resources such as electricity, natural gas, propane, coal, etc.
- Hand out copies of *Ms. Sene's Dilemma* and have students answer the questions. Discuss answers with the class. (You may want to have a class discussion of Question 7 rather than letting students answer this question on their own first.)

## Extensions

Have students interview gasoline station owners, propane dealers, or a local utility representative to find out how energy prices are set and what factors can cause them to change. Students could then show how the price information they obtained is related to the laws of supply and demand.

Encourage students to investigate gasoline supply and demand in Europe and other parts of the world, and find out why gasoline prices are often higher in other countries than in the United States.

Have students investigate the effects of taxes, government subsidies, and government price controls on the supply and demand of energy sources. Have students investigate how gasoline and other energy prices have changed since the beginning of the 1970s. The investigation can include the following points:

- The relationship between events such as the energy crisis of 1973-1974 and sudden increases in energy prices
- How energy prices in the 1970s compare to today's prices when adjusted for inflation
- Predicting energy prices 25 years from now using past price data

## Related KEEP Activities

Several activities in this guide address the economics of energy development and consumption. Use "Energy Divide" to introduce concepts found in this activity. "At Watt Rate" helps students understand how much energy they use. Follow this activity with "Reading Utility Bills," "Reading Utility Meters," and the Energy Cost Analysis Sheets in "The Cost of Using Energy." Use "Energy Futures" to have students envision how future societies will use energy resources.

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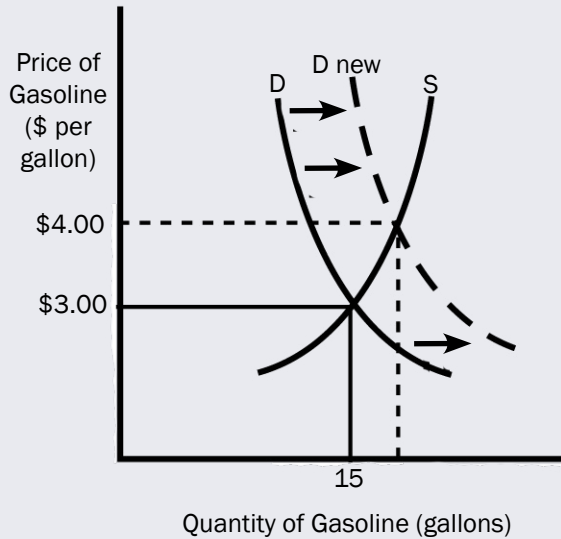
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# Examples of Supply and Demand Curve Shifts

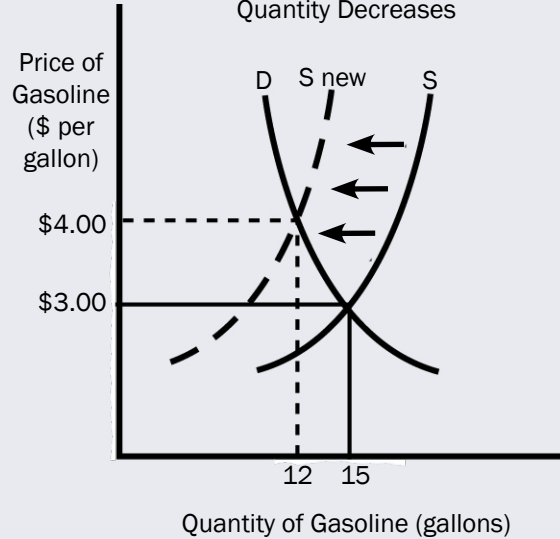
**Increase in Income Shifts Demand Curve to the Right:**

Equilibrium Price and Quantity Increase

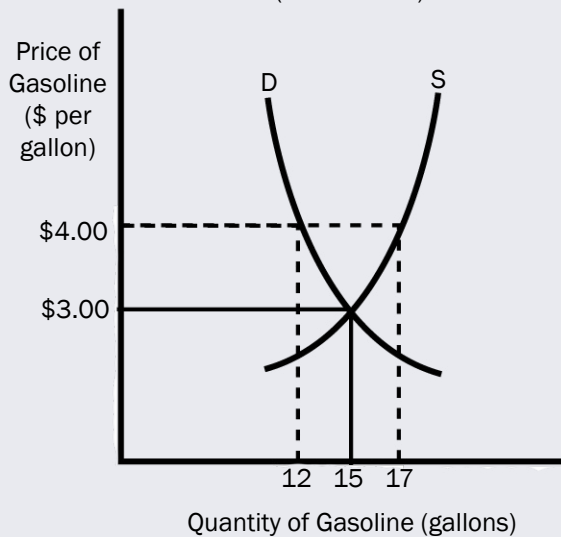


**Increase in Gasoline Production Cost Shifts Supply Curve to the Left:**

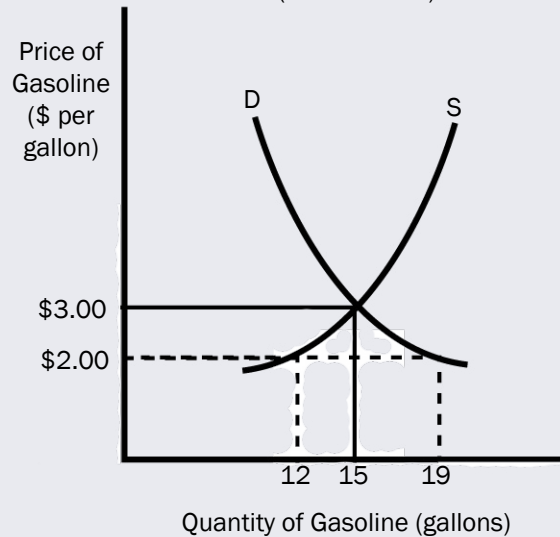
Equilibrium Price Increases, Equilibrium Quantity Decreases



**A Surplus of 5 Gallons per Customer Occurs at a Price of \$4.00 per Gallon**  
(17 - 12 = 5)



**A Shortage of 7 Gallons per Customer Occurs at a Price of \$2.00 per Gallon**  
(12 - 19 = -7)



# Supply and Demand Answers

- As the price per barrel of oil decreases, the number of barrels of oil demanded per week increases. The law of demand states that, other things being equal or constant, decreasing the price of a good or service increases the quantity of the good or service demanded by consumers. Assuming that other factors are constant, decreasing the price of a barrel of oil increases its demand, which is consistent with the law of demand.
- Factors that could change the demand for oil include
  - changes in income of people buying gasoline and other oil-derived products;
  - changes in automobile efficiency and the efficiencies of other technologies that use oil as a fuel;
  - substitution of other forms of transportation for driving;
  - substitution of automobiles that use other fuels; and
  - colder or warmer than normal winters, and their effect on the amount of heating oil used.
- The table shows how the factors in Question 2 shift the demand curve.

Factor	Increases or Decreases Demand	Shifts Demand Curve to the...
Increased Income	Increases Demand	Right
Decreased Income	Decreases Demand	Left
Increased Efficiency	Decreases Demand	Left
Decreased Efficiency	Increases Demand	Right
Substitutions of Other Form of Transportation	Decreases Demand	Left
Substitution of Automobile That Uses Other Fuels	Decreases Demand	Left
Colder Than Normal Winter	Increases Demand	Right
Warmer Than Normal Winter	Decreases Demand	Left

- As the price per barrel of oil increases, the number of barrels of oil supplied per week increases. The law of supply states that, other things being equal or constant, increasing the price of a good or service increases the quantity of the good or service produced by producers. Assuming that other factors are constant, increasing the price of a barrel of oil increases its supply, which is consistent with the law of supply.
- Factors that could change the supply of oil include
  - new discoveries of crude oil;
  - a decline in the amount of oil produced from oil fields;
  - changes in the number of companies producing oil;
  - changes in the number of oil-producing nations; and
  - wars or economic embargoes involving oil-producing nations.



# Supply and Demand Answers

6. The table shows how the factors in Question 5 shift the supply curve.

Factor	Increases or Decreases Demand	Shifts Demand Curve to the...
New Crude Oil Discoveries	Increases Supply	Right
Decline in Oil Production	Decreases Supply	Left
Increase in Number of Companies Producing Oil	Increases Supply	Right
Decrease in Number of Companies Producing Oil	Decreases Supply	Left
Increase in Number of Oil-Producing Nations	Increases Supply	Right
Decrease in Number of Oil-Producing Nations	Decreases Supply	Left
War or Economic Embargo Involving Oil Producing Nations	Decreases Supply	Left

7. The two sketches of the supply and demand curve graphs show a market equilibrium price of \$36 and a quantity of 2,600 barrels of oil.

8. Increases in demand shift the demand curve to the right, while the supply curve does not change its position. The result is an increase in both the equilibrium price and quantity.

Decreases in demand shift the demand curve to the left, while the supply curve does not change its position. The result is a decrease in both the equilibrium price and quantity.

9. Increases in supply shift the supply curve to the right, while the demand curve does not change its position. The result is an increase in equilibrium quantity and a decrease in equilibrium price.

Decreases in supply shift the supply curve to the left, while the demand curve does not change its position. The result is a decrease in equilibrium quantity and an increase in equilibrium price.

10. Shortages of oil occur for prices that are below the equilibrium price. Surpluses occur for prices that are above the equilibrium price.

11. The price of oil would be expected to rise because a shortage of oil corresponds to its price being lower than the equilibrium price. Raising prices would reduce the demand for oil until an equilibrium price is reached.

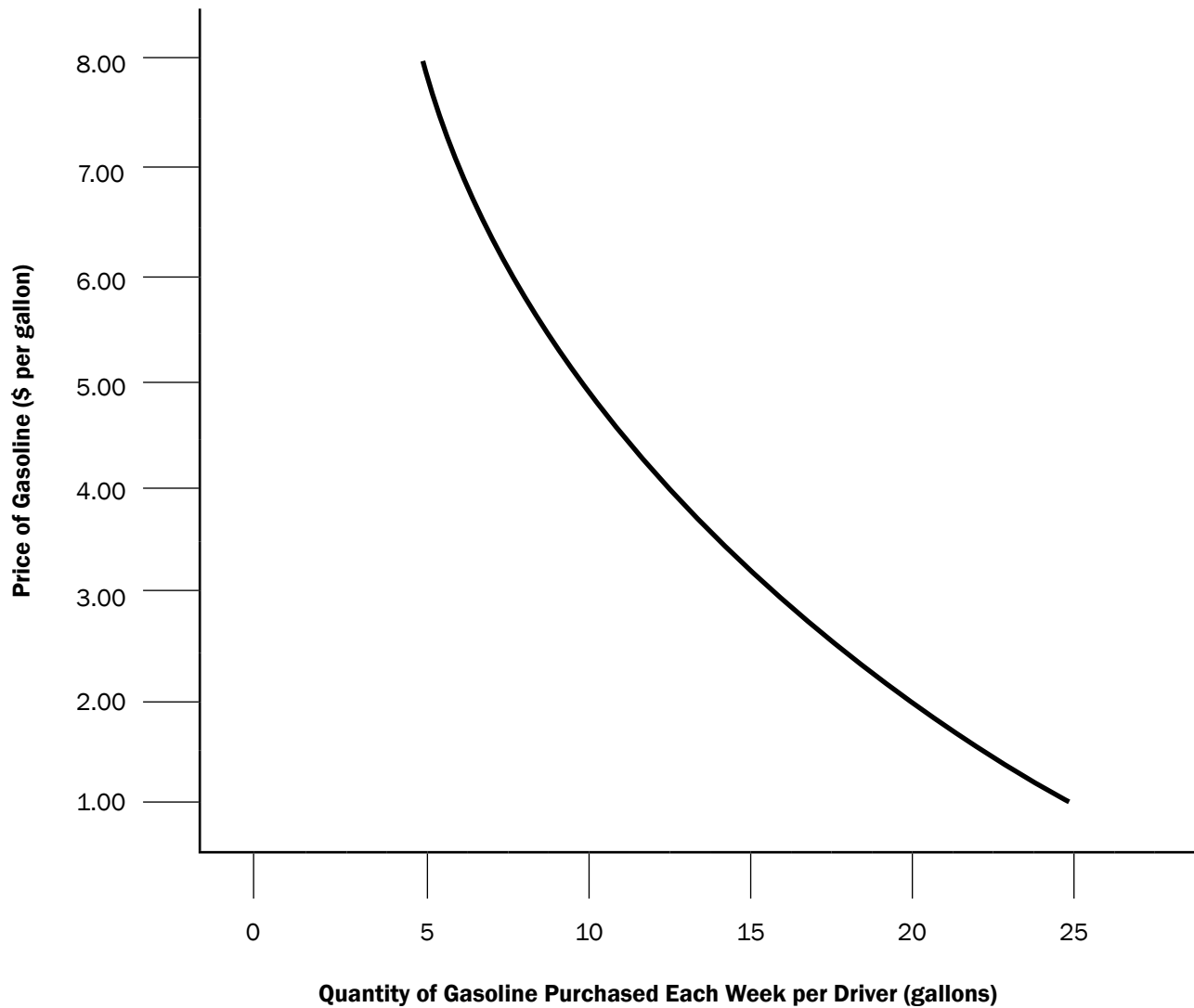
12. The price of oil would be expected to fall because a surplus of oil corresponds to a price higher than the equilibrium price. Lowering prices would increase the demand for oil until an equilibrium price is reached.

Price Per Barrel	Surplus or Shortage?	By How Many Barrels?
\$2	Shortage	-9,000 (100 – 9,100)
\$8	Shortage	-7,000 (300 – 7,300)
\$16	Shortage	-5,000 (700 – 5,700)
\$24	Shortage	-3,300 (1,000 – 4,300)
\$32	Shortage	-1,000 (2,100 – 3,100)
\$36	Equilibrium	0
\$40	Surplus	1,000 (3,100 – 2,100)
\$48	Surplus	3,300 (4,300 – 1,000)
\$56	Surplus	5,000 (5,700 – 700)
\$64	Surplus	7,000 (7,300 – 300)
\$72	Surplus	9,000 (9,100 – 100)

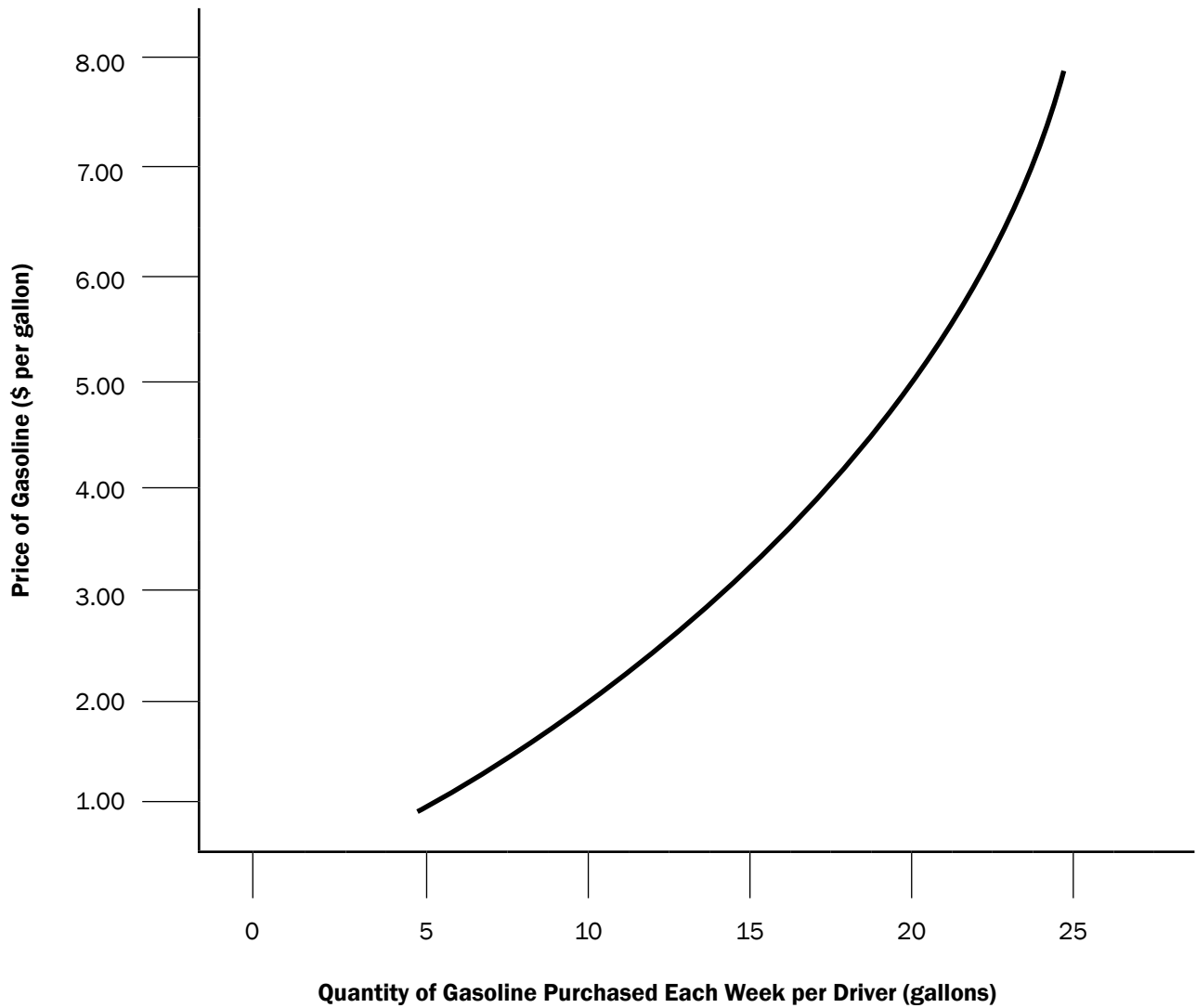
# Ms. Sene's Dilemma Answers

1. The equilibrium price and quantity for gasoline sold at Kero's gasoline station is \$4.00 and 400 gallons of gasoline.
2. The quantity demanded for Kero's gasoline after the nearby station's price drop is 360 gallons. Kero now has 40 gallons of gasoline left at the end of one week after the price drop. The extra amount of gasoline is called a surplus.
3. Kero now has 50 customers. Since each customer now buys 11 gallons of gasoline, the total amount of gasoline they demand is 550 gallons.
4. Kero now has a shortage of 150 gallons per week.
5. The \$3.90 per gallon Kero now charges for gasoline is not an equilibrium price because at this price, the quantity demanded by customers (550 gallons) exceeds the quantity Kero supplies (400 gallons), which results in a shortage. For an equilibrium price, the quantity demanded must equal the quantity supplied.
6. Should Kero ration gasoline among her 50 customers, each would get eight gallons of gasoline per week (400 gallons divided by 50 customers).
7. Possible solutions to Kero's problem:
  - Reconsider gasoline rationing. Each customer would then get slightly less than ten gallons of gasoline per week. Rationing would allow all her customers to have some gasoline. However, she might lose a few customers.
  - Serve customers on a first-come, first-served basis. This approach is similar to rationing except not all her customers would get gasoline.
  - Buy more gasoline from a high-cost supplier and try to cut some of her other business costs.
  - Buy higher priced gasoline at a loss and hope that competitors will raise prices soon. This solution would be a good one only if Kero were sure that other gas stations were also losing money and were likely to raise prices soon. Kero can try this solution for only a short time because she can't stay in business for long without making a profit.

# Demand Curve for Gasoline



# Supply Curve for Gasoline



# Supply and Demand

## Introduction

Try these exercises to see how the laws of supply and demand work together to set oil prices.

## Law of Demand

A demand schedule for oil is given in the table at right.

On a piece of graph paper, sketch a demand curve based on this demand schedule. The price per barrel should be shown on the vertical axis of the graph, while the barrels demanded per week (quantity) should be shown on the horizontal axis.

Price Per Barrel	Barrels Demanded per Week
\$72	100
\$64	300
\$56	700
\$48	1,000
\$40	2,100
\$32	3,100
\$24	4,300
\$16	5,700
\$8	7,300
\$2	9,100

## Questions

1. State the relationship between the price per barrel of oil and the barrels demanded per week. Explain how this relationship obeys the law of demand.
2. List three factors that could change the demand for oil.
3. For each factor listed in Question 2, state whether it would shift the demand curve to the right or left. Give reasons why the demand curve shifted the way it did.

# Supply and Demand

## Law of Supply and Market Equilibrium

A supply schedule for oil is given in the table at right.

Sketch a supply curve, based on this supply schedule, onto the demand curve graph you sketched earlier.

Price per Barrel	Barrels Supplied per Week
\$2	100
\$8	300
\$16	700
\$24	1,000
\$32	2,100
\$40	3,100
\$48	4,300
\$56	5,700
\$64	7,300
\$72	9,100

## Questions

- State the relationship between the price per barrel of oil and the barrels supplied per week. Explain how this relationship obeys the law of supply.
- List three factors that could change the supply of oil.
- For each factor listed in Question 5, state whether it would shift the supply curve to the right or left. Give reasons why the supply curve shifted the way it did.
- Find the market equilibrium price and quantity for oil. (Hint: look at the point where the supply and demand curve intersect.)
- Use one of the factors from your answer to Question 2 to explain how a change in the demand for oil would change the market equilibrium price and quantity of oil.
- Use one of the factors from your answer to Question 5 to explain how a change in the supply of oil would change the market equilibrium price and quantity of oil.

# Supply and Demand

## Surplus and Shortage

Using the graph of the supply and demand curves you made for oil and using the oil demand and supply schedules, determine whether a surplus or shortage of oil exists for each of the prices listed in the table below. Some entries are already shown.

## Questions

10. State the relationship between the price of oil above and below the equilibrium price and the existence of a shortage or surplus.

Price Per Barrel	Surplus or Shortage?	By How Many Barrels?
\$2	Shortage	-9,000 (100 – 9,100)
\$8		
\$16		
\$24		
\$32		
\$36	Equilibrium	0
\$40		
\$48		
\$56	Surplus	5,000 (5,700 – 700)
\$64		
\$72		

11. If a shortage of oil existed, would you expect the price of oil to rise or fall? Explain.

12. If a surplus of oil existed, would you expect the price of oil to rise or fall? Explain.

# Ms. Sene's Dilemma

Ms. Kero Sene owns a gasoline station. She regularly receives 400 gallons of gasoline each week from her distributor. At the existing price of \$4.00 per gallon, her 40 regular customers each bought ten gallons per week. Therefore, at this price, the weekly quantity demanded for gasoline at Kero's was 400 gallons each week and the weekly quantity supplied was 400 gallons.

1. What is the equilibrium price and quantity for gasoline sold at Kero's gasoline station?

Kero had been charging \$4.00 per gallon of gasoline, about the same as other stations in town. Therefore, regular customers spent an average of \$40 each per week, and Kero received revenue of \$1,600 per week. Then one day, another nearby station lowered its gasoline price by five cents a gallon to \$3.95 per gallon. Kero lost four regular customers.

2. What is the quantity demanded for Kero's gasoline after the price drop by the nearby station? How many gallons of gasoline does Kero have left over at the end of one week after the price drop? What is the extra amount of gasoline called?

In order to get her customers back, Kero lowered her price to \$3.90 per gallon. Her customers returned but so did ten new customers, and her loyal customers all decided they would drive more. Now each customer averaged 11 gallons per week in purchases.

3. How many customers does Kero now have, and what is the total amount of gasoline they demand?
4. Kero now has a shortage of how many gallons per week?
5. Is Kero's charge of \$3.90 per gallon now an equilibrium price for gasoline? Explain.

In order to increase her quantity of supply, Kero would have to pay a lot more to bring gasoline from a distant distributor. She could not afford this, but she did not want to leave some of her customers without gasoline. She believed she had two choices: to ration gasoline by limiting the amount of gasoline each of the 50 customers could buy every week, or to raise the price to \$3.95 per gallon, the price that the other stations now charged.

6. If Kero's gasoline is rationed among 50 customers, how many gallons would each customer get per week?

She decided that rationing may make some customers angry, so she raised the price to \$3.95. Her new customers then went elsewhere and she had the original 40 customers again. However, they were buying slightly more than the ten-gallon average that they bought at the \$4.00 per gallon price. There was still a shortage of gasoline.

7. What are the possible solutions to Kero's problem? Discuss advantages and disadvantages of each.