LESSON

1 Sequences • Digits

WARM-UP

Facts Practice: 100 Addition Facts (Test A)†

Mental Math: Count by tens from 10 to 100. Count by hundreds from 100 to 1000.

a. 3 + 3	**b.** 30 + 30	**c.** 300 + 300
d. 40 + 50	**e.** 200 + 600	**f.** 50 + 50
g. 20 + 20 + 20	**h.** 500 + 500 + 500	

Problem Solving:

The counting numbers are 1, 2, 3, 4, and so on. How many one-digit counting numbers are there?

NEW CONCEPTS

Sequences

Counting is a math skill that we learn early in life. Counting by ones, we say the numbers

1, 2, 3, 4, 5, 6, ...

These numbers are called **counting numbers.** We can also count by a number other than one. Below we show the first five numbers for counting by twos and the first five numbers for counting by fives.

2, 4, 6, 8, 10, ...

5, 10, 15, 20, 25, ...

An ordered list of numbers forms a **sequence.** Each member of the sequence is a **term.** The three dots mean that the sequence continues even though the numbers are not written. We can study a sequence to discover its counting pattern, or rule. The rule can be used to find more terms in the sequence.

Example 1 What are the next three terms in this counting sequence?

3, 6, 9, 12, _____, _____, _____, ...

†For instructions on how to use the Warm-up activities, please consult the preface.

Solution The pattern is "Count up by threes." To find the next three terms, we may count up by threes, or we may count up by ones and emphasize every third term (one, two, *three,* four, five, *six,* ...). Either way, we find that the next three terms are **15, 18,** and **21.**

Example 2 Describe the rule for this counting sequence. What is the next term in the sequence?

56, 49, 42, _____, ...

Solution This sequence counts down. We find that the rule for this sequence is **"Count down by sevens."** Counting down by seven from 42 gives us **35.**

Digits There are ten **digits** in our number system. They are 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The number 385 has three digits, and the last digit is 5. The number 148,567,896,094 has twelve digits, and the last digit is 4.

Example 3 The number 186,000 has how many digits?

Solution The number 186,000 has **six digits.**

Example 4 What is the last digit of 26,348?

Solution The number 26,348 has five digits. The last digit is **8.**

LESSON PRACTICE

Practice set Describe the rule for each counting sequence. Then write the next three terms in the sequence.

a. 6, 8, 10, _____, _____, _____, ...

b. 7, 14, 21, _____, _____, _____, ...

c. 4, 8, 12, _____, _____, _____, ...

d. 21, 18, 15, _____, _____, _____, ...

e. 45, 40, 35, _____, _____, _____, ...

f. 12, 18, 24, _____, _____, _____, ...

How many digits are in each of these numbers?

g. 36,756 **h.** 8002 **i.** 1,287,495

What is the last digit of each of these numbers?

j. 17 **k.** 3586 **l.** 654,321

MIXED PRACTICE

Problem set Write the next term in each counting sequence:

1. 10, 15, 20, _____, ... **2.** 56, 49, 42, _____, ...

3. 8, 16, 24, _____, ... **4.** 18, 27, 36, 45, _____, ...

5. 24, 21, 18, _____, ... **6.** 32, 28, 24, 20, _____, ...

Write the missing term in each counting sequence:

7. 7, 14, _____, 28, 35, ... **8.** 40, _____, 30, 25, 20, ...

9. 20, _____, 28, 32, 36, ... **10.** 24, 32, _____, 48, ...

11. _____, 36, 30, 24, ... **12.** 21, 28, _____, 42, ...

Describe the rule for each counting sequence, and write the next three terms:

13. 3, 6, 9, 12, _____, _____, _____, ...

14. 8, 16, 24, _____, _____, _____, ...

15. 6, 12, 18, _____, _____, _____, ...

16. 40, 35, 30, _____, _____, _____, ...

17. 18, 21, 24, _____, _____, _____, ...

18. 9, 18, 27, _____, _____, _____, ...

19. What word names an ordered list of numbers?

How many digits are in each number?

20. 186,000 **21.** 73,842 **22.** 30,004,091

What is the last digit of each number?

23. 26,348 **24.** 347 **25.** 9,675,420

LESSON

12 Lines • Number Lines • Tally Marks

WARM-UP

Facts Practice: 100 Subtraction Facts (Test B)

Mental Math: Count up and down by 25's between 0 and 300.
Count up and down by 50's between 0 and 500.

a. 6500 + 500	**b.** 1000 − 500	**c.** 75 + 75
d. 750 + 750	**e.** 460 − 400	**f.** 380 − 180
g. 20 + 30 − 5	**h.** 16 − 8 + 4 − 2 + 1	

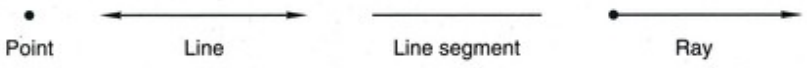
Problem Solving:

Lance, Molly, and José lined up side by side for a picture. Then they changed their order. Then they changed their order again. List all the possible side-by-side arrangements Lance, Molly, and José could make.

NEW CONCEPTS

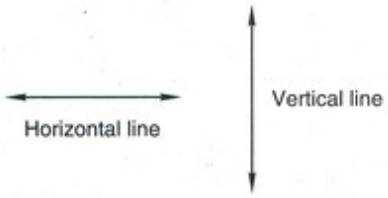
Lines

In mathematics we study numbers. We also study shapes such as circles, squares, and triangles. The study of shapes is called **geometry.** The simplest figures in geometry are the **point** and the **line.** A line does not end. Part of a line is called a **line segment** or just a *segment.* A line segment has two endpoints. A **ray** (sometimes called a *half line*) begins at a point and continues without end. Here we illustrate a point, a line, a segment, and a ray. The arrowheads on the line and the ray show the directions in which those figures continue without end.



Lines, rays, and segments can be **horizontal, vertical,** or **oblique.** The term *horizontal* comes from the word *horizon.* When we look into the distance, the horizon is the line where the earth and sky seem to meet. A horizontal line is level with

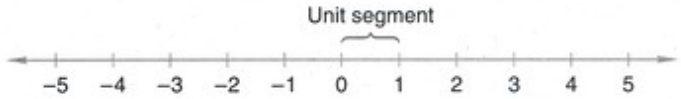
the horizon, extending left and right. A vertical line extends up and down.



A line or segment that is neither horizontal nor vertical is oblique. An oblique line appears to be slanted.

Oblique lines

Number lines By carefully marking and numbering a line, we can make a **number line.** **A number line shows numbers at a certain distance from zero.** On the following number line, the distance from 0 to 1 is a segment of a certain length, which we call a *unit segment*. The distance from 0 to 5 is five unit segments. The arrowheads show that the number line continues in both directions. Numbers to the left of zero are called **negative numbers.** We read the minus sign by saying "negative," so we read –3 as "negative three." The small marks above each number are **tick marks.**



The numbers shown on the number line above are called **integers.** Integers include all the counting numbers, the negatives of all the counting numbers, and the number zero.

Example 1 This sequence counts down by ones. Write the next six numbers in the sequence, and say the numbers aloud.

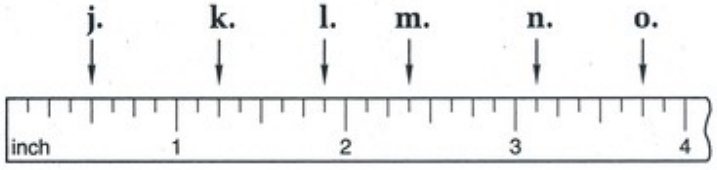
5, 4, 3, ...

Solution The next six numbers in the sequence are

2, 1, 0, –1, –2, –3

We read these numbers as "two, one, zero, negative one, negative two, negative three."

For problems **j–o,** name the mark on the ruler to which each arrow is pointing.



Use an inch ruler to measure each segment to the nearest eighth of an inch.

p. _____

q. _____

r. _____

s. Is $6\frac{1}{8}$ inches closer to 6 inches or 7 inches?

t. Round $5\frac{7}{8}$ inches to the nearest inch.

MIXED PRACTICE

Problem set

1. (32) Draw a quadrilateral that has four right angles.

2. (13) In her pocket Sallie has 3 pennies, 2 nickels, a dime, 3 quarters, and a half dollar. How much money is in Sallie's pocket?

For problems 3–5, write an equation and find the answer.

3. (21) One hundred thirty-eight children climbed on three buses to go to the zoo. If the same number of children were on each bus, how many children were on each bus?

4. (44) The distance across a nickel is about 2 centimeters. Two centimeters is how many millimeters?

5. (35) How many years were there from 1776 to 1976?

6. (40) Three friends want to share five oranges equally. How many oranges should each friend receive?

23. (75) The multiplication $3 \times \frac{1}{2}$ means $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$. So $3 \times \frac{1}{2}$ equals what mixed number?

Use the information and the table below to answer problems 24 and 25.

Mr. and Mrs. Minick took their children, Samantha and Douglas, to a movie. Ticket prices are shown in the table.

Movie Ticket Prices

Adults	$9.00
Ages 9–12	$4.50
Under 9	$3.75

24. (11, Inv. 5) Samantha is 12 years old and Douglas is 8 years old. What is the total cost of all four tickets?

25. (23, Inv. 5) Before 5 p.m., adult tickets are half price. How much money would the Minicks save by going to the movie before 5 p.m. instead of after 5 p.m.?

26. (83) Which of these figures is an illustration of an object that "takes up space"?

A.  B.  C.  D. 

27. (62, 72) Estimate the area of a room that is 14 ft 2 in. long and 10 ft 3 in. wide.

28. (Inv. 8) The pie chart at right shows how a family's monthly expenses are divided.

(a) Which expense consumes about one third of the budget?

(b) About what fraction of the budget does food consume?

29. (45, 73) What is the perimeter of a rhombus with sides 2.4 centimeters long?

30. (78) Light travels about 186,000 miles in one second. Write that number in expanded notation using powers of 10.

We have shaded 2 whole circles and $\frac{1}{3}$ of a circle. Now we divide each whole circle into thirds and count the total number of thirds.

$$\frac{3}{3} + \frac{3}{3} + \frac{1}{3} = \frac{7}{3}$$

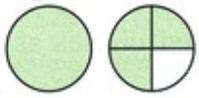
We see that seven thirds are shaded. So an improper fraction equal to $2\frac{1}{3}$ is $\frac{7}{3}$.

It is not necessary to draw a picture. We could remember that each whole is $\frac{3}{3}$. So the 2 of $2\frac{1}{3}$ is equal to $\frac{3}{3} + \frac{3}{3}$, which is $\frac{6}{3}$. Then we add $\frac{6}{3}$ to $\frac{1}{3}$ and get $\frac{7}{3}$.

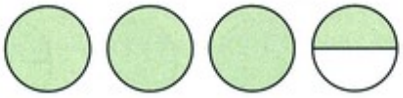
LESSON PRACTICE

Practice set* For problems **a–c**, name the number of shaded circles as an improper fraction and as a mixed number.

a.



b.



c.

Change each mixed number to an improper fraction:

d. $4\frac{1}{2}$ **e.** $1\frac{2}{3}$ **f.** $2\frac{3}{4}$ **g.** $3\frac{1}{8}$

MIXED PRACTICE

Problem set

1. (50) On a five-day trip the Jansens drove 1400 miles. What was the average number of miles the Jansens drove on each of the five days?

2. (62) Estimate the product of 634 and 186 by rounding both numbers to the nearest hundred before multiplying.

3. (71, 79) (a) $\frac{1}{10} = \frac{\square}{100}$

   (b) What percent equals the fraction $\frac{1}{10}$?