COUNTING ON gasoline

Counting on Gasoline is part of an integrated education program distributed nationally by the Canadian Centre for Energy Information (Centre for Energy). The purpose of this series of current and practical petroleum industry learning resources is to increase students', teachers' and parents' understanding of petroleum and its importance to all Canadians.

Each part of the series focuses on student participation and real-world examples to help make the petroleum industry come alive to students. Important background information and thought-provoking questions to extend learning are woven through each activity.

The activities in *Counting on Gasoline* are designed to be used in a variety of ways. Students can complete the activities in groups or individually, or they can be directed by the teacher. In addition, an interactive online learning activity is available in the Energy Education/EnerActivities section of **www.centreforenergy.com** for students to work on individually or in pairs.

Students should complete the introductory activity *What's in the Price of a Litre of Gasoline?* before moving on to the others, since it allows them to develop a base of information on which to build their learning about the additional concepts and skills covered in subsequent lessons.

Canadian Centre
for Energy Information

Your Resource Source

The Canadian Centre for Energy Information (Centre for Energy) is a non-profit organization created in 2002 to meet a growing demand for balanced, credible information about the Canadian energy sector. On January 1, 2003, the Petroleum Communication Foundation (PCF) became part of the Centre for Energy. Our educational materials will build on the excellent resources published by the PCF and, over time, cover all parts of the Canadian energy sector from oil, natural gas, coal, thermal and hydropower to nuclear, solar, wind, fuel cell and other alternative sources of energy.

The Centre for Energy does not take positions on issues. The Learning Resource Series was developed using a multi-stakeholder review process with the aim of creating fact-based, balanced documents. Educators helped ensure that the educational materials are interesting and applicable to students in schools across Canada.

Canadian Centre for Energy Information
Tel: (403) 263-7722
Facsimile: (403) 237-6286
E-mail: infoservices@centreforenergy.com

To order publications and educational materials, call toll free: 1-877-606-4636

To find out more about the Canadian Centre for Energy Information or to find up-to-date information on petroleum issues, statistics or Centre for Energy education resources, please visit the Centre for Energy's portal at: **www.centreforenergy.com.**

Printed in Canada
Revised April 2006

Background Information

TEACHING TIPS

The *Did You Know* text blocks offer additional information, which teachers can use to provide a more complete understanding of the concepts or to encourage students to explore further. The *Hints* provide the teacher with ideas to guide students to think through some of the questions and problems posed in the activities. *Hints* can be shared with students as needed. *Tips* offer suggestions for facilitating activities.

Teachers are encouraged to read background information on gasoline pricing (see below) prior to introducing these activities. Many Centre for Energy classroom materials are available free to Canadian teachers *(some restrictions apply)*. Other Centre for Energy publications may be purchased at a nominal cost. Please visit the Centre for Energy bookstore at **www.centreforenergy.com** for product descriptions and ordering information. Publications may also be ordered by calling the toll-free number at 1-877-606-4636.

- *Our Petroleum Challenge, 7th edition* This book provides a general introduction to Canada's crude oil and natural gas industry. Section 1 presents an overview of the nation's crude oil and natural gas resources and the role they play in modern society. Section 2 describes in more detail the steps involved in finding, producing, processing, transporting, refining, selling and using petroleum products. Section 3 discusses the challenges and opportunities facing the industry in the 21st century. Current energy statistics and petroleum information and can be found online at the following websites:
- *Canadian Centre for Energy Information:* **www.centreforenergy.com**
- *International Energy Publications - Key World Energy Statistics:* **www.iea.org**
- *BP World Energy:* **www.bp.com/worldenergy**

Current and historical information (1986 to today) on crude oil pricing can be found at:

- *Natural Resources Canada Oil Division:* **www.nrcan.gc.ca/eneene/sources/pripri/index-eng.php**

Current and historical information on gasoline pricing in Canada can be found at:

- *MJ Ervin & Associates Weekly Pump Price Survey:* **www.mjervin.com**
- *Canadian Petroleum Products Institute Fuel Facts:* **www.cppi.ca**
- *Canadian Association of Petroleum Producers Industry Facts and Information:* **www.capp.ca**
- *Canadian Centre for Energy Information Gasoline Prices:* **www.centreforenergy.com**
- *Canadian Automobile Association:* **www.caa.ca/mini%20sites/gasprice/pricing.html**
- *Canada-Department of Finance:* **www.fin.gc.ca/toc/2006/gas_tax-eng.asp**

Curriculum Links and Learning Outcomes

The activities in Counting on Gasoline are designed to fit within these Alberta curricula and learning outcomes:

MATH 8: NUMBER OPERATIONS
- Use concepts of rate, ratio, proportion and per cent to solve problems in meaningful contexts.

MATH 8: DATA ANALYSIS
- Select, defend and use appropriate methods of collecting data: designing and using surveys; and research, using electronic media.
- Display data by hand or by computer in a variety of ways, including box and whisker plots.

MATH 24: NUMBER OPERATIONS
- *Describe and apply arithmetic operations on tables to solve problems, using technology as required.*
- *Solve consumer problems using arithmetic operations.*
- Solve budget problems, using graphs and tables to communicate solutions.
- Modify a spreadsheet template to allow users to input their own variables.

APPLIED MATH 10: NUMBER PATTERNS IN TABLES
- *Analyze the numerical data in a table for trends, patterns and interrelationships.*
- *Describe and apply arithmetic operations on tables to solve problems, using technology as required.*

APPLIED MATH 20: GRAPHING AND DESIGN
- Analyze graphs or charts of given situations to derive specific information.

APPLIED MATH 20: FINANCE
- Solve consmer problems, using arithmetic operations.

NOTE

The following set of activities is designed to support the curriculum strands listed on these pages, but is not a complete unit of study designed to meet all the learning requirements for each curriculum. Rather, the resource is intended as a supplement or extension to the broader lessons included in the curriculum and therefore covers only selected learning outcomes.

INFORMATION AND COMMUNICATION TECHNOLOGY 8 TO 11

- P2: Organize and manipulate data
- C1: Access, use and communicate information from a variety of technologies.
- C6: Use technology to investigate and/or solve problems.
- C7: Use electronic research techniques to construct personal knowledge and meaning.

Pan-Canadian Science Links

The activities in Counting Gasoline fit within the grade 7 to 9 general learning outcomes from the Pan-Canadian Common Framework of Science Learning Outcomes listed below.

- #112: Illustrate how the needs of individuals, society and the environment influence and are influenced by scientific and technological endeavours.
- #210: Analyze qualitative and quantitative data and develop and assess possible explanations.

STUDENT ACTIVITY 1 **MATH 8, 24 APPLIED MATH 10, 20 ICT 8 TO 11**

What's in the Price of a Litre of Gasoline?

Learning Outcomes

- *MATH 8:* Use concepts of rate, ratio, proportion and per cent to solve problems in meaningful contexts.
- *MATH 8:* Select, defend and use appropriate methods of collecting data: designing and using surveys; and research, using electronic media.
- *MATH 8*: Display data by hand or by computer in a variety of ways, including box and whisker plots.
- *MATH 24: Describe and apply arithmetic operations on tables to solve problems, using technology as required.*
- *MATH 24: Solve consumer problems using arithmetic operations.*
- *MATH 24:* Solve budget problems, using graphs and tables to communicate solutions.
- *MATH 24:* Modify a spreadsheet template to allow users to input their own variables.
- *APPLIED MATH 10: Analyze the numerical data in a table for trends, patterns and interrelationships.*
- *APPLIED MATH 10: Describe and apply arithmetic operations on tables to solve problems, using technology as required.*
- *APPLIED MATH 20:* Analyze graphs or charts of given situations to derive specific information.
- *APPLIED MATH 20:* Solve consmer problems, using arithmetic operations.
- *ICT 8 TO 11:* Organize and manipulate data.
- *ICT 8 TO 11:* Access, use and communicate information from a variety of technologies.
- *ICT 8 TO 11:* Use technology to investigate and/or solve problems.
- *ICT 8 TO 11:* Use electronic research techniques to construct personal knowledge and meaning.

PREPARATION

Make note of the price of a litre of regular unleaded gasoline at a local service station. Photocopy the student handouts *Gasoline Pricing Guidelines* and *Gasoline Pricing Worksheet* for students to work on individually or in small groups. Some students may also need a copy of the *Gasoline Pricing Worksheet Example* to help guide them through the calculations.

TIP

Another version of this activity can be completed online. See page 11 for more information on the Counting on Gasoline Online resource.

NOTE*

PEI's gasoline tax rate is set monthly. This is the rate for March 2006. For updated rates, go to Tax Information at: **www.gov.pe.ca/pt/taxandland/**

Activity

Introduce the activity by asking students the following questions: Do you think gasoline prices are too high in Canada? What's a fair price for regular gasoline? If you were setting gasoline prices, how much would you charge?

Explain that retail gasoline prices are determined from a complicated mix of many different factors, including international crude oil costs, the US/Canadian dollar exchange rate, federal, provincial/territorial and municipal taxes, and the costs of refining and selling gasoline. Explain that this activity will allow students to work out their own price for gasoline.

Share how much a litre of regular gasoline costs today at a local service station. Have students write down that number on the top of their *Gasoline Pricing Worksheet,* along with the date and location of the station.

Tell students that the following worksheet covers each of the main components of the retail pump price of gasoline, in a simplified form. Students may work individually or in pairs. Have students read the facts in each section and do research when necessary to gather accurate data. Ask them to make decisions where they can and then fill in their answers on the *Gasoline Pricing Worksheet.*

Answer Key

Line 1

- Use the "spot" West Texas Intermediate (WTI) oil price, since that is the most commonly used crude oil pricing benchmark in Canada.

Line 4

- Litres per barrel of oil: 159.0. To convert the crude oil prices (Line 3) into cents per litre, divide the number in Line 3 by 159.

Line 7

- Provincial and Territorial Taxes (cents/litre)

Newfoundland and Labrador	16.5	Manitoba	11.5
Nova Scotia	15.5	Saskatchewan	15.0
New Brunswick	14.5	Alberta	9.0
Prince Edward Island*	19.7	British Columbia	14.5
Quebec	15.2	Northwest Territories	10.7
Ontario	14.7	Yukon	6.2
		Nunavut	6.4

Line 8

- Municipal Transit Taxes (cents/litre)
  Victoria, BC 2.5
  Vancouver, BC 6.0
  Montreal, QC 1.5

Line 9

- Federal excise tax is 10.0 cents per litre.

Line 11

- Nova Scotia, New Brunswick, and Newfoundland and Labrador pay the blended HST of 15%. All other provinces and territories pay the 5% GST.

Line 13

- Quebec adds a provincial sales tax of 7.5% to gasoline purchases.

Glossary of Terms

A number of important, and perhaps unfamiliar terms appear in this activity. The terms are highlighted below in bold (in order of their appearance in the student handout):

- Since 1990, all gasoline sold in Canada must be unleaded. That means it is not treated or mixed with lead or lead compounds. Unleaded gasoline comes in a variety of grades, usually sold as regular, mid-grade and premium. The difference between them is the octane rating, a number between 1 and 100. **Regular gasoline** has an octane level of 87, mid-grade gasoline usually has an octane rating of 89 and premium gasoline has an octane rating of 92 or 93. Regular unleaded is the least expensive gasoline you can buy at a service station in Canada.

- **Crude Oil** is petroleum in its natural state as it comes up from a well or after it passes through a gas-oil separator. Once it is refined, it is no longer crude oil.

- **Royalties** are similar to a tax on oil that's produced. For every barrel of oil that a petroleum company brings to the surface and sells, the company pays a certain percentage of the oil's value to the government.

- Crude oil goes through a process called **refining**, which simply means removing any impurities or unwanted material. A number of different products are made from the refining process, including tar, wax, grease, asphalt, jet and diesel fuel, gasoline and petrochemicals.
- The **profit margin** is the difference between how much you pay for something and how much you charge when you sell that same product to someone else. In other words, it's the amount of money you make in the deal.
- **Marketing** is another word for selling and in this case also includes storing, delivering and promoting the gasoline.

Summary and Analysis

Once students have completed the pricing activity, conduct a class discussion using one or more of the following questions:

- What price did you calculate for a litre of regular gasoline? How does your price compare to the current price at your local gasoline station? If your price is higher or lower than that price, how might your local gasoline retailer have calculated the costs differently to arrive at that price?
- How does your price compare to the prices of your classmates? If you were buying gasoline from someone in your class, who would you choose to buy it from?
- Why do you think most service stations now sell items in addition to gasoline, like snacks, coffee and newspapers?

HINT

Think of the probable profit margins of other items compared to gasoline, and the potential of making additional sales when gasoline customers come into the store.

Extensions

1. Explain to the class that gasoline prices can drop significantly during a price war, when several competing service stations lower their gasoline prices to attract customers. As a class, discuss: What do you think happens to crude oil costs during a price war? What happens to refining and retailing margins? What happens to taxes? Have students create a spreadsheet to show the effects of a gasoline price war. For homework, ask students to amend their spreadsheet to illustrate the effects of differing crude oil costs or dollar exchange rates on gasoline pricing.

2. Have students use their gasoline pricing worksheet numbers to add up the per litre totals for each of the four pricing sections below:

   - Crude oil costs (Line 4)
   - Refining costs (Line 5)
   - Marketing and retailing costs (Line 6)
   - Taxes (Lines 7 + 8 + 9 + 11 + 13)

Have students calculate the percentage represented by each pricing section and create a pie graph, labelling all four sections. Ask them to identify the key point their graph conveys, and write a title and caption for the graph explaining that point.

3. Have students write an informative online news article on what they found out about gasoline pricing. Ask them to include graphics or photographs, with captions, to help communicate their main points. Explain that the article should:

   - Grab the reader's attention with a punchy headline.
   - Lead off with the most important information.
   - Contain short (under 20 words) sentences.
   - Be written at a grade 7 reading level.
   - Be no longer than 300 words.

Invite students to post their articles on the school website or e-mail it to a friend.

4. Have students investigate the kinds of work done by people along the gasoline supply chain. Ask them to choose a job or career and research what that position requires in terms of education (especially regarding math!), experience and skills, and what it offers in terms of salary, benefits and working conditions. Information on dozens of petroleum-based careers can be found at **www.centreforenergy.com** in the Careers section and at **www.careersinoilandgas.com**

NOTE

- Gasoline prcies: link to **http://mjervin.com/gasoline_prices.htm**
- Litres/barrel: link to **www.mbarron.net/Nile/measure.htm**
- Gasoline taxes: link to **www.fin.gc.ca/toc/2006/gas_tax-eng.asp**

Online Resource

A complementary learning resource on gasoline pricing can be found in the education section of the Centre for Energy portal, **www. centreforenergy.com.**

There are two activities in the online resource: an online calculator and spreadsheet. The online calculator is designed like a "wizard": it facilitates a basic gasoline pricing calculation and links students directly to the necessary Web-based data. As a result, using the online calculator allows students to calculate gasoline prices easier and quicker than using the print version of this document. The second activity – an online spreadsheet – allows students to manipulate the standard variables to calculate and compare five different gasoline pricing scenarios.

Students can play alone or with a partner. Background information for teachers and a variety of sample calculations can be downloaded and printed from the introductory pages of the online activity.

Five extension activities round out the online resource.

The online resource supports the following learning outcomes listed on page 6.

STUDENT HANDOUT

Gasoline Pricing Guidelines

RESEARCH AND CALCULATION | ACTION

Supply and Production Costs

1 Crude Oil Costs (US$/barrel)

Gasoline is made from crude oil. Canadian refiners must compete with refiners in other countries to buy their crude oil on the world market. Everyone pays the going price. The world price depends on the balance between supply and demand. When the demand is less than the total amount of crude oil available, prices fall. When demand is higher than supply, buyers will outbid each other and drive prices up. Demand is affected by factors such as weather and economic growth. Crude oil must be delivered to the refinery so there are transportation costs to add in too.

Look in the business section of a newspaper or on the Internet for the latest crude oil price per barrel.

Enter the world crude oil price per barrel on line 1.
This price per barrel is in US dollars.

HINT

Look for the "spot" West Texas Intermediate (WTI) oil price, since that is the most commonly used crude oil pricing benchmark in Canada.

2 US/Cdn$ Exchange Rate

The strength of the Canadian dollar also influences how much we pay for oil. In the newspaper or on the Internet, find the current US/Canadian dollar exchange rate.

Enter the Cdn$ exchange rate on line 2.

3 Crude Oil Costs (Cdn$/barrel)

Convert the US$ price to the equivalent Cdn$ price using the current exchange rate.

Enter the Cdn$ price per barrel on line 3.

4 Crude Oil Costs (Cdn/litre)

Find out how many litres there are in a barrel of oil. Convert the crude oil price (line 3) into cents per litre. Round the number to one decimal point.

Enter the cost in cents per litre on line 4.

The price of Cdn$45.00 per barrel is about 28 cents per litre and Cdn$75.00 per barrel is about 47 cents per litre. As consumers we would all prefer to see the oil price at $45.00, instead of $75.00, but if you live in an oil producing province like Alberta or Newfoundland and Labrador, a large portion of your provincial revenues would come from oil royalties (similar to a tax on the oil that's produced). In Canada's oil producing provinces, lower oil prices could lead to reduced education or health programs, or higher income taxes. Regardless of personal preferences, we have no choice but to pay the current world price for crude oil.

ACTION	RESEARCH AND CALCULATION

5 Refining Costs Plus Profit Margins

Decide what your refining margin will be (in cents per litre) and enter that number on line 5.

Now that you have bought some crude oil, you need to refine it into gasoline. There are 16 gasoline refineries in Canada. A typical refinery costs more than $1 billion to build and hundreds of millions of dollars each year to operate (not counting the cost of the crude oil). Different kinds of crude oil make different amounts and grades of gasoline and require different processes. Gasoline that is sold to consumers must meet more than a dozen quality standards to ensure it's safe to handle and will work properly in your car. This activity will give you a price per litre for regular gasoline.

The refiner's margin is the difference between the cost of the crude oil and the price at which the refiner can sell the gasoline. This margin covers the refining costs and gives a profit to the refiner. Refining margins are typically between six and 12 cents per litre.

6 Marketing and Retailing Costs Plus Profit Margins

Decide what your marketing and retailing margin will be (in cents per litre) and enter that number on line 6.

Now that your gasoline has been made, it must be stored in tanks until it can be sold and delivered to the consumer. Some gasoline moves by pipeline, some by rail car, some by barges and some by trucks to local distribution centres. From there it is delivered to local services stations, usually by truck. Gasoline can often be loaded and unloaded several times before reaching a service station. Everyone in the distribution chain expects to make some profit on their piece of the business!

There are also a number of costs involved in gasoline retailing. The land, buildings, underground storage tanks and pumps for the gas station must all be bought and maintained. Then there are salaries and employee benefits, property taxes, utility bills, advertising campaigns and credit card charges.

Some of these costs are fixed costs that stay the same regardless of how much gasoline is sold. Other costs vary depending on the volume of business. Therefore, when you calculate your marketing and retailing margins per litre of gasoline, it's important to consider whether you live in a big city with high sales volumes, or a smaller community where the sales per station will be lower. Marketing and retailing margins can be as high as 23 cents per litre in more remote communities like Whitehorse and Yellowknife, and can actually be negative (that means everyone loses money!) when "price wars" drive pump prices below cost. Most recently, marketing and retail margins in major cities in Canada have ranged from three to nine cents per litre, with the Canadian average at about five cents per litre.

RESEARCH AND CALCULATION | ACTION

TAXES

Now you must add in the federal, provincial/territorial and municipal taxes. Sorry, but there are no choices here! Research the applicable taxes for your community. Make sure you investigate taxation at all levels: federal (GST/HST), provincial/territorial and municipal. Remember to write the tax in cents per litre.

HINT

You can find gasoline taxation rates at:
www.fin.gc.ca/toc/2006/gas_taxeng.asp

7 **Provincial and Territorial Taxes**

Every province and territory charges a tax on gasoline. Find out what your tax is, in cents per litre.

Enter your provincial or territorial tax on line 7.

8 **Municipal Taxes**

Three urban centres in Canada have a transit tax on gasoline. This helps fund the local transit system. Find out if your community has a municipal tax on gasoline.

Enter your municipal tax, if applicable on line 8.

9 **Federal Taxes**

Everyone in Canada pays the federal excise tax.

Enter Canada's federal excise tax per litre on line 9.

10 **Taxes Sub-total**

Add lines 4 through 9.

Enter the sub-total on line 10.

11 **GST or HST**

Some provinces pay a blended GST (Goods and Service Tax) and PST (Provincial Sales Tax) called the Harmonized Sales Tax (HST). Others pay just the GST. Find out if you are a GST or HST province or territory.

Enter the correct GST/HST for your province/territory on line 11.

12 **Taxes Sub-total**

Add lines 10 and 11.

Enter the sub-total on line 12.

13 **Quebec Taxes**

If you live in Quebec, you must add the Quebec Sales Tax, which is applied after the GST is added. For Quebec residents only, add 7.5% QST.

Enter the Quebec tax on line 13.

14 **Grand Total!**

Add lines 12 and 13.

Enter your final gasoline price on line 14.

GASOLINE PRICING WORKSHEET

Current local retail price of regular gasoline (Cdn(cent symbol) / litre) _____

Date: _____

Location: _____

Use this table to build your gasoline price.

LINE	COST	MEASUREMENT
1. Crude oil costs	_____	(US$/barrel)
2. US/Cdn$ exchange rate	_____	
3. Crude oil costs	_____	(Cdn$/barrel)
4. Crude oil costs	_____	(Cdn cents/litre)
5. Refining costs	_____	(Cdn cents/litre)
6. Marketing and retailing costs	_____	(Cdn cents/litre)
7. Provincial tax	_____	(Cdn cents/litre)
8. Municipal tax (if applicable)	_____	(Cdn cents/litre)
9. Federal excise tax	_____	
10. Sub-total (4+5+6+7+8+9)	_____	(Cdn cents/litre)
11. GST or HST	_____	(Cdn cents/litre)
12. Sub-total (10+11)	_____	(Cdn cents/litre)
13. QST (if applicable)	_____	(Cdn cents/litre)
14. My total retail gasoline price per litre	_____	(Cdn cents/litre)

GASOLINE PRICING WORKSHEET EXAMPLE

Current local retail price of regular gasoline (Cdn cents/litre)	93.2 cents
Date:	March 28, 2006
Location:	Calgary AB

LINE		COST	MEASUREMENT
1.	Crude oil costs	US$64.16	(US$/barrel)
2.	US/Cdn$ exchange rate	1.17	
3.	Crude oil costs	Cdn$75.05	(Cdn$/barrel)
4.	Crude oil costs	47.2 cents	(Cdn¢/litre)
5.	Refining costs	10.5 cents	(Cdn¢/litre)
6.	Marketing and retailing costs	9.0 cents	(Cdn¢/litre)
7.	Provincial tax	9.0 cents	(Cdn¢/litre)
8.	Municipal tax (if applicable)	_	(Cdn¢/litre)
9.	Federal excise tax	10.0 cents	(Cdn¢/litre)
10.	Sub-total (4+5+6+7+8+9)	85.7 cents	(Cdn¢/litre)
11.	GST or HST	6.0 cents	(Cdn¢/litre)
12.	Sub-total (10+11)	91.7 cents	(Cdn¢/litre)
13.	QST (if applicable)	_	(Cdn¢/litre)
14.	My total retail gasoline price per litre	91.7 cents	(Cdn¢/litre)

STUDENT ACTIVITY 2 **MATH 8, 24 APPLIED MATH 10, 20 ICT 8 TO 11**

From Sea to Sea

Learning Outcomes

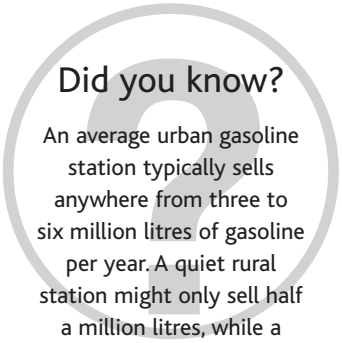
- *MATH 8:* Select, defend and use appropriate methods of collecting data: designing and using surveys; and research, using electronic media.
- *MATH 8:* Display data by hand or by computer in a variety of ways, including box and whisker plots.
- *MATH 24:* Solve budget problems, using graphs and tables to communicate solutions.
- *APPLIED MATH 10: Analyze the numerical data in a table for trends, patterns and interrelationships.*
- *APPLIED MATH 10: Describe and apply arithmetic operations on tables to solve problems, using technology as required.*
- *APPLIED MATH 20:* Analyze graphs or charts of given situations to derive specific information.
- *APPLIED MATH 20:* Solve consmer problems, using arithmetic operations.
- *ICT 8 TO 11:* Organize and manipulate data.
- *ICT 8 TO 11:* Access, use and communicate information from a variety of technologies.
- *ICT 8 TO 11:* Use technology to investigate and/or solve problems.
- *ICT 8 TO 11:* Use electronic research techniques to construct personal knowledge and meaning.

Activity

Explain that gasoline prices differ from city to city, town to town across Canada, because of taxes, transportation costs and demand. Have students visit the MJ Ervin & Associates web site at **www.mjervin.com** to find a listing of current prices for regular gasoline in 46 cities across the country. Have students analyze the data to answer the following questions:

- In which city is gasoline the most expensive? Where is it the least expensive?
- Which city's price is the closest to the Canadian average price?
- Calculate the average gasoline prices for the cities listed in Alberta. Do the same for the cities listed in Ontario, Quebec and Newfoundland and Labrador. Which province has the highest average prices of these four? Why do you think that is so?
- What pricing statistic do you find the most surprising? Why?

Have students select a sampling of 10 cities across Canada and create a print or electronic graph, table or spreadsheet to show the differences in gasoline prices, from least expensive to most expensive. Make sure they label the graph.



STUDENT ACTIVITY 3 **MATH 8, 24 APPLIED MATH 10, 20 ICT 8 TO 11**

Cheaper Than Water?

Learning Outcomes

- *MATH 8:* Use concepts of rate, ratio, proportion and per cent to solve problems in meaningful contexts.
- *MATH 8:* Select, defend and use appropriate methods of collecting data: designing and using surveys; and research, using electronic media.
- *MATH 8:* Display data by hand or by computer in a variety of ways, including box and whisker plots.
- *MATH 24:* Solve budget problems, using graphs and tables to communicate solutions.
- *APPLIED MATH 10:* Analyze the numerical data in a table for trends, patterns and interrelationships.
- *APPLIED MATH 20:* Analyze graphs or charts of given situations to derive specific information.
- *ICT 8 TO 11:* Organize and manipulate data.
- *ICT 8 TO 11*: Access, use and communicate information from a variety of technologies.
- *ICT 8 TO 11:* Use technology to investigate and/or solve problems.

Preparation

Before class, have students go to a store to research the price of five consumable liquids, such as bottled water, pop, juice, iced tea and milk. Ensure their market research includes both the price and the quantity of the liquid (e.g. cost for a two-litre bottle of pop). Then have students check the price per litre of regular gasoline at a local service station.

Activity

In class, have them convert their consumable liquids prices to Canadian cents per litre. Ask: How do these prices compare to today's regular unleaded gasoline price in our community? Have students create and label a print or electronic graph, table or other visual display that truthfully compares the prices of all the liquids, including gasoline, from lowest to highest.

STUDENT ACTIVITY 4 **MATH 8 APPLIED MATH 10, 20**

Around the World

Learning Outcomes

- *MATH 8:* Display data by hand or by computer in a variety of ways, including box and whisker plots.
- *APPLIED MATH 10:* Analyze the numerical data in a table for trends, patterns and interrelationships.
- *APPLIED MATH 20:* Analyze graphs or charts of given situations to derive specific information.

Activity

Photocopy or display the list of the 2005 average prices for gasoline in 31 different countries around the world. Have students find the five countries with the lowest gasoline prices and the five with the highest prices. Ask them to create and label a table or graph that ranks these 10 countries' gasoline prices from lowest to highest. Remind students that every country pays the same price for crude oil on the world market. Ask: How do average prices around the world compare to the average price in Canada? Why do you think retail prices around the world differ so much?

NOTE

Prices are quoted for premium gasoline except for Australia, Canada, Japan, Korea, Mexico and New Zealand which have prices quoted for regular gasoline.

First quarter 2005 average retail gasoline prices around the world (US$/litre)

Australia	$0.784	Greece	$1.049	Norway	$1.644
Austria	1.221	Hungary	1.285	Poland	1.189
Belgium	1.516	Ireland	1.232	Portugal	1.351
Canada	0.680	Italy	1.486	Slovak Republic	1.163
Chinese Taipei	0.734	Japan	1.116	South Africa	0.769
Czech Republic	1.082	Korea	1.330	Spain	1.135
Denmark	1.457	Luxembourg	1.220	Sweden	1.465
Finland	1.454	Mexico	0.558	Switzerland	1.170
France	1.406	Netherlands	1.648	Turkey	1.789
Germany	1.465	New Zealand	0.847	United Kingdom	1.514
				United States	0.513

Source: World Key Energy Statistics Report, 2005 edition, International Energy Agency.

Tip: Students might want to add 10 to 15 % to the regular gasoline prices quoted for Australia, Canada, Japan, Korea, Mexico and New Zealand to ensure a fair comparison among premium unleaded gasoline prices.

STUDENT ACTIVITY 5 **MATH 8, 24 APPLIED MATH 10, 20 ICT 8 TO 11**

Word on the Street

Learning Outcomes

- *MATH 8:* Use concepts of rate, ratio, proportion and per cent to solve problems in meaningful contexts.
- *MATH 8:* Select, defend and use appropriate methods of collecting data: designing and using surveys; and research, using electronic media.
- *MATH 8:* Display data by hand or by computer in a variety of ways, including box and whisker plots.
- *MATH 24:* Solve budget problems, using graphs and tables to communicate solutions.
- *APPLIED MATH 10:* Analyze the numerical data in a table for trends, patterns and interrelationships.
- *APPLIED MATH 20:* Analyze graphs or charts of given situations to derive specific information.
- *ICT 8 TO 11:* Organize and manipulate data.
- *ICT 8 TO 11:* Access, use and communicate information from a variety of technologies.
- *ICT 8 TO 11:* Use technology to investigate and/or solve problems.

Activity

Have students pair up. Explain that together they are going to conduct a consumer research survey near a local gasoline station. Have them approach 50 people of driving age and suggest they say politely: *"Hello, we are conducing a survey for a school project. May we ask you just one question? We currently pay XX cents per litre of regular unleaded gasoline. How much of that goes to taxes do you think?"* Tell students to thank people for their answers and record each response on a sheet.

Back in the classroom, have student pairs decide if they will input their data in cents per litre or percentages of a litre. If they received responses in both formats, have them convert answers to their chosen format by performing the correct calculation. For example:

To convert cents per litre to a percentage	**To convert a percentage to cents per litre**
If the current price per litre is 92.5 cents	If the current price per litre is 92.5 cents
And the response is 50 cents	And the response is 65%
Then % per litre is (50.0/92.5) = 54.0%	Then cents per litre is (92.5 x 0.65) = 60.1 cents

Once all the responses have been converted to a similar format, have students compile the results of their survey and figure out how best to organize their data. Ask them to analyze the results and summarize what they learned from their survey responses. Have each pair create a visual presentation of their results (graph, table, spreadsheet etc.) and present their data along with their interpretations of the survey results to the rest of the class.

Once the presentations are complete, ask students if they think this was a random survey. Why or why not?

Canadian Centre
for Energy Information

Counting on Gasoline
Resource Review

Please help us improve this resource by providing feedback on the following areas. You may complete and fax this review form to the Centre for Energy at (403) 237-6286, or by mail to 1600, 800 6th Avenue SW, Calgary, AB T2P 3G3. You may also e-mail your comments to infoservices@centreforenergy.com

In what grade and subject did you use this resource?

_____

_____

_____

Did you find the resource useful for your class?

☐ Yes ☐ No

Would you use it again and/or recommend it to other teachers?

☐ Yes ☐ No

Which if the activities did you and your students complete?

- ☐ #1 What's in the price of a litre of gasoline?
- ☐ #2 From sea to sea
- ☐ #3 Cheaper than water?
- ☐ #4 Around the world
- ☐ #5 Word on the street
- ☐ Counting on Gasoline – Online Resource

Of the activities you completed, which ones did you and your students find the most interesting. Please list your top three.

TEACHER	*STUDENTS*
1	1
2	2
3	3

Please rate this resource in the following categories:

Curriculum fit	☐ Good fit	☐ Some fit	☐ No fit
Age level	☐ Too old	☐ Too young	☐ Just right
Activities	☐ Too many	☐ Too few	☐ Just right
Time required	☐ Too long	☐ Too short	☐ Just right
Support materials (i.e. student handouts)	☐ Appropriate	☐ Not needed	

Other support materials needed:

_____

_____

_____

_____

Please offer your suggestions for improving this resource. Feel free to expand on your responses given above and/or continue on a separate page if necessary.

_____

_____

_____

_____

Thank you! Your input is appreciated. We invite you to complete the following information so we can send you a token of our appreciation.

Name: _____

School: _____

Street address: _____

City: _____

Province: _____

Postal code: _____

Phone: _____

Fax: _____

E-mail: _____

Please indicate if you would like to be added to our mailing list

☐ Yes ☐ No