LESSON 28

• Measuring Time and Elapsed Time

Power Up

facts

Power Up D or E

count aloud

Count by 12s from 12 to 72. Count by 5s from 2 to 52.

mental math

a. **Number Sense:** 100×25

b. **Number Sense:** 7×25

c. **Fractional Parts:** $\frac{1}{2}$ of 40

d. **Fractional Parts:** $\frac{1}{4}$ of 40

e. **Fractional Parts:** $\frac{3}{4}$ of 40

f. **Fractional Parts:** $\frac{1}{10}$ of 40

g. **Fractional Parts:** $\frac{9}{10}$ of 40

h. **Number Sense:** $7 \times 7, + 1, \div 5, \div 5$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. Half of the students in the room were girls. Half of the girls had brown hair. Half the brown-haired girls wore ponytails. If 4 brown-haired girls were wearing ponytails, how many students were in the room?

New Concept

We measure the passage of time by the movement of Earth. A **day** is the length of time it takes Earth to spin around on its axis once. We divide a day into 24 equal parts called **hours.** Each hour is divided into 60 equal lengths of time called **minutes,** and each minute is divided into 60 **seconds.**

Besides spinning on its axis, Earth also moves on a long journey around the sun. The time it takes to travel around the sun is a **year.** It takes Earth about $365\frac{1}{4}$ days to travel once around the sun. To make the number of days in every year a whole number, we have three years in a row that have 365 days each. These years are called **common years.** Then we have one year that has 366 days. A year with 366 days is called a **leap year.**

Math Language

Sometimes there are seven years in a row without a leap year. This happens around "century years" that cannot be divided evenly by 400. For example, since 1900 cannot be divided evenly by 400, the seven-year span 1897–1903 contained no leap years.

A year is divided into 12 **months.** The month February has 28 days in common years and 29 days in leap years. Four months have 30 days each. All the rest have 31 days each. Seven days in a row is called a **week.** We may refer to a calendar to see which day of the week a particular day of the month falls on.

To identify longer spans of time, we may use the terms **decade, century,** and **millennium.** A decade is a period of ten years, and a century is a period of 100 years. A millennium is a period of 1000 years.

Example 1

A century is how many decades?

A century is 100 years. A decade is 10 years. Since 10 tens equals 100, a century is **10 decades.**

Example 2

According to this calendar, June 8, 2014 is what day of the week?

June 8, 2014 is a **Sunday,** the second Sunday of the month.

JUNE 2014

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Thinking Skill

Verify

What do the letters at the top of each column represent?

The time of day can be shown by a clock. A clock can be either **digital** or **analog.** Analog clocks show time with hands that point to places on a circular number line. An analog clock actually contains two number lines in one. One number line is the hour scale. It has 12 marks, usually numbered, that show the hours of the day. The other number line is the minute scale. It has 60 smaller marks, usually unnumbered, that show the minutes of the hour. The two scales are wrapped into a circle so that the ends are joined. A full day is 24 hours long, but most clocks show only 12 hours.

Reading Math

We sometimes refer to the time of day using fractions of an hour.

A quarter hour is 15 minutes.

A quarter after 2 is 2:15.

A quarter past 1 is 1:15.

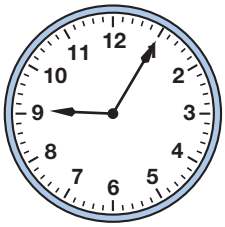
A quarter to 4 is 3:45.

Half past 7 is 7:30.

The 24 hours of a day are divided into **a.m.** hours and **p.m.** hours. The time 12:00 a.m. is called *midnight* and is the beginning of each day. The time 12:00 p.m. is called *noon* and is the midpoint of each day. The 12 hours before noon are the "a.m." hours. The 12 hours after noon are the "p.m." hours. When stating the time of day, we will use the labels "a.m." and "p.m." to prevent confusion.

Example 3

The clock shows the time that Rick's first morning class ends. He woke up two hours before this time. His lunch period begins three hours after this time. What time did Rick wake up? What time does Rick's lunch period begin?



The clock shows 5 minutes after the ninth hour. The proper form is hour, colon, two digits for the minutes, and then a.m. or p.m. The time indicated is 9:05 a.m. To find the time two hours earlier, we count back two hours to **7:05 a.m.** In three hours the time will be after noon, so the a.m. will switch to p.m. The time will be **12:05 p.m.**

Elapsed time is the amount of time between a starting time and an ending time. For example, if you start your homework at 4:00 p.m. and finish at 5:15 p.m., then 1 hour and 15 minutes elapsed between the time you started and the time you ended.

Example 4

Raven and her friends attended a movie that was 2 hours and 5 minutes long and ended at 9:20 p.m. What time did the movie begin?

In this problem, we are given the ending time and the elapsed time. We are asked for the beginning time. Two hours before 9:20 p.m. is 7:20 p.m., and 5 minutes before 7:20 p.m. is **7:15 p.m.,** which is when the movie began.

Lesson Practice

a. Four centuries is how many years?

b. According to the calendar in Example 2, what is the date of the third Thursday in June 2014?

c. A leap year has how many days?

d. What is the name for $\frac{1}{10}$ of a century?

e. Write the time that is 2 minutes after eight in the evening.

f. Write the time that is a quarter to nine in the morning.

g. Write the time that is 20 minutes after noon.

h. Write the time that is 30 minutes after midnight.

i. Write the time that is a quarter after nine in the morning.

j. If it is morning, what time is shown by the clock?

k. What time would be shown by the clock 2 hours later? 2 hours earlier?

l. The movie started at 3:15 p.m. and ended at 5:00 p.m. How long was the movie?

Written Practice

Distributed and Integrated

Formulate For problems **1–3,** write an equation and find the answer.

1. (16) After Anastacia paid Beatrice $600 for rent, she had $1267 remaining. How much money did Anastacia have before paying rent?

2. (11) Mae-Ying had $1873. She earned $200 more for babysitting. How much money did she then have?

***3.** (21) **Explain** Dan separated 52 cards into 4 equal piles. How many cards were in each pile? Write a multiplication pattern. Explain how you found your answer.

4. (28) One half of a decade is how many years?

***5.** (25) **Analyze** Which factors of 18 are also factors of 24?

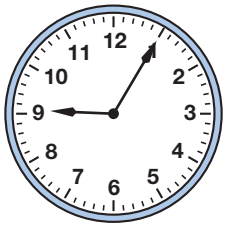
6. (26) $\frac{543}{3}$

7. (26) $\frac{\$6.00}{8}$

8. (24, 26) $528 \div (28 \div 7)$

9. (18) $6w = 696$

10. (28) It is evening. What time is shown by this clock? What will the time be in three hours?



11. (28) Write the time that is half past noon.

12. (Inv. 2) How much money is $\frac{1}{2}$ of a dollar plus $\frac{5}{10}$ of a dollar?

13. (28) According to this calendar, May 10, 2042 is what day of the week?

MAY 2042

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

14. (2) What is the largest three-digit even number that has the digits 5, 6, and 7?

15. (6)
$$\begin{array}{r} 4387 \\ 2965 \\ +\ 4943 \\ \hline \end{array}$$

16. (13)
$$\begin{array}{r} \$63.75 \\ -\ \$46.88 \\ \hline \end{array}$$

17. (14)
$$\begin{array}{r} 4010 \\ -\quad f \\ \hline 563 \end{array}$$

18. (17)
$$\begin{array}{r} 3408 \\ \times\quad 7 \\ \hline \end{array}$$

19. (17)
$$\begin{array}{r} \$3.56 \\ \times\quad 8 \\ \hline \end{array}$$

20. (17)
$$\begin{array}{r} 487 \\ \times\quad 9 \\ \hline \end{array}$$

21. (28) What time is 5 minutes before nine in the morning?

22. (19) **Connect** Write two multiplication facts and two division facts for the fact family 10, 2, and 20.

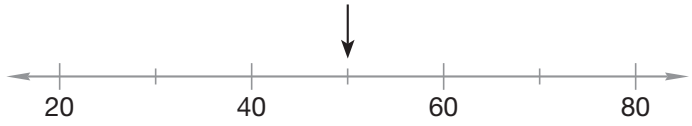
23. (26) Show how to check this division answer. Is the answer correct?

$$9\overline{)200} \quad 22 \text{ R } 2$$

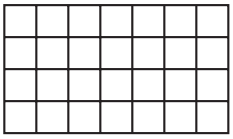
24. (1) **Conclude** What are the next three terms in this counting sequence?

…, 400, 500, 600, 700, ____, ____, ____, …

25. (27) **Represent** To what number is the arrow pointing?



26. (13) Which multiplication fact shows the number of small squares in this rectangle?



27. (28) How many centuries equal a millennium?

***28.** (Inv. 2) How many quarter circles equal a whole circle?

29. (23, 28) **a.** **Analyze** How many minutes are in an hour?

b. How many minutes are in half an hour?

c. Use the numbers in the answers to parts **a** and **b** to write a fraction equal to one half.

***30.** (10) **Multiple Choice** During their retirement, Tanisha's grandparents plan to visit every state in the United States except for Alaska and Hawaii. So far they have visited 29 of those states.

Which equation can be used to find how many states Tanisha's grandparents still have to visit?

A $n + 29 = 50$ **B** $n = 29 + 48$ **C** $29 + n = 48$ **D** $n + 48 = 29$