LESSON 31

- Pairs of Lines
- Angles

Power Up

facts

Power Up F

count aloud

Count by 12s from 12 to 84. Count by 5s from 3 to 53.

mental math

a. **Number Sense:** How many is 2 dozen? . . . 3 dozen? . . . 4 dozen?

b. **Number Sense:** Makalo has read 48 pages. He must read 25 more pages to finish the book. How many pages long is the book?

c. **Measurement:** The airplane was 1200 meters above the ground. If the airplane climbs another 340 meters, how high will it be?

d. **Percent:** 50% of 20

e. **Percent:** 25% of 20

f. **Percent:** 10% of 20

g. **Time:** How many days is 32 weeks? (*Think:* 7×32.)

h. **Calculation:** $4 \times 9, -1, \div 5, +1, \times 4$

problem solving

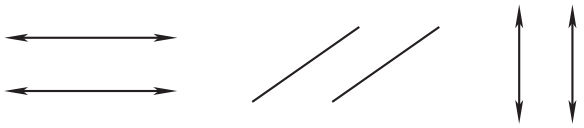
Choose an appropriate problem-solving strategy to solve this problem. Sylvia, Goldie, and Kyle are trying to decide what to eat for lunch. Sylvia wants to eat either sandwiches or spaghetti. Goldie wants to eat salad, soup, or sandwiches. Kyle does not want to eat spaghetti but is fine with anything else. What is a lunch choice that all three can agree on?

New Concepts

Pairs of Lines

When lines cross we say that they **intersect.** If we draw two straight lines on the same flat surface, then those lines either

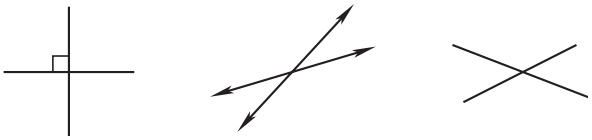
intersect at some point or they do not intersect at all. Lines that go in the same directions and do not intersect are called **parallel lines.** Parallel lines always stay the same distance apart. Thinking of train track rails can give us the idea of parallel lines. Here are pairs of parallel lines and parallel line segments:



Math Symbols

The symbol ⌜, which forms a small square at the intersection of the sides of an angle, is used to show that the sides are perpendicular.

Lines on the same surface that are not parallel are called **intersecting lines.** Here are pairs of intersecting lines and intersecting line segments:



The pair of segments on the left are **perpendicular.** Perpendicular lines and segments intersect to form "square corners." The other two pairs of lines and segments are **oblique.** Oblique lines and segments are neither parallel nor perpendicular.

Parallel and Perpendicular Segments

For this activity, work with a partner. Draw a line segment. Then have your partner draw line segments, one parallel to your segment and one perpendicular to it. Switch roles with your partner and repeat the activity.

Example 1

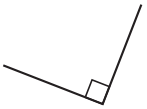
Draw a pair of oblique lines.

We draw two lines that intersect but that do not form square corners. Many arrangements are possible.

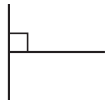
Example 2

Which of the following figures does *not* appear to contain perpendicular segments?

A



B



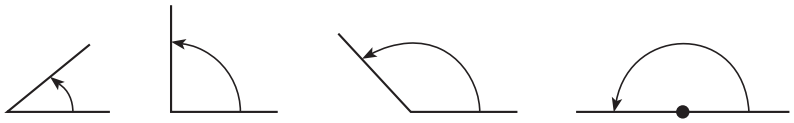
C

D

Perpendicular segments intersect to form square corners. The segments in **A** appear to be perpendicular. (You may need to turn your book slightly to see this.) The segments in **B** and **D** also appear to be perpendicular. The segments that do not appear to be perpendicular are those in choice **C.**

Angles

When lines or segments intersect, angles are formed. An **angle** is an "opening" between intersecting lines, rays, or segments. We see in the figures below that the amount of opening can vary; some angles may be more open or less open than other angles. We have different names for angles depending upon how open they are.



acute right obtuse straight

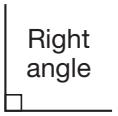
Thinking Skill

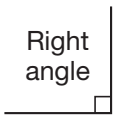
Connect

Name an exact hour of the day when the hour hand and the minute hand of a clock form each of the following angles:

- right angle
- acute angle
- obtuse angle
- straight angle

An angle that is like the corner of a square is called a **right angle.** *Right angle* does not mean the angle opens to the right. A right angle may open in any direction. *Right angle* simply means "square corner." Sometimes we draw a small square in the angle to indicate that it is a right angle.





An angle whose opening is less than a right angle is an **acute angle.** Some remember this as "a cute" little angle.

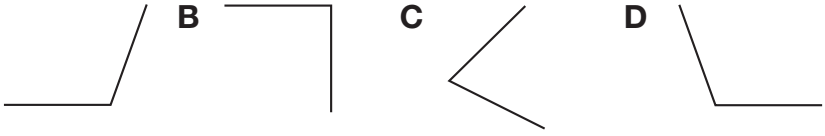
An angle whose opening is more than a right angle is an **obtuse angle.**

An angle whose opening forms a straight line is a **straight angle.**

Example 3

Which of these angles appears to be a right angle?

A B C D



A right angle is like the corner of a square. Angles **A** and **D** are open too wide, and angle **C** is not open wide enough. The only angle that appears to be a right angle is angle **B.**

Lesson Practice

a. Draw two parallel segments.

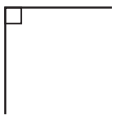
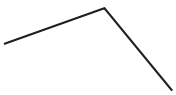
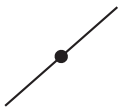
b. Draw two perpendicular lines.

c. Draw two oblique segments.

Represent Draw an example of each angle:

d. acute angle **e.** obtuse angle **f.** right angle

Describe each angle shown as acute, obtuse, right, or straight:

g.  **h.**  **i.**  **j.** 

Written Practice

Distributed and Integrated

1. (31) **a.** Draw a pair of intersecting lines that are perpendicular.

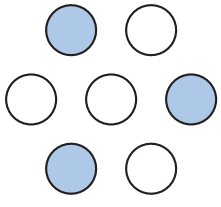
b. Draw an obtuse angle.

2. (16) **Formulate** L'Neisha bought a kaleidoscope for $4.19. If she paid for it with a $10 bill, how much money should she get back? Translate the problem by using the *some – some went away* formula and solve the problem.

3. (28) How many hours are there in 7 days?

4. (11) **Formulate** From 6:00 a.m. to 4:00 p.m. the temperature rose 23° to 71°F. What was the temperature at 6:00 a.m.? Write an equation that follows the addition formula and solve the problem to find the missing number.

***5.** (30) What fraction of this group is shaded?



6. (25) **List** Write the factors of 19.

7. (13)
$$\begin{array}{r} \$16.38 \\ -\ \$\ 9.47 \\ \hline \end{array}$$

8. (14)
$$\begin{array}{r} 1000 \\ -\quad q \\ \hline 576 \end{array}$$

9. (26) $5n = 280$

10. (29) $\begin{array}{r} 476 \\ \times \quad 80 \\ \hline \end{array}$

11. (29) $\begin{array}{r} \$9.68 \\ \times \quad 60 \\ \hline \end{array}$

12. (26) $\$19.44 \div 8$

13. (28) Write the time that is thirty minutes before midnight.

14. (Inv. 2) Compare: $\frac{1}{10}$ of 100 ◯ $\frac{1}{2}$ of 20

15. (26) A youth hockey game is divided into 3 time periods of equal length. The entire game is 36 minutes long. What is the length in minutes of each period?

16. (10, 13) $\$96 + \$128.13 + \$27.49 + w = \$300$

17. (24, 26) $328 \div (32 \div 8)$

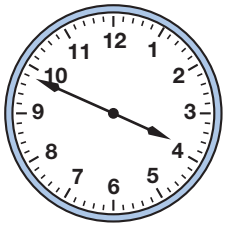
18. (24) $648 - (600 + 48)$

19. (2) Think of an odd number, and multiply it by 2. Now add 1. Is the final answer odd or even?

20. (25) **Multiple Choice** Which of these numbers has neither 2 nor 5 as a factor?

A 125 **B** 251 **C** 512 **D** 215

21. (28) It is afternoon. What time is shown on this clock?



22. (Inv. 2) What number is the numerator of the fraction $\frac{2}{3}$?

***23.** (7) **Represent** Use words to write the number 123,400.

*24. (13) The costs of four items in the school cafeteria are shown in this table:

Item	Cost
Cheese sandwich	$1.35
Juice	$0.60
Carrot sticks	$0.35
Apple	$0.75

Ollie purchased all four items for lunch. What was the cost of Ollie's lunch?

25. (12) **Estimate** Copy this number line and draw an arrow that points to the location of the number 75.

26. (26) **Justify** Show how to check this division answer. Is the answer correct? Why or why not?

$$8\overline{)300} \quad 37 \text{ R } 6$$

27. (23, 28) **a.** How many years is a century?

b. How many years is half a century?

c. Use the numbers in the answers to parts **a** and **b** to write a fraction equal to $\frac{1}{2}$.

28. (Inv. 2, 28) One fourth of an hour is how many minutes?

29. (1) **Conclude** Write the next four terms in this counting sequence:

27, 18, 9, . . .

30. (13, 17) Jackson bought five boxes of his favorite cereal for $2.87 each. Altogether, how much did the five boxes of cereal cost? Change this addition problem to a multiplication problem and find the product:

$2.87 + $2.87 + $2.87 + $2.87 + $2.87