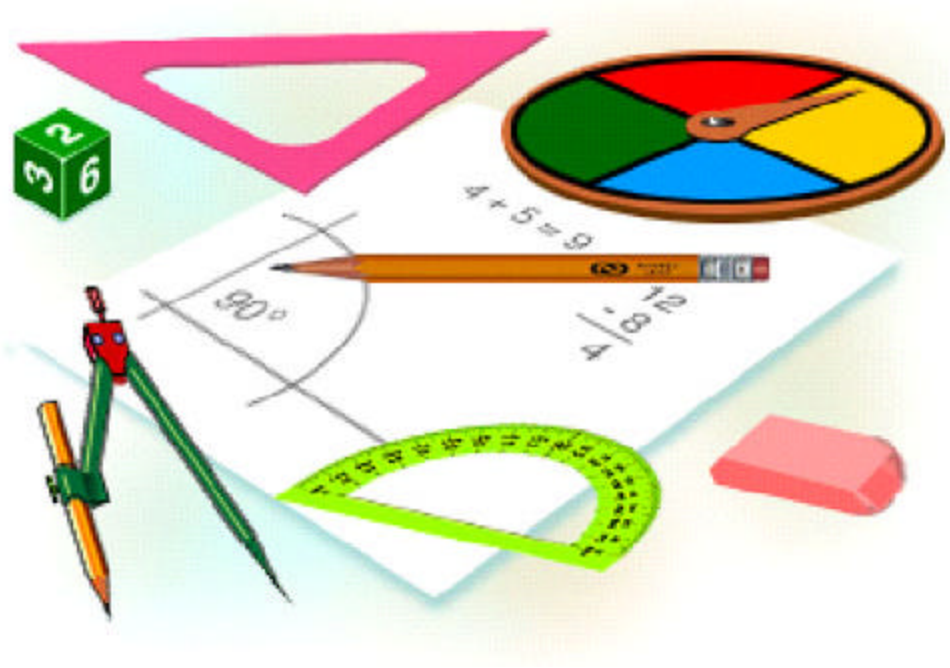
The Next Step

Mathematics Applications for Adults



Book 14012 - Measurement

OUTLINE

Mathematics - Book 14012

Measurement
Time
demonstrate an understanding of time (minutes, hours, a day, a week, a month).
state time indicated on an analog clock face in numerals to the nearest minute.
name the days of the week and months of the year.
Money
identify value of coins: penny (cent), nickel, dime, quarter, loonie, and toonie.
use of the “$” and “¢” signs.
use of decimal point to write dollar/cent amounts.
Temperature
accurately read temperature in degrees Celsius, above and below zero.
describe temperature in ordinary terms.

THE NEXT STEP

Book 14012

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***; therefore a month is approximately four weeks long. 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.

THE
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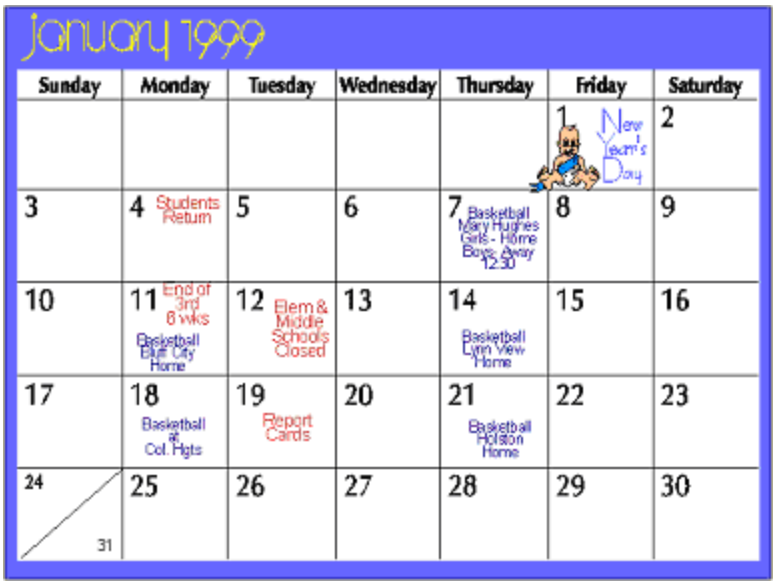
2001
CALENDAR

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

Analog Clock

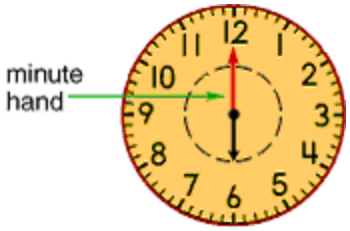
We divide ***days*** into 24 ***hours***, but hours are divided into ***60*** parts. Roman astronomers called each division a ***par minuta*** or "small part of an hour." From the Latin name comes our word ***minute***. These early astronomers also divided minutes into *60* equal parts. They called each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

Measures of Time

1 minute (min.) = 60 seconds (sec.)
1 hour (hr.) = 60 minutes
1 day (da.) = 24 hours
1 week (wk.) = 7 days
1 year (yr.) = 365 days

Hour Hand

Minute Hand



Second 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.**

How to Tell Time

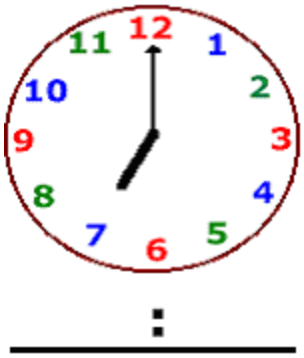
This clock demonstrates how minutes are to be read on an analog clock face. We know that there are 60 minutes in one hour, so the minute hand indicates the number of minutes that we are to read. In this picture, the minute hand (the longer red hand) is pointing at the 2 which stands for 10 minutes. The 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

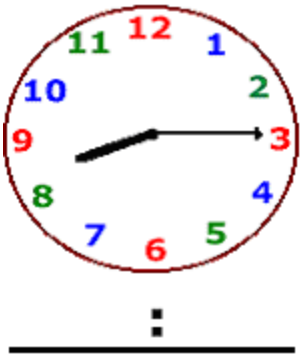
hour hand points at the 10.

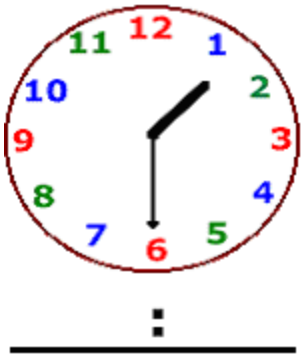
To figure out the minutes on a clock face, you must skip count by fives. For example, the 1 represents 5 minutes, the 2 represents 10 minutes, the 3 represents 15 minutes…and so on.

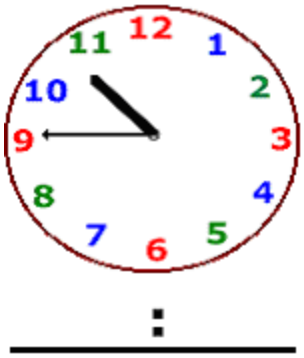
Practice Exercise

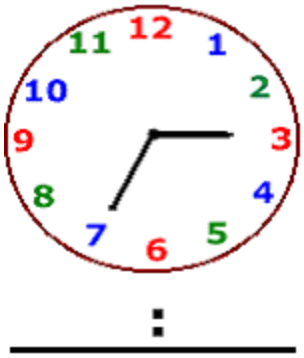
Can you tell what time it is? The big hand tells the hour and the little hand tells the minutes. You start with the big hand and say the hour and then the little hand and say the minutes. So the first clock's time is 7:00. Try the rest and see how well you can tell time.

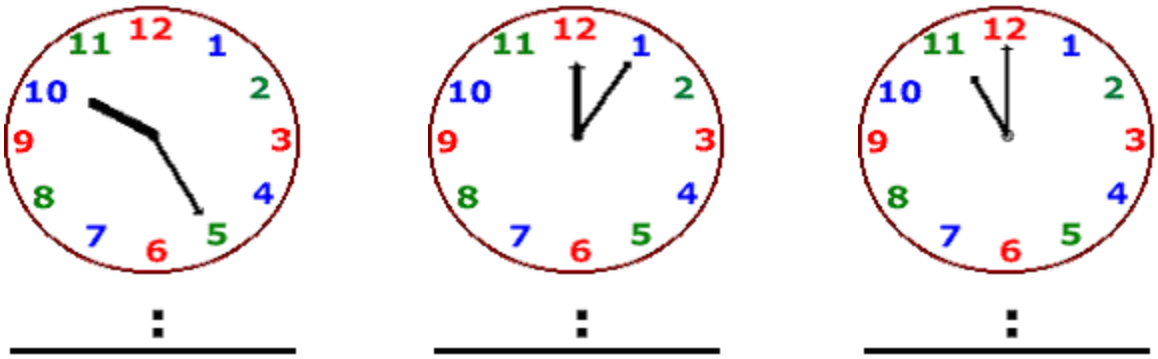












Standard time means the measurement of the day in two blocks of twelve hours each. The twelve hours from midnight to just before noon are ***a.m.*** hours. The twelve hours from noon until just before midnight are ***p.m.*** hours. The abbreviations "a.m." and "p.m." come from the Latin for ***ante meridiem***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

Digital Clock

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 "12:38". That means 12 hours and 38 minutes. You will also notice that the numbers are proceeded by the letters "A.M." which tells us that this clock is reading "12:38 in the morning", "38 minutes after 12", "38 minutes past 12", "38 minutes

after midnight", "38 minutes past midnight", "22 minutes before 1", or "22 minutes to 1".

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 money is divided into coins and bills. The value of the coins are

a penny	1 cent	.01 or 1¢
a dime	5 cents	.05 or 5¢
a quarter	25 cents	.25 or 25¢
a loonie	100 cents	$1.00 or 100¢
a toonie	200 cents	$2.00 or 200¢

Penny (Cent)

Nickel

Dime

Quarter

Dollar (Loonie)

Toonie

The value of the bills are

5 dollars	$5.00	500 cents
10 dollars	$10.00	1000 cents
20 dollars	$20.00	2000 cents
50 dollars	$50.00	5000 cents
100 dollars	$100.00	10000 cents


BANK OF CANADA • BANQUE DU CANADA
5
CANADA
CINQ • FIVE
DOLLARS
5


5
CANADA
ANV6665666
ANV6665666
5


10
CANADA
TEN • DIX
DOLLARS
10
SPECIMEN
SPECIMEN
BANQUE DU CANADA • BANK OF CANADA


10
CANADA
SPECIMEN
SPECIMEN
FDT5479469
FDT5479469
10


20
20
BANK OF CANADA
CANADA
BANQUE DU CANADA
CE BILLET A COURS LÉGAL · THIS NOTE IS LEGAL TENDER
OTTAWA
1991
VINGT · DOLLARS · TWENTY


20
CANADA
AIG6265533
AIG6265533
20


50
50
CANADA
OTTAWA
1988
FIFTY · DOLLARS · CINQUANTE


50
CANADA
FHL4830932
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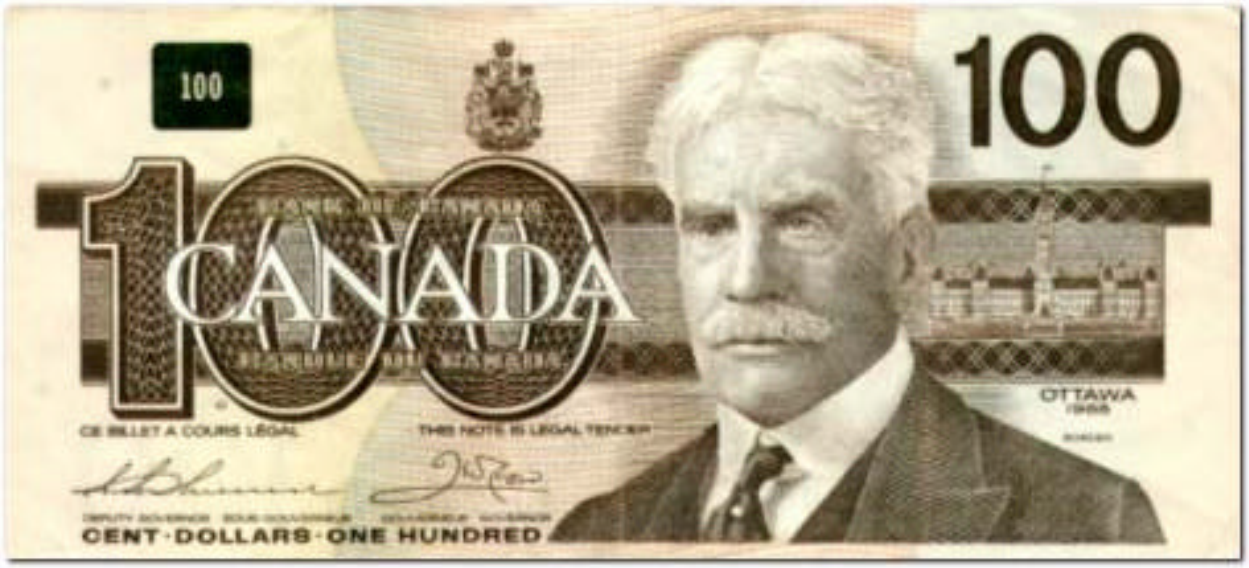


Canadian money is created in decimal-based currency. That means we can add, subtract, divide, and multiply money the same way we do any decimal numbers.

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 is read as 1 dollar and 11 cents
$4.63 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

Temperature

A temperature reading determines the hotness or coldness of a material. The faster the molecules move in a material; the higher the temperature. The slower the molecules move in a material; the lower the temperature.

Temperature is the measure of heat energy. Most people choose to use a thermometer to measure temperature. The most common thermometer consists of a column of red alcohol or mercury that expands when it is heated. As the alcohol expands, it moves up the column resulting in a higher temperature reading.

Alcohol thermometers contain alcohol which has a low boiling point, so it can't be used to measure high temperatures. It has, however, a low freezing point and can be used to measure very low temperatures.

Mercury is the only metal that is liquid at room temperature. It has a high boiling point and can be used to measure high

temperature, but it freezes at –40 degrees Celsius, so it can't be used to measure very low temperatures.

Clinical thermometers contain mercury but are shorter than regular thermometers. The passageway that holds the mercury is much narrower than regular thermometers so that one tenth of a degree will be very noticeable and makes the thermometer easier to read. It is ideal for determining body temperature.

Normal temperature for a human is 37 degrees Celsius. Body temperatures of higher than 40 degrees Celsius and below 36 degrees Celsius indicate serious medical problems.

Metal thermometers contain no liquid. Instead they have two strips of metal fused together. The two metals expand and contract at different temperatures. As a result the strips bend. A metal pointer is attached to the strip and as the metal bends the arrow on the pointer indicates the temperature.

The Centigrade Scale

In 1742, Swedish astronomer Anders Celsius (1701 - 1744) invented a scale for measuring heat. His scale is called the ***centigrade*** or ***Celsius*** scale. Celsius's scale is based on the freezing and boiling points of water. The freezing point of water is 0 degrees Celsius. The boiling point is 100 degrees Celsius. While the Fahrenheit scale is used in the United States, the centigrade scale is used in most countries throughout the world. It is the scale preferred by scientists.

The markings on a thermometer are in degrees.
We read the degrees as:
above zero +1, +2, +3, ……
below zero -1, -2, -3, ……..

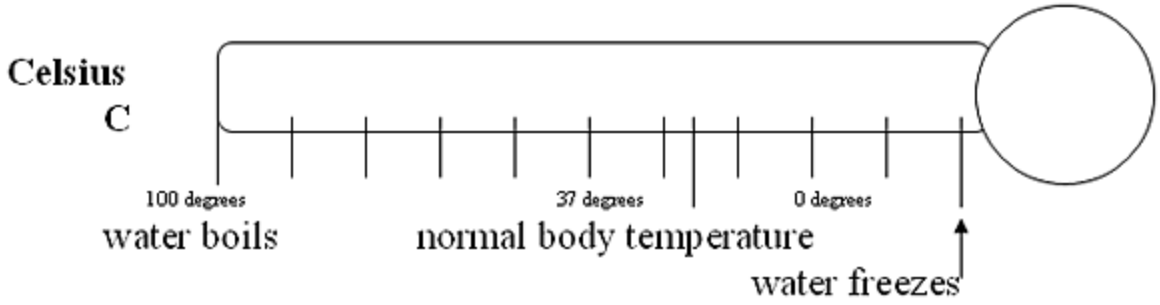
A degree Celsius memory device:

There are several **memory aids** that can be used to help the novice understand the degree Celsius temperature scale. **One such device** is:

*When it's **zero** it's **freezing**,*
*when it's **10** it's **not**,*
*when it's **20** it's **warm**,*
*when it's **30** it's **hot**!*

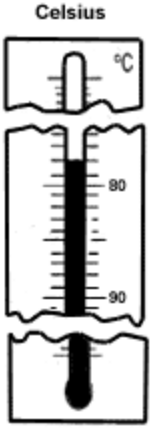
Or, another one to remember:

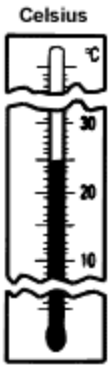
30's hot
20's nice
10's cold
zero's ice



Practice Exercise

The temperature on the Celsius thermometer below is -78 degrees. This can be written as -78℃.



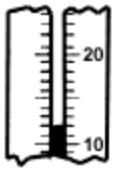


The temperature on the Celsius Thermometer is 25 degrees. This Can be written as 25 C.

Record the temperature reading shown on each thermometer.

1.

a



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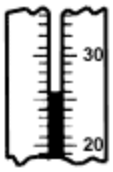
b



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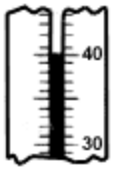
c



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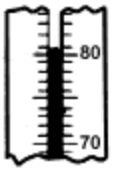

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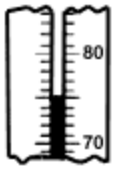

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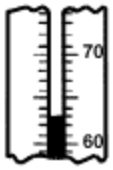

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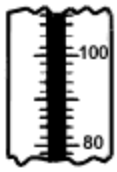

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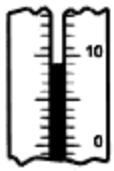

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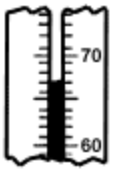

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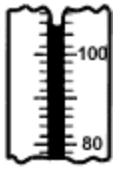

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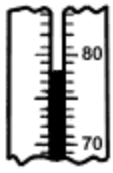

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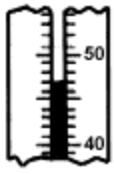

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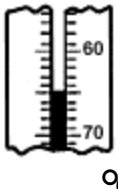

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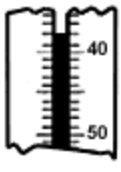

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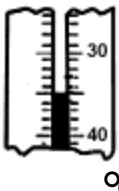

_____°C.

Answer Key

Book 14012 – Measurement

Page 9

Row 1: 7:00, 8:15, 1:30
Row 2: 10:45, 9:10, 2:35
Row 3: 10:25, 12:05, 11:00

Page 23

Row 1: 12 degrees, 26 degrees, 40 degrees, 81 degrees
Row 2: 75 degrees, 63 degrees, 104 degrees, 9 degrees
Row 3: 67 degrees, 103 degrees, 78 degrees, 47 degrees
Row 4: -65 degrees, -28 degrees, -38 degrees, -35 degrees