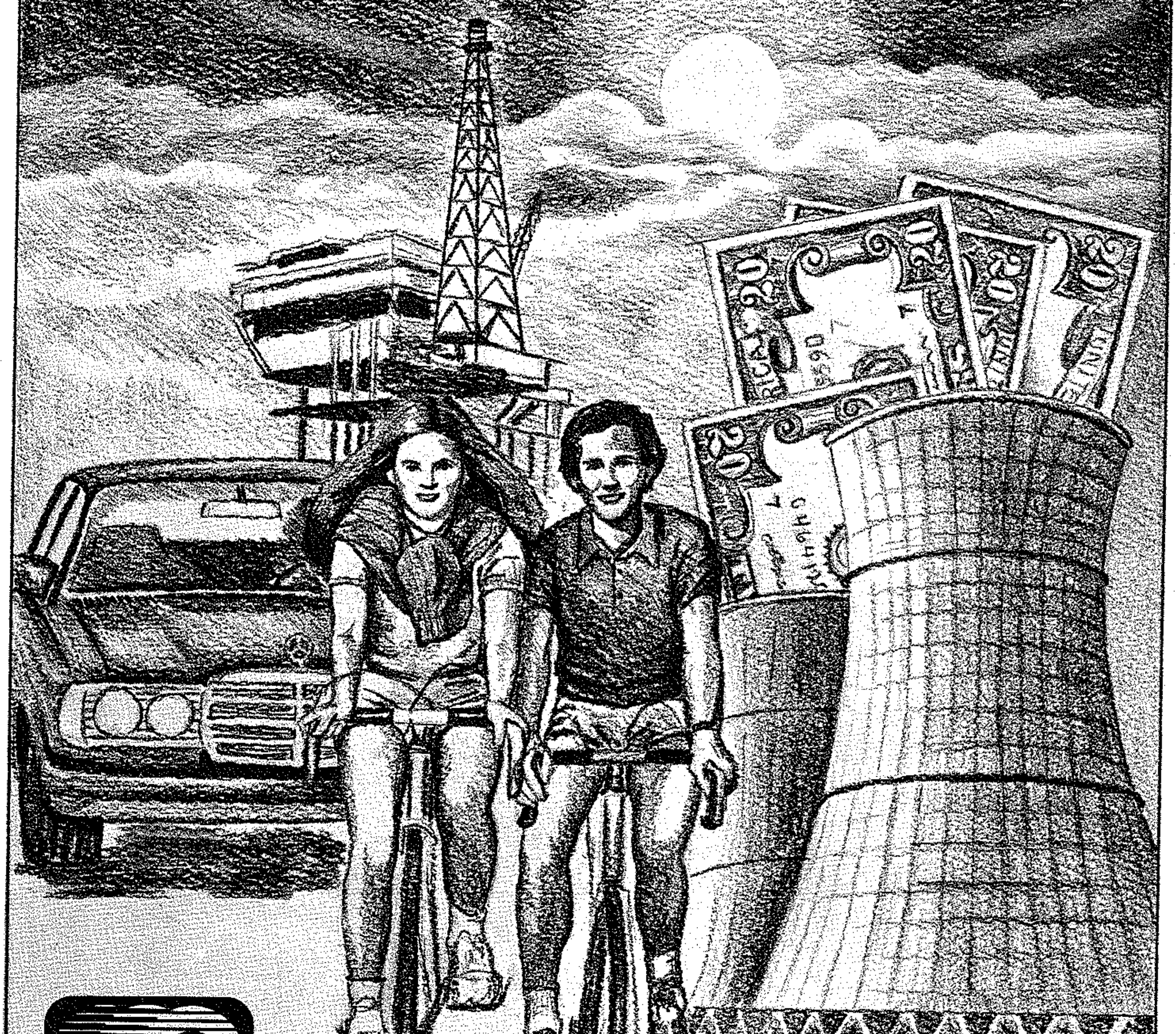
ENERGY AND ECONOMICS



nebraska energy office

A Basic Teaching Unit For Junior High Schools

ENERGY AND ECONOMICS:

A Curriculum Unit for

Junior High Schools

by

Joyce Gleason

and

William Walstad

Center for Economic Education

University of Nebraska-Lincoln

with

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TO THE INSTRUCTOR . . .

"Energy and Economics" is a unit which introduces junior high students to the topic of energy from an economic perspective.

This unit consists of 12 individual lesson plans which incorporate such economic concepts as supply, demand, equilibrium, scarcity and cartels in the energy marketplace. It contains worksheets and simulation games with teacher background material to help teach the interrelationships between energy and economics.

ACKNOWLEDGEMENTS

The original "Basic Teaching Units on Energy" consisted of a package of 30 instructional packets contained within three volumes. The original fourteen units were written at the University of Nebraska-Lincoln, under the auspices of the Nebraska Energy Office, by Nebraska teachers participating in a three-week Faculty Development Institute sponsored by the U.S. Department of Energy (summer, 1978).

An additional eight units were written by independent authors in the summer of 1979 and the final eight units were developed as a result of a second federal grant (summer, 1980).

The present format has been achieved as a result of an evaluation conducted by the Nebraska Energy Office, February, 1981. Rather than continue to offer all 30 units as a single package, the Nebraska Energy Office determined to revise, edit, and typeset the 10-12 highest quality units and continue to offer the other units in their present format. Provisions have been made to add additional units as the need arises.

The editors of these revised "Basic Teaching Units" wish to thank the individual writers, original editors, and clerical staff for their contributions in creating the "Basic Teaching Units."

The Nebraska Energy Office extends a special thanks to Joyce Gleason and William Walstad for their efforts in writing "Energy and Economics: A Basic Teaching Unit for Junior High Schools," and to Pam Savery for contributing artwork.

ENERGY AND ECONOMICS

Overview and Rationale

The events of the past decade raised new interest in energy education and created greater recognition of the important role energy plays in our economy. Over the period the price of a barrel of oil increased over six-fold, and at times shortages of oil, gasoline, and natural gas threatened the livelihood of both consumers and producers. The crisis situation also prompted new exploration for basic energy resources and stimulated new investment in research and development of alternative energy sources. Increasing environmental concerns added to the difficulties by slowing the growth of nuclear power and by introducing stricter pollution standards for autos and the use of coal. In an earlier decade the United States government declared war on poverty; the target of the past decade was energy.

Although energy markets have stabilized in recent years and the economy appears to have adjusted to previous energy shocks, the need for energy education remains strong. From a business viewpoint, energy is a basic resource input in the production of most goods and services—from fertilizers to plastics to transportation. The price of energy has and will continue to have a profound impact on basic economic questions such as: What goods and services will be produced? How will the products be produced? And, who will get (or be able to afford) the output produced? From the consumer viewpoint, the price and availability of energy will strongly influence housing, lifestyles, and career decisions. We, as citizens, are often asked to discuss and vote on energy-related matters, ranging from a gasoline tax for roads to energy tax credits for low-income consumers.

Consequently, this curriculum unit on energy and economics is designed to provide junior high school students with an introduction to the topic of energy from an economic perspective. Energy issues and economics are interrelated. Failure to explore the economic dimension to energy problems means that student understanding will remain incomplete and the depth of the analysis will be limited. The application of basic economic concepts to energy issues can provide students with the tools to improve their analysis of the problems and will help them understand the consequences of alternative solutions to energy problems for consumers, business, or the public.

This curriculum unit offers junior high school teachers of social studies, science, economics, or consumer education a package of 12 lessons on basic economic concepts and their application to energy issues. The unit is flexible and can be used in whole or in part to fit specific classroom needs. The lesson material should be self-explanatory for both teachers and students and it does not require that teachers or students have a background in economics. **A basic description of each lesson is provided in the following paragraphs and it should be read before using the lesson.**

Lesson 1: Alternative Energy Uses (Scarcity and Opportunity Cost)

The unit begins in Lesson 1 by developing the understanding that energy is a scarce resource in our economy. **Scarcity** in economics means that productive resources, such as energy, are limited relative to our wants or uses for them. Since energy is a scarce good it has economic value, and in our market system its economic value is reflected by its price. A rising price for an energy resource, as occurred with crude oil during the 1970's, indicates that this energy resource is becoming relatively more scarce; conversely, a falling price for an energy resource, as occurred with crude oil in recent years, means that oil is becoming relatively less scarce from the economist's perspective.

In the first exercise, students are asked to list the many different ways they use energy (broadly defined). From this list the teacher can develop the notion that there are basically unlimited wants or uses for energy. This idea can also be demonstrated by asking students to list all their energy wants if they (or their parents) did not have to pay for the energy consumed.

Of course we know that energy is not a free good. It is a scarce resource that has economic value and consequently we must pay for its use. What if energy becomes more scarce and the price rises, or our income to pay for it falls? Then we must reduce our energy use, assuming we can't reduce spending elsewhere. This **choice** confronts the students in the second part of the exercise. The teacher can use the situation to develop the idea that the condition of scarcity forces us to make tough economic choices or decisions as to how we will use our scarce energy resources.

The concept of choice then leads us to the concept of **opportunity cost.** Whenever a choice is made there is an opportunity cost. For example, the opportunity cost of choosing to impose a 55 mph speed limit on drivers was the increase in time drivers had to spend on the road going from one location to another. Although there were benefits from this action in the form of saved lives and reduced gasoline consumption, the fact remains that with any economic decision there is an opportunity cost.

In Lesson 1 students must rank order their list of energy uses from one to ten. Now suppose income falls so that only nine uses can be supported. Then students must consider the costs and benefits of the choice between selecting the ninth use or the tenth use. To obtain the benefits of the higher ranked ninth use for energy (the next to last use), the individual has to forego the opportunity to use the limited income for the tenth energy use (the last one on the list). Similar examples of opportunity cost are provided in the remainder of the lesson so the teacher can illustrate this fundamental economic concept in many ways. The concept will also be used in the economic decision-making in Lesson 2.

Lesson 2: A Framework for Energy Decision-Making

The condition of scarcity necessitates choice, and consequently, calls for consumers, producers, or workers to make difficult economic decisions. Decisions can be made in a multitude of ways. We can make a decision by flipping a coin (chance). We can ask our friends or close relatives what they think. We can let an expert or authority figure decide for us.

No matter how the decision is finally made, it is usually worthwhile with most important decisions to give careful consideration to the problem. Lesson 2 presents a basic framework for making economic decisions based on a five-step problem-solving model. The framework is easy to use and helps students see all the important dimensions of a decision and the opportunity costs of an energy choice. The examples and framework also show students that there is a more rational way to make decisions than by chance, peer pressure, edict, wish or fancy.

Lesson 3: Trade-offs in Energy Choices

As was explained in Lesson 1, an overriding characteristic of productive resources is that they are limited relative to our wants or uses for them. This basic economic problem of scarcity forces people to make choices. Whenever individuals choose to consume or produce one economic resource instead of another economic resource, they are making a **trade-off**—that is, they are trading off less of one thing for more of something else.

Society makes trade-offs, too. There is, for instance, a trade-off between energy production or consumption and environmental quality. As we choose to produce more energy we may be reducing the quality of the environment because of the increased pollution from the increased energy production. This fundamental dilemma is illustrated in the role-playing situation in Lesson 3.

The value of what we receive in making a trade-off is the estimate of the benefit from the choice. The value of what we give up in making the trade-off is our measure of opportunity cost. In some cases, opportunity cost is measured in dollars spent. For example, the opportunity cost of $100 million dollars in government spending on energy research is the loss of the opportunity to spend those funds on other federal programs. In other cases, opportunity costs can not be measured strictly in money terms. For example, an increase in energy production has an opportunity cost in terms of reduced environmental quality, but clean air has no exact price tag. The non-monetary costs and benefits of alternative choice are essential to consider as part of the trade-off dilemma in decision-making.

Lesson 4: Energy Measurement and Consumption

Energy is a commodity which is bought and sold in markets. Knowledge of the essential relationship between energy and economics requires that students develop a basic understanding of demand and supply factors in energy markets. Lessons 4 through 10 build the essential skills necessary for students to learn the basics of supply and demand and apply the concepts to energy decisions.

Lesson 4 focuses on energy measurement and consumption. Consumers are often not aware of the amount or quantity of energy consumed, so the exercises show students how to measure electricity consumption in the home. Then, the relationship between electricity consumption and price is explored. Students are asked to hypothesize about what would happen to electrical consumption if the price significantly increases or decreases. The purpose of the lesson is to develop an intuitive notion of the "law of demand." Simply stated, there is an observed inverse or negative relationship between price and quantity consumed, so as electricity prices increase significantly, consumers will reduce their consumption, and vice versa.

Lesson 5: Resources for Energy Production

To meet our energy consumption wants, a supply of energy goods (e.g., electricity, gasoline, heating oil) must be provided for purchase in the market. The production of energy consumer goods in turn depends on supplies of productive resources.

There are three basic types of productive resources. **Natural resources** (also called land) are gifts of nature. Water, wind, the sun or forests are examples of renewable natural resources. Nonrenewable natural resources such as oil, coal or natural gas are used up in the energy production process. **Human resources** (also referred to as labor) are the skills and abilities of people in our society to produce goods or services. Finally, there are **capital resources** (capital goods) which are physical goods which can be used to produce other goods or services. Examples of capital goods include machines, tools or factories. The three basic resources are defined in the first part of the lesson.

Most energy production requires the use of natural, human and capital resources. This idea is illustrated in the second part of the lesson using electrical production as the example.

Lesson 6: Supplying Energy Resources

Supply factors must also be considered when examining the energy market. Lesson 6 uses a simulation activity (the geologist's dilemma) to illustrate how additional energy supplies are discovered and brought to market. In the simulation students are asked to gather beads and cornmeal scattered throughout the classroom. The beads represent energy resources (e.g., coal, oil, natural gas, solar power). At first, student teams find it easy to collect the resources, but over time additional exploration produces less energy and the cost of recovery rises. The simulation provides a "hands-on" demonstration that as energy resources become more difficult to extract and search costs rise, the price (or incentive paid to producers) must rise. Thus, the simulation provides an intuitive explanation for the observed positive relationship between price and the quantity supplied. The relationship is known as the "law of supply:" as price rises, the quantity supplied by producers increases; as price falls, the quantity supplied by producers decreases.

Lesson 7: Energy and the Laws of Supply and Demand

The determination of energy prices and quantity exchanged in a market involve both demand and supply. Lesson 7 formally presents the "law of demand" and the "law of supply" using a simple graphical example for teachers to use with students. A follow-up worksheet asks students to apply the basic ideas to answer questions about the supply and demand for Mrs. Kero Sene's gasoline station.

Lesson 8: Profits and Incentives in Energy Markets

Profits are the driving force of a market economy. In fact, it is the expectation of profit that motivates businesses to obtain the necessary natural, human, and capital resources to produce energy. For example, oil companies purchase land, construct drilling towers, and hire skilled workers in their never-ending search for oil. As profits increase, the oil companies have an even greater economic incentive to expand their search for oil by drilling more wells.

Lesson 8 presents activities which help students understand the role of profits in the market economy. The first worksheet helps illustrate the idea that profit is the difference between total revenue (price of the product times the quantity sold) and the total costs of productive resources. The second worksheet presents data on oil prices and drilling activity to illustrate effects of expected profits on production and supply.

Lesson 9: Competitive Markets and Cartel Power

Lesson 9 is a simulation on how prices are determined in competitive and cartel markets for oil. Part I of the simulation provides an excellent example of competitive markets and price determination in action. In Part II of the simulation, a cartel is created by the oil producing nations (sellers) and these nations set the price for barrels of oil. In the debriefing session students are asked to discuss the impact of cartel formation and price setting on the competitive market.

Lesson 10: World Energy Markets

Lesson 10 uses maps and data to illustrate the relationship between energy suppliers and energy demanders in a world economy. The term energy on the map refers only to oil and natural gas production, but since these are two basic sources of energy, the map reflects the imbalance among energy producers and consumers. In the United States the energy demand is greater than the energy supply so we must import some of our energy resources from energy-rich nations where energy demands are less than energy supplies (e.g., OPEC countries). The basic purpose of the lesson is to illustrate for students how interdependent our economic world has become. Imbalance in energy resources forces nations to trade to meet their energy wants or to benefit from natural abundance. Trading among nations for such a basic commodity as energy makes nations more dependent on each other, but gives countries more production or consumption opportunities.

Lesson 11: Inflation and Energy Prices

Prices for goods and services are often changing. This fact has been especially apparent in energy markets in the past decade. The purpose of this lesson is to show how we measure price changes in our economy so we can determine if we are experiencing a period of inflation, deflation or price stability over time.

When the average level of all prices in our economy is rising, this trend is called price inflation. When the average of all prices is falling, we are experiencing deflation. If the average of all prices stays about the same we are experiencing a period of price stability. The measurement of these three trends is important because price levels affect how many goods and services people can afford to buy. If prices rise faster than incomes, then we conclude that purchasing power or real income has fallen. If, for example, gasoline prices are rising faster than the prices of other goods and services and incomes, then purchasing power would fall and people would probably be forced to spend less on gasoline.

One way to compare price changes is through the use of a price index. This lesson explains how the Consumer Price Index (CPI) is constructed. Then, a similar energy price index (EPI) is constructed and the CPI and EPI are compared from 1967 to 1982.

Lesson 12: Energy Futures

Although oil imports have fallen in recent years, existing known reserves of oil are still predominantly found in the Middle East. If new discoveries in the U.S. or other countries are not made, then the U.S. could again become excessively dependent on foreign oil, and oil prices would probably rise. The new price incentive would encourage a search for alternative energy sources — a topic explored in this final lesson.

Lesson 12 concludes the examination of the economics of energy by looking at past trends and future prospects. In the first worksheet, students are given graph data on the relative sources of energy in different time periods of our history from 1850 to 1980. The second worksheet asks students to research information on alternative energy sources which may become economically viable sources of energy in the future. Finally the student is asked to consider the policy implications of government intervention to promote alternative energy production.

Conclusion

Energy is a complex but relevant topic to study in the schools. The discipline of economics and basic economic concepts can be used by teachers to help students understand energy issues. Many of the questions which are asked about energy require some economic analysis before a teacher or student can properly answer the questions. Why did oil prices rise and fall over the past three years? Is solar power a feasible energy alternative to oil or coal? Should the government intervene in energy markets to protect low income consumers? Are oil company profits too large? These questions are just a few of the many questions asked about energy that require some fundamental understanding of economics before they can be properly answered. Certainly there are other questions for students to ask, but if students are exposed to basic economics and if they can see how they apply to energy issues, then they will be better prepared to analyze these complex energy issues. This curriculum unit should help you achieve that important goal.

ENERGY AND ECONOMICS

Unit Goals and Objectives

Recommended Level:
Grades 7-9

Academic Areas:
Social Studies, Economics, Science, Consumer Education

Time Required:
12-15 days (optional)

Process Skills:

analyzing	reading	measuring
interpreting data	note taking	record-keeping
researching	graphing	
writing	role-playing	

Goals:

When students complete this unit, they should be able to make the following generalizations about energy and economics:

1. Energy issues often have an economic dimension.
2. An energy-related problem often requires economic analysis before a decision can be made about how to solve the problem.
3. Basic economic concepts, such as scarcity, opportunity cost, market supply and demand, can be used to analyze energy problems or issues.

Student Objectives:

1. Students will identify the basic economic problem of scarcity in energy markets, the necessity of choice, and the opportunity costs of economic decisions.
2. Students will apply a framework for economic decision-making to energy problems.
3. Students will recognize the trade-offs involved in energy choices.
4. Students will measure electricity consumption and predict the economic relationship between price and quantity demanded.
5. Students will describe the productive resources used for energy production.
6. Students will predict that as fossil fuels become more difficult to extract the costs of energy will rise.
7. Students will explain the role of profits in a market economy and their impact on oil exploration.
8. Students will analyze the supply and demand forces in a competitive market using a single market model.
9. Students will explain how a cartel can interfere with prices in a competitive market.
10. Students will infer that nations are interdependent in world energy markets based on graphical data presented.
11. Students will compute and compare price changes using a consumer price index (CPI) and an energy price index (EPI).
12. Students will analyze past trends in energy use and will supply information on alternative energy sources in the future.

INSTRUCTOR INFORMATION. . .

Lesson 1: Alternative Energy Uses

Rationale:

Energy consumption often occurs without consideration of whether particular uses are necessary. When resources are scarce, choices must be made among alternative energy uses. In this lesson, students will review their uses of energy, decide which uses are most important to them, and consider the opportunity cost of their choices. Finally, they will look at alternative uses of energy.

Objectives:

Students will identify individual uses of energy.

Students will prioritize their energy wants.

Students will list alternate uses for an energy resource.

Students will determine the opportunity cost of an energy choice.

Implementation:

Distribute student worksheets. Follow the "Teacher Suggestions" which appear on the next page.

Debriefing:

Use discussion questions listed in point #5 and exercise, **Alternate Energy Uses,** in #6 of "Teacher Suggestions."

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TEACHER SUGGESTIONS

Materials Needed

Student Worksheets: "My Energy Choices"
"Alternate Uses of Energy"

Large classroom charts: (Optional) These can be made from pieces of butcher paper. One should be labelled "Energy We Use" and one labelled "Priorities and Opportunity Cost." You will need one copy of each chart per class.

Teaching Strategies

1. Using worksheet "My Energy Choices," have students list all the energy they used yesterday.
2. Now have the students rewrite their lists in column #2 putting their most necessary use first and prioritizing other uses so that the least important use is last.
3. Tell students to imagine that their income has fallen so that they have to drop one item from their list of uses. They will have to choose between the last two items. (They should choose to drop the last item if it is least important.) This choice illustrates the concept of **opportunity cost.** Tell them that the **opportunity cost** of their choice is the use that they gave up.
4. Now have them imagine that their income falls so that they can only afford their top five uses. Ask: "What is the **opportunity cost** of these top five uses?" (The **opportunity cost** is the bundle of uses below #5 that they had to give up.)
5. If you made classroom charts, list one item from each student's list under "Energy We Use." Now have students vote or take turns rearranging the list according to the importance of the use on the chart "Priorities and Opportunity Cost." Now you can reemphasize to the class the opportunity cost of various choices similar to #3 and #4 above.
6. **Alternate Energy Uses**

   A. Divide the class into groups of four. Each group receives a sheet of colored paper with the name of an energy resource or picture (cut-out from a magazine) depicting a resource on the card, a large sheet of paper, and a marking pen. Be sure the examples used are of resources which have many alternate uses. Some examples might include: electricity, gasoline, oil, wood, natural gas. Explain that each group is to think of as many uses for the resource as possible within a five minute period. One person in the group will list all of the group's responses on the sheet of paper.

   B. By group, the class examines and discusses each group's resource and uses for the resource. If the class suggests other uses for a resource, they may be added to the list but should be separated from the group's original responses. Tape each group's listing to the wall.

   C. Each person now returns attention to the list of uses for the resource his group considered. From the original alternative listed by the group, each person chooses the one thing he/she would want produced with the resource. Using individual responses, ask:

      a. What did you choose?

      b. What do you give up if you use the resource for that purpose? (Develop the concept of opportunity cost-what was given up; the next best alternative given up; the next best choice foregone.)

   In discussion bring out the idea that once a use is designated for a resource, that resource can not be used for other purposes; therefore, wise choice of use is important. Elicit students' ideas about how scarcity and opportunity cost are related to the concept of conservation.

Alternative Energy Uses
Lesson #1
Page 3, Worksheet 1.1

Name______________________

Date______________________

MY ENERGY CHOICES

In Column #1 list as many different ways you used energy yesterday as you can. Think very hard and try to remember every time. In order to help you get started, some ideas are already listed. Cross out any you did not use. Now take the items in column 1 and rearrange in column 2 in order of importance with the most important first and least important coming last.

Column 1	**Column 2**
1. Used an electric can opener	1.
2. Watched TV	2.
3. Rode the bus	3.
4. Took a bath or shower in hot water	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.
11.	11.
12.	12.
13.	13.
14.	14.
15.	15.
16.	16.
17.	17.
18.	18.
19.	19.
20.	20.

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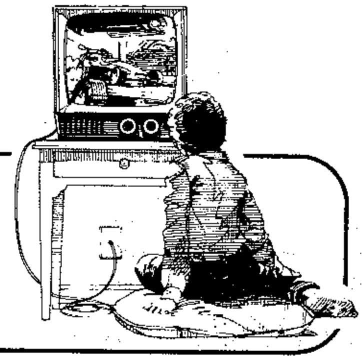
**Lesson 2:
A Framework For
Energy Decision
Making**



Rationale:

As with other economic decisions, choices about energy alternatives must be made because energy resources are scarce. This lesson provides a framework for a rational approach to making these decisions.

Objectives:

Students will learn the steps involved in rational decision-making.

Students will learn to construct a decision matrix.

Students will apply the framework to sample energy problems and use this framework for decision-making.

Implementation:

The **Teacher Suggestions** section includes background material for the teacher plus a sample choice problem so that students can work through a matrix with the teacher in class either using chalkboard or transparency.

Then the students can apply the decision-making framework to the problems posed in worksheet 2.1.

Debriefing:

Consider problems in worksheet 2.1.

A. Possible alternatives: Do nothing, buy bike, used car, motorcycle, new car, others? Possible Criteria: Save fuel, save money, comfort, convenience, others? Evaluation will be individual. After decision is made, point out that "opportunity cost" of your choice is the second-best alternative.

B. Possible alternatives: Bus system, subway system, parking lots on edge of center with shuttle service, do nothing, others? Possible criteria: Cost, energy conservation, convenience of citizens, help downtown business, others?

INSTRUCTOR INFORMATION. . .

TEACHER SUGGESTIONS

Introduction:

Problem-solving and making choices lies at the heart of economics because of the condition of **scarcity.** **Scarcity** means that productive resources are limited relative to peoples' wants. This forces people to make choices about how to use these limited resources more effectively to satisfy wants. Making a choice can be difficult, and it usually helps to use a reasoned approach to make an economic decision.

A Reasoned Approach to Decision-Making

A reasoned approach to economic decision-making involves the following steps:

1. State the problem or issue. Identify the important facts.
2. Determine the feasible alternatives.
3. Identify the criteria or goals to consider for the alternatives.
4. Evaluate each alternative according to the criteria.
5. Make a decision based on the overall evaluation.

This five-step process may not lead to a simple solution of a problem. In fact there may be several possible or acceptable alternatives. What the process is designed to do is to get you to consider the important dimensions of a problem **before** you make a decision.

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The use of a matrix or grid to evaluate alternatives may be helpful. We introduce this framework now so that students may use it to evaluate issues that arise in later lessons. A sample grid follows. The alternative courses of action are listed in the first column, and the goals or criteria for evaluation are listed across the top row. The intersection of rows and columns creates boxes or "cells" in which to evaluate each alternative with respect to the criteria heading that column. To evaluate each alternative, the decision-maker may rate each alternative by numbers such as "1", "2", "3", according to its ability to meet each goal, or use a plus (+) or minus (—) mark or zero (0) depending on whether an alternative helps, hinders, or is neutral with respect to achieving the goal.

At the junior high level, the plus/minus/zero system probably works best. Double symbols can be used when the alternative has a strong effect on goal achievement. Consider the following energy-related economic problem and use the grid framework to help make a decision:

Jim uses his car to drive to school (2 miles from home), for school programs and dates (40 miles each week), and to get to work (150 miles per week). Each week Jim spends $20 on gasoline, $5 on lunches, $10 on entertainment and $15 is saved for college and car insurance. His parents require him to save this amount and will not allow him to work any more hours. Suppose gasoline prices rose so that Jim will spend $8 more each week on fuel for his car if he continues his present routine. Since he doesn't have the extra money, he has to make some choices. What will he decide?

1. Identify the problem: How to change Jim's budget when the price of gasoline rises.
2. Possible alternatives are listed. (These are not the only ones.)
3. Some criteria for judging alternatives are listed. (There are others that students may use in place of or in addition to these.)
4. Evaluate each alternative in terms of the important criteria. Here we used the " + " and "—" system.
5. Make your decision. In this case the decision involves giving up part of present activities (the opportunity cost) in order to continue the others.

Example of Possible Grid Evaluation:

	Criteria					
Alternatives	Reduce Use	Maintain Lifestyle	Obey Parents	Stay Healthy	Save Time	Score Total
1. Reduce saving by $8	—	+	—	+	+	+3—2 = +1
2. Reduce entertainment	+	—	+	+	+	+4—1 = +3
3. Skip lunch & cut entertainment to save $8	+	—	+	—	+	+3—2 = +1
4. Share rides to save $8	+	±	+	+	—	+4 —2 = +2

Reducing entertainment appears to be the best choice. Sharing rides is probably the next best choice, but it is riskier. You will probably spend more time waiting if you have to share rides (—) and you may have to reduce the independence of your lifestyle (±). (Remember, however, the conclusion could change if different weights were given to each criterion. For this example we have assumed that each criterion has equal weight.)

Name____________________

Date____________________

Making Choices

Here are two sample problems. Use the decision-making grid framework to help you make a choice in each situation. In each case follow the five steps: (1) Identify the problem. (2) List good alternatives. (3) Identify criteria or goals to use in considering the alternatives. (4) Evaluate the alternatives according to each goal. (5) Make your decision.

A. Mary has $3,000 saved. She has no car but just accepted a new job 5 miles from home. She lives in Florida and until now has rented a car or gone with friends whenever she needed a ride far from home (about once a week). What should she do in order to have transportation for work?

B. The city of Mega (population 200,000) is considering possible solutions to its traffic, pollution and parking problems in downtown area. Presently there is no public transportation system. How can Mega deal with these problems?

Name____________________

Date____________________

DECISION-MAKING GRID

	CRITERIA					
ALTERNATIVES						TOTAL SCORE

DECISION-MAKING GRID

	CRITERIA					
ALTERNATIVES						TOTAL SCORE

INSTRUCTOR INFORMATION. . .

Lesson 3: Trade-offs In Energy Choices

Rationale:

When people choose to do one thing instead of another they are making a **trade-off.** That is, they are trading off one thing for something else. Energy decisions require trade-offs too. For example, a choice to produce more energy can come at the expense of environmental preservation. This lesson looks at this energy-environment trade-off using a role-playing exercise and a decision-making grid to analyze the problem.

Objectives:

Students will play the role of various decision-makers.

Students will examine a complex social decision from different individual perspectives.

Students will identify the trade-offs and opportunity costs of social decisions.

Students will compare the costs and benefits of alternative decisions using a decision-making grid.

Implementation:

Have students play various roles suggested for the imaginary town of Woodland City at a simulated town meeting. Distribute student fact sheet which provides the information needed to conduct the role-playing exercise. Assign a role to each student from "Occupation Sheet." Any except #1 (the mayor), #11 (manager), #13 (store owner), and #14 (development specialist) can be played by more than one student. (See note at end of Occupation sheet.)

Debriefing:

"Citizens" will vote on building the power plant. Before the vote, discuss the following questions (Part A) with the class or have the students write responses to one or more of these. Also, review the decision-making grid framework for "citizens" to analyze their alternatives. See example under "B".

A. Questions:

1. What resources did Woodland City have that the Electric Company needed?
2. What resources did the Electric Company have that would benefit Woodland City?
3. What resources might be destroyed if the power plant is built?
4. List advantages (benefits)/disadvantages (costs) for building the power plant in Woodland City.
5. Are the benefits of having the power plant built worth the costs of building it?
6. Have each student consider the trade-offs for their citizen's role if the plant is built. (For example, the mayor may have added responsibility, and loss of environmentalists' votes.)

INSTRUCTOR INFORMATION. . .

B. Sample Grid for Environmentalist

Criteria / Policy Alternatives	More Jobs	Clean Air (x2)	Less Expensive Power	Preserve Park Area	Total Score
Build Power Plant	+	— —	+	—	+2 —3 = —1
Don't Build Plant	—	+ +	—	+	+3 —2 = +1

Based on this decision grid and the information provided, the best choice appears to be not to build the power plant.

INSTRUCTOR INFORMATION. . .

Woodland City Occupation Sheet

1. You are the mayor of Woodland City. It is your job to run the meeting. You are concerned about the high unemployment rate in your city.
2. You are a representative of the electric company. Your company has a great deal of money and has given you authority to make promises to the residents . . . just get them to vote YES on the coal power plant.
3. You are an environmentalist. You know that if the coal power plant is built, trees will be cut down, birds and animals will be driven from their homes in a forest near the national park.
4. You are a farmer who owns the forest land the electric company wants to buy. They have offered you a great price for the land. You are getting old and want to sell the land at this price.
5. You own the farm next to the proposed location of the new power plant. You are afraid by-products from the plant will harm your cattle and/or your land.
6. You are an unemployed worker. You think the power plant might hire you.
7. You are a housewife in Woodland. You are tired of the dust from the coal mines and think it may be harmful to your children. You don't want another coal mine!
8. You are a logger at the lumber mill. You feel if the power plant is developed, trees will be cut down and you will be forced to close the saw mill. You have three children and **must** earn a living.
9. You are a student. Your friends and you enjoy the national park. You are afraid that if the town says "yes" to the power plant, the park may become less scenic.
10. You are an older resident of Woodland City. You no longer work and are afraid if electric rates continue to go up, you will not be able to afford to pay your utility bills.
11. You are the head park ranger at the national park. You have worked several years to develop the park and don't want its beauty destroyed by a huge power plant.
12. You own one of the existing coal mines. If the power plant comes into being, you may lose many of your workers because of higher wages at the new mine **or** the electric company may buy coal from your mine. You decide which viewpoint seems most realistic.
13. You own the grocery store in Woodland. If the power plant employs more people, that means more business for your store.
14. You are a land development specialist. You have wanted to use that same tract of land for a new housing development.
15. You are a resident of Woodland. You are not sure how you feel about the issue but as you listen at the meeting you may form an opinion or idea and wish to speak.

***Note to Teacher:** Each student should be assigned a role. The easiest way to do this might be to copy this sheet and clip out each numbered item. Then pass these out to students and assign the role they get. Any on the list, except #1, #11, #13, and #14 can be assigned to more than one student. While you are assigning roles, have each student think of a name that represents their role and make a name tag to wear during the town meeting. You also might want to make and distribute copies of the decision-making grids from worksheet 2.2.

Name______________________

Date______________________

Role-playing Exercise

WOODLAND CITY

Each of you is a citizen of Woodland City. You will be given a description of yourself by your teacher. You are to pretend you are this person — act like they would act, say what they would say.

The town council has called a meeting because a representative from an electric company is in town to try to persuade the town council to approve the building of a large coal power plant just half a mile from town.

You will be given a chance to speak at the meeting. Remember you are representing a different person than yourself!

Important Facts About Woodland City:

1. There are two large coal mines near the city. They employ 1000 people but the streets of Woodland City are often filled with coal dust.
2. As of today, 500 Woodland City residents are out of work.
3. A large forest surrounds Woodland City. A national park is three miles south of town.
4. The price of electricity in Woodland is well above the national average.
5. The largest industry in Woodland City is logging.
6. A large river flows south of the town.

Important Facts About the Electric Company:

1. The company plans to mine coal around Woodland City to generate the electricity.
2. The company promises to sell some of the electricity to Woodland residents bringing down the price of electricity.
3. The company is the largest electric company in the country.
4. The company is planning to supply electricity to 50,000 consumers using the new plant.

The meeting is about to begin . . . don't be late!

The mayor will call the meeting to order.

INSTRUCTOR INFORMATION. . .

**Lesson 4:
Energy Measurement
And Consumption**

Rationale:

Energy consumption, particularly electricity consumption, often occurs without the consumer being aware of the amount being used. This activity teaches students how to measure electricity consumption and increases awareness of the inverse relationship between price and quantity consumed.

Objectives:

Students will read electric meters to measure consumption over a specific period.

Students will compare electricity usage over different time periods.

Students will describe the law of demand using electricity as the example (e.g., There is an inverse relationship between price and quantity of electricity consumed.)

Students will identify other factors (besides price) which may influence the demand for electricity.

Implementation:

Distribute student worksheets and discuss.

Do exercises in class on worksheet #4.1.

Have students keep worksheet #4.2 at home for one week to record meter readings and complete questionnaire. Collect and discuss at the end of week during unit.

Debriefing:

Answers to Worksheet 4.1:

a. 1000	f. 6	k. 4000	p. 4482	u. one-half
b. 1000	g. 1926	l. 600	q. 40	v. 5000
c. 100	h. 4482	m. 90	r. 80	w. Watts
d. 900	i. 6044	n. 2	s. 160	x. 200w
e. 20	j. 1562	o. 4692	t. 2000	y. 180;540

z. Number of light fixtures times 40; Divide by 1,000

B. 1.a. 419 b. $8.60 c. $5.69 d. $14.29

2. Should be $17.96 ($8.60 + $9.36)

Answers to Worksheet 4.2 (#4-7): These questions are designed to help students define the law of demand using electricity as the example.

4. With a 1% price increase, the quantity of electricity consumed would decrease only slightly or not at all. A 10% price increase

INSTRUCTOR INFORMATION. . .

would cause a greater decrease in electricity consumption. A 50% price increase would probably lead to an even greater decline in electricity consumption.

5. There is an inverse (negative) relationship between price and the quantity of electricity consumed. (An illustration of the law of demand.) As price increases, the quantity of electricity decreases.

6. With a 1% price decrease, the quantity of electricity consumed would probably only increase slightly or not at all. With a 10% price decline there would be a greater increase in electricity consumption. The greatest increase in electricity consumption would come with a 50% price decline.

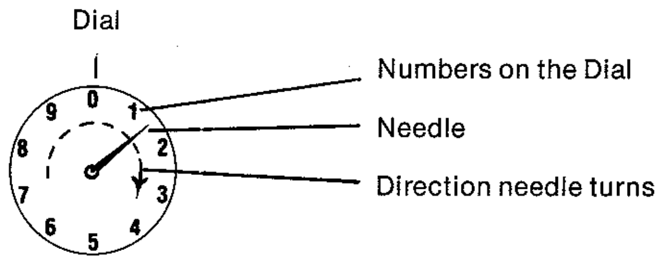
7. There is an inverse (negative) relationship between price and the quantity of electricity consumed. (An illustration of the law of demand.) In this situation, as price declines, the quantity of electricity consumed increases.

Name________________________________

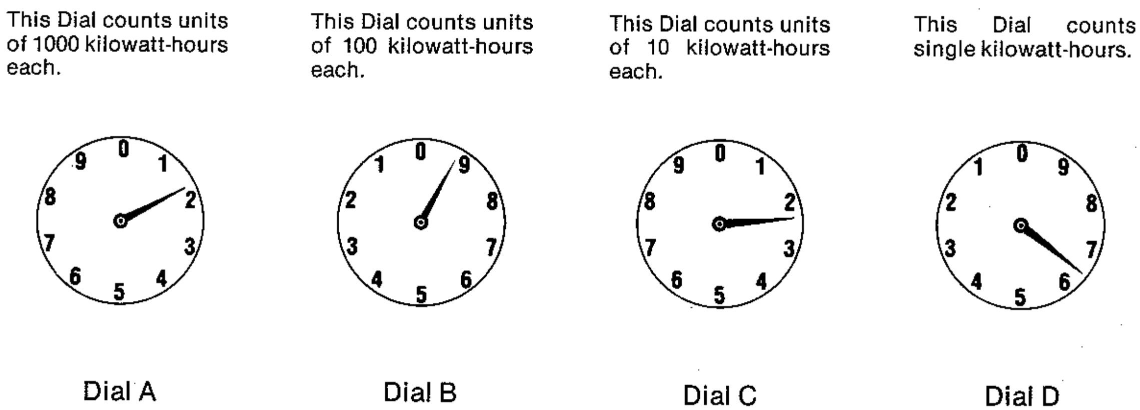
Date________________________________

LEARNING ACTIVITY ON METER READING

The amount of electricity you use is measured by a METER attached to your house or apartment. An electricity meter has dials on which one or more needles will point to the number of kilowatt-hours of electricity that you have used since the meter was installed. One of the dials on the meter will look like this:



STUDY THE ILLUSTRATION BELOW.



Dial A. The needle turns in a clockwise direction.

Dial B. The needle turns in a counterclockwise direction.

Dial C. The needle turns in a clockwise direction.

Dial D. The needle turns in a counterclockwise direction.

As the needle turns in a clockwise or counterclockwise direction, it counts one unit of electricity used. The number of units counted is THE LAST NUMBER PASSED BY THE NEEDLE.

Energy Measurement and Consumption
Lesson #4
Page 4, Worksheet 4.1 (2)

Name______________________________

Date______________________________

The diagram on the preceding page of the single dial shows that one unit of electricity has been counted.

STUDY THE second illustration carefully to notice that several dials are needed to count the total number of units of electricity used in a home. The reason for the four dials is that each dial can count only ten units, so each dial as explained will count a unit of a different size.

Notice that the needle on Dial A has just passed the number 1. Therefore, this needle has just counted one unit that measures (a) ________ (1, 10, 1000) kilowatt-hours. Dial A measures (b) ________ kilowatt-hours.

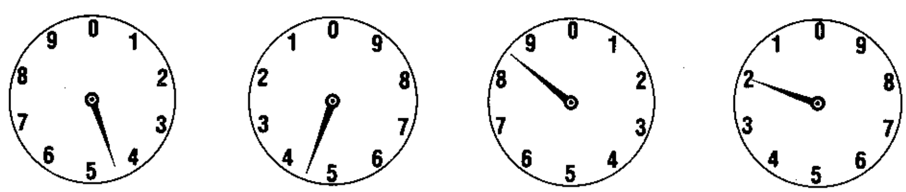
The needle on Dial B has just counted the number 9. This needle has just counted 9 units, each measuring (c) ________ (9, 100, 900) kilowatt-hours. Dial B reads (d) ________ (9, 100, 900) kilowatt-hours.

The needle on Dial C has just counted the number 2. Dial C reads (e) ________ (2, 10, 20) kilowatt-hours.

The needle on Dial D has just counted the number 6. Dial D reads (f) ________ (6, 60, 1) kilowatt-hours.

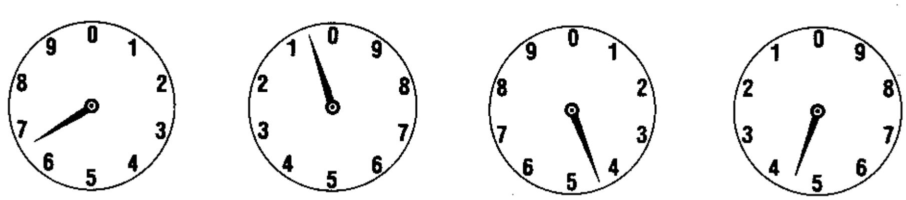
In order to get the total reading of the electricity meter shown above, we must add together the readings on Dials A, B, C, and D. In other words, we must add to get a total of (g) ________ kilowatt-hours.

Each month a man from the power company is sent to your home to read your electricity meter. His job is to determine how much electricity you used during the month. For example, suppose your meter looked like this in the month of April:



According to the meter, you have used to date (h) ________ kilowatt-hours of electricity.

In May, the person from the power company makes another reading.



He finds that your electricity meter now reads (i) ________ kilowatt-hours. Since the April reading, you have used (j) ________ kilowatt-hours. You find this by subtracting the April reading from the May reading.

YOU SHOULD NOW BE ABLE TO FIND AND READ THE METER FOR ELECTRICITY IN YOUR OWN HOME.

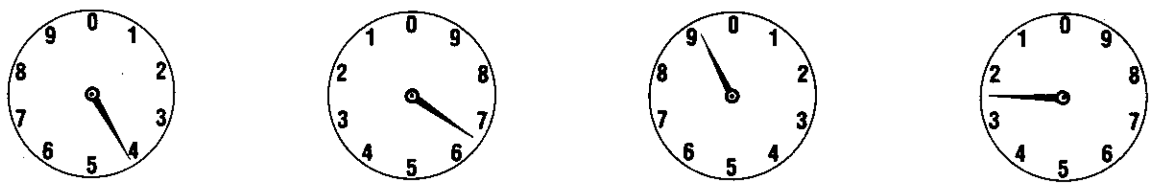
Energy Measurement and Consumption
Lesson #4
Page 5, Worksheet 4.1 (3)

Name________________________

Date________________________

Study the meter below. Fill in the blanks beneath each dial.

1000 | 100 | 10 | 1



means (k) ________ kilowatt-hours

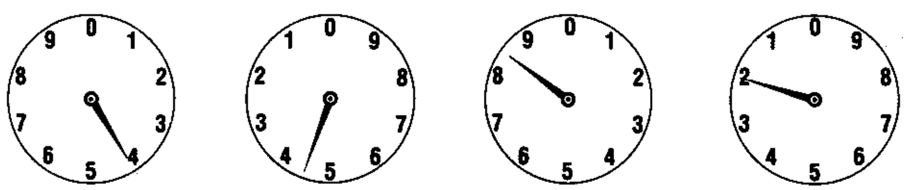
means (l) ________ kilowatt-hours

means (m) ________ kilowatt-hours

means (n) ________ kilowatt-hours

According to your calculations, this meter shows that a total of (o) ________ kilowatt-hours have been used.

The meter shown below reads (p) ________ kilowatt-hours.



Energy Measurement and Consumption
Lesson #4
Page 6, Worksheet 4.1 (4)

Name________________________

Date________________________

A. WHAT IS A KILOWATT-HOUR?

Take a look at an ordinary light bulb and you will notice that its wattage is indicated. For example, the bulb might read 100 watts, 60 watts, 40 watts, and so on. The wattage marked on a bulb indicates the amount of electricity that bulb will use in one hour.

For example, a 100-watt bulb will use 100 watt-hours of electricity in 1 hour. Similarly, a 60-watt bulb will use 60 watt-hours of electricity in 1 hour.

Since a 40-watt bulb will use (q) ________ watt-hours of electricity in 1 hour, then the same bulb will use (r) ________ watt-hours of electricity in 2 hours. How many watt-hours of electricity will a 40-watt bulb use in four hours? (s) ________

To answer this question, you must multiply. You find that a 40-watt bulb will use 4 x 40 watt-hours of electricity in four hours.

Answer the following:

w. A 100-watt bulb will use 100 ________ of electricity in 1 hour.

x. Two 100-watt bulbs will use ________ of electricity in 1 hour.

y. How many watt-hours of electricity will 3 60-watt bulbs use in 1 hour? in three hours?

Because the average home will use several thousand watt-hours of electricity in one month, it is more convenient to measure the amount of electricity in a unit larger than the watt-hour. One kilowatt-hour is equal to 1000 watt-hours. REMEMBER that a kilowatt-hour is larger than a watt-hour.

If five 200-watt bulbs were used for one hour, they would use a total of 5 times 200 watt-hours or 1000 watt-hours or 1 kilowatt-hour.

Two kilowatt-hours equal (t) ________ watt-hours.

500 watt-hours equal (u) ________ of a kilowatt-hour.

How many watt-hours equal 5 kilowatt-hours? (v) ________

z. If each fluorescent tube in the lighting fixtures in your classroom is labeled 40 watts, how many watt-hours of electricity is being used in 1 hour? How many kilowatt-hours in 1 hour?

Name________________________

Date________________________

B. HOW ELECTRIC BILLS ARE COMPUTED

SAMPLE ENERGY CHARGE

First 200 kwh at	$ .0430 per kwh
Next 1300 kwh at	.0260 per kwh
Over 1500 kwh at	.0215 per kwh
Total kwh at (Fuel Clause)	.00215 per kwh

SAMPLE BILL COMPUTATION: Suppose that your total electricity consumption for the month amounted to 500 kwh. The charge for this monthly consumption would be figured out in this way.

First 200 kwh at $.0430 . . . .$8.60
Next 300 kwh at $.0260 . . . .$7.80
Total of 500 kwh at $.00215 . . . .$1.08 (Fuel Clause)
Total $17.48

WORK SPACE FOR ABOVE COMPUTATIONS:

COMPUTING ELECTRIC BILLS

Work all problems on this paper showing the calculations for each. Use the Sample rate schedule to do these.

1. Mr. Collins read his meter at the beginning of May. It read 4335 kwh. When he subtracted the April reading of 3916, he found the number of kilowatt-hours he used in one month. What would his electric bill amount to in Green Bay?
   a. Subtract b. First 200 kwh? c. Next 1300 kwh? d. Total? (add b & c)

2. Can you find an error in this bill?
   Mr. J.J. Jones
   111 Energy Blvd.
   Antsville, Indiana 60761

Previous meter reading	Present meter reading	No. kwh. Used	Amount to be paid
3569	4129	560	$20.16

Energy Measurement and Consumption
Lesson #4
Page 8, Worksheet 4.2 (1)

Name____________________

Date____________________

Daily Use of Electricity in my Home

Date and Time	Electric Meter Reading (kwh)	Kilowatt-Hours Used Daily (#2-#7)
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Questions

1. On which day did your family use the most electricity?

2. Why do you think they used more on that day?

3. Could your family cut down on electricity use? If so, name the ways.

4. What would probably happen to electricity consumption in general if the price of electricity per kwh increased:

   a. by 1%   b. by 10%   c. by 50%

Name______________________

Date______________________

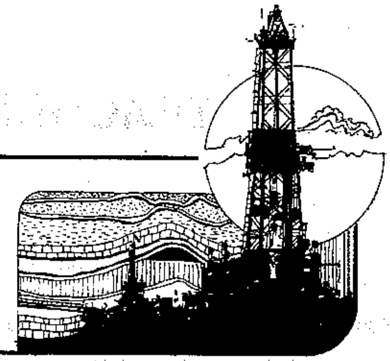
5. Describe the relationship between an increase in the price of electricity and the quantity of electricity consumed.

6. What would probably happen to electricity consumption in general if the price of electricity per kwh decreased:

   a. by 1% b. by 10% c. by 50%

7. Describe the relationship between a decrease in the price of electricity and the quantity of electricity consumed.

INSTRUCTOR INFORMATION. . .



**Lesson 5:
Resources For
Energy Production**

Rationale:

To meet our wants and needs, a supply of goods and services must be provided. The production of goods and services in turn depends on supplies of basic productive resources. How these resources are combined to produce goods and services in general, and electricity in particular, is the subject of this activity.

Objectives:

Students will identify and give examples of the three basic categories of productive resources.

Students will describe how resources are combined to produce electricity.

Students will follow steps in a flow chart of the production of electricity.

Implementation:

Use "Teacher Suggestions" which follow on next page. Distribute student worksheets and display flow chart transparency for discussion.

Debriefing:

Steps 4-6 in "Teacher Suggestions" are good debriefing exercises.

INSTRUCTOR INFORMATION. . .

TEACHER SUGGESTIONS

Materials Needed

Worksheets: 5.1 Productive Resources
5.2 Productive Resources for Electricity

Flow Chart: Electricity Generator Flow Chart. (This can be made on a transparency or drawn on a large piece of butcher paper instead of making a transparency, if the teacher prefers.)

Teaching Strategies

1. Begin by reviewing: We now know we have certain wants. In order to meet these wants we must somehow produce goods and services. For this production to occur it is necessary to have **productive resources.**

2. Worksheet 5.1 may be used as a guide for students to take notes while you discuss productive resources. Use the transparencies to describe each type of productive resource. Say, "The first type is **natural resources.** Natural resources are the basic building blocks of production. Some of Nebraska's natural resources include water, the sun, the wind, and fertile farmland. Some natural resources are renewable. Examples of renewable resources are water and forests. Others such as oil and coal are used up in the process of production. They are called nonrenewable. **Capital goods** are those things which are used to produce other goods and services. They include machines, tools, and factories. The final resource is called **human resources.** Human resources are the skills, talents, and abilities of people of society. It is very important we understand that these three types of productive resources are necessary for any production to occur." Answers to worksheet: (1) resources; (2) natural resources; (3) water, fertile land; (4) water, trees; (5) oil, coal; (6) capital goods; (7) machines, tools, factories; (8) human resources; (9) peoples' skills, talents, abilities; (10) production.

3. Display the large Electricity Flow Chart or Transparency. Review with students briefly how electrical energy is produced. The easiest way to do this is to follow the arrows on the chart.

4. Divide students into groups of three or four people. Have them fill in Student Handout 5.2 together. When they have completed this task, ask them to add their ideas to the energy flow chart. Compare and discuss answers from each group. Which resources are found naturally in Nebraska for electricity production?

5. Have each group "brainstorm" the productive resources needed for one of the following activities:

   a. riding a bus
   b. airplane trip
   c. cab ride
   d. car ride with parents

   When students have completed their lists, have one group member display their results on the chalkboard.

INSTRUCTOR INFORMATION. . .

6. Ask the students the following questions:

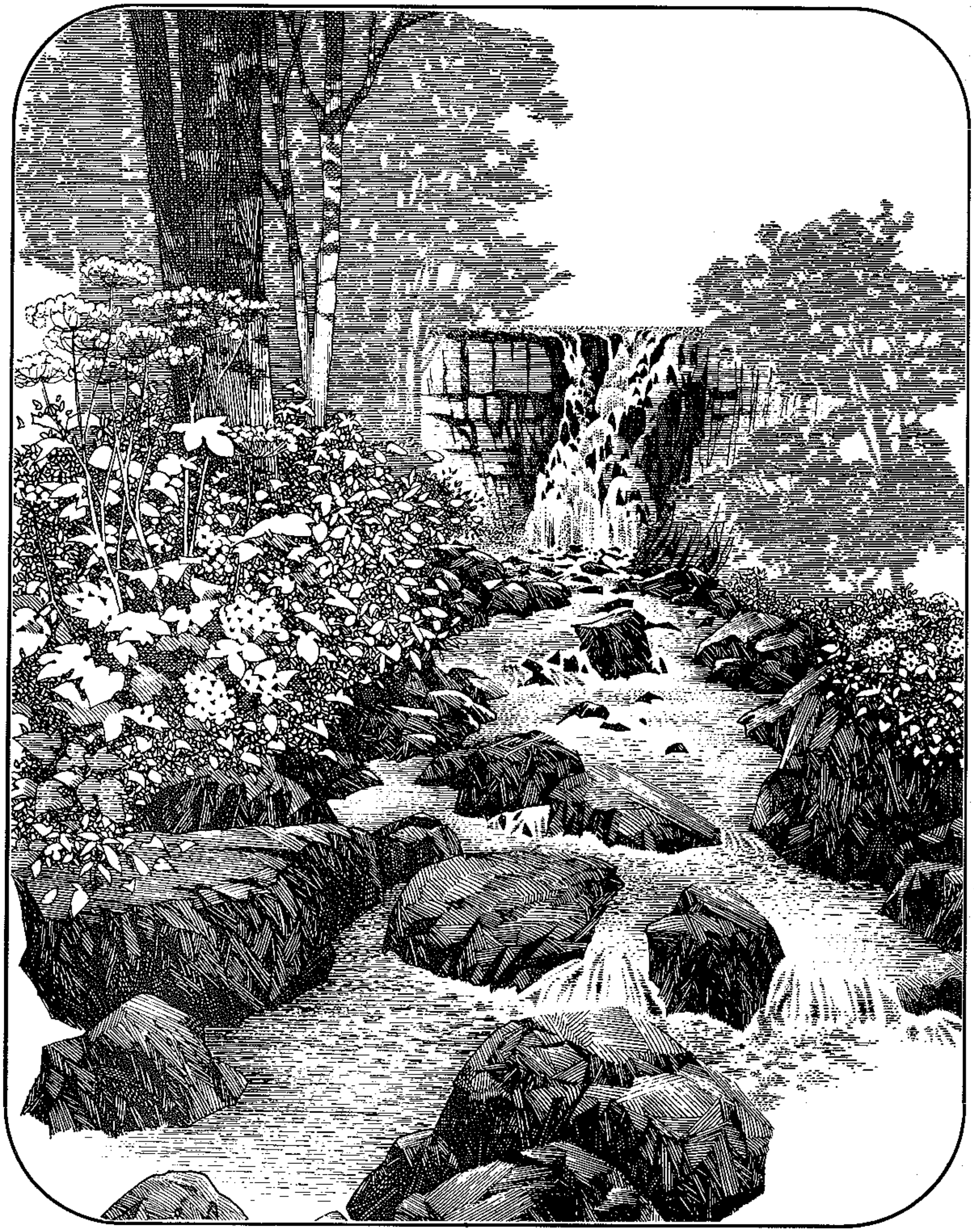
   a. Which natural resources were needed for each activity? (gasoline, air, jet fuel, iron, steel, etc., materials in vehicle, in roads, airports)

   b. Stop and think for a moment. What would happen if the natural resources were more limited and they were no longer available for all of our uses? (Shortages might develop, prices would rise, we would look for alternative resources to use.)

   c. Which of these natural resources is least scarce? (Air)

   d. What are some ways we can overcome a limited supply? (Rationing, search for alternative resources, use substitute goods or services.)

Answers: Flow Chart: Natural Resources-air, water, coal, gas, uranium; Capital resources-generators, electric plants, tools, trucks, etc.; Human resources-engineers, managers, maintenance workers, rate specialists, etc.
Worksheet 5.1: Use lecture information.
Worksheet 5.2: Same as transparency flow chart.

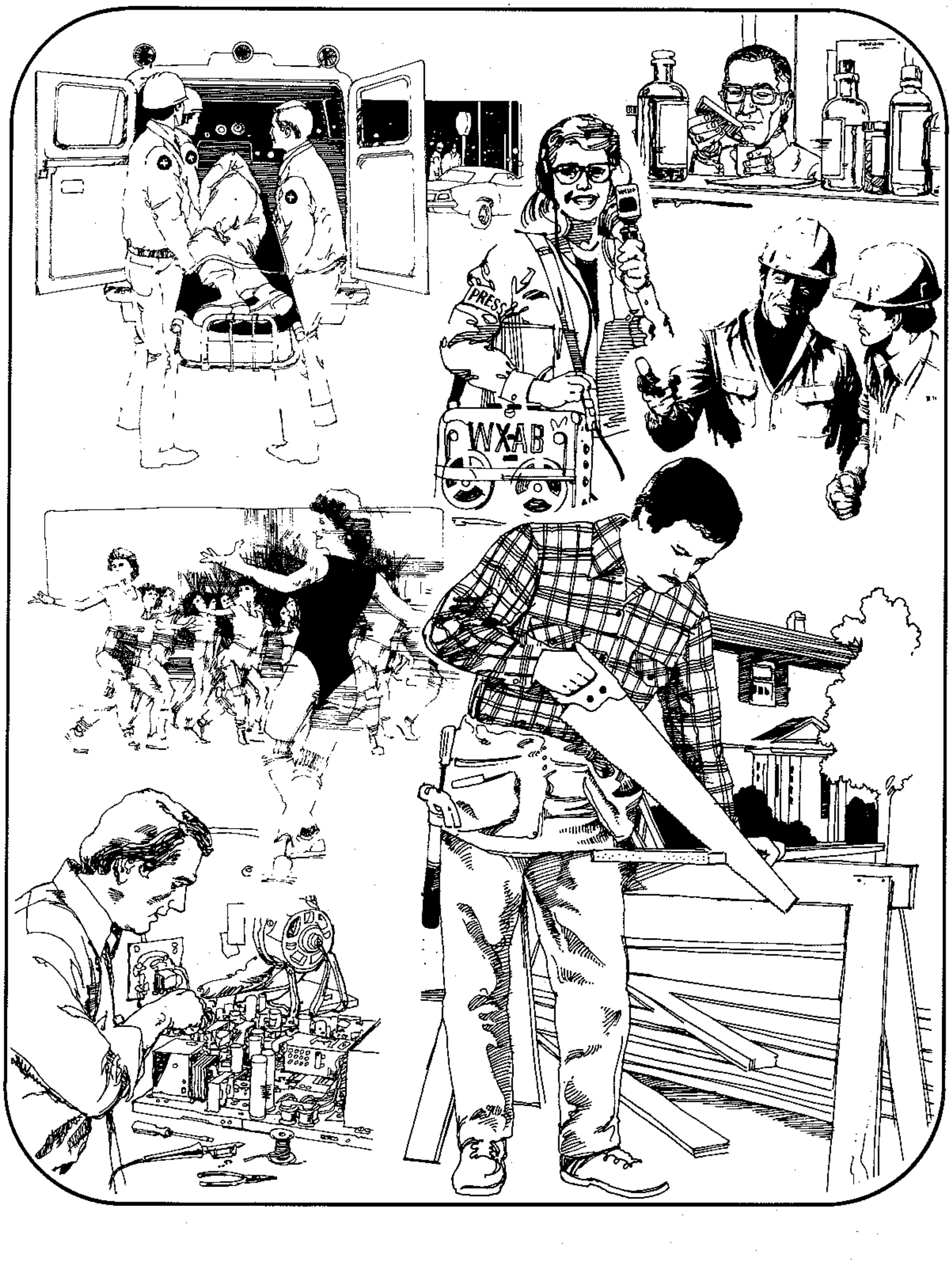


Natural Resources

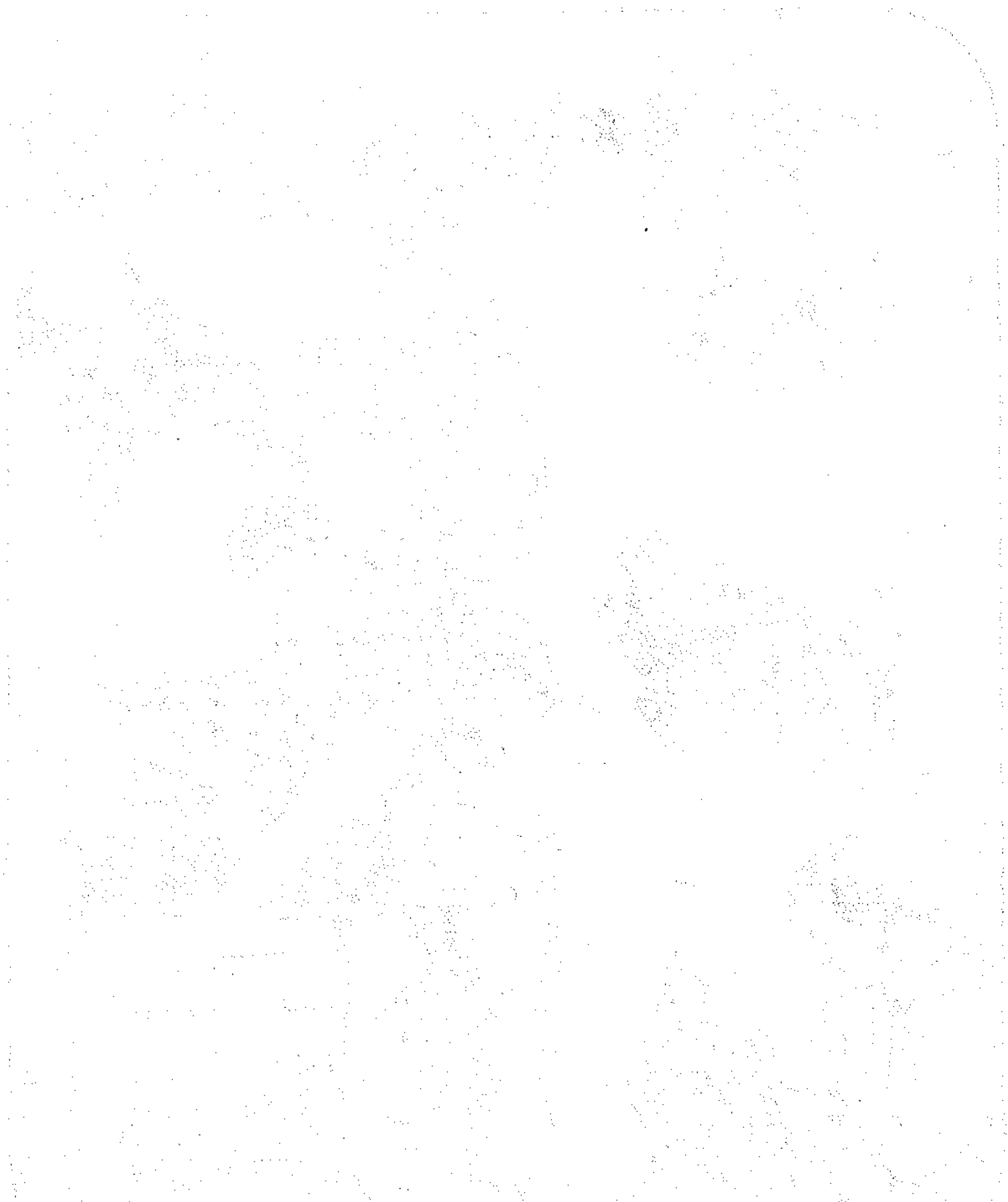
are the raw materials which
come from the environment.

Capital Goods or Capital Resources

are those things created to be used to produce other goods and services. Capital goods such as tools, factories and machinery are a necessity for production.



Human Resources are people and their skills and knowledge.



Name____________________

Date____________________

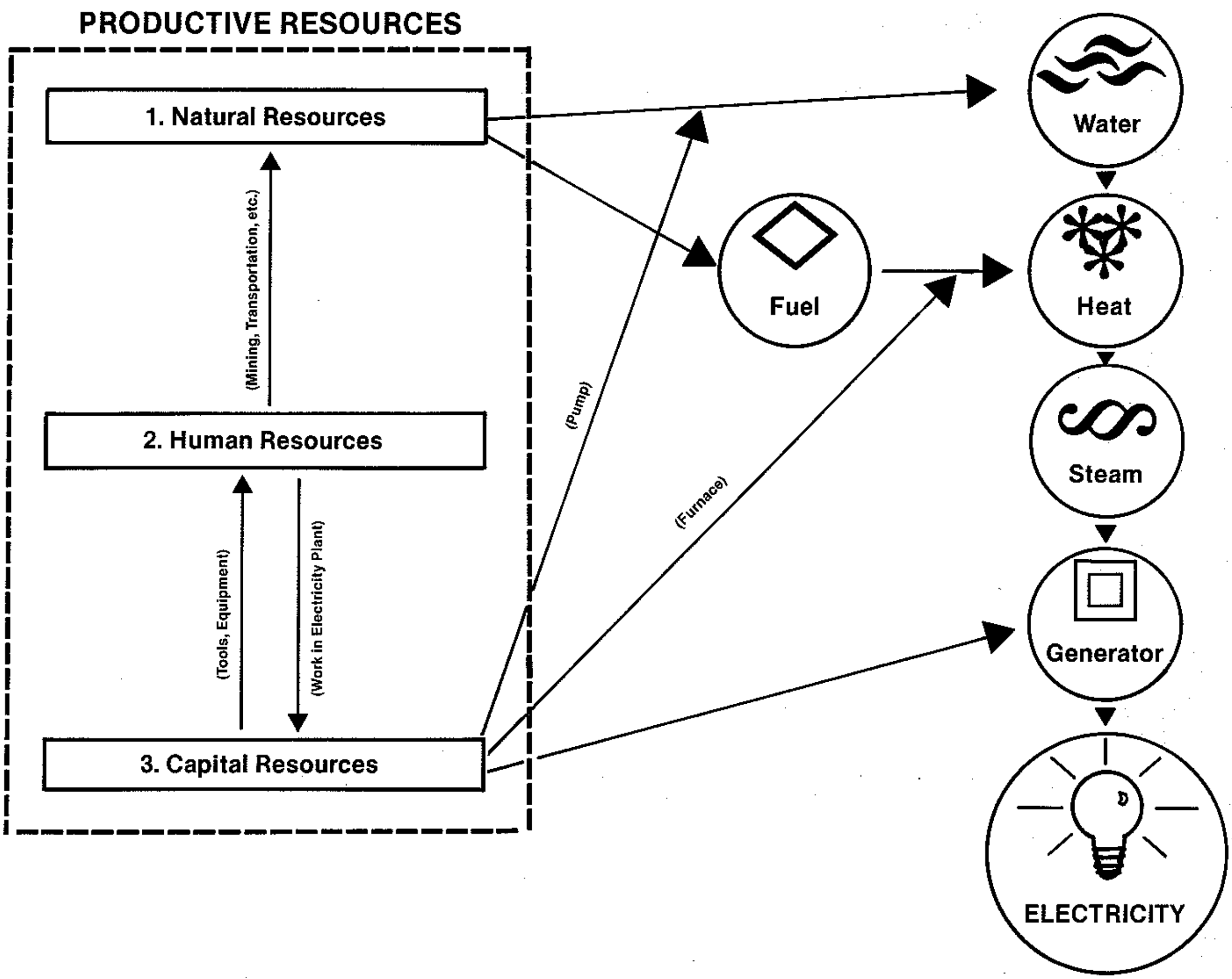
Productive Resources

As your teacher explains some important facts on productive resources, fill in the missing words below.

1. For production to occur it is necessary to have ______________________________.
2. One productive resource is ______________________________.
3. Some of Nebraska's natural resources are ________________ and ________________ ______________________________.
4. Examples of renewable natural resources are ____________________ and ______________________________.
5. Non-renewable resources such as ________________ and ________________ are used up in the process of production.
6. ____________________ are those things which are used to produce goods and services.
7. ________________, ________________, and ________________ are some examples of capital goods.
8. ________________________ are the third type of productive resources.
9. Human resources are ______________________________.
10. All three types of productive resources are necessary for ________________________.

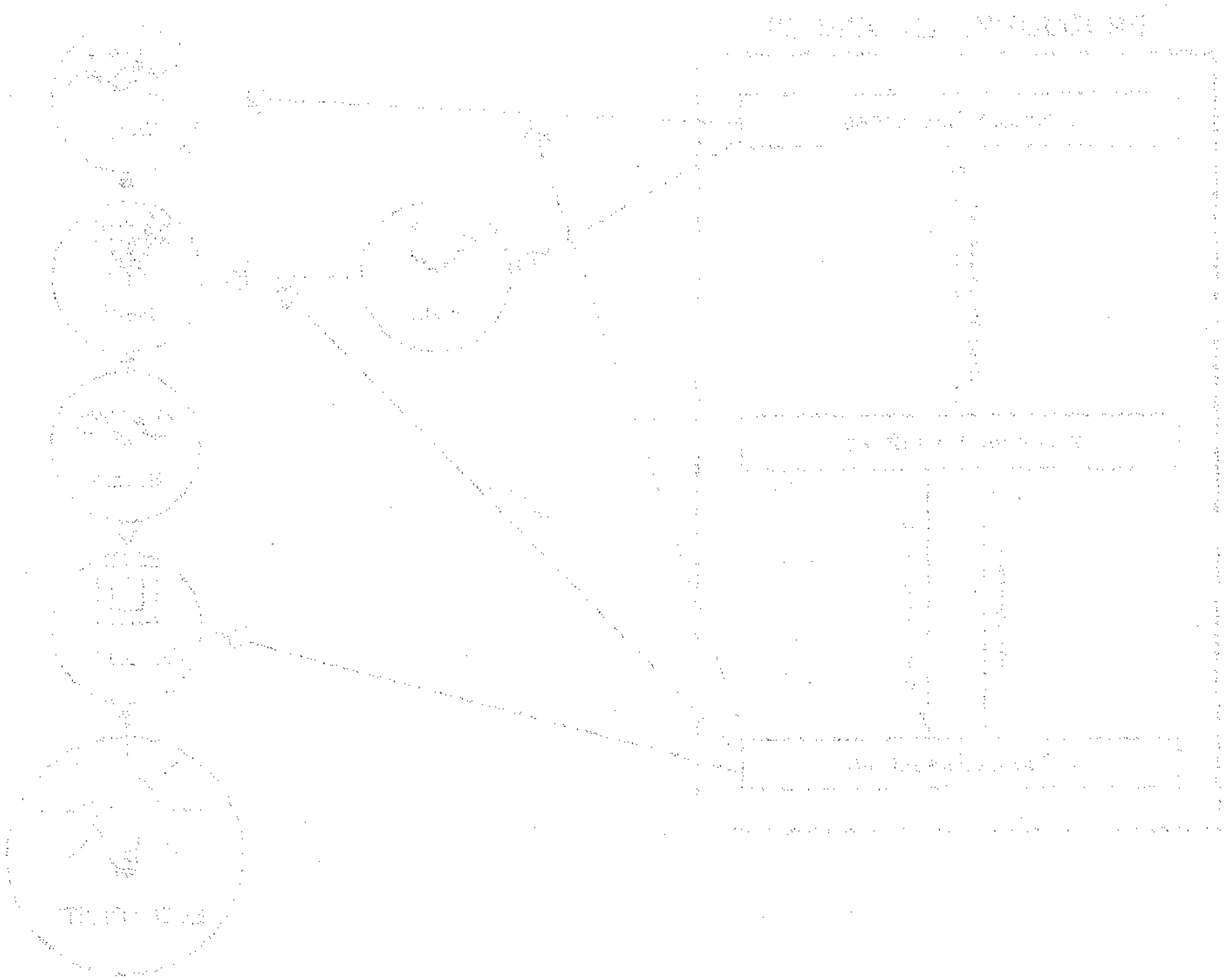
Additional Notes:

ELECTRICITY GENERATION FLOW CHART



This chart shows some relationships between productive resources and the final product: Electricity.

Can you think of other connections not shown here?



Resources for Energy Production
Lesson #5
Page 5, Worksheet 5.2

Name____________________

Date____________________

Look carefully at the electricity flow chart. With your group, come up with at least two productive resources for each category below.

Natural Resources:

Capital Resources:

Human Resources:

INSTRUCTOR INFORMATION. . .

Lesson 6:
Supplying
Energy Resources

Lesson 6: Supplying Energy Resources

Rationale:

In the last lesson we examined types of productive resources. In this activity we analyze some of the other factors affecting supply. In the next lesson, we will look at both demand and supply and how they interact to form a market equilibrium price and quantity.

Student Implementation:

Students will observe that remaining fossil fuel reserves are unknown.

Students will predict that as fuels become more difficult to find, the cost of energy will rise.

Students will infer that as prices for energy rise, there is incentive for producers to explore and produce new energy sources.

Implementation:

A large handful of beads and cornmeal will be scattered as suggested. Students will be divided into five companies to search for energy resources in three one-minute intervals. At the end of this activity, the teacher will ask for clean-up volunteers. See how responses would change as you offer various prices for each bead collected.

Debriefing:

Use set of questions in Teacher Instructions.

INSTRUCTOR INFORMATION. . .

Activity Instructions*

Materials Needed:

A large handful of very small beads, at least four different colors, mixed with an equal quantity of cornmeal in a small canister, such as a container for 35mm film. The percentages of bead colors to be placed in the canister are suggested in number 4.

Directions: READ THE FOLLOWING TO STUDENTS

1. This lesson illustrates some of the existing dilemmas in obtaining energy supplies.

2. Before students arrive in class, throw the handful of beads high in the air, hitting the ceiling. Divide the class into five companies.

3. Each company will search for one color bead. The total number of beads should be broken down into the following proportions.

   Company I — black (coal) 50%
   Company II — red (uranium) 3%
   Company III — white (natural gas) 10%
   Company IV — blue (oil) 37%
   Company V — cornmeal (solar) heaping tablespoon

NOTE TO TEACHERS: (If any company starts to gather all colors, **do not** interfere or comment.)

4. Explain that you have thrown an unknown quantity of beads, energy resources, on the classroom floor. The total resources available represent those available in 1957.

5. The first search will last one (1) minute.

6. Start the search.

7. Stop in one minute.

8. Have each company count its resources.

9. Keep the resources (beads) in separate piles. Record the totals for each group for each round on the blackboard.

10. Start a second search for one more minute. Each company must search for resources **still missing.** Record totals.

11. Start a third and final one minute round. Search and record totals.

*This game is from **Energy Tradeoffs in the Marketplace,** prepared by Washington State Superintendent of Public Instruction Office and Washington State Council on Economic Education, (Seattle, WA: 1980) pp. 51-55.

INSTRUCTOR INFORMATION. . .

Debriefing Questions

1. Which energy sources were easiest to collect? Why? Which were most difficult? Why?

   Answer: Probably coal and oil are the easiest to collect because they were most abundant; most difficult to collect would be uranium and solar.

   What makes them easy or difficult to find? Is it the availability of the beads or is it the skill of the searchers?

   Answer: Both availability and skill are important.

NOTE TO THE TEACHER: Cornmeal (solar) is diffuse and hard to gather. (The gathering and conversion represents a high cost in terms of land, labor or capital. Until technology reduces costs, **i.e. land, labor or capital, it will not be widely used.)**

---

2. Looking at the piles of energy, what generalizations can you make?

   Answer: The third pile may be smaller than the previous piles because the beads are harder to find and people may not have looked as hard.

3. Did anyone collect more than one energy resource? Is it realistic to collect more than one? Explain.

   Answer: Yes — it is realistic — companies will gather the most accessible source of energy — i.e. oil companies often mine coal.

4. What **economic** resources were used to gather the energy beads?

   Answer: Labor resources primarily; capital if a tool was used.

5. What do we know about the number of beads that were left on the floor?

   Answer: Only that there are fewer beads available now than when the group first started to search for them.

6. What is the supply of energy?

   Answer: It is not all of the beads thrown on the floor. Instead it is the beads on the table and whatever additional beads students can find in the near future if they think they can receive a good price for what they have found so far.

7. How might we have found more beads in the same time period?

   Answer: A broom or vacuum cleaner could be used, or everyone could look for all colors.

INSTRUCTOR INFORMATION. . .

8. What is the opportunity cost of obtaining a vacuum cleaner or broom during the search period?

   Answer: The opportunity cost is any beads that must be foregone while you are looking for a vacuum cleaner.

9. As energy becomes more scarce and demand continues to increase, what should happen to prices?

   Answer: Prices should rise.

10. Did you change the room's environment as you looked for beads?

    Answer: If the furniture has been disturbed, this would represent environmental costs.

11. Identify a number of examples of social benefits and social costs associated with the production of energy.

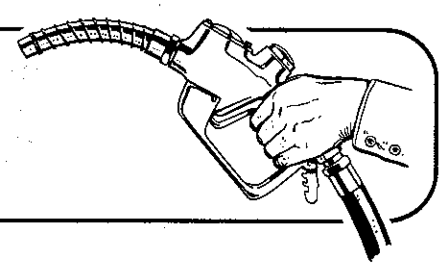
    Answer: Social costs — strip mining, oil wells, oil spills, etc. Social benefits — air conditioned buildings, improved transportation, etc.

12. Ask for student volunteers to help clean up the room. Then ask how many students would help if you paid them a penny a bead. Increase the amount that you offer per bead to 5¢, 10¢, 25¢ per bead until you can entice the entire class into helping you. Then relate their response to the "Law of Supply" which indicates that increased price will call out larger supply.

13. Note that this direct relationship between quantity supplied and price is known as the "Law of Supply".

INSTRUCTOR INFORMATION. . .

Lesson 7: Energy And The Laws of Supply & Demand



Rationale:

The quantity buyers wish to purchase at each price is called the **demand** for the product. The quantity sellers wish to offer at each particular price is called the **supply** of the product. In this worksheet/graphing exercise we will see how supply and demand interact to determine market prices.

Objectives:

Students will define demand, supply, and equilibrium price and quantity.

Students will read and interpret graphs depicting demand and supply curves.

Students will analyze the forces causing a shortage or a surplus of a product.

Implementation:

1. Choose an item that is commonly purchased by junior high students (such as a cassette tape or album) and select several prices for that item ranging from very low to outrageously high. Put these prices on the board and ask the quantity that students would purchase at each particular price. Put these quantities beside each price. This represents a hypothetical demand schedule for that item. You should find that a smaller quantity is purchased at the higher prices. This inverse relationship between price and quantity bought is called the **Law of Demand.** Demonstrate this to the students by looking at the nominal results (price and quantity). Then graph results, with price on the vertical axis and quantity on the horizontal axis.

2. a. Show Transparency 7.1 illustrating the "law" of demand. Have students answer the questions there.

   b. Then, show Transparency 7.2 and discuss relationship between quantity supplied and price.

   c. Now put 7.1 on top of 7.2. At what price is the amount demanded the same as the amount supplied? (About $2.50) What is this quantity? (About 2,500) These are called the equilibrium price and quantity.

   d. Above the equilibrium price there will be a surplus (quantity supplied exceeds quantity demanded). For example, at a price of $4.00 the quantity supplied is 4000 units and the quantity demanded is 1000 units.

INSTRUCTOR INFORMATION. . .

e. Below the equilibrium price there will be a shortage (quantity demanded exceeds the quantity supplied). For example at $1.00 the quantity demanded is 4000 units and the quantity supplied is 1000 units.

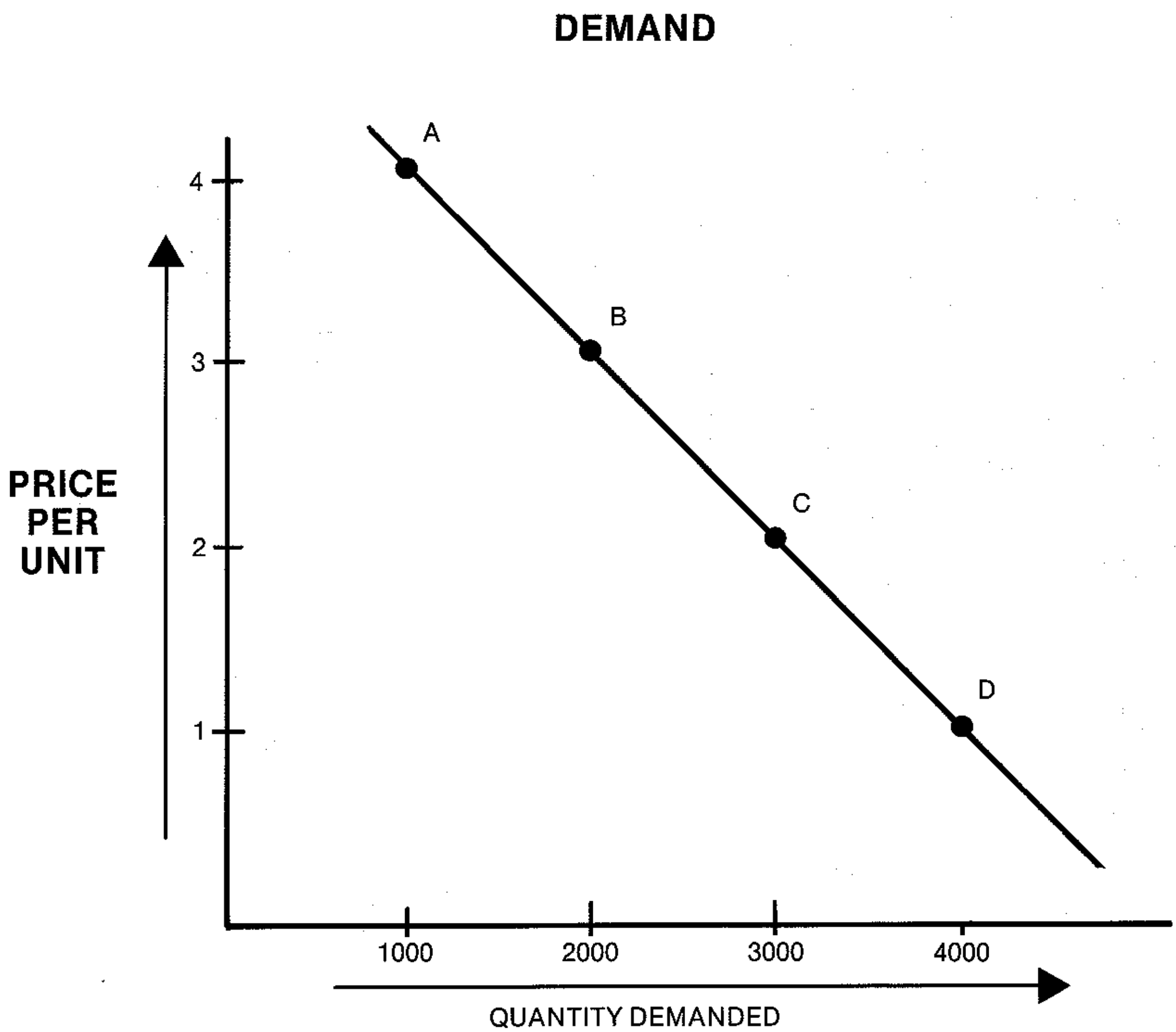
3. Distribute Worksheet 6.1.

Debriefing:

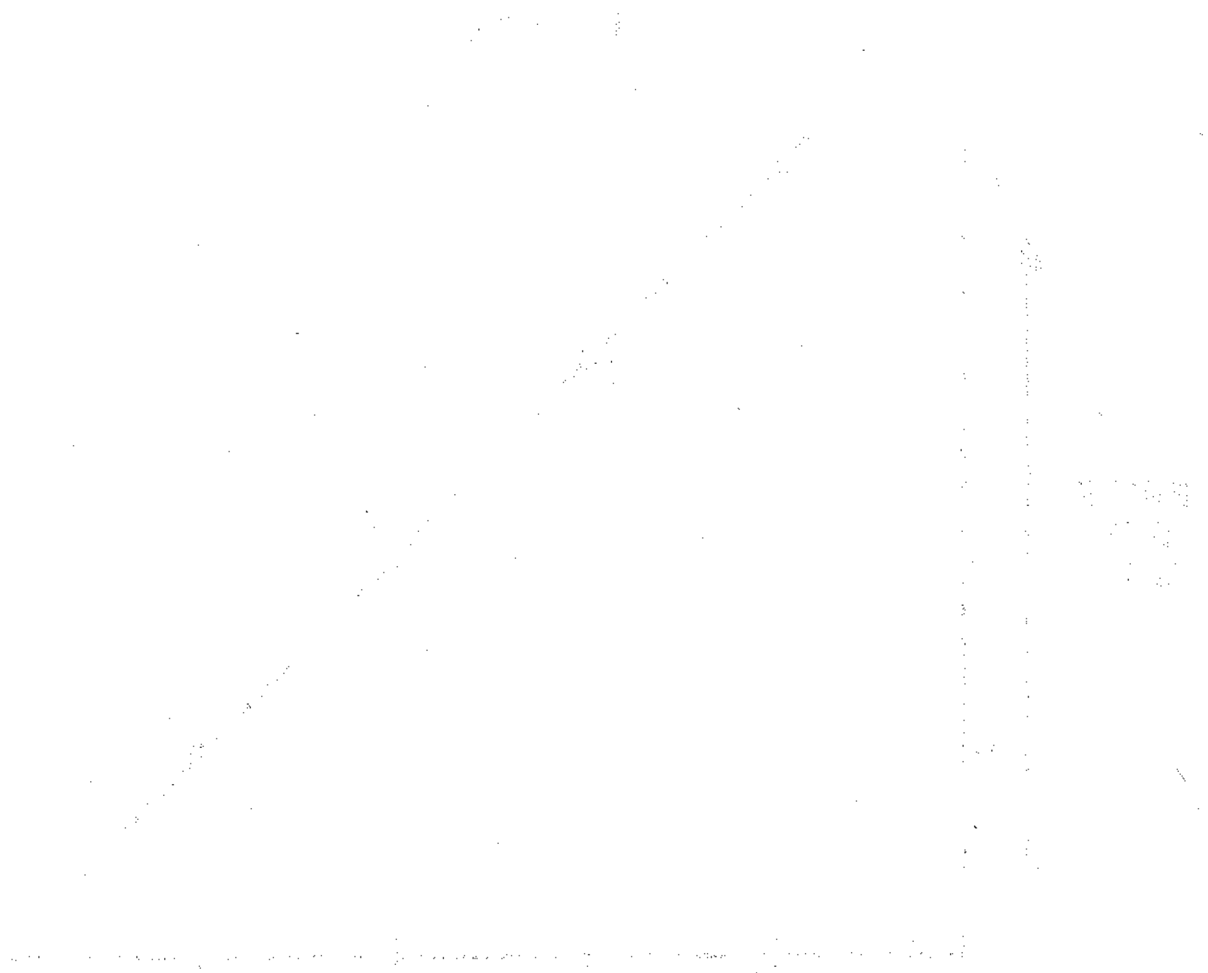
Discuss worksheets with correct answers. Brainstorm on solutions to Mrs. Sene's dilemma.

Answers: (a) 400; (b) 400; (c) supplied; (d) $10; (e) $400; (f) 360; (g) 40; (h) equilibrium; (i) 550; (j) shortage; (k) equilibrium; (l) eight; (m) shortage.

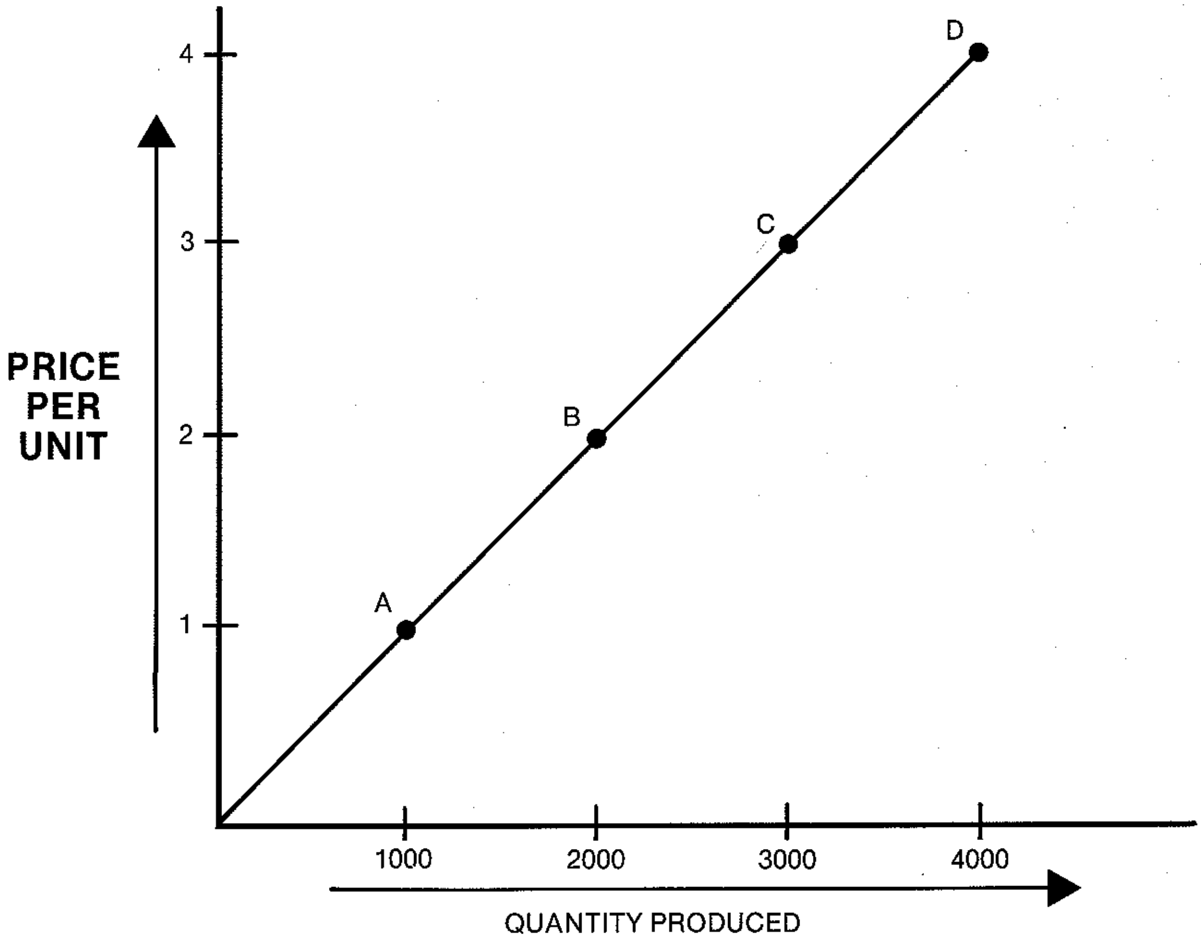
Some possible solutions: (a) Rationing — might lose customers but everyone could have some gasoline; (b) Buy extra gasoline from high-cost suppliers and try to cut costs elsewhere; (c) Serve customers on a first-come first-serve basis — same disadvantages as rationing without the advantage; (d) Buy higher priced extra gasoline at a loss, but hope that competitors will raise prices soon — this would be good only if you are sure that other stations are also losing and will need to raise prices soon. (She can't stay in business for long without a profit.)



Demand is the willingness and ability of consumers to spend money for goods and/or services. For most things in a given time period, the higher the price, the smaller the quantity that will be demanded. (Or the lower the price, the greater the quantity that will be demanded.) This **inverse** relationship between prices and quantities demanded is called "the law of demand." Notice that the graph of this relationship is a downward sloping demand curve.



SUPPLY



Supply is the amount of goods available for purchase to consumers. Two factors determine the supply: (1) cost of production and (2) the selling price. Generally, the higher the price, the larger the quantity that producers will be willing and able to supply. This is called the "law of supply."

If cost of production rises, the **supply will decrease** (curve shifts left) because producers won't find it profitable to produce the same amounts at the original prices. They will require a higher price to produce at each original quantity.

Name______________________

Date________________________

DEMAND

Look at the Demand Graph and answer the following:

. . . How much is demanded at $4? at $2?

. . . How much are people willing and able to pay to purchase 4 units?

An **increase** in demand means people will buy more at each price. The new demand curve would be to the right of the original. (For example, people might buy 2 at $4, 3 at $3, 4 at $2, and 5 at $1.)

A **decrease** in demand means people will buy less at each price. This would be illustrated by a demand curve to the left of the original. (For example, people might buy 0 at $4, 1 at $3, 2 at $2, 3 at $1.)

Therefore, an **increase** or **decrease** in demand means that the original demand curve has shifted. Such a **change** in demand means there is a **new** demand schedule.

SUPPLY

Look at the Supply Graph and answer the following:

. . . How much will be supplied at $4? at $1?

. . . What price will producers require to offer 3,000 units?

. . . As price of this product rises, producers will supply more or less?

Name________________

Date________________

Instructions: As you read the story fill in the number of the appropriate answer from the list below.

Mrs. Sene's Dilemma

Mrs. Kero Sene owns a gasoline station. She regularly receives 400 gallons of gasoline each week from her distributor. At the existing price of $1.00 per gallon her 40 regular customers each bought 10 gallons per week. Therefore, at this price the weekly quantity demanded for gasoline at Kero's was (a) ________ gallons each week. As you have seen, her weekly quantity supplied was (b) ________ gallons. Everybody was satisfied since the quantity demanded was equal to the quantity (c) ________. When the quantity of demand and supply are equal, this point is called an **equilibrium quantity** and **equilibrium price.**

Kero had been charging $1.00 per gallon of gasoline, about the same as other stations in town. Therefore regular customers spent an average of (d) ________ each per week, and Kero received revenue of (e) ________.

Then one day another nearby station lowered its gasoline price by 2¢ a gallon. Kero lost four regular customers. The quantity demanded for Kero's gasoline was now only (f) ________ gallons per week and there were (g) ________ gallons left over. This extra amount is called a **surplus.** Since the quantity supplied is now more than that demanded for Kero's gasoline, $1.00 is no longer the (h) ________ price.

In order to get her customers back, Kero lowered her price to 97¢ 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. With 50 customers, this brought total quantity demanded for Kero's gas to (i) ________ gallons per week. Now Mrs. Kero had a (j) ________ of gasoline. There was still no (k) ________ price.

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 each of the 50 customers to (l) ________ gallons per week or to raise the price to 98, the price that the other stations now charged. She decided that rationing may make some customers angry so she raised the price to 98¢. Her new customers went elsewhere then and she had her original 40 customers again. However, they were buying slightly more than the 10 gallon average that they bought at the $1.00 price. There was still a (m) ________. What are the possible solutions to Kero's problem? Discuss advantages and disadvantages of each.

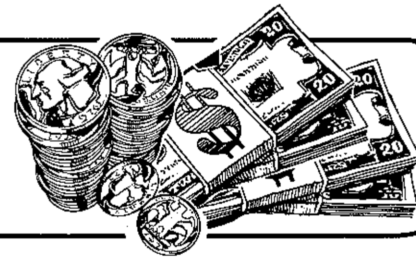
Possible Answers

(Some may be used more than once or not at all)

1. shortage
2. supplied
3. 400
4. $400
5. 550
6. more
7. demanded
8. $10,000
9. 360
10. equilibrium
11. less
12. eight
13. $10
14. 40

INSTRUCTOR INFORMATION. . .

Lesson 8: Profits And Incentives in Energy Markets



Rationale:

The profit motive may be the most important factor in directing business activity in a market system because business will produce goods and services that they expect will earn a profit. Profits are also retained by businesses as an important source of funds for future investment and growth. Understanding the role of profits is essential to understanding energy production in our economy.

Student Objectives:

Students will identify the role that profits play in our economic system.

Students will define profits, profit motive, gross sales, depreciation, fringe benefits, total costs of production.

Students will construct a hypothesis about the relationship between oil prices, profits, and drilling activity, and relate this to the Law of Supply.

Implementation:

1) Have students define underlined words on worksheet 8.1. This could be done orally with the aid of a dictionary. (gross sales — total sales revenue before subtracting costs or taxes; fringe benefits — addition to wage costs like insurance benefits, vacation pay, etc.; depreciation — estimated cost of machinery, plant and equipment deterioration; profit — gross sales (total revenue) minus total costs.)

2) Distribute and explain how to do worksheet problems using above concepts.

3) Worksheet 8.2 illustrates the relationship between price and investment in oil well drilling. The implication of rapidly rising prices (assuming costs stay the same or rise less rapidly) is that profits will increase. The expected increase in profits provides incentive for more exploration (drilling) and in turn, more oil production.

Debriefing:

Correct answers to worksheets 8.1 and 8.2. Discuss these in class, especially 8.2.
Answers 8.1: 1) $150,000 2) more than profits 3) a. $96,000 b. 30,000 c. 23,000 d. 7,000 + 20,000 + 16,000 = 43,000 4) $96,000 5) $54,000 6) No, because gasoline is a cheaper substitute 7) Not to produce 8) Profits determined by price of miracle and its substitutes as well as costs.

INSTRUCTOR INFORMATION. . .

Answers 8.2: 1) Prices rose rapidly due to Arab and later Iran's oil embargo and government de-control of prices. (Oil prices were kept low by policy in early 1970's — both our government and OPEC countries had some controls.) 2) They would rise 3) Grew, because companies expected more profits with higher prices. Also high prices made it easier to afford to drill in new places. 4) Graph should slope up from left to right. 5) Law of Supply.

Name____________________

Date____________________

The Profit Motive

Suppose you invented a miracle fuel that could be used as a substitute for gasoline in any present automobile. In order to produce it, you purchased some expensive equipment, and you borrowed $100,000 for this to get your new business started.

During the year, the firm sold 150,000 gallons of fuel to a retailer for $1.00 per gallon.

1. What were the **gross sales** for the firm?____________________

2. Are the **gross sales** the same as **profits** or more or less?____________________

3. If the actual production costs for fuel for one year were:

Salaries and **fringe benefits**	$30,000
Building rent	7,000
Equipment **depreciation**	20,000
Utilities	3,000
Raw materials for fuel	20,000
Interest on loan	16,000

   a. What are the **total costs** of production?____________________

   b. How much is spent on human resources (labor)?____________________

   c. Natural resources (raw materials)?____________________

   d. **Capital** goods?____________________

4. To make a **profit,** you must have sales that are more than $____________________

5. What are the **profits** in this example?____________________

Name______________________

Date_______________________

6. Suppose the price of gasoline was 75¢ per gallon. Do you think you could sell any miracle fuel at $1.00 a gallon?____

   Why or why not?____

7. What would you decide about production of miracle fuel if the government told you that no one could charge more than $.50 per gallon?____

   Explain why you would make this decision.____

8. What seems to determine whether or not you make the decision to produce miracle fuel?____________

Name______________________

Date______________________

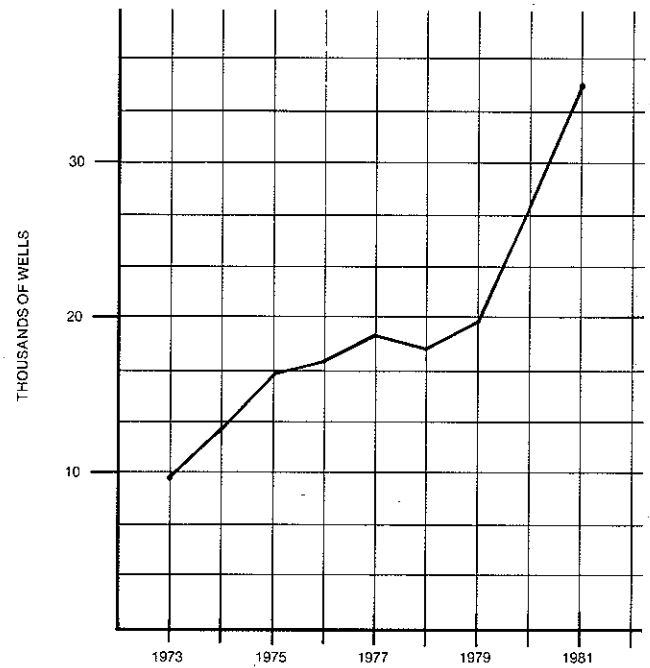
Oil Prices and Drilling Activity

Below is a table and a graph with some information about oil prices and oil wells drilled in the United States from 1973 to 1981. Use this information to answer the questions below.

Oil Prices and Drilling Activity

Year	Average Real Price of Crude Oil per Barrel (1981 Dollars)	Oil Wells Drilled (Excludes Dry Holes)
1973	$ 2.12	9,902
1974	4.08	12,784
1975	4.97	16,408
1976	5.59	17,059
1977	6.19	18,912
1978	6.98	17,775
1979	10.63	19,383
1980	19.41	27,026
1981	28.34	34,645

Statistical Abstract of the United States — 1981, Table 130, and *Economic Report of the President, 1981*, Table 6-2.



Number of Oil Wells Drilled (excluding dry holes), United States, 1973-81 *With the increase in the world price of oil and the decontrol of the price of oil, oil drilling activity in the United States has risen considerably.*

Source: Economic Report of the President, 1982.

1. What happened to oil prices over this period?______________________

2. When prices rose as rapidly as they did during 1973-1981, what do you suppose happened to oil companies' profits? (assuming that production costs stayed the same or rose less rapidly)

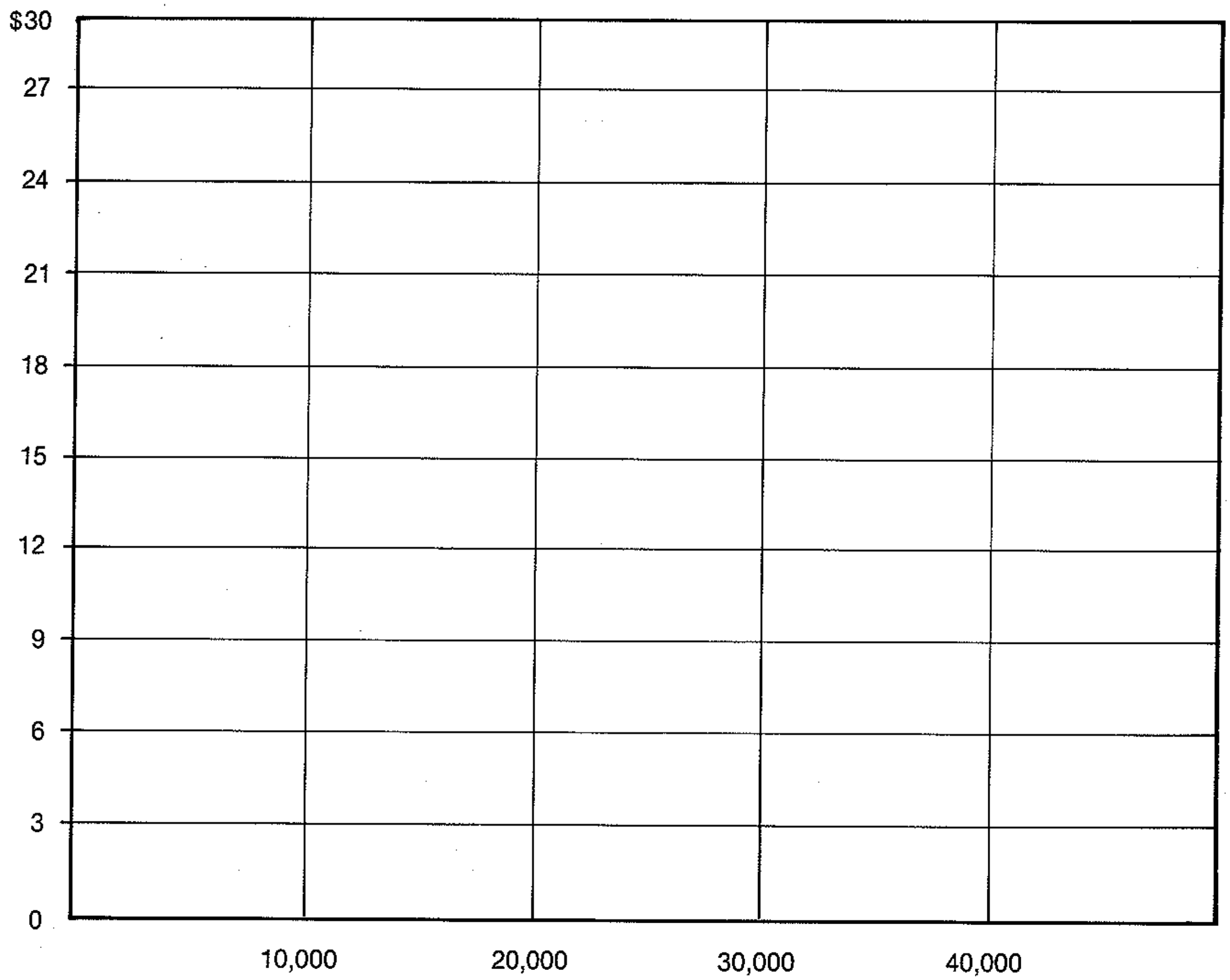
3. What happened, in general, to the number of new oil wells drilled each year from 1973-1981?________ Why do you think this occurred?

Name________________________

Date________________________

4. Make a graph showing this information measuring price and number of wells drilled as shown. (Round prices to nearest dollar, number of wells to nearest hundred.)

Crude Oil Price per barrel



Numbers of wells drilled

5. What economic concept does this graph illustrate?

INSTRUCTOR INFORMATION. . .

**Lesson 9:
Competitive Markets
And Cartel Power**

Lesson 9: Competitive Markets and Cartel Power

Rationale: The world market for oil has not been competitive for most of its history. In this simulation students will observe the different price effects of a competitive market and one dominated by a cartel.

Student Objectives: Students will describe the effects that different market conditions have on price.

Students will participate in a market which simulates the pressures that cartel members face to lower their prices.

Implementation: Use the "Oil Price Game" simulation for students to experience transactions occurring in both competitive and cartel-like markets.

Debriefing: Discuss questions included with game instructions.

INSTRUCTOR INFORMATION. . .

The Oil Price Game—
Everybody Plays*

Time Allotment: One class period.

Materials: **32 SELL cards**
32 BUY cards

Teacher Instructions: Divide the class into two groups. Distribute one set of cards to the Oil Consuming nations; a different set of cards to the Oil Producing nations. Tie white arm bands on the Oil Producers and use another color tie for the Oil Consumers, or use some other identifying symbols.

Allow plenty of time for students to get a notion of the game and learn the procedures.

Anticipate some difficulty with learning how transactions are made and prices reported.

PART I

Play begins with the distribution of BUY and SELL cards. (It will help speed up the game if you match the color of the card to the arm band color.) Cards suitable for copying are on last page of this activity. Sample cards are found p. 89.

Insert price per barrel on each BUY card according to this distribution.

Price	# of cards
$21.00	4
19.00	4
17.00	4
15.00	4
13.00	4
11.00	4
9.00	4
7.00	4
5.00	5
3.00	4

Insert price per barrel on each SELL card according to this distribution.

Price	# of cards
$19.00	2
17.00	2
15.00	2
13.00	2
11.00	4
9.00	4
7.00	6
5.00	6
3.00	4

A complete set of Buyer and Seller cards should be used whenever the game is played with a class of more than 32 students. While the game is played, the cards should be kept in separate stacks on a desk near where the recorder is tallying the prices. As cards are turned in, students should take a different buy or sell order, according to their roles. Individual cards may be used more than once in the game, but make sure students don't keep cards for more than **one** transaction. If a student is unable to complete a transaction within five minutes, a new card may be given out to replace the old instructions.

Have students keep a record of their individual "profits." Buyers' profit is difference between purchase price and price on cards. Sellers' profit is difference between sale price and price on card. Tell students to maximize profits if they can.

*This game is from **Energy in the Global Marketplace,** Oak Ridge, TN: U.S. Department of Energy, 1978, pp. 39-45. 69.

INSTRUCTOR INFORMATION. . .

Record the price on the board where students can see the price at which oil is being sold. One way to show the tendency of prices to reach some "equilibrium" level is to record prices by time period. The following table could be used to record this information on the board.

Price	Five Minutes of Play	Second Five Minutes of Play	Third Five Minutes of Play
$21			
20			
19			
18			
17			
16			
15			
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			

Prices at left list the **possible** prices at which oil could be sold in the game. As students report each transaction, make a mark beside the price reported.

Separate transactions made during the first five minutes from those in other time frames. Transactions tend to move toward the equilibrium as time passes, mainly because more buyers and sellers become aware of the price of oil.

Debrief: After 15 minutes, or sooner if the price has stabilized, declare the market closed, collect all outstanding cards, and ask the students to analyze what happened. Address the following questions:

1. Economists often talk about the supply and demand for a certain product. Who demanded oil in the game? (The Buyers; the Oil Consuming nations.)

2. Who were the suppliers? (The Sellers; the Oil Producing nations.)

3. At the beginning of the game, what was the range, the highest and the lowest prices, at which oil sold? Was the price range as wide during the succeeding five-minute periods? Why or why not? (Most simulations start off with the maximum range, from $3 to $21, with transactions moving toward the theoretical equilibrium of $11, by the end of the game. Don't expect $11 as the only price at the game's end. Prices will nearly always vary, but with each round the variances will lessen.

4. By the end of the game, what price do you think would have been acceptable to the majority of Buyers and Sellers? Why? (Answers will vary. Usually students will see that a price becomes acceptable when it is not violating the majority of Buyers and Sellers instructions, and when it still allows some profit to both parties.)

5. What happened when a seller tried to sell at a price higher than the acceptable price? Did the same thing happen when a buyer tried to buy at a price lower than the acceptable one? (Students should suggest that the price above or below this acceptable price would be impossible for most participants to meet.)

6. How does the market for oil differ from the real world market? (Much of the oil sold in the world market is controlled by OPEC. This organization of petroleum exporting nations determines the supply and price of oil. There is no competitive market for the international sale of oil.)

Part II

The first part of the simulation created a world market for oil, but it was unlike the present real market because it contained competition among both buyers and sellers. Today the world market for oil is dominated by an organization called OPEC whose members are major oil exporting countries. When sellers organize to control production and prices, that organization is called a cartel. OPEC is a cartel.

To simulate a cartel, tell Sellers that they must agree upon a price before beginning any bargaining. They must **not** change this price during the bargaining session.

Allow enough time for the oil producers to determine the oil price. After the "cartel" has decided on a price, distribute buy cards to the rest of the class. These students should be instructed to buy oil at the lowest price possible, and yet not violate their instructions. Record the transactions as before. You should anticipate two outcomes:

1. Students in the "cartel" will stay with their fixed price, thus making it impossible for some buyers to purchase oil. Frustration will bring the game to an end quickly, with only a few students being able to make transactions.

2. Some "cartel" members will be unable to maintain their fixed prices because of pressure imposed by the frustrated buyers. If this happens, keep the game going until the fixed price is either reestablished or dissolves entirely.

Debrief: At the end of the simulation, have students review what happened. Use the following questions to help guide the thinking:

a. How was the price of oil determined in this game? (The cartel members agreed beforehand on the price. They tried to maintain this price despite pressure from their buyers.)

b. How did the outcome differ from the first one? (Probable answers: difference in final price; cartel produced a higher price.)

c. Why might some cartel members break a price agreement? (Some nations might think they could make more money by selling more oil at a lower price, pressure from buyers, and distrust of other cartel members also might influence decisions.)

d. What factors help a cartel maintain a fixed price? (A cartel is most likely to be successful if the members have similar political or ideological ties.)

e. Of the two types of world oil markets, which is better for consuming nations? Why? (The competitive market. In an open market, prices are lower and quantity produced is greater than in a controlled market.)

f. Which is probably better for producing nations — the cartel or competitive market? (Probably the cartel, since the profits are generally greater.)

INSTRUCTOR INFORMATION. . .

g. How can a rise in world oil prices affect production of oil in the United States? (A higher world price might make it profitable to develop new oil wells or seek alternative sources of energy. These activities would increase production of energy in the United States.)

h. What might happen if the price of oil quadrupled? (Perhaps world-wide economic depression. This, of course, could reduce the demand for oil to a point where oil prices might drop again.)

BUY CARDS

Buy 1,000 barrels of oil for **not more than** $________ per barrel. Try to get the price you can below this price. **Do not** buy oil above this price. If you haven't bought any oil after 5 minutes, get another buy order.

Buy 1,000 barrels of oil for **not more than** $________ per barrel. Try to get the price you can below this price. **Do not** buy oil above this price. If you haven't bought any oil after 5 minutes, get another buy order.

Buy 1,000 barrels of oil for **not more than** $________ per barrel. Try to get the price you can below this price. **Do not** buy oil above this price. If you haven't bought any oil after 5 minutes, get another buy order.

Buy 1,000 barrels of oil for **not more than** $________ per barrel. Try to get the price you can below this price. **Do not** buy oil above this price. If you haven't bought any oil after 5 minutes, get another buy order.

SELL CARDS

Sell 1,000 barrels of oil for **not less than** $________ per barrel. Try to get the price you can above this price. **Do not** sell oil below this price. If you haven't sold any oil after 5 minutes, get another sell order.

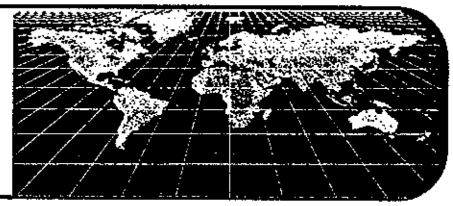
Sell 1,000 barrels of oil for **not less than** $________ per barrel. Try to get the price you can above this price. **Do not** sell oil below this price. If you haven't sold any oil after 5 minutes, get another sell order.

Sell 1,000 barrels of oil for **not less than** $________ per barrel. Try to get the price you can above this price. **Do not** sell oil below this price. If you haven't sold any oil after 5 minutes, get another sell order.

Sell 1,000 barrels of oil for **not less than** $________ per barrel. Try to get the price you can above this price. **Do not** sell oil below this price. If you haven't sold any oil after 5 minutes, get another sell order.

INSTRUCTOR INFORMATION. . .

Lesson 10: World Energy Markets



Rationale:

One of the reasons the OPEC cartel has had so much power over oil prices is that OPEC countries control a large fraction of oil production. In many other areas of the world consumption is greater than production. Where domestic demand is greater than supply, people turn to imported energy. In this exercise, students will recognize which regions of the world are importers of energy and which are exporters, and consequently, how interdependent nations are.

Objectives:

Students will identify countries or regions from a world map.

Students will determine the relationship between energy supply and demand for each country or region from the world map.

Students will define the terms, imports and exports.

Students will explain why nations trade for energy.

Students will construct a bar graph depicting U.S. dependence on energy imports.

Implementation:

Have students complete Worksheet 10.1. The aid of a map is necessary. You may wish to have them work in groups on this. Worksheet 10.2 is an exercise in graphing and also illustrates U.S. dependence on imports.

Debriefing:

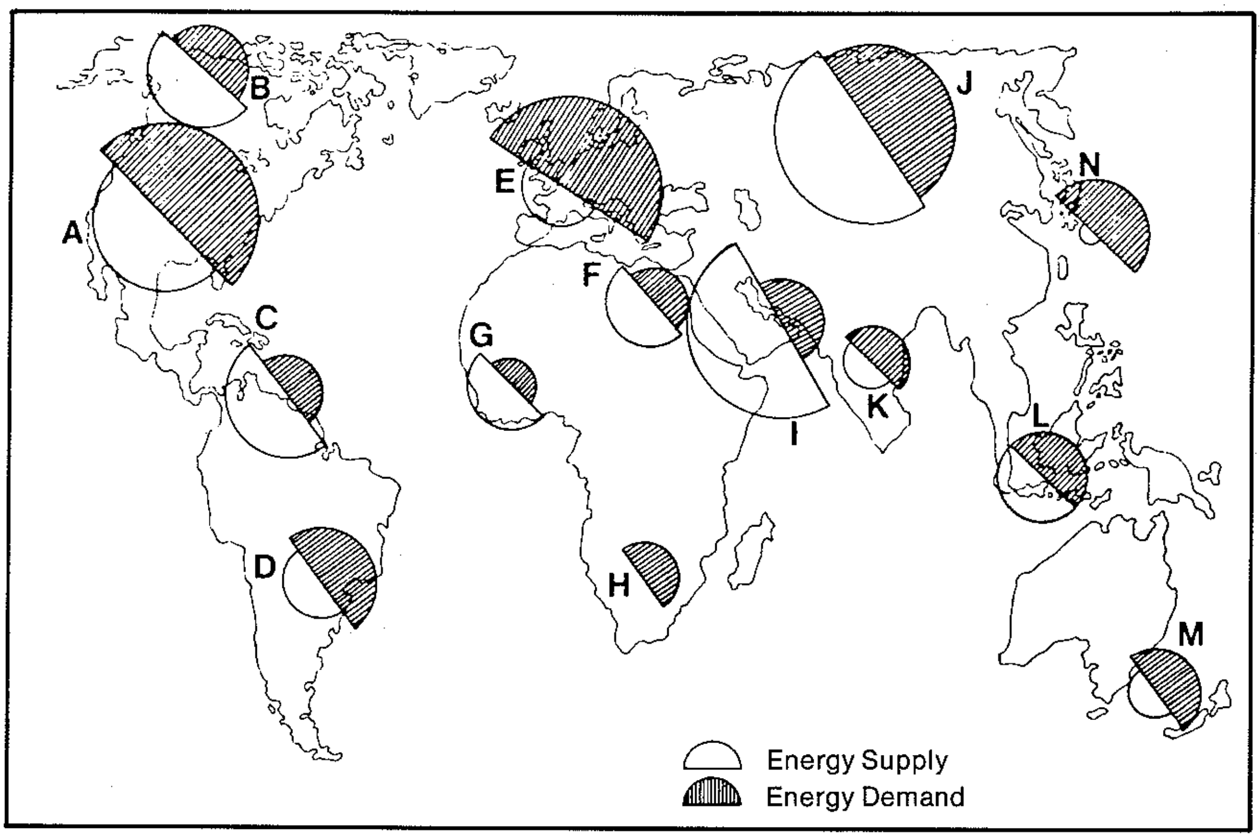
Go over answers to Worksheet 10.1. Collect 10.2
Answers: 1. U.S., South America, Western and Eastern Europe, South Africa, South Asia, Australia, Japan; 2. Central America, West Africa, North Africa, Middle East, USSR, Canada; 3. Any two where one has excess supply and other has excess demand; 4. Transportation costs; political friends or enemies; 5. Shortages might result at first; prices would rise since supplies would fall and we would have to use more costly forms of energy to meet demand. In short, we import because imported energy is cheaper than alternatives.

Worksheet 10.2: Check to be sure students understand graph construction.

Name____________________

Date____________________

Energy Supply and Energy Demand in World Regions



Source: U.S. Department of Energy, **Energy in the Global Marketplace,** November 1978, p. 54 and Central Intelligence Agency, **International Energy Statistical Review,** November 30, 1982. (The term energy for the map refers to oil and natural gas).

1. Place the correct letter from the map in front of the country or region name that matches it.
2. Put a check in the appropriate column. Base your choice on the information on the map. The first one has been done for you.

World Energy Markets
Lesson #10
Page 3, Worksheet 10.1 (2)

Name______________________

Date______________________

Code	Area or Nation	Supply Greater than Demand	Demand Greater than Supply	Balance Supply & Demand
A	United States		✓	
	Canada			
	Australia			
	Japan			
	Central America			
	Southeast Asia			
	South Asia			
	South America			
	USSR			
	Western Europe			
	Middle East			
	North Africa			
	South Africa			
	West Africa			

1. Judging from the map, which regions probably have to buy or **import** energy (oil and natural gas) from foreign countries?______________________

2. Judging from the map, which regions probably sell or **export** energy (oil and natural gas) to other countries?______________________

3. Trading partners are those countries who buy or sell goods and services from each other. Can you find five possible trade partners?______________________

4. In addition to the need for energy and the supply of energy, what other factors influence what nations will be trade partners?______________________

5. What reasons can you give for why we do not stop imports and become energy independent?______________________

Name____________________

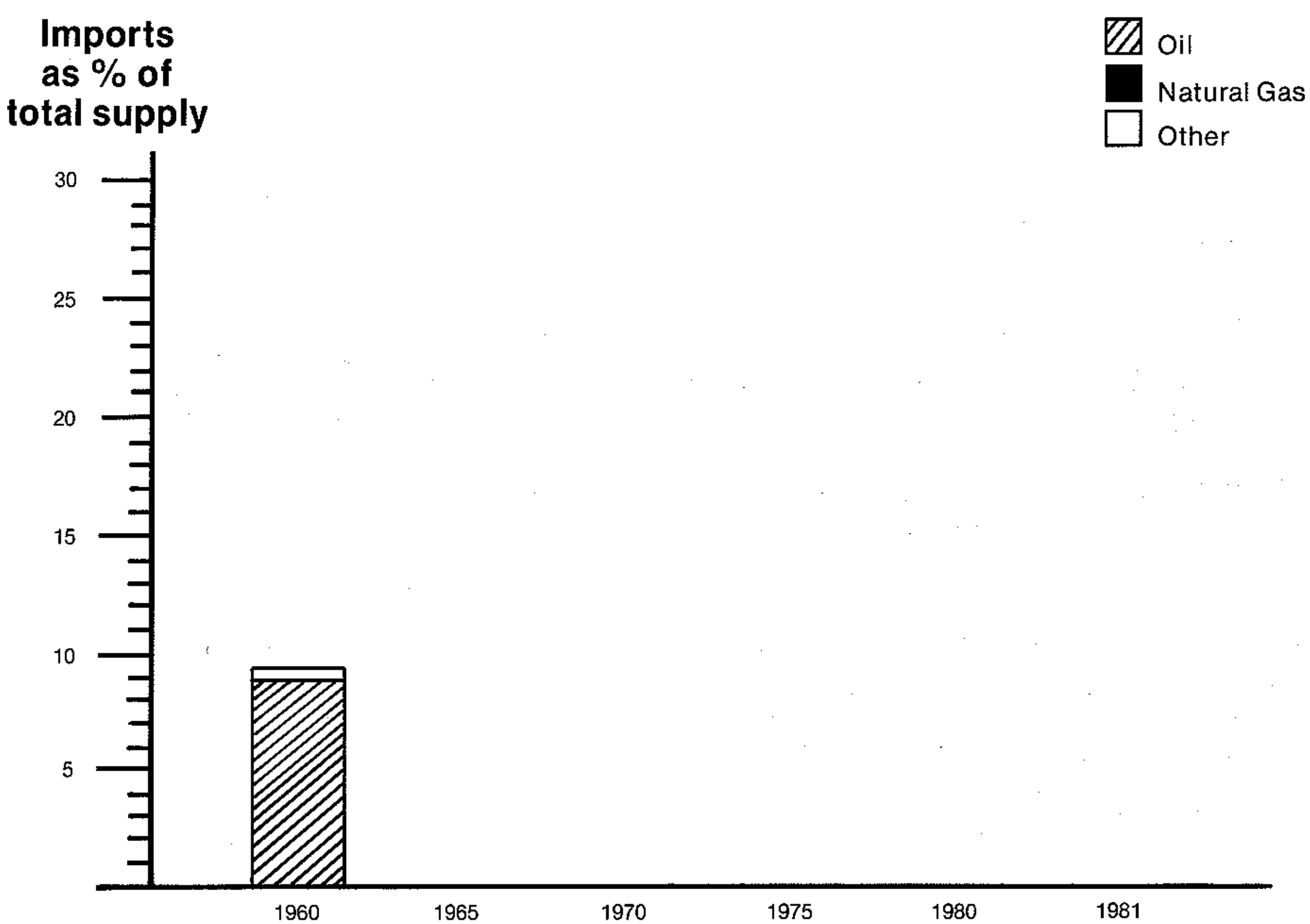
Date____________________

United States Dependence on Energy Imports

Below is some information on U.S. energy imports. Use this information to construct a bar graph which shows our changing dependence on foreign imports over a 21 year period. The first year is done for you.

ENERGY SUPPLY BY TYPE OF FUEL
(Supply in quadrillion British Thermal Units. Imports as percent of total)

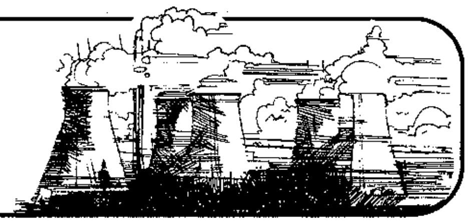
	1960	1965	1970	1975	1980	1981
Total supply	45.6	54.9	69.5	73.1	79.6	78.1
Imports						
Total imports as % of supply	9.3	10.8	12.1	19.3	20.1	17.8
Oil imports as % of supply	8.8	10.0	10.8	17.6	18.5	16.1
Natural gas imports % of supply	—	.9	1.3	1.4	1.3	1.1



Source: **Statistical Abstract of the United States,** 1982, Table no. 972, p. 572.

INSTRUCTOR INFORMATION. . .

Lesson 11: Inflation And Energy Prices



Rationale:

When the average level of prices for all goods and services is rising, we are experiencing a period of inflation. When the price level remains the same we experience price stability. But how do we measure price level changes? One way is to consruct a general price index such as the well-known Consumer Price Index (CPI). We can also create an energy price index (EPI) to measure price level changes for a specific class of goods. The construction and use of the CPI and EPI is the subject of this lesson.

Objectives:

Students will define price, price level, inflation, and deflation.

Students will describe construction of a price index.

Students will calculate changes in a price index given price information.

Students will compare rates of change in prices.

Implementation:

1. Ask the class to think of energy related products they or their families have purchased. Examples: electricity, heating fuel, gasoline, etc. Then go down the list and ask whether the price of the item has been going up, going down, or staying stable. Put arrows beside each to indicate direction. If most are up, then discuss inflation. (Deflation, if down).
   Define inflation: when average of all prices is rising over a period of time.

2. Pass out handout and worksheets on price indices.

Debriefing: Answers to Worksheets:

Worksheet 11.1: A. (1.) Prices rising, (2.) About 20% (3.) [(420 - 120) ÷ 120] x 100 = 250% B. (1.) Inflation (2.) Arab oil embargo cut supply; OPEC countries formed a strong cartel to raise prices and restrict their supply (3.) In 1983 energy prices were generally stable. Check CPI for latest information.

Worksheet 11.2: Oil, $13; Keorsene, $18; Gas, $37.50; Total, $68.50.
A. [(68.50 - 47.00) ÷ 47] x 100 = 48%; Index 148
B. Period 2, 26%; Period 3, less than 22% or (148-26) ÷ 26
C. About 48%

Recent information on the CPI and items covered in it can be found in the **Monthly Labor Review** available in most public libraries.

Name________________________

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The Consumer Price Index

The United States Bureau of Labor Statistics, a division of the U.S. Department of Labor, issues the Consumer Price Index (CPI) every month. The CPI is the most widely used measure of price trends in the individual things consumers buy as well as in all these prices taken together (total consumer prices). Percent changes are computed in order to find out how much prices may have changed from one period to another.

In order to construct the CPI, unit prices are collected for about 400 different goods and services. They fall into eight main categories that together make up the "market basket" for the index:

Food and beverages
Housing
Apparel and upkeep
Transportation
Medical care
Entertainment
Personal care
Other

Prices for the market basket are collected at some 24,000 different retail outlets. Information is obtained elsewhere on the costs of housing and a few other items. The 400-item market basket for which prices are gathered is typical of what and how much consumers buy. Information on what consumers buy is obtained from them at roughly ten-year intervals. The most recent consumer survey covered about 40,000 families.

In order to compute the total Consumer Price Index or to compute indexes for groups of items (such as for food or for transportation), one must **weight** every item in the market basket. Weighting is a way of combining the items according to their importance in the average consumer budget, that is, according to how much is spent annually on each item. The exercises in Handout 8-2 show how weighting is carried out.

Consumer prices are presented in the form of an **index** because that allows us to measure the **percent change** in consumer prices from some starting point — a point usually called the **base.** The base for the Consumer Price Index consists of average prices for a year or a group of years. The base for any index is always set at 100.0, and the index shows the changes from that base. If prices go up after the base year, the Consumer Price Index will then be more than 100.0. For example, if prices rise 10 percent, the index will be 110.0. If prices had fallen 5 percent instead, the index would have been 95.0.

Presenting the CPI as an index is useful for a second reason. Consumers buy many different items that are priced in many different ways. For example, meat is priced by the pound, light bulbs by their power, refrigerators by — among other things — their size. By setting these various kinds of prices at 100 in the base year and computing the percent changes from the base, it becomes possible to compare price changes among them.

From *Master Curriculum Guide for the Nation's Schools,* Part II, *Strategies for Teaching Economics: Junior High School Level (Grades 7-9),* 1981. Joint Council on Economic Education, 2 Park Avenue, New York, NY 10016.

The Energy Price Index

The energy price index is compiled from the different fuel prices measured in the consumer price index. It includes prices of fuel oil, coal, bottled gas, piped gas, electricity, motor fuel, motor oil, coolant, etc.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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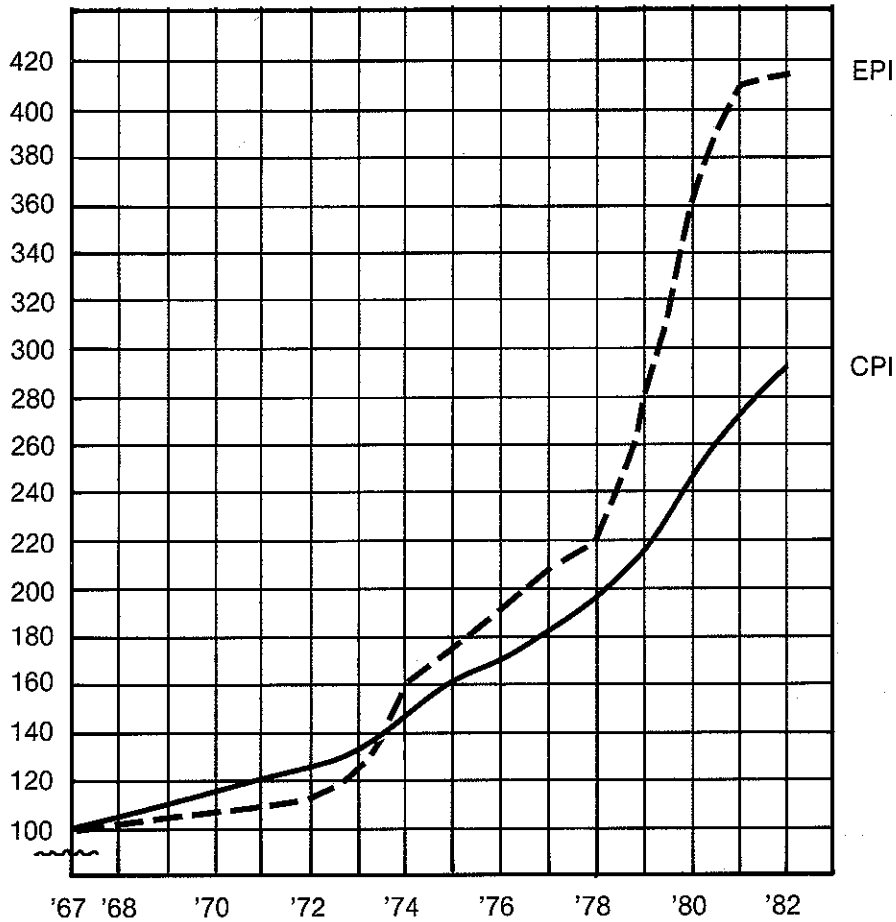
The graph below pictures the behavior of the CPI and EPI from 1967 to 1982. After examining it, answer the questions that follow:

Consumer and Energy Price Index*
(1967 = 100)



*Energy prices of fuel oil, coal, bottled and piped gas, electricity, motor fuel, motor oil, coolant, etc. Source: Department of Labor, Bureau of Labor Statistics

A. Look at the graph on the Consumer Price Index (CPI).
   (1) What can you say about changes in both price levels since 1967?
   (2) What was the percent change in consumer prices from 1967 to 1973 in energy prices?
   (3) Look at the change from 1973 to 1982. What was the percent change for that period in energy prices?

B. "Inflation" is defined as a period of time when the average of all prices—or the general price level—is increasing.

   (1) Were the 1970s a period of inflation? Why do you think so?
   (2) Compare the energy price index to the CPI. What happened in 1973 to cause energy prices to rise? Why have energy prices risen so rapidly since 1978?
   (3) What has been happening to the general price level during the past 12 months? Has it been stable? Going up? Going down? Fluctuating?

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Computing a Weighted Consumer Price Index

This handout will teach you how to calculate a **weighted** price index. The Consumer Price Index (CPI) needs to be weighted to accurately reflect the importance of various goods and services in the average consumer budget. Weighting is used in calculations that combine individual items that are of different importance. Some items are purchased more frequently or in greater quantity than others. Therefore, their prices need to be given a greater weight.

In the following exercise, you will calculate a simplified Consumer Price Index and be able to see how weighting is done. The exercise simplifies the CPI calculation in two ways: (1) It covers only a single part of the entire CPI. (2) The category in the exercise contains only three items while the actual category in the CPI covers many items. The exercise shows the construction of the index for the same month in three successive years. The calculations for the first two periods have been done for you and are explained. After you read the explanation and examine the calculations for the first two periods, you will calculate the index for the third period.

Look over the examples for the first two months that appear below and the explanation that follows. Note that for each item, the Price per Unit given in column 1 is multiplied by the weight (Quantities Bought) in column 2. The results are the Weighted Expenditures shown in column 3.

Item	(1) Average Price per Unit	(2) Quantities Bought	(3) Weighted Expenditures (= col. 1 x col. 2)
	Period One (base month, first year)		
Motor Oil (quart)	$0.50	20 quarts	$10.00
Kerosene (gallon)	0.40	30 gallons	12.00
Gasoline (gallon)	1.00	25 gallons	25.00
			Total energy = $47.00
	Period Two (same month, second year)		
Motor Oil (quart)	$0.60	20 quarts	$12.00
Kerosene (gallon)	0.50	30 gallons	15.00
Gasoline (gallon)	1.30	25 gallons	32.50
			Total energy = $59.50

Based on handout in Master Curriculum Guide for the Nation's Schools, Part II, Strategies for Teaching Economics: Junior High School Level (Grades 7-9), 1981. Joint Council on Economic Education, 2 Park Avenue, New York, NY 10016

Look at the numbers for Period One. The first column shows the prices at which a family purchased items in one month. The second column tells how much a family purchased of each item during the month. The figures in the third column result from multiplying the first two columns together. For oil, the family paid 50 cents per quart and bought 20 quarts. Therefore, it spent $10 on oil during the month. Similar calculations are made for gasoline and kerosene.

The $47 shown in the last column for Period One is the sum of a family's expenditures on the three items during the month. Since that is the base month for the index being constructed, the expenditures for Period One are set at 100.0.

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In Period Two, because prices have risen, the purchase of the same kinds and quantities of fuel comes to $59.50. To calculate the price index for Period Two, subtract $47.00 from $59.50. (The answer is $12.50.) Then express $12.50 as a percent of $47.00. (Divide 12.50 by 47 and multiply the result by 100.) The answer is 26.6 percent. Expenditures for the same quantity have risen 26.6 percent from Period One to Period Two. Add the 26.6 percent to the base-period value of 100.0. The result is an index of prices for Period Two of 126.6.

Now comes your turn. Compute the index for Period Three in the same way as just explained for Period Two. That means you will multiply the information in columns 1 and 2 for Period Three and write the results in the third column. Then use the total of the items in the third column to compute the price index for Period Three compared to Period One as explained in the previous paragraph.

Period Three (Same month, third year)

Item	(1) Average Price per Unit	(2) Quantities Bought	(3) Weighted Expenditures (= col. 1 x col. 2)
	Period One (base month, first year)		
Motor Oil (quart)	$0.65	20 quarts	$________
Kerosene (gallon)	0.60	30 gallons	$________
Gasoline (gallon)	1.50	25 gallons	$________
		Total energy	$________

Directions: Compute the price index for Period Three in the space below.

Questions:

a. What is the price index for Period Three?________________________

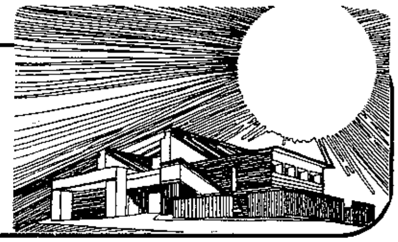
b. Did the price index rise faster in Period Two or in Period Three?________________________

Given the figures to prove your contention: percent rise in Period Two ________; in Period Three ________

c. What is the total percent rise from Period One to Period Three?________________________

INSTRUCTOR INFORMATION. . .

Lesson 12: Energy Futures



Rationale: The consumption of energy has changed substantially in the United States in the past century. Energy consumption will probably be much different in the future. This lesson examines past trends and considers alternative sources of energy for the future.

Objectives: Students will rank order various energy sources in different time periods based on historical graph information.

Students will identify alternative energy sources for the future.

Students will research a few facts about alternative energy sources.

Students will analyze the possible impact of various policy alternatives that would encourage development of other fuels.

Implementation: Worksheet 12.1 can be used to demonstrate which fuels are important today and that energy sources have varied greatly over the century. This is a foundation for Worksheet 12.2 where students can examine alternative energy futures. You may wish to do part H as a brainstorming exercise with group.

Debriefing: Correct worksheets, discussing answers with students.

Worksheet 12.1: (1) oil, gas, coal, hydro, nuclear, wood; (2) wood, coal, oil; (3) no; changes in cost of production and relative scarcity lead to changes in relative prices; new technology encourages use of some fuels over others, e.g., auto use led to more oil demand.

Worksheet 12.2: A. gas from coal; B. geothermal; C. oceans; D. fusion; E. wind; F. biomass; G. solar energy; H. Some possibilities:

1. De-control oil and gas prices. As these prices are allowed to rise naturally, producers will increase supplies through new exploration and costlier extraction methods. Also higher oil and gas prices make the use of alternative fuels more attractive.

2. Subsidize research and/or production of new types of energy. Private corporations alone do not always have the resources to do research in areas where the social benefits may outweigh the private benefits.

3. Give tax breaks to developers of alternative energy sources to encourage production.

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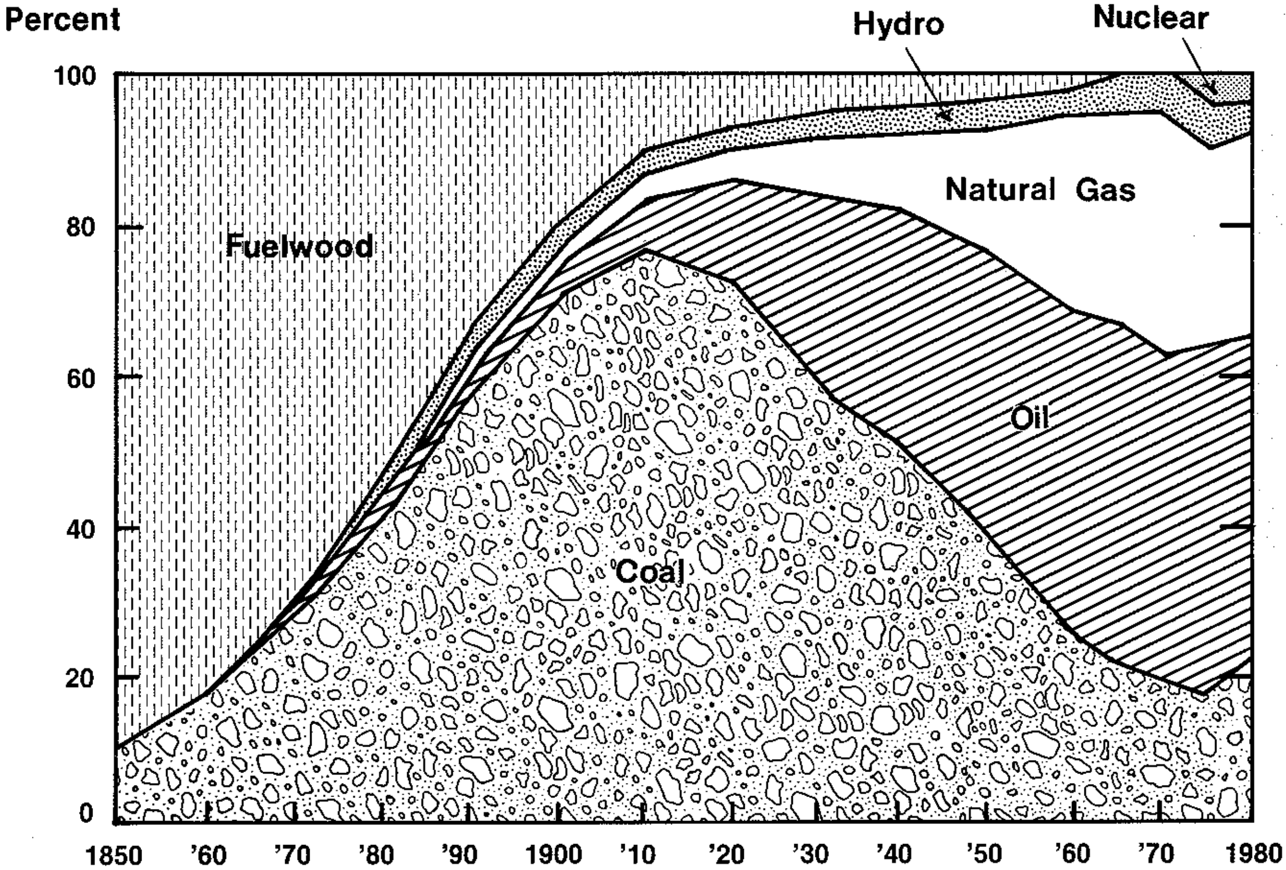
SOURCES OF ENERGY CONSUMPTION, 1850-1980



Sources: 1850-1960: H.H. Landsberg and S.H. Schurr, *Energy in the United States* (New York, Random House, 1968)' 1960-1980; U.S. Energy Information Administration, *1981 Annual Report to Congress,* Vol. II. (Natural gas liquids, shown separately in both sources, are combined with oil in the chart.) In Joint Council on Economic Education, *The Economics of Energy* (New York, JCEE, 1983) p.5.

The graph shows that sources of energy consumption change over the years.

1. List sources of energy used in 1980 putting them in order from most to least important: a. ________

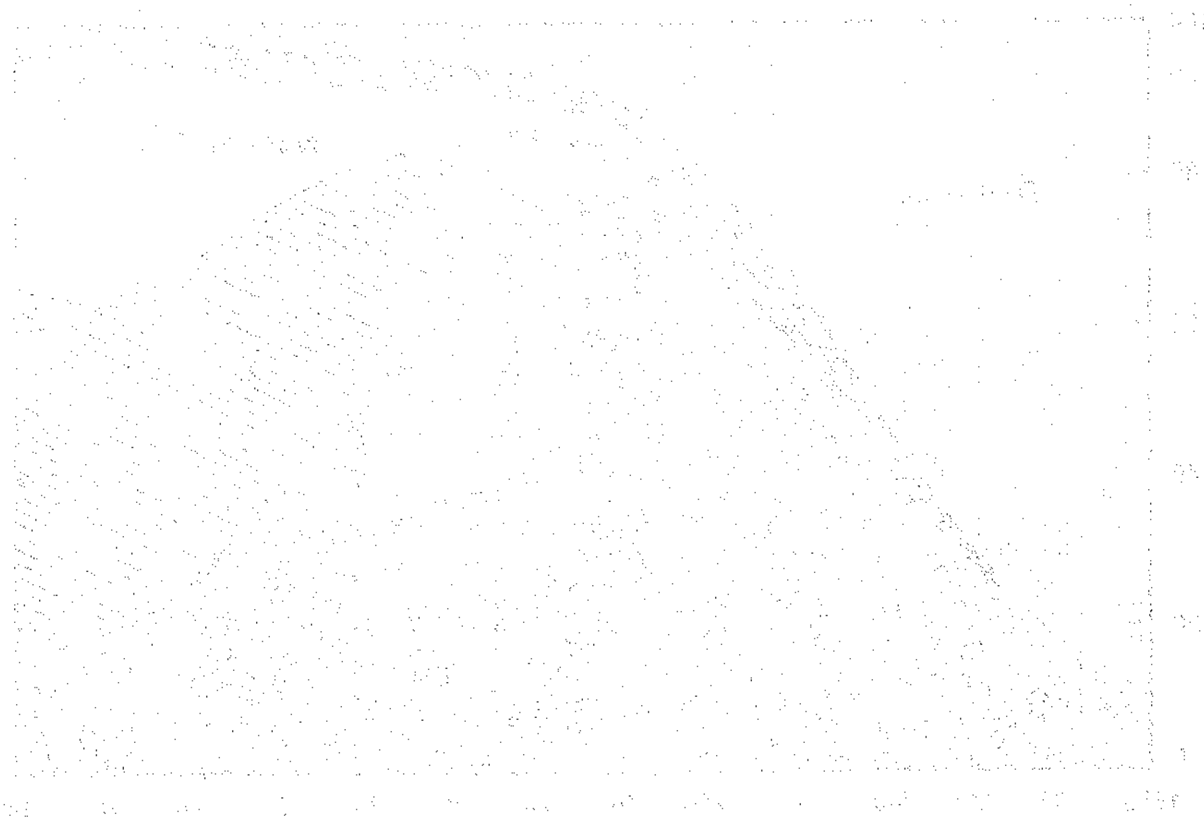
   b. ________ c. ________ d. ________ e. ________ f. ________

2. Which fuel was most important in 1870? ________________ in 1900? ________________ in 1970?

   ____

3. Does the graph give information about why coal and wood are relatively less important sources of fuel today?____

   What is your opinion about why these changes have occurred over the years?



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Energy Sources of the Future

Below are several sets of facts about sources of energy that have possibilities for much greater use in the future. Use the encyclopedia or other information materials to help you choose the correct title for each set of facts from the list. Add one more important fact about each energy source. You may want to add a fact about cost, environmental effects, or the potential for future use of the fuel.

Future energy sources

Biomass	Gas from coal	Geothermal
Wind	Fusion	Petroleum
Solar	Oceans	Nuclear

A. ____

(1) A synthetic fuel where coal is crushed, dried, and heated up to over 1500°F at high pressure causing chemical bonds of coal to break apart and form gas.

(2) Presently is higher cost than natural gas but this may change if supplies of natural gas become more scarce and prices are no longer controlled.

(3) ____

____

B. ____

(1) Heat of the earth captured from fluids beneath the surface of the earth.

(2) It is close enough to the surface in a few areas, especially in western United States.

(3) ____

____

C. ____

(1) Tides and currents can be used to turn turbines for electrical energy.

(2) Energy can be obtained by taking advantage of the temperature differential between surface waters and depth.

(3) Seaweed (Kelp) bioconversion can be used since kelp grows easily and can be used for fuels and feeds.

(4) ____

____

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Date____________________

D. ______________________________________

(1) This is the power which creates the heat and light in the sun.

(2) The main fuel used is a variety of hydrogen which is abundant since it is an element found in water.

(3) Scientists still are trying to develop machinery that can produce self-sustaining fusion reactions. Safety and cost are other production problems.

(4) ______________________________________

E. ______________________________________

(1) A windmill is a simple machine using this form of energy.

(2) This power can be converted to electricity and stored in batteries or to heat and stored in hot water or other hot materials.

(3) This power can pump water to a high reservoir and then water power can be used to generate electricity.

(4) ______________________________________

F. ____________________________(Organic matter from plant or animal wastes.)

(1) Biomass products like wood can be burned to create energy.

(2) Biomass can be converted into synthetic gas, fuel oil, methane.

(3) Biomass can be fermented or digested by organisms to create biogas or fuels such as alcohol.

(4) ______________________________________

G. ______________________________________

(1) Houses can be designed to take advantage of sunlight's warmth in winter and to protect from their heat in summer. These are passive uses.

(2) Sunlight can be used to heat water and other materials and then the stored heat can be used.

(3) Sunlight can be converted to electricity through photosensitive materials. This is called a photovoltaic system.

(4) ______________________________________

H. List two or three possible policies that government could use to encourage development and use of these alternative fuels.