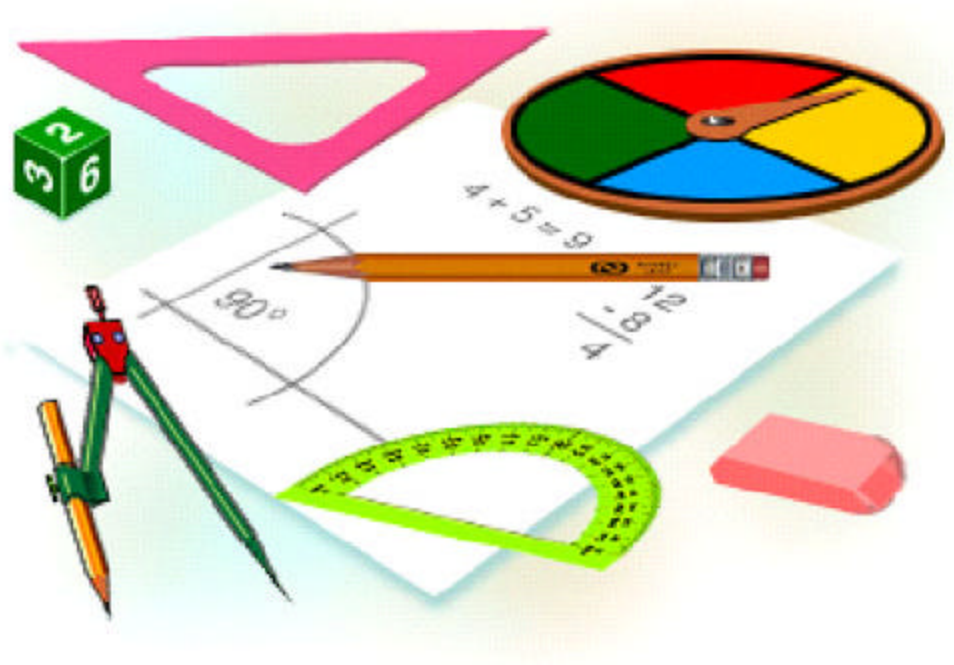
The Next Step

Mathematics Applications for Adults



Book 14016 – Measurement

OUTLINE

Mathematics - Book 14016

Measurement
Time
add and subtract time.
Money
find unit cost, tax payable, discount amount, simple interest payable, rounding off to the nearest cent.
Charts and Graphs (bar, line, pictograph)
answer questions about information contained in a given chart.
answer questions about information contained in given graphs.
Metric Measurement
find area of rectangle, square, triangle and any multi-sided figure.
find volume of a rectangular prism.
Word Problems with Measurement
solve one/two step problems with addition, subtraction, multiplication and division of whole numbers, fractions, decimals, percent, time, money, temperature, and metric measurement.

THE NEXT STEP

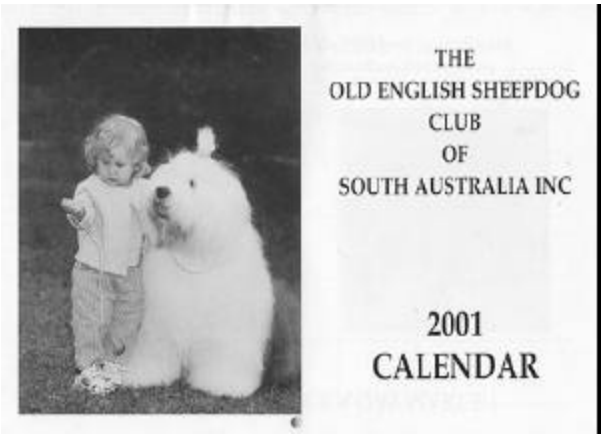
Book 14016

Measurement

Time

A ***day*** is the time it takes earth to spin around once on its *axis*, or twenty-four hours. (The axis is an imaginary pole that runs through the middle of the planet from the North Pole to the South Pole.) Seven days make up one *week*. Twenty-eight to thirty-one days make up one ***month***. A month is the approximate time needed for the moon to revolve once around earth. The lunar month actually takes twenty-nine days, twelve hours, forty-four minutes, and three seconds.

Twelve months make up one ***year***. A year is the time it takes earth to revolve once around the sun, or 365 days, five hours, forty-eight minutes, and forty-six seconds.

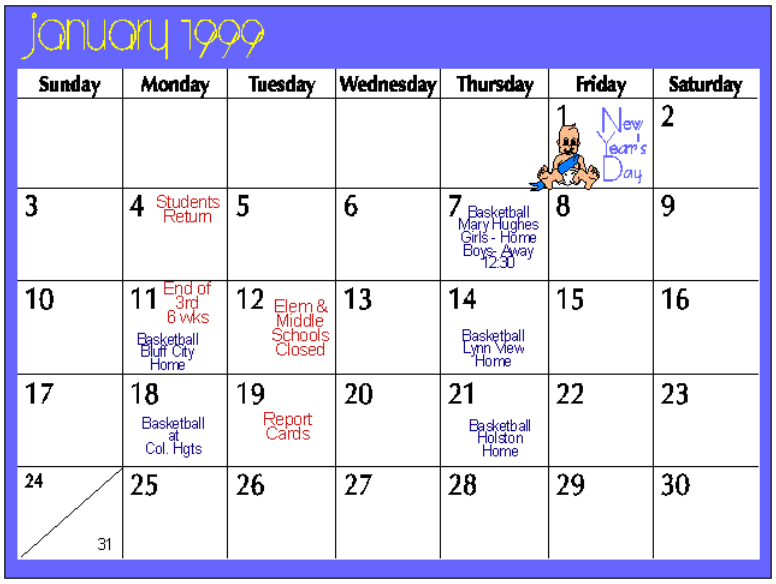


Calendars are tools that help us group days into weeks, months, and years. The calendar used throughout the world today is called the ***Gregorian*** calendar.

The astronomer Sosigenes was asked by Julius Caesar to created a calendar for the Roman Empire. The calendar was based on the solar year of 365 days. The year was divided into twelve months. Each month lasted thirty or thirty-one days, with the exception of February, which lasted either twenty-eight or twenty-nine days. The Julian calendar is the basis for the Gregorian calendar that was introduced by Pope Gregory VIII in 1582. The names used for the months in the Roman calendar were used in the Julian calendar. These names are also used today.

Roman	Gregorian	Roman	Gregorian
Januarius	**January**	**Quintilis**	**July**
Februarius	**February**	**Sextilis**	**August**

Martius	**March**	**September**	**September**
Aprilis	**April**	**October**	**October**
Maius	**May**	**November**	**November**
Junius	**June**	**December**	**December**



The names we use for weekdays come from the Saxons of England. The Saxons named the days for the planets and their gods.

SUN'S day .....Sunday
MOON'S day .....Monday
TIW'S day .....Tuesday
WODEN'S day .....Wednesday
THOR'S day.....Thursday
FRIGG'S day .....Friday
SATURN'S day .....Saturday

Sosigenes made a mistake in the Julian calendar, but nobody found the mistake for hundreds of years. He made every fourth

year a leap year, but these leap years made the calendar too long to measure the cycle of the sun. By the 1500s, the Julian calendar was almost two weeks ahead of the actual solar year.

Pope Gregory VIII fixed the mistake in 1582. Leap years were now added to the calendar every four years except for the years that begin new centuries, unless the number of the new century can be divided evenly by 400.

The century date 1900 was not a leap year (1900 ¸ 400 = 4 3/4), but the year 2000 was a leap year (2000 ¸ 400 = 5).

Pope Gregory VIII's calendar is accurate to within sixteen seconds per year. That's the reason we still use it today.

⇒ **Remember: 30 days has September**
April, June, and November,
All the rest have 31,
Except February which has 28 days clear
And 29 each leap year.

Numeric Dating

Numeric dating is the way of recording the date with 8 digits.
year: the last two digits 1977 = 77
month: 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12
day: number of the day

The three styles are:

d/m/y	01/11/95
y/m/d	95/11/01
m/d/y	11/01/95

These are all different ways of writing November 1, 1995.

Numeric dating is usually used when filling in forms.

Remember all the concerns that we had around the year 2000? This was all due to the fact that we were using numeric dating. As the year 2000 was approaching, we had a problem with computers that were reading only the last 2 digits of the year. If the computers were not 2000 compatible, they were reading 20<u>01</u> as 1901 or 20<u>21</u> as 1921.

Express the following with numeric dating using m/d/y.

1) January 17, 2002
2) July 2, 1994
3) May 14, 1965
4) September 17, 1889
5) Today's date

Schedule

A table that lists activities and the times they happen

Example:

FLIGHTS FROM MIAMI TO NEW YORK CITY	
Each flight lasts about 2 hours and 45 minutes.	
Airline	**Departure Time**
Airline A	9:10 A.M.
Airline B	10:15 A.M.
Airline C	12:50 P.M.
Airline D	1:20 P.M.

We divide ***days*** into 24 ***hours***, but hours are divided into ***60*** parts. Roman astronomers called each division a ***par minuta*** or "small part of an hour." From the Latin name comes our word ***minute***. These early astronomers also divided minutes into *60* equal parts. They called each division ***par seconda***, or ***second***.

Measures of Time

60 seconds (sec) = 1 minute (min)
60 minutes = 1 hour (hr)
24 hours = 1 day
7 days = 1 week (wk)

12 months (mo), or 52 weeks, or 365 days = 1 year (yr)
366 days = 1 leap year

Practice Exercise

Fill in the answer

1. 52 mins = _____ secs
2. 51 secs 57 mins = _____ secs
3. 9 mins = _____ secs
4. 56 secs 32 mins = _____ secs
5. 51 mins = _____ secs
6. 26 mins 57 secs = _____ secs
7. 2,700 secs = _____ mins
8. 2,580 secs 14 hours = _____ mins
9. 2,520 secs = _____ mins
10. 6 hours 1,560 secs = _____ mins
11. 2 days = _____ hours
12. 1,920 mins 43,200 secs = _____ hours
13. 840 mins = _____ hours
14. 5 hours 1,200 mins = _____ hours
15. 17,280 mins = _____ days
16. 953 days 5,760 mins = _____ days
17. 15,840 mins = _____ days
18. 264 hours 15,840 mins = _____ days

19. 1,531 mins = _____ hours _____ mins

20. 2,250 mins 3,600 secs = _____ hours _____ mins

21. 765 mins = _____ hours _____ mins

22. 2,112 mins 10 days = _____ hours _____ mins

Adding and Subtracting Measurements of Time

When you add or subtract time measurements, you may have to carry or borrow between the different units. Here are two examples.

Example Barb worked 6 hours and 50 minutes on Tuesday and 5 hours 30 minutes on Thursday. How much total time did she work on the two days?

Step 1 Line up the measurements, putting like units under like units.

6 hr 50 min
+ 5 hr 30 min

Step 2 Add the minutes and add the hours.

$$\begin{array}{r} 6 \text{ hr } 50 \text{ min} \\ +\ 5 \text{ hr } 30 \text{ min} \\ \hline 11 \text{ hr } 80 \text{ min} \end{array}$$

Step 3 80 minutes is 1 hour and 20 minutes. Rewrite the sum.

$$\begin{aligned} 11 \text{ hr} + 80 \text{ min} &= 11 \text{ hr} + 1 \text{ hr} + 20 \text{ min} \\ &= 12 \text{ hr} + 20 \text{ min} \end{aligned}$$

Answer: Barb worked 12 hours and 20 minutes on the two days.

Example Subtract 6 minutes 45 seconds from 12 minutes 20 seconds.

Step 1 Line up the measurements, putting the like units under like units.

$$\begin{array}{r} 12 \text{ min } 20 \text{ sec} \\ -\ \ 6 \text{ min } 45 \text{ sec} \\ \hline \end{array}$$

Step 2 One minute is the same as 60 seconds. Rewrite the top number as 11 minutes + 60 seconds + 20 seconds, or 11 minutes 80 seconds.

$$\begin{array}{r} 11 \text{ min } 80 \text{ sec} \\ -\ \ 6 \text{ min } 45 \text{ sec} \\ \hline \end{array}$$

Step 3 Subtract the seconds and subtract the minutes.

11 min 80 sec
- 6 min 45 sec
5 min 35 sec

Answer: The result of the subtraction is 5 minutes 35 seconds.

Fill in the answer.
(Hint: remember to reduce to lowest terms. 2 hr 69 min = 3 hr 9 min)
seconds (sec) - minutes (min) - hours - days

1. **17hours 59mins**
+8hours 28mins

2. **3mins 20secs**
-3mins 17secs

3. **10hours 32mins**
+13hours 55mins

4. **11hours 41mins**
-3hours 56mins

5. **3mins 20secs**
+3mins 17secs

6. **9 mins 39 secs**
- 2mins 13 secs

Standard time means the measurement of the day in two blocks of twelve hours each. The twelve hours from midnight to just before noon are ***a.m.*** hours. The twelve hours from noon until just before midnight are ***p.m.*** hours. The abbreviations "a.m." and "p.m." come from the Latin for ***ante meridiem*** and ***post meridiem***, meaning ***before*** (ante) and ***after*** (post) midday or noon (***meridiem***).

Today many clocks and watches use the battery-powered vibrations of a quartz crystal to keep time. The natural vibration of a quartz crystal is 100,000 times per second. Modern clocks and watches show the time in digital as well as analog displays.

Digital **Analog**

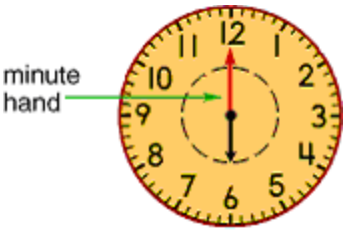
How to Tell Time

This clock demonstrates how minutes are to be read on an analog clock face. We know that there are 60 minutes in one hour, so the minute hand indicates the number of minutes that we are to read. In the picture on page 113, the minute hand (the longer red hand) is pointing at the 2 which stands for 10 minutes. The hour hand (the shorter blue hand) is pointing at the 9. We can read the time as "10 minutes after 9", "10 minutes past 9", or "9:10". You could even say that it is "50 minutes before 10", because it will take another 50 minutes before the hour hand points at the 10.

To figure out the minutes on a clock face, you must skip count by fives. For example, the 1 represents 5 minutes, the 2 represents 10 minutes, the 3 represents 15 minutes…and so on. Each mark between the large numbers represents 1 minute.

Hour Hand

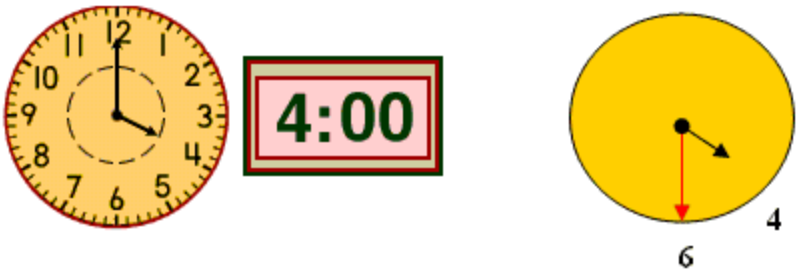
Minute Hand



O'clock

The clock shows 1 **o'clock**

Half Hour



A **half hour** is 30 minutes, so when the **minute hand** reaches the six and the hour hand remains on four, the new time will be **4:30.**

Practice Exercise

What time is it?

_____

_____

_____

_____

_____

_____

_____

_____

_____

Digital time is read from left to right. The first number stands for hours and the second number, after the colon, stands for minutes.

The clock above reads “10:20”. That means 10 hours and 20 minutes. You will also notice that the numbers are proceeded by the letters “P.M.” which tells us that this clock is reading “10:20 in the evening”, “20 minutes after 10”, “20 minutes past 10”, “40 minutes before 11”, or “40 minutes to 1”.

Military Time

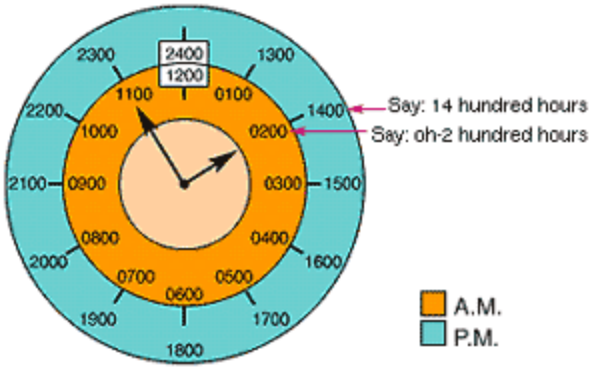
Standard time can be confusing. For example, eight o’clock can mean eight in the morning or eight in the evening. To avoid confusion, scientists created a 24-hour clock. The hours are numbered ***1*** through ***24***, beginning at midnight. This way of counting the hours in a day is called ***military time***. People who use military time say the time in a special way. For example, 11:00 is not called “eleven o’clock,” but “eleven hundred hours.”

Standard Time	24-Hour Time	Military Time
12:01 midnight	00:00	0001 hours
1:00 am	01:00	0100 hours
2:00 am	02:00	0200 hours
3:00 am	03:00	0300 hours
4:00 am	04:00	0400 hours
5:00 am	05:00	0500 hours
6:00 am	06:00	0600 hours
7:00 am	07:00	0700 hours
8:00 am	08:00	0800 hours
9:00 am	09:00	0900 hours
10:00 am	10:00	1000 hours
11:00 am	11:00	1100 hours
12:00 noon	12:00	1200 hours
1:00 pm	13:00	1300 hours
2:00 pm	14:00	1400 hours
3:00 pm	15:00	1500 hours
4:00 pm	16:00	1600 hours
5:00 pm	17:00	1700 hours
6:00 pm	18:00	1800 hours
7:00 pm	19:00	1900 hours
8:00 pm	20:00	2000 hours
9:00 pm	21:00	2100 hours
10:00 pm	22:00	2200 hours
11:00 pm	23:00	2300 hours
12:00 midnight	24:00	2400 hours

24-Hour Clock

A clock that does not use A.M. or P.M.

Example:



Money

The word ***dollar*** comes from the German word for a large silver coin, the ***Thaler***. In 1781, ***cent*** was suggested as a name for the smallest division of the dollar. Thomas Jefferson, third President of the United States and an amateur scientist, thought that the dollar should be divided into 100 parts. The word ***cent*** comes from the Latin ***centum***, which means one hundred.

Canadian currency was first proposed in 1850, but the first coins were not released for circulation until December 12, 1858.

1 penny = 1 cent (¢)

1 nickel = 5 cents

1 dime = 10 cents

1 quarter = 25 cents

1 dollar ($) = 100 cents

Penny (Cent)

Nickel

Dime

Quarter

Dollar (Loonie)

Toonie

Canadian money is created in decimal-based currency. That means we can add, subtract, divide, and multiply money the same way we do any decimal numbers.

The basic unit of Canadian currency is the “loonie” or dollar. The dollar has the value of one on a place value chart. The decimal point separates dollars from cents, which are counted as tenths and hundredths in a place value chart.

$1.11	**ones = dollars**	**.**	**tenths = dimes**	**hundredths = pennies**
one cent				**1**
ten cents		**.**	**1**	**0**
one dollar	**1**	**.**	**0**	**0**

$4.63	**ones = dollars**	**.**	**tenths = dimes**	**hundredths = pennies**
three cents				**3**
sixty cents		**.**	**6**	**0**
four dollars	**4**	**.**	**0**	**0**

$1.11 = $1.00 + 10Ë + 1Ë is read as 1 dollar and 11 cents
$4.63 = $4.00 + 60Ë + 3Ë is read as 4 dollars and 63 cents

When you write down amounts of money using the dollar sign, ***$***, you write the amounts the same way as you write decimal numbers—in decimal notation. There is a separate cents sign, ***Ë***. The cents sign does not use decimal notation. So if you have to add cents to dollars, you have to change cents to dollar notation.

8Ë = $.08

36Ë = $.36

100Ë = $1.00

Fill in the blank.

1. 8 quarters equals _____ cents.
2. 5 dimes, 5 quarters equals _____ cents.
3. **457** cents equals _____ dimes, _____ pennies, _____ quarter, _____ dollars.
4. **221** cents equals _____ nickels, _____ dollars, _____ penny.
5. 5 quarters, 1 nickel, 2 pennies, 5 dollars, 5 dimes

equals _____ cents.

6. 3 dollars equals _____ cents.

7. **186** cents equals _____ dollar, _____ penny, _____ nickels, _____ dimes, _____ quarters.

8. 4 dimes, 4 dollars, 1 penny equals _____ cents.

9. 7 quarters equals _____ cents.

10. 9 pennies equals _____ cents.

11. 3 dimes, 4 nickels, 2 pennies equals _____ cents.

12. **43** cents equals _____ pennies, _____ quarter, _____ nickels.

13. 7 dollars equals _____ cents.

14. **68** cents equals _____ pennies, _____ nickels, _____ dimes.

15. 1 dime, 1 penny, 1 dollar, 2 nickels equals _____ cents.

16. **275** cents equals _____ dollars, _____ quarters.

17. 5 dimes, 4 dollars, 4 quarters, 1 penny equals _____ cents.

18. 6 pennies equals _____ cents.

19. 3 quarters, 1 nickel, 4 dimes equals _____ cents.

20. **181** cents equals _____ dollar, _____ quarter, _____ penny, _____ nickel, _____ dimes.

21. 2 quarters equals _____ cents.

22. 2 dollars, 3 nickels, 2 pennies, 4 quarters equals _____ cents.

Complete the following.
Remember to include a $ in your answer.

1. $80.99 × 4	**2.** $687.43 + 501.96	**3.** $658.74 − 176.31	**4.** $454.35 − 263.51
5. $973.94 − 851.67	**6.** $165.01 − 154.54	**7.** $55.99 + 26.81	**8.** $4 \overline{)\$52}$
9. $7 \overline{)\$9.03}$	**10.** $10 \overline{)\$89.30}$	**11.** $427.79 + 117.45	**12.** $92.69 × 3

13. $44.44 +87.67	**14.** $134.02 −121.76	**15.** $73.42 × 8	**16.** $553.98 +368.18
17. $30.68 +94.91	**18.** $89.92 +16.40	**19.** $39.24 −36.22	**20.** $575.17 +515.15
21. $19.17 −14.49	**22.** $543.43 −533.37	**23.** $4\overline{)\$25.60}$	

Unit Pricing

Family members are consumers as well as workers. They spend a considerable amount of money to purchase food and other items that they need or desire. To obtain the maximum value for their money it is important to shop wisely. One way to stretch a dollar in the supermarket is to compare *unit prices* of items. A unit price is the amount charged for a single unit of measure such as one ounce or one pound. The unit price of an item is frequently printed on a price label along with the total cost of the item. If two items are of the same quality, it is worthwhile to buy the item that is a cent or two less per unit. Small savings

repeated many times add up to big savings. The following formula may be used to compute the unit price of an item:

Unit Price = (Price of Item) ÷ (Weight of Item)

Example 1: If a ten pound bag of potatoes costs $1.25, what is the price per pound of the potatoes?

Solution: Price per pound $1.25 ÷ 10 = $.125

The unit price is approximately 13 cents per lb.

Example 2: Is it better to buy a 2 pound jar of jelly for $1.18 or a 3 pound jar of the same jelly for $1.68?

Solution:

$1.18 ÷ 2 = $.59 per pound

$1.68 ÷ 3 = $.56 per pound

The 3 pound jar for $1.68 is the better buy.

Find the unit price for each item.

1) 12 oranges $6.00
2) 1 dozen eggs $2.00
3) 5 pencils $1.25
4) 2 books $7.40
5) 3 cans of peas $1.30
6) 2 bags of flour $12.50
7) 2 kg. of potatoes $1.99
8) 7 bubble gum 50¢
9) 2 l of milk $5.40
10) 6 socks $8.40

What is GST/HST?

GST is a 7% tax on the sale of most goods and services in Canada. Three participating provinces- Nova Scotia, New Brunswick, and Newfoundland- harmonized their provincial sales tax with GST to create the harmonized sales tax (HST). HST applies to the same base of goods and services as GST but at a rate of 15%. Of this, 7% is the federal portion and 8% is the provincial portion.

When you calculate tax, you are working with percent and decimals. First you find out how much something is and then multiply by the percent. Almost every time you buy something you will have to include the tax into the total cost.

Example You buy a coat for $120.00 with a tax of 15%. What would the total cost be?

15% = .15

$120.00 x .15 = $18.00 is the tax

$120.00 + $18.00 = $138.00 is the total

Discount

The amount by which the original price is reduced is called a discount and is usually received in a sale.

Example:

To find the discount, multiply the cost of the item by the rate of discount. Subtract the discount from the original price to find the new cost.

Example There is a discount of 35% on a $130.00 dress. What is the discount or saving to you?

35% = .35

$130.00 x .35 = $45.50

The new cost is $130.00 - $45.50 = $84.50

Practice Exercise

Store Discounts and Taxes

Sparky's Electronics Price List

DVD Player	$90	Digital Camera	$303
VCR	$97	101-disc CD Changer	$168
13 inch television	$70	50 inch television	$825
Laptop Computer	$2,088	Portable CD Player	$116
2-Way Radio	$41	Cordless Phone	$39
Answering Machine	$93	Wireless Phone	$85

Using the price list, calculate each question to the nearest cent.

1.	8% sales tax on one 50 inch television. What is the sales tax?
2.	You want to buy the Answering Machine and also the 101-disc CD Changer. If the sales tax is 6.5%, what is your after-tax total?
3.	28% discount on one 2-Way Radio. Sales tax is 9%. How much is the after-tax total?
4.	4% sales tax on one Wireless Phone. What is the

	sales tax?
5.	You ordered two 13 inch televisions on-line. Sparky's offers a 15% discount off the price of the 13 inch television. You pay no tax, but the total shipping charge for the order is $5.49. What is the total to pay?
6.	4.4% sales tax on one Laptop Computer. What is the sales tax?
7.	10% discount on one Digital Camera. What is the discount?
8.	You want to buy the VCR and also the 50 inch television. If the sales tax is 8.5%, what is your after-tax total?
9.	9.5% sales tax on one Cordless Phone. What is the sales tax?
10.	70% discount on one Portable CD Player. What is the discount?

What is Credit?

Credit is *money* that you borrow. You use the money now. You promise to pay back the money later.

Credit is also *time.* You get time to pay for goods or services. You use the goods or services now. You promise to pay for them later.

"Buy now, pay later" is the common saying.

Credit is good for an emergency, and you might save money if you buy when the price is right.

Most credit is not free. Say you borrow some money. In some cases, you must pay back more money than you borrowed. The extra money you pay back is called interest.

Credit ties up future income. It is a promise to pay. Don't buy on credit unless you know you *can* pay. Pay off your debt as soon as you can.

Resist the temptation to buy too much or to pay more than you should.

Remember that if you can't pay, you may lose goods or income.

Developing a Budget

In order to be able to spend money wisely, an individual or family should devise a spending plan. Some people appear to be afraid of the idea of planning how to spend their money. They may fear that such planning will prevent them from using their money as they wish. Having a spending plan is a way of using available money to your goals. The spending plan should agree with the actual income. If the plan does not agree an adjustment should be made.

A realistic spending plan for managing an income will begin with a list of available resources. The list should include the sources of income, the amount of money from each source, and the times when each amount can be expected.

A spending plan is known as a budget and a budget should give a clear picture of where you stand financially. The basic budget is a four-point plan for spending.

1. Spending for comfortable daily living. This includes having enough money on hand to pay for basic items that keep you going from day to day.
2. Spending for major purchases. Major purchases includes household appliances, a house, car, or special vacation.
3. Spending for financial security. Savings accounts, insurance, and investment are a form of spending and one of the most

rewarding. You are buying peace of mind, and the ability to borrow money inexpensively. It is getting extra value for every dollar spent. You can receive interest from the bank, insurance companies and corporations for placing your dollars with them.

1. Splurge spending.

There is an occasional "throw caution to the winds" buy in each of us. With splurge spending you can dine at a superb restaurant; go to an unplanned baseball game. Keep splurge spending in proportion to the overall budget.

There is a checklist to begin a budget.

1. Open a checking account.
2. Start a savings account.
3. Total net income (income after taxes)
2. List all expenses (those that are constant, those that can change).

If the money going out does not match or is less than what is coming in, then you must cut some of your expenses so that you can ***balance*** your budget. A balance is achieved when your income matches your expenses. The goal is to achieve a ***surplus*** where you will have more money coming in than going out. You never know when you might need some extra money for an emergency.

Charts and Graphs

Charts/Tables

Charts or tables use lines or columns of numbers or words to provide information. The information could relate to distances on a map, weight or height charts, nutritional value information on a box of food, etc.

Example Nutritive value chart

The nutrition information is given for the consumer who wants to see:

1) what is in the product
2) how it compares to another brand

	BRAND A	BRAND B
per 30 g serving		
Energy	75 cal	115 cal
Protein	3.6 g	3.1 g
Fat	1.0 g	2.2 g
Carbohydrate	23 g	23 g
Sugar	5.5 g	5.0 g
Starch	7.2 g	15 g
Fibre	10 g	2.9 g
Sodium	300 mg	145 mg
Potassium	350 mg	120 mg

From the example above of the two boxes of cereal, you could answer the following questions:

1) Which brand has more calories per serving? (Brand B)
2) Which brand provides the higher fibre content? (Brand A)
3) If you were on a low sodium diet, which brand would be better for you? (Brand B)
4) Which brand has the higher starch? (Brand B)
5) Which brand has the higher potassium? (Brand A)

Example Height/Weight Chart

The information given on height/weight charts is for the person who may have health concerns or concerns about body image.

The Metropolitan Life Insurance Company revised their height/weight charts in 1983. New statistics showed that despite a few more pounds, their subscribers were not dying earlier. The new charts reflect the weights of people that lived the longest in each height category; they are not ideal weight tables. Some health educators recommend lower weight ranges than those specified here. But, if you have chased a few pounds for years that put you over "ideal body weight", relax. The new charts show that those few pounds will probably not increase your mortality.

Frame Size

If you have always wondered what size frame you are, here is the method the insurance company used. This will be easier with the help of a friend.

1. Extend your arm in front of your body bending your elbow at a ninety degree angle to your body. (your forearm is parallel to your body).
2. Keep your fingers straight and turn the inside of your wrist to your body.
3. Place your thumb and index finger on the two prominent bones on either side of your elbow, measure the distance between the bones with a tape measure or calipers.

Compare to the medium-framed chart below. Select your height based on what you are barefoot. If you are below the listed inches, your frame is small. If you are above, your frame is large.

ELBOW MEASUREMENTS FOR MEDIUM FRAME			
Height in 1" heels	Elbow	Height in 1" heels	Elbow
Men	Breadth	**Women**	Breadth
5'2"-5'3"	2 1/2"-2 7/8"	4'10"-4'11"	2 1/4"-2 1/2"
5'4"-5'7"	2 5/8"-2 7/8"	5'0"-5'3"	2 1/4"-2 1/2"
5'8"-5'11"	2 3/4"-3"	5'4"-5'7"	2 3/8"-2 5/8"
6'0"-6'3"	2 3/4"-3 1/8"	5'8"-5'11"	2 3/8"-2 5/8"
6'4"	2 7/8"-3 1/4"	6'0"	2 1/2"-2 3/4"

HEIGHT & WEIGHT TABLE FOR WOMEN

Weights at ages 25-59 based on lowest mortality.
Weight in pounds according to frame
(in indoor clothing weighing 3 lbs.; shoes with 1" heels).

Height Feet Inches	Small Frame	Medium Frame	Large Frame
4' 10"	102-111	109-121	118-131
4' 11"	103-113	111-123	120-134
5' 0"	104-115	113-126	122-137
5' 1"	106-118	115-129	125-140
5' 2"	108-121	118-132	128-143
5' 3"	111-124	121-135	131-147
5' 4"	114-127	124-138	134-151
5' 5"	117-130	127-141	137-155
5' 6"	120-133	130-144	140-159
5' 7"	123-136	133-147	143-163
5' 8"	126-139	136-150	146-167
5' 9"	129-142	139-153	149-170
5' 10"	132-145	142-156	152-173
5' 11"	135-148	145-159	155-176
6' 0"	138-151	148-162	158-179

HEIGHT & WEIGHT TABLE FOR MEN

Weights at ages 25-59 based on lowest mortality.
Weight in pounds according to frame
(in indoor clothing weighing 5 lbs.; shoes with 1" heels).

Height Feet Inches	Small Frame	Medium Frame	Large Frame
5' 2"	128-134	131-141	138-150
5' 3"	130-136	133-143	140-153
5" 4"	132-138	135-145	142-156
5' 5"	134-140	137-148	144-160
5' 6"	136-142	139-151	146-164
5' 7"	138-145	142-154	149-168
5' 8"	140-148	145-157	152-172
5' 9"	142-151	148-160	155-176
5' 10"	144-154	151-163	158-180
5' 11"	146-157	154-166	161-184
6' 0"	149-160	157-170	164-188
6' 1"	152-164	160-174	168-192
6' 2"	155-168	164-178	172-197

6' 3"	158-172	167-182	176-202
6' 4"	162-176	171-187	181-207

Example Distance tables (map)

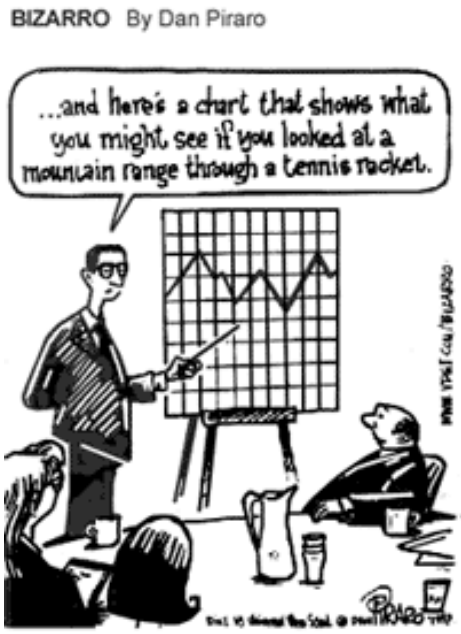
The information contained on these distance charts or tables is ideal for a tourist who is trying to plan a day-trip and is not familiar with the area. People who do a lot of traveling for business or pleasure find this type of information quite useful.

All distances on this map and along the New Brunswick highways are stated in kilometres.
To convert to miles multiply by 5/8. (Example 50x5=250 ÷8=31.2miles)
The chart below gives approximate distances between principal communities in both kilometres and miles.
In all cases the distance given is of the shortest route between the two points.

Kilometres ☐ Miles ☐	Bathurst		Campbellton		Edmundston		Fredericton		Miramichi		Moncton		Sackville		Saint John		Woodstock	
Bathurst			114	71	300	186	252	157	79	49	222	138	249	155	355	221	353	219
Campbellton	114	71			201	125	362	225	190	118	332	206	359	223	466	290	295	183
Caraquet	66	41	180	112	380	236	290	180	118	73	260	162	288	179	413	257	390	242
Charlo	85	53	24	15	224	139	338	201	166	103	307	191	335	208	417	261	321	199
Chatham	72	45	182	113	275	170	182	113	8	5	149	93	177	110	285	177	283	176
Dalhousie	94	58	23	14	224	139	340	211	171	106	310	193	341	212	440	275	320	199
Edmundston	300	186	201	125			275	171	266	165	460	286	505	314	381	237	177	110
Fredericton	252	157	362	225	275	171			172	107	182	113	228	142	103	64	104	65
Miramichi	79	49	190	118	266	165	172	107			158	98	185	115	275	171	275	171
Moncton	222	138	332	206	460	286	182	113	158	98			53	33	152	94	285	177
Sackville	249	155	359	223	505	314	228	142	185	115	53	33			204	127	330	205
Saint John	355	221	466	290	381	237	103	64	275	171	152	94	204	127			206	128
St. Andrews	387	240	460	286	355	220	135	84	307	191	248	154	300	186	96	60	178	111
Saint-Léonard	273	167	159	99	42	26	236	147	224	139	422	264	464	288	339	211	135	84
St. Stephen	375	233	460	286	342	213	125	78	296	184	255	158	312	194	107	66	170	106
Sussex	279	173	390	242	399	248	121	75	199	124	75	47	131	81	73	45	224	139
Woodstock	353	219	295	183	177	110	104	65	275	171	285	177	330	205	206	128		

You could use the information in the chart/table on page 210 to find the distance in kilometres between the following places:

1) Saint John to Moncton (152 km)
2) Woodstock to Campbellton (295 km)
3) Sackville to Bathurst (249 km)
4) Edmundston to Fredericton (275 km)
5) Caraquet to Miramichi (118 km)



Bizarro by *Dan Piraro*

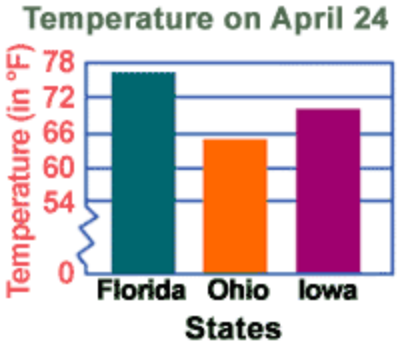
Graphs

A ***graph*** is a kind of drawing or diagram that shows ***data***, or information, usually in numbers. In order to make a graph, you must first have data.

Bar Graph

A graph that uses separate bars (rectangles) of different heights (lengths) to show and compare data

Example:



Line Graph

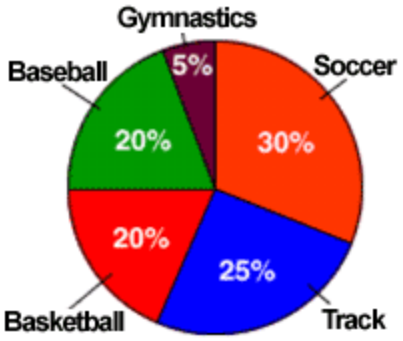
A graph in which line segments are used to show changes over time

Example:

Circle Graph

A graph using a circle that is divided into pie-shaped sections showing percents or parts of the whole

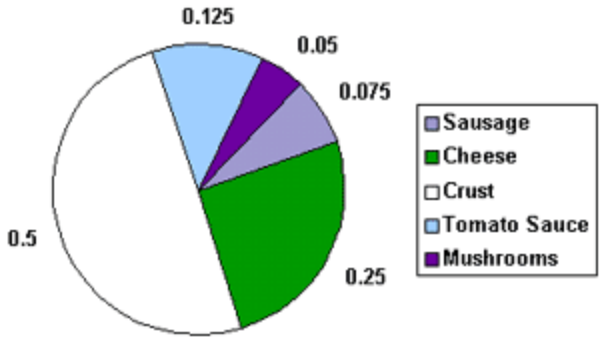
Example:



Pie Charts

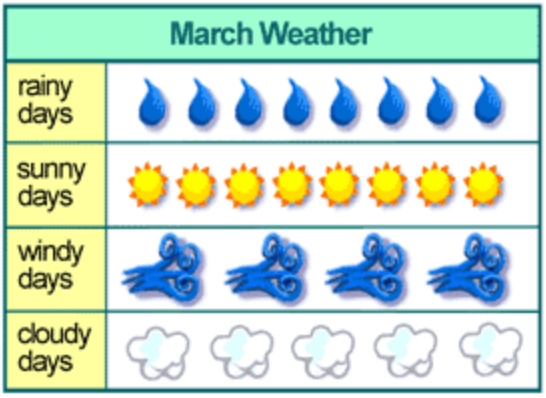
A pie chart is a circle graph divided into pieces, each displaying the size of some related piece of information. Pie charts are used to display the sizes of parts that make up some whole.

The pie chart below shows the ingredients used to make a sausage and mushroom pizza. The fraction of each ingredient by weight is shown in the pie chart below.



We see that half of the pizza's weight on the previous page comes from the crust. The mushrooms make up the smallest amount of the pizza by weight, since the slice corresponding to the mushrooms is smallest. Note that the sum of the decimal sizes of each slice is equal to 1 (the "whole" pizza").

Pictographs (picture graphs) are graphs that use pictures called ***icons*** to display data. Pictographs are used to show data in a small space. Pictographs, like bar graphs, compare data. Because pictographs use icons, however, they also include keys, or definitions of the icons.



Practice Exercise

1. This table shows the distance ran by 6 children.

Name	Distance
Andrew	2500 m
Nick	3800 m
Ken	2050 m
Kimberly	3300 m
James	2800 m
Jeremy	4025 m

(a) What distance did Nick run? How much further did he run than James?

(b) Who ran more than 3 km?

(c) What is the total distance of the longest and shortest runs?

(d) Who ran the third longest distance?

Complete the table below.

	Number of boys	Number of girls	Total
Eat noodles		6	12
Eat hamburgers	7		12
Eat chicken rice	9		
Total		21	43

(a) How many children ate chicken rice?

(b) How many boys ate noodles and hamburgers?

(c) Which food was most popular?

This picture graph shows the number of stamps kept by each child.

Penny	
Kelly	
Jenny	

 stands for 3 stamps.

(a) Kelly has _____ stamps.

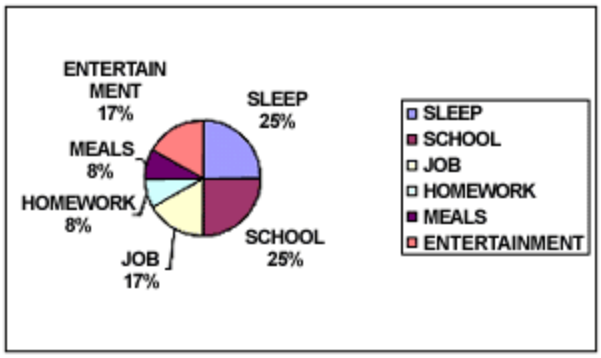
(b) Penny has _____ less stamps than Jenny.

(c) Jenny has twice as many stamps as _____.

(d) Penny has _____ stamps.

(e) The 3 girls have _____ stamps altogether.

Percent of Hours of a Day Spent on Activities



1. Which two activities took up half of the time of the day?

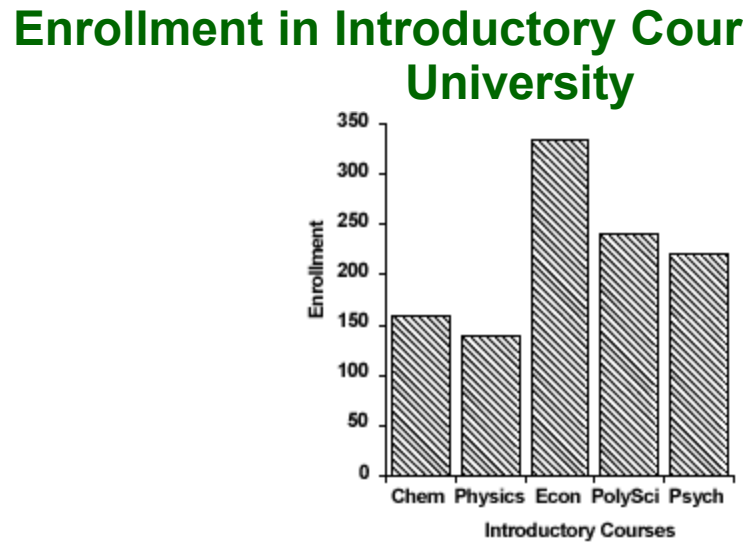
2. Which two activities took up the least amount of time?

3. Which activity took up one fourth of the day?

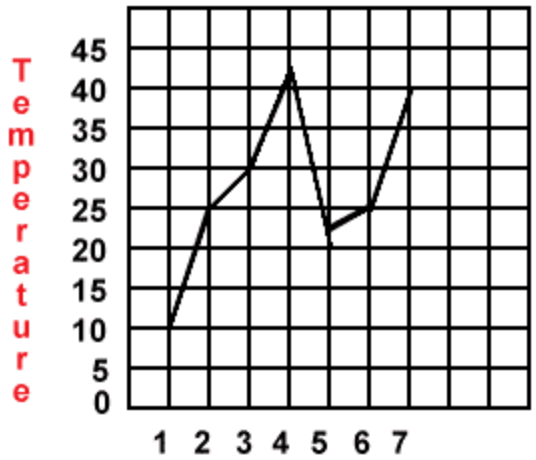
4. What percent of the day does homework take up?

5. Which activity takes up the same amount of time as meals and entertainment together?

Given the graph below, answer the following questions.



1. Which course has the most students enrolled in it?
2. Order the courses by enrollment from lowest to highest.
3. The enrollment in Econ (Economics) is approximately how many times bigger than the enrollment in Chem (Chemistry)?
4. Approximately how many students were enrolled in the course with the most students?
5. Approximately how many more students are in Econ than in Physics?



Average Daily Temperature for
January 1-7 in Degrees Fahrenheit

1. This graph shows the temperatures during the period of a week, month, or year?

2. The temperatures in the beginning of the week were rising or falling?

3. Between what days did the least amount of change take place?

4. If freezing is 32 degrees, which day was above freezing?

5. Between what days was the greatest drop in temperature?

Metric Measurement

In the 1790s, French scientists worked out a system of measurement based on the ***meter***. The meter is one ten-millionth of the distance between the North Pole and the Equator. The French scientists made a metal rod equal to the length of the standard meter.

By the 1980s, the French metal bar was no longer a precise measure for the meter. Scientists figured out a new standard for the meter. They made it equal to 1/299,792,548 of the distance light travels in a vacuum in one second. Since the speed of light in a vacuum never changes, the distance of the meter will not change.

The French scientists developed the ***metric*** system to cover measurement of length, area, volume, and weight.

Metric Length Equivalents

Metric Unit	Abbreviation	Metric Equivalent
millimeter	mm	.1 centimeter
centimeter	cm	10 millimeters
decimeter	dm	10 centimeters
meter	m	100 centimeters
decameter	dam	10 meters
hectometer	hm	100 meters
kilometer	km	1000 meters

Metric Weight Equivalents

Metric Unit	Abbreviation	Metric Equivalent
milligram	mg	.001 gram
centigram	cg	10 milligrams
decigram	dg	10 centigrams
gram	g	1,000 milligrams
decagram	dag	10 grams
hectogram	hg	100 grams
kilogram	kg	1,000 grams

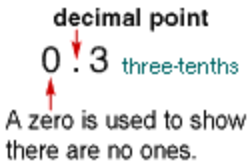
Metric Volume Measures

Metric Unit	Abbreviation	Metric Equivalent
milliliter	ml	.001 liter
centiliter	cl	10 milliliters
deciliter	dl	10 centiliters
liter	l	1,000 milliliters
decaliter	dal	10 liters
hectoliter	hl	100 liters
kiloliter	kl	1,000 liters

Decimal Point

A period that separates the whole numbers from the fractional part of a number; or that separates dollars from cents

Example:



Kilometers	**Hectometers**	**Decameters**	**Meters**	**Decimeters**	**Centimeters**	**Millimeters**
Kilograms	**Hectograms**	**Decagrams**	**Grams**	**Decigrams**	**Centigrams**	**Milligrams**
Kiloliters	**Hectoliters**	**Decaliters**	**Liters**	**Deciliters**	**Centiliters**	**Milliliters**

To use this chart, if a question asks you how many grams that you can get from 200 centigrams, for example, try this:

Start by putting down the number:

200

If we don't see a decimal point, the number is a whole number; and therefore, a decimal point may be inserted to the right of the last digit:

200.

Now, using your chart, start at centigrams and count back to grams (two spaces to the left).

Move the decimal point in your number the same amount of spaces in the same direction:

2.00

The answer to the question is that 200 centigrams is equal to 2 grams.

If a question asks you to tell how many millimeters are is 8.3 decimeters, try this:
Write down the number:

8.3

We already see a decimal point, so there is no need to guess where to place it:

8.3

Now, using your chart, start at decimeters and count forward to millimeters (two spaces to the right).

Move the decimal point in your number the same amount of spaces in the same direction:

830.

The answer to the question is that 830 millimeters is equal to 8.3 decimeters.

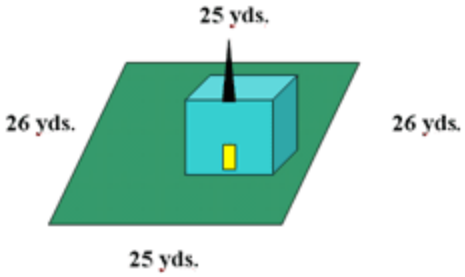
Practice Exercise

Fill in the answer.

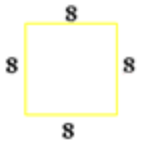
1. 1370 g = _____ kg
2. 36.61 mm = _____ cm
3. 1158 cg = _____ g
4. 105.39 mg = _____ cg
5. 10 L = _____ cl
6. 10.91 cl = _____ ml
7. 8000 L = _____ kl
8. 7.2 cm = _____ mm
9. 2.79 g = _____ cg
10. 12.23 cl = _____ ml
11. 3000 L = _____ kl
12. 11.5 cm = _____ mm
13. 9000 L = _____ kl
14. 909.7 cm = _____ m
15. 4 L = _____ ml
16. 9.75 m = _____ cm
17. 90 mg = _____ cg
18. 10.23 kl = _____ L
19. 11 L = _____ ml
20. 7.51 m = _____ cm
21. 1000 mg = _____ g
22. 10471 m = _____ km
23. 100 ml = _____ cl
24. 12.876 m = _____ cm
25. 8.1 km = _____ m
26. 9520 mm = _____ m
27. 2.32 L = _____ cl
28. 1500 mg = _____ g
29. 11 cl = _____ ml
30. 9000 ml = _____ L
31. 11.59 g = _____ cg
32. 11.62 kg = _____ g
33. 29 ml = _____ cl

Calculating Perimeter

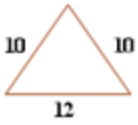
Perimeter is calculated in different ways, depending upon the shape of the surface. The perimeter of a surface outlined by straight lines is calculated by adding together the lengths of its sides.



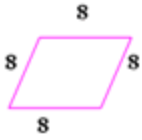
25 + 26 + 25 + 26 = 102 yds. perimeter of the rectangular lot



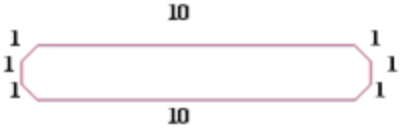
8 + 8 + 8 + 8 = 4 x 8 = 32
4s (4 sides) = perimeter of a square



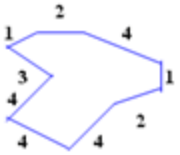
10 + 10 + 12 = 32
3s (3 sides) = perimeter of a triangle



8 + 8 + 8 + 8 = 4 x 8 = 32
4s = perimeter of a rhombus



1 + 1 + 10 + 1 + 1 + 1 + 10 + 1 = 26
8s = perimeter of an irregular octagon



4 + 1 + 2 + 4 + 4 + 4 + 3 + 1 + 2 = 25
all sides = perimeter of an irregular polygon

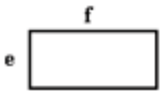
Practice Exercise

Find the perimeter.

1. 

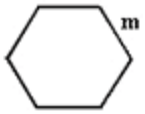
All sides equal 8 m

24 m

2. 

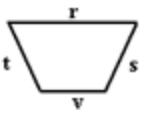
e = 9 cm
f = 17 cm

_____

3. 

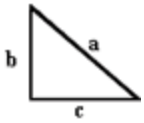
m = 18 cm
All sides are equal

_____

4. 

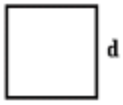
v = 3 m
t = 7 m
r = 10 m
s = t

_____

5. 

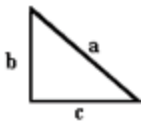
a = 6 m
c = 2 m
b = c

_____

6. 

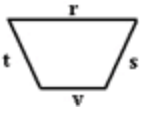
The side d of this square is 32 m

_____

7. 

a = 9 m
b = 2 m
c = b

_____

8. 

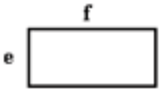
v = 5 yd
t = 8 yd
r = 14 yd
s = t

_____

9. 

The side d of this square is 38 m

_____

10. 

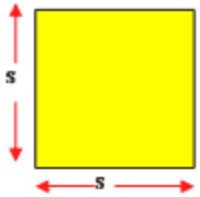
e = 7 yd
f = 12 yd

_____

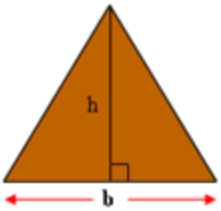
Calculating Area

Area is calculated in different ways, depending on the shape of the surface. Area is expressed in squares: square inches, square meters, etc.

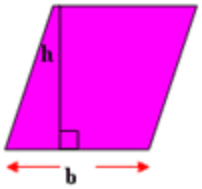
An area with a perimeter made up of straight lines is calculated in different ways for different shapes.



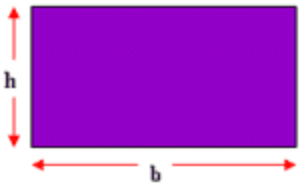
S^2 = area of a square



$\frac{\text{base x height}}{2}$ = area of a triangle



base x height = area of a rhombus



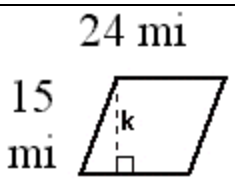
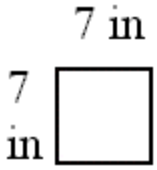
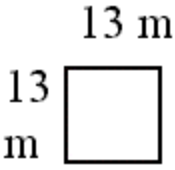
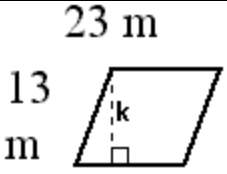
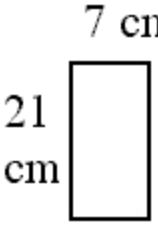
b x h = area of a rectangle

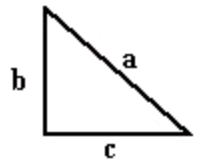
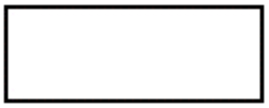
- ***The area of a rectangle, square, or rhombus is sometimes referred to as length x width (l x w) instead of base x height.***

- ***The area of a triangle is sometimes expressed as ½ the base x height (1/2 b x h).***

Practice Exercise

Find the area for each.

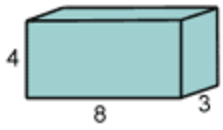
1.		All sides are 9 ft **81 square ft**
2.		k = 21 mi _____
3.		 _____
4.		 _____
5.		k = 18 m _____
6.		 _____

7. c = 26 ft b = 26 ft 	_____
8. 23 in 16 in 	_____
9. 11 cm 55 cm 	_____
10. 	All sides are 17 cm _____

Calculating Volume

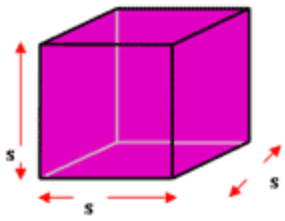
Volume is the amount of space contained in a three-dimensional shape. Area is a measurement of only ***two*** dimensions, usually length and width. Volume is a measurement of ***three*** dimensions, usually ***length***, ***width***, and ***height***, and is measured in cubic units.

To find the volume of a ***cube*** or a ***rectangular prism***, multiply length by width by height.



l x w x h = volume of a rectangular prism
8 x 3 x 4 = 96

Since a cube has sides of equal length, multiply the length of one side by itself three times, S^3:



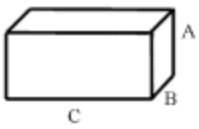
S^3 = volume of a cube

Practice Exercise

Find the volume.

1. 
All sides are 5 cm

_____

2. 

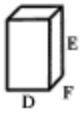
A = 9 ft
B = 5 ft
C = 20 ft

_____

3. 

A = 15 cm
B = 3 cm
G = 28 cm

_____

4. 

D = 26 cm
E = 32 cm
F = 5 cm

_____

Fill in the missing spaces and complete the table.
Round to the nearest hundredth.

	length	*width*	*height*	*volume*
5.	7 ft	9 ft	12 ft	___ cubic feet
6.	4 cm	13 cm	6 cm	___ cubic centimeters
7.	20 mm	12 mm	56 mm	___ cubic millimeters
8.	50 mm	75 mm	80 mm	___ cubic millimeters
9.	___ m	11 m	6 m	528 cubic meters
10.	10 mm	___ mm	15 mm	900 cubic millimeters
11.	7 m	5 m	___ m	455 cubic meters
12.	12 mm	10 mm	19.3 mm	___ cubic millimeters
13.	5 mm	11 mm	12.9 mm	___ cubic millimeters
14.	15.64 cm	4.97 cm	4 cm	___ cubic centimeters
15.	5.32 m	4.46 m	6 m	___ cubic meters

Perimeter	
Polygon	P = sum of the lengths of the sides
Rectangle	$P = 2(l + w)$
Square	$P = 4s$
Area	
Parallelogram	$A = bh$
Rectangle	$A = lw$
Square	$A = s^2$
Triangle	$A = \frac{1}{2}bh$
Volume	
Rectangular Prism	$V = lwh$

Word Problems with Measurement

Converting Measurements

When solving problems you must always keep in mind what units are being used. Converting measurements involves using ratios and rates correctly to change from one unit to another.

Example What is the volume of a rectangular solid with a length of 3 m, a width of 2 m, and a height of 90 cm?

The formula you will need to solve the problem is $V = lwh$. But before you multiply you will need to convert the measurements given in the problem to the same unit of measurement.

Here the problem is solved by converting to metres.

Convert 90 cm to metres: **90 cm = 0.90 m.**

Volume = length x width x height
= 3 m x 2 m x 0.9 m
= 5.4 cubic metres

This example can also be solved in terms of centimetres.

Convert to centimetres:

Volume = length x width x height
= 3m x 2 m x 90 cm
= 300 cm x 200 cm x 90 cm
= 5 400 000 cubic centimetres

Each answer represents the same quantity:
5 400 000 cubic centimetres = 5.4 cubic metres

How do you decide which unit to choose? Generally, it is easiest to convert to the smallest unit of measure so that you will not have to work with fractions. Another factor to consider is the answer options in multiple choice questions. Always convert to the unit of measure given in the answer options.

1. Kevin has 1200 long-distance minutes per month on his phone-calling plan. How many hours of calls does this represent?
2. A piece of wire is 150 centimeters long. How many meters in length is the wire?
3. Monica needs to glue yarn around the perimeter of a rectangular piece of poster board that is 36 centimeters long and 15 centimeters wide. How much yarn does she need?

4. Ken's laundry room floor has the shape of a square. He wants to tile the room. If one side of the room measures 15 meters, what is the area of the floor in square meters (sq m)?
5. A shipping crate has the shape of a cube that is 8 meters long on each edge. What is its volume in cubic meters?
6. Mary worked from 7:15 A.M. to 12:30 P.M. on Monday and from 7:30 A.M. to 1:45 P.M. on Tuesday. If she earns $7.20 an hour, how much did she earn for her work on Monday and Tuesday?
7. What is the volume of a cube with sides 10 feet long?
8. Troy used 22 ½ centimeters of copper wire in each appliance he repaired. If he fixed eight appliances, how many meters of copper wire did he use?
9. Joe has received an antibiotic for his bronchitis. The instructions say to take four capsules, three times a day. If he takes his first set of capsules at 6:45 A.M., what time should he take his next set of capsules?
10. At Jill's work site, she is supposed to have a 15-minute break every 3 hours. She has worked 200 minutes since her last break. Has she worked long enough to earn the 15-minute break?

Answer Key

Book 14016 - Measurement

Page 7

1. 01/17/02 **2.** 07/02/94 **3.** 05/14/65
4. 09/17/89 **5.** answers will vary

Page 9

1. 3120 secs **2.** 3471 secs **3.** 540 secs
4. 1976 secs **5.** 3060 secs **6.** 1617 secs
7. 45 mins **8.** 883 mins **9.** 42 mins
10. 386 mins **11.** 48 hours **12.** 44 hours
13. 14 hours **14.** 25 hours **15.** 12 days
16. 957 days **17.** 11 days **18.** 22 days
19. 25 hours 31 mins **20.** 38 hours 30 mins
21. 12 hours 45 mins **22.** 275 hours 12 mins

Page 12

1. 26 hours 27 mins **2.** 3 secs
3. 24 hours 27 mins **4.** 7 hours 45 mins
5. 6 mins 37 secs **6.** 7 mins 26 secs

Page 16

Row 1: 8:25, 3:49, 4:22
Row 2: 10:03, 1:09, 12:04
Row 3: 2:10, 6:07, 9:12

Page 22

1. 200 cents **2.** 175 cents **3.** 3 dimes, 2 pennies, 1 quarter, 4 dollars **4.** 4 nickels, 2 dollars, 1 penny **5.** 682 cents **6.** 300 cents **7.** 1 dollar, 1 penny, 3 nickels, 2 dimes, 2 quarters **8.** 441 cents **9.** 175

cents **10.** 9 cents **11.** 52 cents **12.** 8 pennies, 1 quarter, 2 nickels **13.** 700 cents **14.** 8 pennies, 2 nickels, 5 dimes **15.** 121 cents **16.** 2 dollars, 3 quarters **17.** 551 cents **18.** 6 cents **19.** 120 cents **20.** 1 dollar, 1 quarter, 1 penny, 1 nickel, 5 dimes **21.** 50 cents **22.** 317 cents

*****Note***There could be more than one solution for questions 3, 4, 12, and 14. Accept any reasonable response.**

Page 24 **1.** $323.96 **2.** $1189.39 **3.** $482.43 **4.** $190.84 **5.** $122.27 **6.** $10.47 **7.** $82.80 **8.** $13 **9.** $1.29 **10.** $8.93 **11.** $545.24 **12.** $278.07 **13.** $132.11 **14.** $12.26 **15.** $587.36 **16.** $922.16 **17.** $125.59 **18.** $106.32 **19.** $3.02 **20.** $1090.32 **21.** $4.68 **22.** $10.06 **23.** $6.40

Page 26 **1.** 50 cents per orange **2.** 17 cents per egg **3.** 25 cents per pencil **4.** $3.70 per book **5.** 43 cents per can **6.** $6.25 per bag **7.** 1 dollar per kg **8.** 7 cents per bubble gum **9.** $2.70 per liter **10.** $1.40 per sock

Page 29 **1.** $66 **2.** $277.97 **3.** $32.18 **4.** $3.40 **5.** $124.49 **6.** $91.87 **7.** $30.30 **8.** $1000.37 **9.** $3.71 **10.** $81.20

Page 43 **1. a.** 3800 m, 1000 m

b. Nick, Kimberly, and Jeremy
c. 6075 m **d.** Kimberly

Page 44

	Number of boys	**Number of girls**	**Total**
Eat noodles	**6**	6	12
Eat hamburgers	7	**5**	12
Eat chicken rice	9	**10**	**19**
Total	**22**	21	43

a. 19 children **b.** 13 boys **c.** chicken rice

Page 44 **a.** 9 **b.** 6 **c.** Kelly **d.** 12 **e.** 39

Page 45 **1.** Sleep and school
2. Meals and homework **3.** Sleep or school
4. 8% **5.** Sleep or school

Page 46 **1.** Economics **2.** Economics, Political Science, Psychology, Chemistry, Physics
3. Twice as big **4.** 350 students **5.** 200 students

Page 47 **1.** a week **2.** rising **3.** January 5^{th} and 6^{th}
4. January 4^{th} or January 7^{th} **5.** January 4^{th} and 5^{th}

Page 52

1. 1.37 **2.** 3.661 **3.** 11.58 **4.** 10.539
5. 1000 **6.** 109.1 **7.** 8 **8.** 72 **9.** 279
10. 122.3 **11.** 3 **12.** 115 **13.** 9
14. 9.097 **15.** 4000 **16.** 975 **17.** 9
18. 10230 **19.** 11000 **20.** 751 **21.** 1
22. 10.471 **23.** 10 **24.** 1287.6 **25.** 8100
26. 9.52 **27.** 232 **28.** 1.5 **29.** 110
30. 9 **31.** 1159 **32.** 11620 **33.** 2.9

Page 54

2. 52 cm **3.** 108 cm **4.** 27 m **5.** 10 m
6. 128 m **7.** 13 cm **8.** 35 yd **9.** 152 m
10. 38 yd

Page 56

2. 504 square mi **3.** 49 square in
4. 169 square m **5.** 414 square m
6. 147 square cm **7.** 338 square ft
8. 368 square in **9.** 605 square cm
10. 289 square cm

Page 58

1. 125 cm^3 **2.** 392 yd^3 **3.** 1260 cm^3
4. 4160 cm^3 **5.** 756 **6.** 312 **7.** 13440
8. 300000 **9.** 8 **10.** 6 **11.** 13
12. 2316 **13.** 709.5 **14.** 310.92
15. 142.36

Page 61

1. 20 hours **2.** 1.5 meters
3. 102 centimeters **4.** 275 square meters
5. 512 cubic meters **6.** $82.80
7. 1000 cubic feet **8.** 1.8 meters
9. 2:45 P.M. **10.** Yes