Math Series
Measurement

Measuring Time and Temperature

careertech
RCCTA Resource Center for CareerTech Advancement

Oklahoma Department of Career and Technology Education
Resource Center for CareerTech Advancement

Printed in the United States of America by the
Oklahoma Department of Career and Technology Education
Stillwater, OK 74074-4364

Measuring Time and Temperature

Time is a unit of measurement that we use every day. It determines when we get up, when we eat our meals, when we go to work, and when we go to bed. We even use time whenever we speak by using past, present, or future tense.

Temperature is also a measurement we use in our daily lives. When our body temperature is normal, we feel healthy. When the weather outside is cold, we wear warmer clothes. And most of us prefer to eat hot soup or cold ice cream. Time and temperature share something else in common. Both are based on the relationship of the earth to the sun. A day is based on how much sunlight we get, and a year is based on how long it takes the earth to orbit the sun. Likewise, the temperature on earth is based on how much heat the sun generates. It turns out that the sun is the central element of both time and temperature.

You use different tools to measure time and temperature every day. CLOCKS, WATCHES, and CALENDARS help you to keep track of time. Temperature is a daily concern of people everywhere. Galileo is credited with creating the first THERMOMETER in 1592. Today, we still use thermometers to measure temperature. You may still be familiar with the GLASS MERCURY THERMOMETER; you probably used one to take your temperature under your tongue (where the blood vessels are close to the surface). In the modern health care field, PORTABLE ELECTRONIC THERMOMETERS are used. These thermometers eliminate the human errors and variations that are possible when reading a glass mercury thermometer.

SPECIFIC OBJECTIVES

1. Identify the units used to measure time.
2. List the abbreviations of units used to measure time.
3. Explain the basic elements of a calendar.
4. Explain how to read an analog clock.
5. State the steps for telling time.
6. Determine the time using an analog clock. (Assignment Sheet 1)
7. Distinguish between the 12-hour clock and the 24-hour clock.
8. Interpret the time using a 24-hour clock. (Assignment Sheet 2)
9. Explain world time zones.

10. Calculate time around the world. (Assignment Sheet 3)
11. Identify the time zones in the continental United States.
12. Calculate time in the United States. (Assignment Sheet 4)
13. Explain how to convert units of time between larger and smaller units.
14. Convert units of time. (Assignment Sheet 5)
15. State principles for adding and subtracting units of time.
16. Calculate measurements of time using addition and subtraction. (Assignment Sheet 6)
17. Identify the units used to measure temperature.
18. State the formulas for converting units of temperature between the metric and English systems.
19. Calculate the temperature by converting units between the metric and English systems. (Assignment Sheet 7)
20. Solve word problems involving time and temperature. (Assignment Sheet 8)

Focus Assignment

Outline all of the activities you completed yesterday from the time you woke up until the time you went to sleep. Include what time you completed each activity. (Example: 6:00-6:15 A.M. – ate breakfast).

Look back over your outline: What does it show about your use of time? If you would change how you use time, how would you change it?

Did You Know?

In 2000 B.C., the Egyptians invented the very first clocks called shadow clocks. In 800 B.C., the Egyptians invented the sundial. In 1290, the Europeans invented the first mechanical clock. In 1948, the first atomic clock was built in the United States, which today can measure time to the billionth of a second.

objective 1

IDENTIFY THE UNITS USED TO MEASURE TIME.

- 60 seconds = 1 minute
- 60 minutes = 1 hour
- 24 hours = 1 day
- 7 days = 1 week
- 52 weeks = 1 year
- 12 months = 1 year
- 10 years = 1 decade
- 100 years = 1 century
- 1,000 years = 1 millennium

Did You Know?

The ancient Egyptians were the first to divide a day into 24 equal parts. They determined that there were 12 hours of daylight and 12 hours of darkness. However, as the length of daylight changed throughout the year, so did the length of hours. It was the Babylonians, in about 3000 B.C., who were the first to make all 24 hours of equal length. The Sumerians first divided hours into minutes and seconds about 5,000 years ago. They based their counting system on 60s (rather than 10s used in the decimal system) because 60 is easily divided by 2, 3, 4, 5, 6, and 10.

objective 2

LIST THE ABBREVIATIONS OF UNITS USED TO MEASURE TIME.

- sec. = second(s)
- min. = minute(s)
- hr. = hour(s)
- da. = day(s)
- wk. = week(s)
- mo. = month(s)
- yr. = year(s)
- C. = century(ies)

Did You Know?

Trees are some of nature's most accurate timekeepers. Their growth layers, appearing as rings in the cross section of the tree trunk, record evidence of floods, droughts, insect attacks, lightning strikes, and even earthquakes. Because the water cycle, or hydrologic cycle, is uneven—that is, the amount of water in the environment varies from year to year—scientists use tree-ring patterns to reconstruct regional patterns of drought and climatic change. This field of study, known as dendrochronology, was begun in the early 1900's by an American astronomer named Andrew Ellicott Douglass.

Dendrochronologists seldom cut down a tree to analyze its rings. Instead, core samples are extracted using a borer that is screwed into the tree and pulled out, bringing with it a straw-size sample of wood about 4 millimeters in diameter. The hole in the tree is then sealed to prevent disease. Core sample patterns are alternating dark and light lines. The darker lines represent the end of a growing season. The light-colored space between the darker lines represents one growing season. Tree rings are formed from the center of the tree outward. The ring closest to the bark is the youngest and final growth ring. The ring closest to the center of the tree is the oldest growth ring. Similar ring patterns are found between trees growing under the same conditions. Widening of a ring indicates good growing conditions, while narrowing indicates poor ones.

Source: U.S. Department of the Interior, U.S. Geological Survey, **Logs of Straws: Dendrochronology**

objective 3 EXPLAIN THE BASIC ELEMENTS OF A CALENDAR.

- DAY—A complete day (24 hours) is the time it takes for the earth to rotate once on its axis. As the earth turns, half of the planet faces the sun and experiences daylight. The other half faces away from the sun and experiences nighttime.

- MONTH—A month was originally based on the amount of time it takes the moon to travel around the earth, which is approximately 29½ days. However, the calendar we use today measures months in 30 or 31 days (except February, which usually has 28 days) and is no longer based on the movements of the moon.

- YEAR—A solar year is the amount of time it takes the earth to travel around the sun, which is 365 days, 5 hours, 48 minutes, and 45.9747 seconds. Because a calendar year is only 365 days, we lose almost 6 hours every year. That means that about every four years we lose one day. To fix this problem, an extra day is added to the month of February every 4 years. These are called leap years and can only occur on years that are divisible by 4.

  EXAMPLE: The year 2000 is divisible by 4, so 2000 was a leap year. The year 1900 is not divisible by 4, so 1900 was not a leap year.

Did You Know?

In the English language, the days of the week are named after the sun, moon, gods, and goddesses. Monday is named after the moon. Tuesday is named after Tiu, the Anglo-Saxon god of war. Wednesday is named after Woden, the chief Anglo-Saxon god. Thursday is named after Thor, the Norse god of sky and thunder. Friday is named after Fria, the Norse goddess of love. Saturday is named after the Roman god Saturn. Sunday is named after the sun.

objective 4 EXPLAIN HOW TO READ AN ANALOG CLOCK.

- READING THE FACE OF A CLOCK

  - ▶ HANDS—There are three (3) pointers (called hands) on the face of a clock. The short hand indicates the hour; the longer, thicker hand indicates the minute; and the longest, thinnest hand indicates the second. These are called the hour hand, the minute hand, and the second hand. In the example on the right, the hour hand is pointing to the 4, the minute hand is pointing to the 2, and the second hand is pointing to the 10.

  - ▶ NUMBERS—There are twelve (12) numbers on the face of a clock. These numbers represent different amounts depending on which hand is pointing at them.

- READING HOURS—Each number on a clock represents one hour. As the hour hand moves from one number to the next, one hour has gone by. When the minute hand is pointed at the 12, the time is said to be "on the hour," which means no minutes are associated with the time.

Did You Know?

Originally, a clock face only had an hour hand that was stationary and numbers that rotated in a circle. Around the 15th century this was changed so that the hour hand rotated and the numbers remained stationary. It wasn't until the late 17th century that the minute hand was added.

EXAMPLE:			
HOW TO SAY THE TIME	One o'clock	Two o'clock	Three o'clock
HOW TO WRITE THE TIME	1:00	2:00	3:00

From Figure 1 to Figure 2, one hour has gone by. From Figure 1 to Figure 3, two hours have gone by.

- READING MINUTES—Each number on the clock represents a multiple of 5 when reading the minute hand. As the minute hand moves from one number to the next, 5 minutes have gone by. To start counting the minutes, begin at the 12, which represents 0 minutes.

EXAMPLE:			
HOW TO SAY THE TIME	Five minutes past one	Ten minutes past one	Twenty minutes past one
HOW TO WRITE THE TIME	1:05	1:10	1:20

From Figure 1 to Figure 2, five minutes have gone by. From Figure 1 to Figure 3, fifteen minutes have gone by.

- READING SECONDS—The seconds on a clock are read in the same way as the minutes. Each number on the clock represents a multiple of 5 when reading the second hand. As the second hand moves between two numbers, 5 seconds have gone by.

objective 5 STATE THE STEPS FOR TELLING TIME.

- STEP 1: Determine where the hour hand is pointing. In the example to the right, it is pointing to the 8.
- STEP 2: Determine where the minute hand is pointing. In the example to the right, the minute hand is pointing to the 5. Remember that each number represents 5 minutes, so counting by fives from the 12 to the 5 we get 25 minutes.
- STEP 3: Determine where the second hand is pointing. In the example to the right, the second hand is pointing to the 11. We count seconds the same way we count minutes. So counting by fives from the 12 to the 11, we get 55 seconds.
- STEP 4: Put it all together. When the hour hand is pointing at the 8 and the minute hand is pointing at the 5, it is 25 minutes past 8 o'clock. And that's exactly how you say it. If someone were to ask you the time, and you looked at the clock above, you would say:

"The time is twenty-five minutes past eight o'clock."
"The time is twenty-five minutes past eight."
"The time is eight twenty-five."

Any one of these is correct. The way you would write the time is 8:25. (Seconds are so small, that people usually only care about hours and minutes when determining the time of day. If you wanted to give the exact reading of the time—such as during a race—you would say, "The time is eight twenty-five and fifty-five seconds." You would write the time as 8:25:55.)

objective 6 COMPLETE ASSIGNMENT SHEET 1.

objective 7 DISTINGUISH BETWEEN THE 12-HOUR CLOCK AND THE 24-HOUR CLOCK.

words you should know

MIDNIGHT	stands for "middle of the night;" the time when one day ends and another day begins
NOON	the time exactly halfway through the day

- 12-HOUR CLOCK—The 24 hours of a day are divided into two categories. The hours from midnight to noon are called **ante meridiem** (abbreviated A.M.), which is Latin for "before noon." The hours from noon to midnight are called **post meridiem** (abbreviated P.M.), which is Latin for "after noon."

  EXAMPLE: Eight o'clock in the morning is written as 8:00 A.M. Eight o'clock in the evening is written as 8:00 P.M.

- 24-HOUR CLOCK—The 24 hours of a day start at 0 (midnight) and end at 23 (11:00 P.M.). This system of measuring the hours in a day is used in most countries outside the United States. In the United States, this system is often called "military time."

Did You Know?

From December to January, the South Pole is known as the "land of the midnight sun" because the sun never sets. Meanwhile, in the North Pole, the sun never rises, and for those two months, daylight is never seen in the North Pole. In June and July, the circumstances are reversed and the North Pole never experiences nighttime and the South Pole never experiences daylight.

12-HOUR CLOCK	24-HOUR CLOCK
12:00 A.M. (midnight)	0000
1:00 A.M.	0100
2:00 A.M.	0200
3:00 A.M.	0300
4:00 A.M.	0400
5:00 A.M.	0500
6:00 A.M.	0600
7:00 A.M.	0700
8:00 A.M.	0800
9:00 A.M.	0900
10:00 A.M.	1000
11:00 A.M.	1100
12:00 P.M. (noon)	1200
1:00 P.M.	1300
2:00 P.M.	1400
3:00 P.M.	1500
4:00 P.M.	1600
5:00 P.M.	1700
6:00 P.M.	1800
7:00 P.M.	1900
8:00 P.M.	2000
9:00 P.M.	2100
10:00 P.M.	2200
11:00 P.M.	2300

objective 8 COMPLETE ASSIGNMENT SHEET 2.

objective 9 EXPLAIN WORLD TIME ZONES.

- The world is divided into 25 time zones. All clocks within each time zone tell the same time.
- All time zones are based on the time in Greenwich, England. This is the point where the meridian is 0° longitude. (The world is divided into sections by imaginary lines called longitude and latitude. Longitudinal lines—also called meridians—run north to south, and latitudinal lines run east to west.)
- The system of time is called the Greenwich Mean Time (GMT) or Coordinated Universal Time (UTC). Each time zone is usually identified in terms of UTC, although GMT is also used. For example, the time zone in Paris, France is UTC+1 (one hour ahead or later than UTC), and the time zone in Los Angeles, California is UTC-8 (8 hours behind or earlier than UTC).
  - ▶ As you travel west of Greenwich, England, you lose one hour for each time zone you cross (UTC-1).
  - ▶ As you travel east of Greenwich, England, you gain one hour for each time zone you cross (UTC+1).
- The International Date Line is a meridian located in the Pacific Ocean at 180° longitude. As you cross this line, the date changes and you either lose or gain one entire day. The western side of the line is one whole day ahead of the eastern side of the line.

Did You Know?

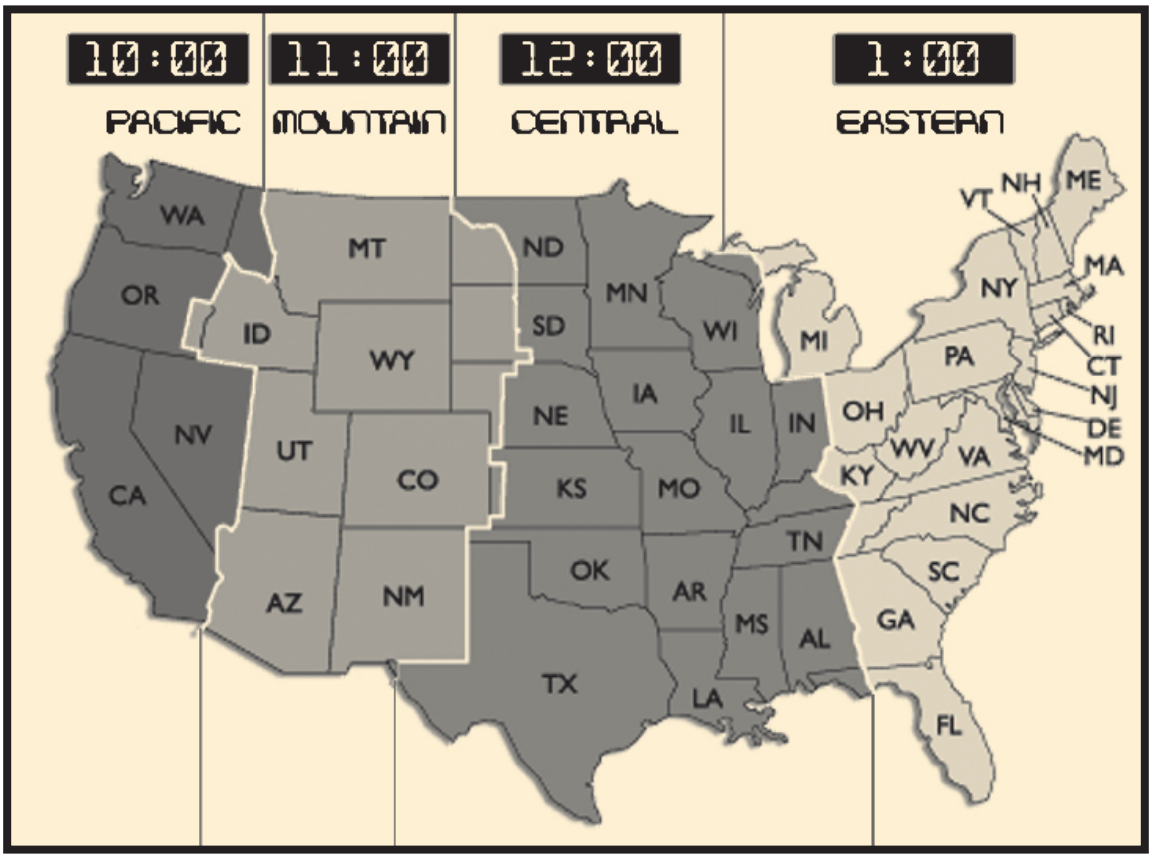
Until the end of the 19th century, the time displayed on clocks was determined by solar time, which determined the time of day by the location of the sun. This meant that most clocks within the same town would tell the same time; however, two towns that were just a few miles apart might have different times. As the railway industry began to grow in the late 1800's, having several different times in one geographic region began to be a problem. In order to develop accurate timetables for the trains, there needed to be a standard time that all areas within one region would follow. In 1884, the International Meridian Conference was held in Washington, D.C., and the system of time zones we now use today was created.

objective 10 COMPLETE ASSIGNMENT SHEET 3.

objective 11 IDENTIFY THE TIME ZONES IN THE CONTINENTAL UNITED STATES.

words you should know

CONTINENTAL UNITED STATES	the 48 states, which excludes Alaska and Hawaii, but includes the District of Columbia



--> **NOTE:** Oklahoma is in the Central Standard Time zone (CST).

TIME ZONE	RELATION TO CST	RELATION TO UTC/GMT	EXAMPLES
Eastern Standard Time (EST)	CST + 1	UTC – 5	1:00 P.M. EST = 12:00 P.M. CST 7:00 A.M. EST = 12:00 P.M. UTC
Central Standard Time (CST)	CST	UTC – 6	12:00 P.M. CST = 12:00 P.M. CST 6:00 A.M. CST = 12:00 P.M. UTC
Mountain Standard Time (MST)	CST – 1	UTC – 7	11:00 A.M. MST = 12:00 P.M. CST 5:00 A.M. MST = 12:00 P.M. UTC
Pacific Standard Time (PST)	CST – 2	UTC – 8	10:00 A.M. PST = 12:00 P.M. CST 4:00 A.M. PST = 12:00 P.M. UTC

Did You Know?

Besides the four time zones used in the continental United States, there are four additional American time zones: the Atlantic Standard Time (AST), which includes part of Puerto Rico; the Alaskan Standard Time (AST), which includes most of Alaska; the Hawaii-Aleutian Standard Time (HST), which includes all of Hawaii and the remainder of Alaska; and the Samoa Standard Time, which includes an area in the Pacific Ocean.

objective 12

COMPLETE ASSIGNMENT SHEET 4.

objective 13

EXPLAIN HOW TO CONVERT UNITS OF TIME BETWEEN LARGER AND SMALLER UNITS.

- FROM LARGER TO SMALLER UNITS

RULE	Multiply the given number of larger units by the number of smaller units contained in one larger unit.
FORMULA	(given number of larger units) x (number of smaller units per larger unit) = answer in smaller units
EXAMPLE	How many days are in 3 weeks? Given number of larger units = 3 weeks Number of smaller units per larger unit = 7 days per 1 week or $\frac{7 \text{ da.}}{1 \text{ wk.}}$ (3 weeks) x $\frac{7 \text{ da.}}{1 \text{ wk.}}$ = 21 days There are 21 days in 3 weeks.

- FROM SMALLER TO LARGER UNITS

RULE	Divide the number of smaller units by the number of smaller units in one larger unit.
FORMULA	$\frac{\text{given number of smaller units}}{\text{number of smaller units per 1 larger unit}}$ = answer in larger units
EXAMPLE	How many minutes are in 360 seconds? Given number of smaller units = 360 seconds Number of smaller units per larger unit = 60 seconds per 1 minute $\frac{360 \text{ seconds}}{60 \text{ seconds per 1 minute}}$ = 6 minutes There are 6 minutes in 360 seconds.

objective 14

COMPLETE ASSIGNMENT SHEET 5.

objective 15 STATE PRINCIPLES FOR ADDING AND SUBTRACTING UNITS OF TIME.

- ADDING UNITS

  Add like units.

  Simplify the answer by converting smaller units into larger units when possible.

  EXAMPLE: Add 7 hours 25 minutes to 2 hours 50 minutes.

	7 hr. 25 min.	Add minutes to minutes.
+	2 hr. 50 min.	Then add hours to hours.
	9 hr. 75 min.	

  Because 75 minutes is more than 1 hour, convert the 75 minutes into hours.

  $$\frac{75 \text{ min.}}{60 \text{ min. per 1 hr.}} = 1 \text{ hr. } 15 \text{ min.}$$

  Add the 1 hour to the 9 hours:

  9 hours 75 minutes = 9 hours + 1hour 15 minutes
  = 10 hours 15 minutes

- SUBTRACTING UNITS

  Subtract like units if possible. If not, regroup units to allow for subtraction.

  Write the answer in simplest form.

  EXAMPLE: Subtract 4 years 4 months from 10 years 8 months.

	10 yr. 8 mo.	Subtract months from months.
–	4 yr. 4 mo.	Then subtract years from years.
	6 yr. 4 mo.	

  EXAMPLE: Subtract 4 weeks 5 days from 6 weeks 3 days.

	^{5} ^{10} 6 wk. 3 da.	1 week = 7 days, and 3 days plus 7 days = 10 days
–	4 wk. 5 da.	
	1 wk. 5 da.	

objective 16 COMPLETE ASSIGNMENT SHEET 6.

objective 17 IDENTIFY THE UNITS USED TO MEASURE TEMPERATURE.

- ENGLISH UNIT
  - ▶ Fahrenheit (°F)
- METRIC UNITS

  --> **NOTE:** The metric system uses two scales to measure temperature. The Kelvin scale is mainly used by scientists. The Celsius scale is used by every day people; however scientists do use it as well.

  - ▶ Celsius (°C)
  - ▶ Kelvin (°K)

    --> **NOTE:** The Kelvin scale was designed so that 0° is the coldest possible temperature, which is called absolute zero. Unlike the Celsius or the Fahrenheit scale, the Kelvin scale never goes below 0°.

	CELSIUS (°C)	FAHRENHEIT (°F)	KELVIN (°K)
Melting point of ice	0	32	273
Boiling point of water	100	212	373

Did You Know?

Heat is one result of kinetic energy—the energy of movement. The molecules of every substance are moving; even those making up solid substances are constantly in motion (although the range of that motion is much smaller than for liquids or gases). When a substance is "hot," its molecules are moving about very rapidly. When a substance is "cold," its molecules are moving less rapidly.

Source: Tennessee Valley Authority

objective 18 STATE THE FORMULAS FOR CONVERTING UNITS OF TEMPERATURE BETWEEN THE METRIC AND ENGLISH SYSTEMS.

- ENGLISH TO METRIC: °F = (°C × 1.8) + 32
- METRIC TO ENGLISH: °C = (°F – 32) ÷ 1.8

--> **NOTE:** °K = °C + 273.16

Did You Know?

The Earth's core, 4,000 miles below the surface, can reach temperatures of 9000 degrees F.

Source: U.S. Department of Energy

objective 19 COMPLETE ASSIGNMENT SHEET 7.

objective 20 COMPLETE ASSIGNMENT SHEET 8.

ASSIGNMENT SHEETS

ASSIGNMENT SHEET 1

name _____ score _____

Equipment list

- pencil or pen

objective 6

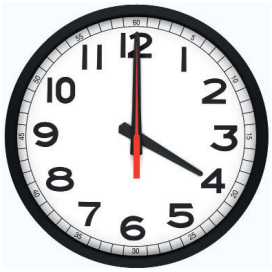
DETERMINE THE TIME USING AN ANALOG CLOCK.

INTRODUCTION

Clocks are all around us. In today's world digital clocks are becoming more popular, but it is not uncommon to see an analog clock. Most wristwatches still use an analog face, and most wall-hanging clocks are also analog. It is important, therefore, to be able to read and understand the time displayed on an analog clock. It is also important to understand how to communicate the time when talking with others.

Part 1—When the minute hand is on the 12, we say the time is on the hour. This means there are no minutes associated with the time. In the spaces provided under each picture, write how we say that time and how we write that time.

1.



Spoken: _____

Written: _____

2.

Spoken: _____

Written: _____

3.

Spoken: _____

Written: _____

4.

Spoken: _____

Written: _____

Part 2

Hours can also be divided into quarters. There are 4 quarter hours in 1 hour, and each quarter hour equals 15 minutes. These quarters occur on the hour, 15 minutes past the hour, 30 minutes past the hour, and 45 minutes past the hour.

			
On the hour	15 minutes past the hour	30 minutes past the hour	45 minutes past the hour

When referring to the times that occur at 15 minutes past the hour, 30 minutes past the hour, and 45 minutes past the hour, we say them a little differently than other times; however, they are written in exactly the same way.

			
HOW TO WRITE THE TIME	7:15	7:30	7:45
HOW TO SAY THE TIME	"Seven fifteen" or "Quarter past seven"	"Seven-thirty" or "Half-past seven"	"Seven forty-five" or "Quarter till eight"

For the following problems, write how the time in the picture would be written and the two different ways the time can be spoken.

5.

Written: _____

Spoken 1: _____

Spoken 2: _____

6.

Written: _____

Spoken 1: _____

Spoken 2: _____

7.

Written: _____

Spoken 1: _____

Spoken 2: _____

8.

Written: _____

Spoken 1: _____

Spoken 2: _____

9.

Written: _____

Spoken 1: _____

Spoken 2: _____

10.

Written: _____

Spoken 1: _____

Spoken 2: _____

11.

Written: _____

Spoken 1: _____

Spoken 2: _____

12.

Written: _____

Spoken 1: _____

Spoken 2: _____

Part 3

When we say the time, we normally say, "The number of minutes past the hour." For example, if the time is 3:10, we would say "The time is ten minutes past three." Or we might simply say, "The time is three ten."

This rule usually applies for minutes that occur between the whole hour and thirty minutes past the hour (which is also spoken as "half-past the hour.") For minutes between half-past the hour and the next hour, there is another way the time is commonly spoken. Look at the clock to the left.

We can express the time on the clock above in two ways. First, we can say, "The time is five-forty." Or we can say, "The time is twenty minutes till six" (which means in 20 minutes it will be six o'clock). You usually do not hear people say, "The time is forty minutes past five." As stated earlier, we normally only express the time using "minutes till" when referring to minutes that occur after half-past the hour and before the next whole hour.

There is also one other instance of how we say the time. When the time is five minutes past the hour (for example, 3:05), we still say, "The time is five minutes past three." However, instead of saying, "The time is three five," we say, "The time is three oh-five."

In the spaces provided, write how we write the time and how we say the time.

13.

Written: _____

Spoken 1: _____

Spoken 2: _____

14.

Written: _____

Spoken 1: _____

Spoken 2: _____

15.

Written: _____

Spoken 1: _____

Spoken 2: _____

16.

Written: _____

Spoken 1: _____

Spoken 2: _____

17.

Written: _____

Spoken 1: _____

Spoken 2: _____

18.

Written: _____

Spoken 1: _____

Spoken 2: _____

Part 4

Below are more practice problems that combine the concepts from Parts 1-3.

19.  Written: _____ Spoken 1: _____ Spoken 2: _____	20.  Written: _____ Spoken 1: _____ Spoken 2: _____
21.  Written: _____ Spoken 1: _____ Spoken 2: _____	22.  Written: _____ Spoken 1: _____
23.  Written: _____ Spoken 1: _____ Spoken 2: _____	24.  Written: _____ Spoken 1: _____ Spoken 2: _____

25.  Written: _____ Spoken 1: _____ Spoken 2: _____	26.  Written: _____ Spoken 1: _____ Spoken 2: _____
27.  Written: _____ Spoken 1: _____ Spoken 2: _____	28.  Written: _____ Spoken 1: _____ Spoken 2: _____
29.  Written: _____ Spoken 1: _____	30.  Written: _____ Spoken 1: _____ Spoken 2: _____

Part 5

In Parts 1-4, you have been given a clock and asked to interpret what it says. Now, you will be given the time and must express it using a clock.

Using the blank clocks, draw both the hour hand and the minute hand that correspond to the given time. (Remember that the hour hand is shorter than the minute hand.)

31.  Eleven fifteen	32.  Five after nine
33.  Ten till two	34.  Half past five
35.  Six forty-five	36.  Three twenty-five
37.  Seven-thirty	38.  Quarter till twelve
39.  Quarter past four	40.  Twenty past one

ASSIGNMENT SHEET 2

name _____ score _____

Equipment list
• pencil or pen

objective 8

INTERPRET THE TIME USING A 24-HOUR CLOCK.

INTRODUCTION

The 24-hour time system is the most commonly used time notation in the world today. Almost all digital clocks and watches that are sold outside the United States display time using the 24-hour notation.

The 24-hour clock displays time as **hours:minutes**, where hours is any number from 00 to 23 and minutes is any number from 00 to 59. Some clocks also display seconds using the **hours:minutes:seconds** notation, where seconds are also any number from 00 to 59. Notice that the 24-hour time notation places a zero in front of the hours, minutes, and seconds that are from 1 to 9. For example, 01:15:23, 10:02:06, and 17:56:09.

Part 1

Write the following times in 24-hour notation.

1. 12:25 A.M. _____
2. 3:10 P.M. _____
3. 6:45 P.M. _____
4. 1:35 A.M. _____
5. 4:40 P.M. _____
6. 11:00 P.M. _____
7. 7:20 A.M. _____
8. 5:55 A.M. _____
9. 8:55 P.M. _____
10. 10:30 A.M. _____

Part 2

Write the following times in 12-hour notation.

11. 17:10 _____

12. 04:20 _____

13. 10:05 _____

14. 08:45 _____

15. 15:25 _____

16. 06:35 _____

17. 01:55 _____

18. 13:30 _____

19. 22:40 _____

20. 20:50 _____

ASSIGNMENT SHEET 3

name _____ score _____

Equipment list
• pencil or pen

objective 10

CALCULATE TIME AROUND THE WORLD.

INTRODUCTION

Due to modern technology and the movement of businesses into the global market, it is becoming more common for people in different international time zones to communicate, often on a daily basis. It is important to understand how these time zones relate to each other to ensure that you are contacting people when they are available (and not calling them in the middle of the night when they are sleeping)!

Part 1

For each row, use the time for the given time zone to fill in the boxes for the remaining time zones. Visit http://wwp.greenwichmeantime.com/gmt-converter.htm to verify your answers.

	ALASKA (UTC-10)	NEW YORK (UTC-5)	SOUTH AFRICA (UTC+2)	CHINA (UTC+8)	AUSTRALIA (UTC+10)
1.		8:00 A.M.			
2.				2:00 P.M.	
3.			7:00 P.M.		
4.	11:00 A.M.				
5.					12:00 P.M.
6.		5:00 P.M.			

Part 2

Use the table in Part 1 to answer the following questions.

7. Charlie works for an international business and is located at the New York branch. He wants to set up a conference call with the office in Australia. If he is scheduled to call them at 4:00 P.M. his time, what time will it be in Australia?

8. Nick lives in New York and has been sent to Alaska on a business trip. He has arranged to call his wife at 9:00 P.M. her time. What time does Nick need to make the call?

9. Rebecca lives in South Africa and needs to organize a conference call with a business group located in China. The group in China has requested the meeting be in the early afternoon. At what time should Rebecca arrange to call them from South Africa?

10. Cindy is from Alaska and is visiting Australia with a friend. If she calls her home from the hotel at 4:00 in the afternoon, what time will it be in Alaska? If she calls on a Thursday, what day will it be in Alaska?

ASSIGNMENT SHEET 4

name _____ score _____

Equipment list

- pencil or pen

objective 12

CALCULATE TIME IN THE UNITED STATES.

INTRODUCTION

It is not uncommon in the United States for family members to live in different time zones. Nor is it uncommon to travel from one time zone to another. Television programs are also sometimes listed in different time zones, depending on where they are being shown.

Part 1

For each row, use the time for the given time zone to fill in the boxes for the remaining time zones.

	EST	CST	MST	PST
1.	10:00 A.M.			
2.			4:00 P.M.	
3.		8:00 A.M.		
4.				9:00 A.M.
5.			2:00 A.M.	
6.	3:00 P.M.			
7.		6:00 P.M.		
8.				10:00 P.M.
9.			7:00 P.M.	
10.		11:00 P.M.		

Part 2

Use the table in Part 1 to answer the following questions.

11. A television football game began at 12:00 P.M. PST. At what time was the game seen in Denver (MST)?

12. Nancy lives in Kansas City, MO (CST). She is scheduled to have a conference call with a client at 10:00 EST. At what time does Nancy need to place the call from Kansas City?

13. When it turns 12:00 midnight in New York City, what time is it in Seattle, Washington (PST)?

14. A conference call is scheduled involving people in Boston (EST), St. Louis (CST), and Denver (MST). The call is scheduled to begin at 11:00 A.M. CST. What time does each group need to call in?

15. Rick lives in Los Angeles, CA (PST). If he calls his sister in Tampa, FL (EST) at 10:00 P.M. his time, what time will it be in Tampa?

ASSIGNMENT SHEET 5

name _____ score _____

Equipment list
• pencil or pen
• calculator

objective 14

CONVERT UNITS OF TIME.

INTRODUCTION

It is common to deal with time in different units. For example, if you are applying for a loan for a new car, the loan would probably state that you must make the payment for 72 months. For how many years would you be paying the loan? In this example, you would have to make payments for 6 years.

INSTRUCTIONS

Write your answers in the spaces provided.

Part 1 – Converting time from larger to smaller units

--> **NOTE:** "Millennia" is the plural form of "millennium."

1. 4 hr. = _____ min.
2. 2 da. = _____ hr.
3. 5 wk. = _____ da.
4. 8 decades = _____ yr.
5. 10 min. = _____ sec.
6. 9 C. = _____ yr.
7. 7 yr. = _____ mo.
8. 5 yr. = _____ wk.
9. 5 millennia = _____ yr.
10. 2 wk. = _____ hr.
11. 4 decades = _____ mo.
12. 10 yr. = _____ da.
13. 12 hr. = _____ sec.
14. 1 da. = _____ min.

15. 3 millennia = _____ mo.

16. 7 decades = _____ wk.

17. 2 wk. = _____ min.

18. 6 C. = _____ wk.

19. 4 decades = _____ da.

20. 1 yr = _____ sec.

Part 2 - Converting time from smaller to larger units

21. 49 da. = _____ wk.

22. 500 yr. = _____ C.

23. 120 sec. = _____ min.

24. 72 hr. = _____ da.

25. 10,000 yr. = _____ millennia

26. 208 wk. = _____ yr.

27. 60 mo. = _____ yr.

28. 180 min. = _____ hr.

29. 90 yr. = _____ decades

30. 2,555 da. = _____ yr.

31. 3600 sec. = _____ hr.

32. 1,344 hr. = _____ wk.

33. 600 mo. = _____ decades

34. 500 yr. = _____ millennium

35. 8,640 min. = _____ da.

36. 1,040 wk. = _____ decades

37. 26,280 hr. = _____ yr.

38. 328,500 da. = _____ C.

39. 20,160 min. = _____ wk.

40. 35,040,000 hr. = _____ millennia

ASSIGNMENT SHEET 6

name _____ score _____

objective 16

CALCULATE MEASUREMENTS OF TIME USING ADDITION AND SUBTRACTION.

Equipment list

- pencil or pen

INSTRUCTIONS

Write your answers in the spaces provided. Express you answers in the simplest form.

Part 1 – Adding units of time

1.

	2 yr.	5 mo.
+	3 yr.	6 mo.

2.

	18 min.	14 sec.
+	4 min.	32 sec.

3.

	5 da.	15 hr.
+	1 da.	10 hr.

4.

	12 wk.	3 da.
+	23 wk.	6 da.

5.

	4 yr.	7 mo.
	1 yr.	4 mo.
+	3 yr.	8 mo.

6.

	14 hr.	25 min.
	2 hr.	11 min.
+	7 hr.	6 min.

7.

	12 wk.	6 da.	19 hr.
+	24 wk.	5 da.	12 hr.

8.

	4 decades	3 yr.	7 mo.
+	5 decades	9 yr.	11 mo.

9.

	4 hr.	45 min.	10 sec.
	9 hr.	22 min.	54 sec.
+	6 hr.	38 min.	7 sec.

10.

	2 da.	11 hr.	20 min.
	2 da.	8 hr.	42 min.
+	1 da.	6 hr.	14 min.

Part 2 – Subtracting units of time

11.

	5 da.	22 hr.
–	3 da.	15 hr.

12.

	3 hr.	14 min.
–	1 hr.	38 min.

13.

	7 yr.	2 mo.
–	2 yr.	7 mo.

14.

	20 wk.	1 da.
–	18 wk.	4 da.

15.

	25 min.	36 sec.
–	19 min.	49 sec.

16.

	9 yr.	27 wk.
–	4 yr.	43 wk.

17.

	2 decades	3 yr.
–	1 decade	8 yr.

18.

	6 da.	17 hr.	1 min.
–	2 da.	23 hr.	48 min.

19.

	9 yr.	33 wk.	4 da.
–	8 yr.	47 wk.	5 da.

20.

	14 yr.	120 da.
–	10 yr.	256 da.

ASSIGNMENT SHEET 7

name _____ score _____

Equipment list
• pencil
• calculator

objective 19

CALCULATE THE TEMPERATURE BY CONVERTING UNITS BETWEEN THE METRIC AND ENGLISH SYSTEMS.

INSTRUCTIONS

Write your answers in the spaces provided. Round your answers to the nearest degree.

Part 1 – Convert English units to metric units

1. 80°F = _____ °C
2. 52°F = _____ °C
3. 15°F = _____ °C
4. 103°F = _____ °C
5. -7°F = _____ °C
6. 0°F = _____ °C
7. 32°F = _____ C°
8. -20°F = _____ °C
9. 98°F = _____ °C
10. 60°F = _____ °C

Part 2 – Convert metric units to English units

11. 0°C = _____ °F

12. 100°C = _____ °F

13. 14°C = _____ °F

14. -10°C = _____ °F

15. 4°C = _____ °F

16. 35°C = _____ °F

17. 18°C = _____ °F

18. -30°C = _____ °F

19. 22°C = _____ °F

20. 85°C = _____ °F

ASSIGNMENT SHEET 8

name _____ score _____

Equipment list
• pencil
• calculator

objective 20

SOLVE WORD PROBLEMS INVOLVING TIME AND TEMPERATURE.

INSTRUCTIONS

Write your answers in the spaces provided.

1. A job requires 240 hours to complete. How many 5-day weeks of 8-hour days are required to get the job done?

2. It takes Liz 23 minutes to travel from her home to work. If she works 5 days a week, how much time does she spend commuting?

3. Kelly has just flown from New York to Seattle, Washington, but has forgotten to change her watch. If her watch says 8:45 P.M., what time is it in Seattle?

4. David and Mary are planning a trip to Paris, France. The temperature is going to be approximately 32°C. What kind of clothing should they pack? Explain your answer.

5. Calvin ran a marathon in 3 hours, 59 minutes, and 35 seconds. Matt ran the same marathon in 4 hours, 1 minute, and 12 seconds. How much faster was Calvin's time than Matt's time?

6. The clock on Michelle's DVR uses military time. If she wants to record a movie that starts at 9:00 P.M. and lasts for 2 hours and 45 minutes, at what times should she begin and stop the recording?

7. Karen has a grandfather clock that plays a chime every quarter of an hour. From 5:05 P.M. till 5:55 P.M., how many times will the clock chime?

8. The standard time zone for New Zealand is UTC+12. The standard time zone for Oklahoma is UTC-6. If Joe lives in Oklahoma and wants to call his friend Alex at 8:00 P.M. New Zealand time, what time does Joe need to call from Oklahoma?

ASSIGNMENT SHEET ANSWERS

ASSIGNMENT SHEET 1

PART 1

1. four o'clock, 4:00
2. seven o'clock, 7:00
3. nine o'clock, 9:00
4. twelve o'clock, 12:00

PART 2

5. 9:15, nine-fifteen, quarter past nine
6. 2:45, two forty-five, quarter till three
7. 11:30, eleven-thirty, half past eleven
8. 10:15, ten-fifteen, quarter past ten
9. 12:30, twelve-thirty, half past twelve
10. 3:45, three forty-five, quarter till four
11. 6:15, six-fifteen, quarter after six
12. 9:45, nine forty-five, quarter till ten

PART 3

13. 1:40, one-forty, twenty minutes till two
14. 10:25, ten twenty-five, twenty-five minutes past ten
15. 3:35, three thirty-five, twenty-five minutes till four
16. 5:50, five-fifty, ten minutes till six
17. 8:05, eight oh-five, five minutes past eight
18. 11:55, eleven fifty-five, five minutes till twelve

PART 4

19. 9:10, nine-ten, ten minutes past nine
20. 12:15, twelve-fifteen, quarter past twelve
21. 5:25, five twenty-five, twenty-five minutes past five
22. 11:00, eleven o'clock
23. 8:45, eight forty-five, quarter till nine
24. 10:20, ten-twenty, twenty minutes past ten
25. 6:30, six-thirty, half past six
26. 1:55, one fifty-five, five minutes till two
27. 4:45, four forty-five, quarter till five
28. 2:05, two oh-five, five minutes past two
29. 6:00, six o'clock
30. 3:40, three-forty, twenty minutes till four

PART 5

For questions 31-40, verify hands are drawn correctly on each clock.

ASSIGNMENT SHEET 2

PART 1

1. 00:25
2. 15:10
3. 18:45
4. 01:35
5. 16:40
6. 23:00
7. 07:20
8. 05:55
9. 20:55
10. 10:30

PART 2

11. 5:10 P.M.
12. 4:20 A.M.
13. 10:05 A.M.
14. 8:45 A.M.
15. 3:25 P.M.
16. 6:35 A.M.
17. 1:55 A.M.
18. 1:30 P.M.
19. 10:40 P.M.
20. 8:50 P.M.

ASSIGNMENT SHEET 3

PART 1

1. 3:00 A.M., 8:00 A.M., 3:00 P.M., 9:00 P.M., 11:00 P.M.
2. 8:00 P.M., 1:00 A.M., 8:00 A.M., 2:00 P.M., 4:00 P.M.
3. 7:00 A.M., 12:00 P.M., 7:00 P.M., 1:00 A.M., 3:00 A.M.
4. 11:00 A.M., 4:00 P.M., 11:00 P.M., 5:00 A.M., 7:00 A.M.
5. 4:00 P.M., 9:00 P.M., 4:00 A.M., 10:00 A.M., 12:00 P.M.
6. 12:00 P.M., 5:00 P.M., 12:00 A.M., 6:00 A.M., 8:00 A.M.

PART 2

7. 7:00 A.M.
8. 4:00 P.M.
9. 8:00 A.M.
10. 8:00 P.M. Wednesday

ASSIGNMENT SHEET 4

PART 1

1. 10:00 A.M., 9:00 A.M., 8:00 A.M., 7:00 A.M.
2. 6:00 P.M., 5:00 P.M., 4:00 P.M., 3:00 P.M.
3. 9:00 A.M., 8:00 A.M., 7:00 A.M., 6:00 A.M.
4. 12:00 P.M., 11:00 A.M., 10:00 A.M., 9:00 A.M.
5. 4:00 A.M., 3:00 A.M., 2:00 A.M., 1:00 A.M.
6. 3:00 P.M., 2:00 P.M., 1:00 P.M., 12:00 P.M.
7. 7:00 P.M., 6:00 P.M., 5:00 P.M., 4:00 P.M.
8. 1:00 A.M., 12:00 A.M., 11:00 P.M., 10:00 P.M.
9. 9:00 P.M., 8:00 P.M., 7:00 P.M., 6:00 P.M.
10. 12:00 A.M., 11:00 P.M., 10:00 P.M., 9:00 P.M.

PART 2

11. 1:00 P.M.
12. 9:00 A.M.
13. 9:00 P.M.
14. Boston – 12:00 P.M., St. Louis – 11:00 A.M., Denver – 10:00 A.M.
15. 1:00 A.M.

ASSIGNMENT SHEET 5

PART 1

1. 240 min.
2. 48 hr.
3. 35 da.
4. 80 yr.
5. 600 sec.
6. 900 yr.
7. 84 mo.
8. 260 wk.
9. 5,000 yr.
10. 336 hr.
11. 480 mo.
12. 3,650 da.
13. 43,200 sec.
14. 1,440 min.
15. 36,000 mo.
16. 3,640 wk.
17. 20,160 min.
18. 31,200 wk.
19. 14,600 da.
20. 31,536,000 sec.

PART 2

21. 7 wk.
22. 5 C.
23. 2 min.
24. 3 da.
25. 10 millennia
26. 4 yr.
27. 5 yr.
28. 3 hr.
29. 9 decades
30. 7 yr.
31. 1 hr.
32. 8 wk.
33. 5 decades
34. ½ millennium
35. 6 da.
36. 2 decades
37. 3 yr.
38. 9 C.
39. 2 wk.
40. 4 millennia

ASSIGNMENT SHEET 6

PART 1

1. 5 yr. 11 mo.
2. 22 min. 46 sec.
3. 7 da. 1 hr.
4. 36 wk. 2 da.
5. 9 yr. 7 mo.
6. 23 hr. 42 min.
7. 37 wk. 5 da. 7 hr.
8. 12 decades 3 yr. 6 mo.
9. 20 hr. 46 min. 11 sec.
10. 6 da. 2 hr. 16 min.

PART 2

11. 2 da. 7 hr.
12. 1 hr. 36 min.
13. 4 yr. 7 mo.
14. 1 wk. 4 da.
15. 5 min. 47 sec.
16. 4 yr. 36 wk.
17. 5 yr.
18. 3 da. 17 hr. 13 min.
19. 37 wk. 6 da.
20. 3 yr. 32 wk. 5 da.

ASSIGNMENT SHEET 7

PART 1

1. 27 °C
2. 11 °C
3. -9 °C
4. 39 °C
5. -22 °C
6. -18 °C
7. 0 °C
8. -29 °C
9. 37 °C
10. 16 °C

PART 2

11. 32 °F
12. 212 °F
13. 57 °F
14. 14 °F
15. 39 °F
16. 95 °F
17. 64 °F
18. -22 °F
19. 72 °F
20. 185 °F

ASSIGNMENT SHEET 8

1. 6 5-day weeks
2. 3 hr. 50 min.
3. 5:45 P.M.
4. 90 °F
5. 1 min. 37 sec.
6. start 21:00, finish 23:45
7. 3
8. 2:00 A.M.

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