

Unit 6 Number Sense: Skip Counting and Multiplication

Introduction

In this unit, students will gain a conceptual understanding of multiplication of whole numbers, recognize patterns in multiples of numbers, and gain confidence with essential multiplication facts. Students will learn about even and odd numbers, and they will add sequences of numbers to model multiplication with repeated addition, skip counting, and objects in equal-sized groups. Students will learn about the commutative property of multiplication through arrays, solve simple real-world problems showing equal groups or arrays, and pay particular attention to patterns among the multiples.

This unit builds an understanding of multiplication and provides students with several strategies for remembering and deriving multiplication facts. It is important that all students learn to remember or reason out the multiplication facts (by skip counting, drawing a picture, or completing a table) so that they can use them to tackle problems with confidence. Lessons NS3-35 and NS3-36 are intended as confidence builders, aimed at persuading students that multiplication facts are easy and possible to remember. Students who develop the ability to automatically recall the times tables find it easier to see patterns, make predictions and estimates, and solve problems. Students can use **BLM Multiplication Practice** (p. K-6) to practice writing multiplication facts for the numbers 2 to 8. Students will also continue to explore multiplication facts in the next unit. To help students master multiplication facts, provide students with opportunities to repeat the activities that help them practice the skills as many times as they need to develop fluency with multiplication facts.

Meeting Your Curriculum

Alberta—All the lessons in this unit are recommended or required. Be sure to cover Extension 1 in Lesson NS3-27 and Extensions 1, 2, and 5 in Lesson NS3-29.

British Columbia—All the lessons in this unit are recommended or required. Be sure to cover Extensions 1 and 2 in Lesson NS3-29.

Manitoba—All the lessons in this unit are recommended or required. Be sure to cover Extensions 1 and 2 in Lesson NS3-29.

Ontario—All the lessons in this unit are recommended or required.

NOTES:

Fluency in multiplying by numbers larger than 5 is not required until Grade 4 or later in Alberta, British Columbia, and Manitoba. However, numbers larger than 5 frequently appear in real-world contexts, so we recommend learning to multiply beyond 5×5 in Grade 3.

Lesson NS3-29 is review for the majority of students. However, we consider skip counting by 3s and 4s helpful for learning and understanding multiplication by 3 and 4, respectively, so we recommend this material for all students.

Recurring Game

What Number Is Hidden?

Objective: To recall the concealed number

Preparation: Give each student tokens. Make sure students have a completed chart from either

BLM Even Multiple Charts (p. G-76) or **BLM Odd Multiple Charts** (p. G-78).

Instructions: Students work in pairs with a single chart. Player 2 looks away (or covers her eyes) while Player 1 covers a number on the chart with a token. Player 2 then tries to remember or determine which number is hidden. After every turn, players trade roles.

Materials. A few lessons in this unit require displaying **BLM Hundreds Charts** (p. K-2), on which you will need to circle numbers, underline digits, or shade cells. You might wish to enlarge one of the charts to fill an entire page, photocopy it onto a transparency, and project it onto the board.

In addition to the BLMs provided at the end of this unit, the following Generic BLMs, found in section K, are used in Unit 6:

BLM Number Lines (p. K-3)

BLM Blank 9×9 Multiplication Table (p. K-4)

BLM 1 cm Grid Paper (p. K-5)

BLM Multiplication Practice (p. K-6)

NS3-29 Skip Counting by 2s and 4s

Pages 5–6

Curriculum Requirement:

AB: required

BC: required

MB: required

ON: required

Goals:

Students will practice skip counting forwards by 2s and 4s from multiples of the number they are counting by.

Students will identify patterns in the digits of numbers they skip count.

Students will connect skip counting forwards to repeated addition.

Prior Knowledge Required:

Can add one-digit numbers and two-digit numbers by counting on

Can add sequences of numbers

Vocabulary: column, even, number line, odd, ones place, pattern, repeated addition, row, **skip count**

Materials:

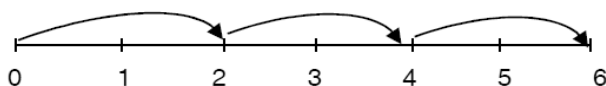
BLM Hundreds Charts (p. K-2)

NOTE: Skip counting by 4s is not required by the Ontario curriculum. However, it acts as preparation for multiplying by 4, so we recommend students in Ontario learn to skip count forward by 4s as well.

Mental math minute. Give students a series of addition questions based on doubles, and have them do jumping jacks as they say the answer to each. They can say the answers in unison or individually. For example, ASK: What is $6 + 6$? (12) If $6 + 6 = 12$, what is $6 + 7$? Continue with $5 + 6$, $6 + 8$, $6 + 4$, and $7 + 5$. In the first and the last round of questions, ask volunteers to explain the solution after they have solved the problem.

Review skip counting by 2s. Draw a number line from 0 to 6 on the board. SAY: To *skip count*, you have to skip numbers as you count. If you only count every other number, you are skip counting by 2s. Let's skip count by 2s together. We will start counting at 0, and then clap for 1, and then say 2. Demonstrate skip counting by 2s to 6 as follows. SAY: 0 (clap for 1), 2 (clap for 3), 4 (clap for 5), 6. SAY: Ready? Let's skip count together. In unison, skip count to 30.

SAY: When we skip count by 2s, the numbers that we say are two apart. Draw a number line from 0 to 6. SAY: We say 0, skip over 1, and say 2. Draw an arrow from 0 to 2. Repeat from 2 to 4 and from 4 to 6. The final picture should look like this:



Draw on the board:



Have a volunteer show skip counting by 2s on the number line. ASK: How do the arrows show skip counting by 2s? (the arrows point from or to the numbers you say, the arrows skip over the numbers you don't say)

Skip counting forwards by 2s is the same as repeated addition. Remind students that when they draw an arrow on a number line, such as an arrow that goes from 0 to 2, this arrow shows addition: it is two steps long and it shows that $0 + 2$ is 2. SAY: The starting point of the arrow shows the first number, zero, the length of the arrow shows the number we are adding, 2, and the number at the tip of the arrow shows the sum, 2. ASK: When we draw another arrow from 2 to 4, what addition do we show? ($2 + 2 = 4$) PROMPT: What is the starting number? (2) What number are we adding, the length of the arrow? (2) What is the total, the number at the tip of the arrow? (4) Repeat with an arrow from 4 to 6.

Explain that when we show arrows of the same length end to tip, going from left to right, we show adding 2 over and over. SAY: This is very similar to repeated addition. Point at the number lines on the board and SAY: These pictures show skip counting. They also show adding 2 over and over. So, repeated addition is the same as skip counting forwards by 2s when we start at 0 or at 2.

Skip counting by 2s on a hundreds chart. Show students the first four rows of a hundreds chart from **BLM Hundreds Charts**. SAY: We can show skip counting by 2s by colouring the numbers we say and not colouring (or skipping) the numbers we don't say. Point to the 2 and SAY: We are going to start at 2, so I am going to colour the 2. Just like on the number line, we are going to skip over the next number to colour the number after. This is skip counting by 2s. On the number line, the arrows pointed to the numbers we counted. On the hundreds chart, we can colour them in. Continue colouring in every other number to show the pattern of skipping numbers to skip count by 2s. Once you have two rows filled in, ask a volunteer to shade in the rest of the chart, skip counting by 2s. The completed chart should look like this:

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	32	33	34	35	36	37	38	39	40

ASK: Is there a pattern in the digits in the ones place? (yes, the numbers we coloured have these digits in the ones place: 2, 4, 6, 8, 0) When does the pattern begin to repeat? (when you start a new row) ASK: If you can remember the numbers we say when skip counting by 2s up to 10, how would this help you skip count up to 20? Up to 30? Up to 40? (the numbers will have the ones digit 0, 2, 4, 6, or 8) Where have we seen this pattern before? (in even numbers)

Write a random number between 0 and 100 on the board. ASK: Will I say this number when I am skip counting by 2s? (if the number is even, yes; if the number is odd, no) Repeat with several even and odd numbers. Ask students to answer the same question for more numbers, but say each one out loud rather than writing it on the board.

Have volunteers skip count by 2s out loud from 20 to 30, from 60 to 70, and so on. You may want to display the entire hundreds chart and indicate where the student should start counting.

Exercises:

1. Continue skip counting by 2s.

- a) 2, 4, 6, 8, _____, _____, _____, _____, _____ b) 24, 26, _____, _____, _____, _____, _____
c) 56, 58, _____, _____, _____, _____, _____

Answers: a) 10, 12, 14, 16, 18; b) 28, 30, 32, 34, 36; c) 60, 62, 64, 66, 68

2. At what number does the pattern in the ones place start to repeat?

- a) 2, 4, 6, 8, 10, 12, 14, 16, 18 b) 10, 12, 14, 16, 18, 20, 22, 24
c) 34, 36, 38, 40, 42, 44, 46, 48 d) 16, 18, 20, 22, 24, 26, 28, 30

Answers: a) 12, b) 20, c) 44, d) 26

3. Skip count forwards by 2s to find the next three numbers.

- a) 36, _____, _____, _____ b) 48, _____, _____, _____ c) 90, _____, _____, _____
d) 68, _____, _____, _____ e) 22, _____, _____, _____ f) 88, _____, _____, _____
g) 16, _____, _____, _____ h) 12, _____, _____, _____

Bonus:

- i) 138, _____, _____, _____ j) 846, _____, _____, _____ k) 896, _____, _____, _____

Answers: a) 38, 40, 42; b) 50, 52, 54; c) 92, 94, 96; d) 70, 72, 74; e) 24, 26, 28; f) 90, 92, 94; g) 18, 20, 22; h) 14, 16, 18; Bonus: i) 140, 142, 144; j) 848, 850, 852; k) 898, 900, 902

Using skip counting to do repeated addition. Write on the board:

$$2 + 2 + 2 + 2 + 2 + 2 = \underline{\hspace{2cm}}$$

Have volunteers draw boxes above the numbers and fill in the sums to find the answer.

(4, 6, 8, 10, 12) SAY: We are doing repeated addition. This is the same as skip counting.

ASK: Do you see the numbers you get when you skip count by 2s, if you start at 2? (yes)

SAY: Skip counting makes adding 2 over and over really easy! Write on the board:

$$16 + 2 + 2 + 2 + 2 + 2 + 2 = \underline{\hspace{2cm}}$$

Have a volunteer draw the boxes. Skip count forwards by 2s as a class, and fill in the boxes and total as you count. (18, 20, 22, 24, 26, 28) Have students copy the question and add 2 over and over. ASK: Did you get the same answer? (yes) Which is easier, skip counting by 2s or adding 2 over and over? (answers might vary, emphasize that both methods give the same answer)

Exercises: Add. Use skip counting to keep track of the sum.

a) $24 + 2 + 2 + 2 + 2 + 2 = \underline{\quad}$

b) $46 + 2 + 2 + 2 + 2 + 2 + 2 = \underline{\quad}$

Bonus: $242 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 = \underline{\quad}$

Answers: a) 34, b) 58, Bonus: 256

Skip counting by 4s. Show students the first four rows of a hundreds chart from BLM Hundreds Charts. SAY: Let's skip count forwards by 4s on the hundreds chart. We will start at 4 and add 4 each time to get to the next number. Using your fingers and saying the numbers aloud, count on from 4 to 8. Ask students to signal thumbs up if you stop at the correct number; make a few deliberate mistakes. On the chart, shade in the correct numbers as you add 4s. As a class, go back to the beginning (4) and say the numbers out loud to skip count by 4s (4, 8, 12, 16, 20, ...), continuing on to 40 or higher, as shown below. Encourage students to add 4 without using their fingers.

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	32	33	34	35	36	37	38	39	40

Distribute BLM Hundreds Charts and have students shade all the numbers they say when skip counting by 4s. When they are done, show a completed chart. ASK: Do you see any patterns in the shaded numbers? PROMPT: Look at the columns. What patterns do you notice? (numbers are only shaded in every other column; some columns are shaded at the top, some are shaded in the second row; as you move down a column, the pattern is shaded, unshaded, and repeat; there is a repeating pattern with the core of 4 columns) PROMPT: Look at the rows. What patterns do you notice? (every row has some shaded squares; every other row is the same; some rows have 2 shaded squares, some have 3)

Students will use their completed skip-counting-by-4s hundreds chart in the next part of the lesson.

Connecting skip counting by 2s and 4s. Show the first two rows of a hundreds chart and shade the numbers you say when skip counting forwards by 4s, starting at 4. SAY: We are going to use the same chart to skip count by 2s. We will start at 2 and count forwards. Circle the numbers said while skip counting by 2s, asking for volunteers to help you skip count.

The chart should look like this:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

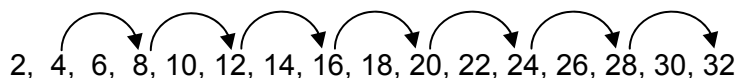
ASK: Did all of the shaded squares get circled? (yes) Did other numbers get circled also? (yes)

SAY: Every second circle was on a shaded square.

Ask students to skip count forwards by 2s aloud together, starting at 2. Write on the board:

2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32

Starting at 4, skip over the next number to get to 8. SAY: Continuing this way gives the numbers you say when skip counting by 4s. To skip count by 4s, we can start at 4 and skip over the next number to get 8. Draw an arrow from 4 to 8. SAY: Skip 10, get 12. Draw the next arrow. SAY: If we keep going, we get all the numbers for skip counting by 4s. Draw the remaining arrows, as shown below:



Say the numbers for skip counting by 4s aloud (4, 8, 12, 16, and so on). SAY: This is another way to skip count by 4s—start with skip counting by 2s and then say every second number.

ASK: What is the ones digit of 4? (4) What is the ones digit of 8? (8) 12? (2) Have a volunteer read the ones digits of the numbers you get when skip counting forwards by 4s, starting at 4, and write them on the board. (4, 8, 2, 6, 0, 4, 8, 2) ASK: Do the ones digits of the numbers start to repeat when you skip count by 4s? (yes) When does the pattern begin to repeat? (after the 0) What is the pattern? (4, 8, 2, 6, 0)

SAY: Skip counting by 4s starting at 0 always gives even numbers. We know that because we can get these numbers by first skip counting by 2s and then skipping again. ASK: What is the pattern in the ones column? (0, 4, 8, 2, 6, and then it repeats)

Exercises: Skip count forwards by 4s.

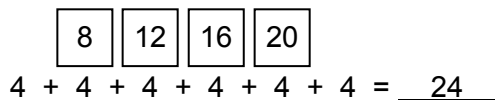
- | | | |
|----------------------------|----------------------------|----------------------------|
| a) 8, _____, _____, _____ | b) 0, _____, _____, _____ | c) 4, _____, _____, _____ |
| d) 12, _____, _____, _____ | e) 32, _____, _____, _____ | f) 48, _____, _____, _____ |
| g) 16, _____, _____, _____ | h) 36, _____, _____, _____ | i) 80, _____, _____, _____ |

Answers: a) 12, 16, 20; b) 4, 8, 12; c) 8, 12, 16; d) 16, 20, 24; e) 36, 40, 44; f) 52, 56, 60; g) 20, 24, 28; h) 40, 44, 48; i) 84, 88, 92

Repeated addition by 4s. SAY: Let's do a repeated addition of 4. Write on the board:

$$4 + 4 + 4 + 4 + 4 + 4 = \underline{\hspace{2cm}}$$

Do the addition as a class. (8, 12, 16, 20, 24) ASK: Do the boxes show skip counting by 4s? (yes) The final picture should look like this:



Repeat with $36 + 4 + 4 + 4 + 4 + 4 + 4 = 56$.

Exercises: Skip count by 4s to add.

a) $24 + 4 + 4 + 4 + 4 + 4 = \underline{\hspace{2cm}}$

b) $48 + 4 + 4 + 4 + 4 + 4 + 4 + 4 = \underline{\hspace{2cm}}$

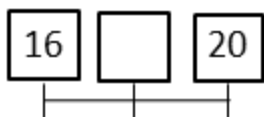
c) $64 + 4 + 4 + 4 + 4 + 4 = \underline{\hspace{2cm}}$

d) $80 + 4 + 4 + 4 + 4 + 4 + 4 = \underline{\hspace{2cm}}$

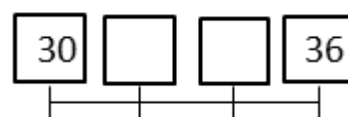
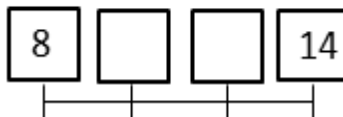
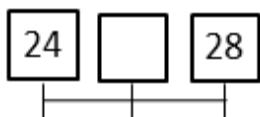
Bonus: $200 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 = \underline{\hspace{2cm}}$

Answers: a) 44, b) 72, c) 80, d) 100, Bonus: 232

Filling in missing numbers in skip counting by 2s or 4s. Write on the board:

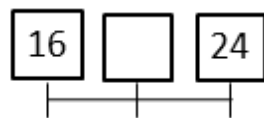


SAY: This picture shows skip counting by 2s. What is the missing number? PROMPT: When skip counting by 2s, what comes after 16? (18) Write “18” in the empty box. Have volunteers use the same method to fill in the blanks in the following pictures:

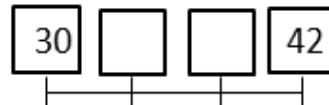
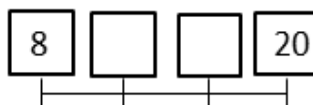
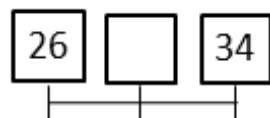


(26; 10, 12; 32, 34)

Write on the board:



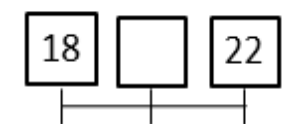
SAY: This picture shows skip counting by 4s. ASK: What is the missing number? (20) Write “20” in the empty box. Have volunteers use the same method to fill in the blanks in the following pictures:



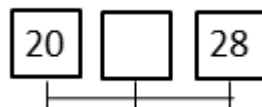
(30; 12, 16; 34, 38)

Keep at least one example of skip counting by 2s and one of skip counting by 4s on the board.

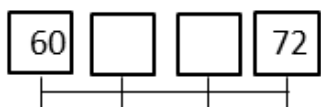
Display the pictures below. SAY: In these examples, the skip counting might be by 2s or by 4s. For each picture, ask volunteers to say if the skip counting is by 2s or by 4s, and then ask another volunteer to fill in the missing numbers.



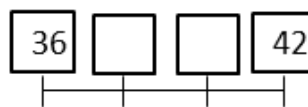
Counting by _____



Counting by _____



Counting by _____



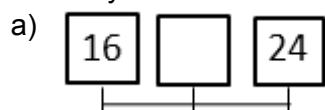
Counting by _____

(20, counting by 2s; 24, counting by 4s; 64, 68, counting by 4s; 38, 40, counting by 2s)

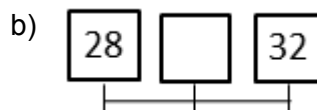
Discuss strategies students could use to decide which number they should be skip counting by. One way is to try to skip count by 2s and to see if they get the desired result. For example, in the first example (18, ____, 22), skip counting by 2 gives 20 as the missing number, and 18, 20, 22 is indeed part of the skip counting by 2 sequence. However, in the second example (20, ____, 28), skip counting by 2s gives 20, 22, 28, which is not correct, so we need to skip count by 4s to get 20, 24, 28.

Ask students to look at the differences between the first and the third number when skip counting by 2s and when skip counting by 4s. Students should notice that when they skip count by 2s the difference, or the gap, is 4, and when they skip count by 4s, the gap is 8. Point out that when one number is missing, the gap between the numbers is double the number we skip count by. Point out that skip counting is just like adding the same number over and over, so this is adding the same number two times. Repeat with an example of two numbers missing: for skip counting by 2, the gap is 6, or $2 + 2 + 2$, and for skip counting by 4, the gap is 12, or $4 + 4 + 4$. Point out that both looking at the gap and trying skip counting by 2s or 4s work well in this lesson.

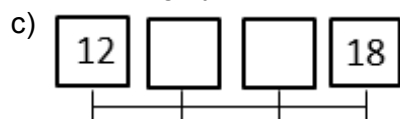
Exercises: Shelly skip counts and leaves out some numbers. What number does she skip count by? Fill in the blanks.



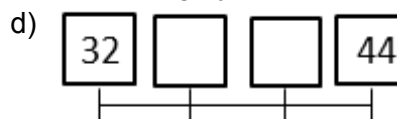
Counting by _____



Counting by _____



Counting by _____



Counting by _____

Answers: a) 20, counting by 4s; b) 30, counting by 2s; c) 14, 16, counting by 2s; d) 36, 40, counting by 4s

NOTE: To help students memorize arithmetic facts and develop fluency, you might try the following exercise. SAY: What numbers do you say when skip counting by 4s? Write on the board:

4 8 12 16 20 24 28 32 36 40

Cover up the first two numbers in the sequence (4, 8), and ask the class to say those numbers three times out loud. Say the whole sequence with the first two numbers still covered. Next, cover up the first three numbers (4, 8, 12), and ask the class to say those numbers three times out loud, followed by the whole sequence. Then, cover up the first four numbers, and ask the class to say those numbers three times, and so on.

Extensions

NOTE: Extensions 1 and 2 are required to cover the curriculum for Alberta, British Columbia, and Manitoba. Extension 5 is required to cover the curriculum for Alberta.

1. **Skip counting backwards by 4s.** Write on the board:

4, 8, 2, 6, 0, and then it repeats

SAY: This is the pattern in the ones digits when we count forwards by 4s. If we need to count back by 4s, we can either subtract 4 each time, or we can try to use the reverse pattern, or the pattern that goes backwards. Have a volunteer write the numbers in the pattern in the opposite order on the board (0, 6, 2, 8, 4, and then it repeats) Write on the board:

80, _____, _____, _____, _____, _____, _____

ASK: If we skip count backwards by 4s, what will the next number in the pattern be? (76) How do you know? ($80 - 4 = 76$; the tens digit needs to be smaller than 8, and the ones digit should be the next number in the pattern of the ones digits) Have more volunteers continue the pattern, explaining how they choose each new number. (72, 68, 64, 60, 56)

Have students skip count backwards by 4s individually.

a) 64, 60, _____, _____, _____

b) 52, 48, _____, _____, _____

c) 100, 96, _____, _____, _____

Bonus: 900, 896, _____, _____, _____

Answers: a) 56, 52, 48; b) 44, 40, 36; c) 92, 88, 84; Bonus: 892, 888, 884

2. Alex skip counts by 4s and makes some mistakes. Explain Alex's mistakes.

a) 4, 8, 12, 14, 16, 20

b) 20, 24, 32, 36, 40

c) 16, 20, 24, 26, 30

Answers: a) 14 should not be there; b) there should be 28 between 24 and 32; c) the last two numbers should be 28, 32 instead of 26, 30

3. Jin starts at 0 and skip counts forwards by 2s or by 4s. He skip counts past 30 but does not say "30." What is Jin skip counting by?

Answer: Jin is skip counting by 4s.

4. Alice starts at 0 and skip counts forwards by 2s or by 4s. She says "18." What is Alice skip counting by?

Answer: Alice is skip counting by 2s.

(Connection to Other Strands: PDM) 5. a) Draw a Venn diagram with two overlapping ovals. Label one oval "Even Numbers" and label the other oval "Numbers you say when skip counting by 4s starting at 0".

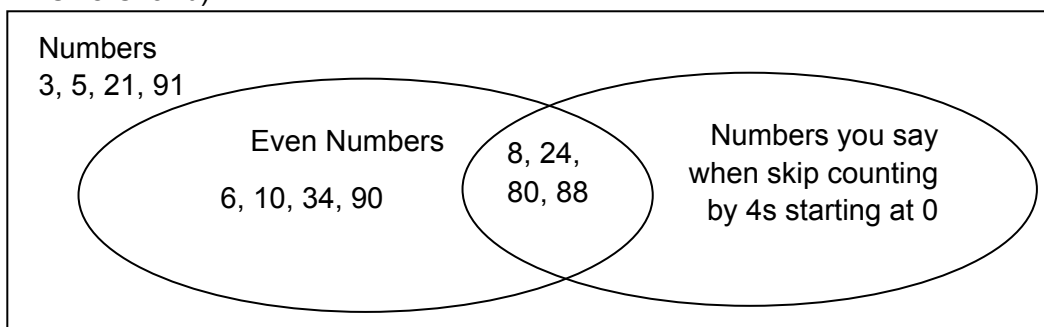
b) Sort the following numbers into the Venn diagram: 3, 5, 6, 8, 10, 21, 24, 34, 80, 88, 90, 91

c) Do you have numbers in all regions of the Venn diagram?

d) Try to add a number to each region of the Venn diagram. What numbers do you add to which region? Which region stays empty?

e) Redraw the Venn diagram so it has no empty regions. You can place ovals inside each other instead of overlapping.

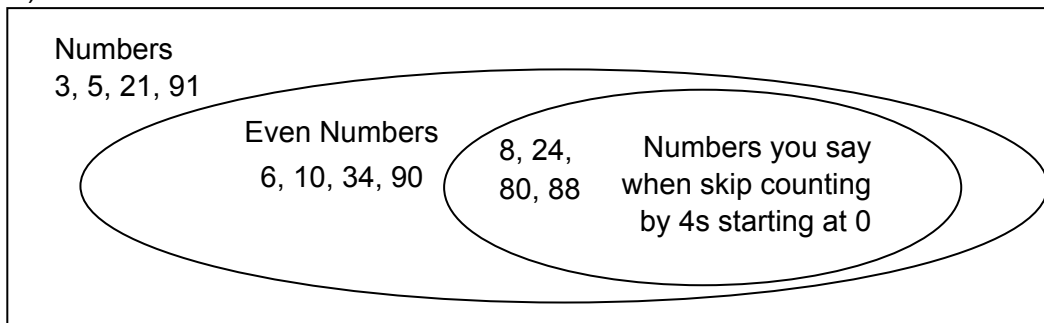
Answers: a–b)



c) no

d) any odd number can go in the region outside the circles; any multiple of 4 can go in the overlapping region; any number that is not a multiple of 4 but is even can go in the "even numbers" group outside the overlapping region; no number can be added to the other region outside the overlapping region

e)



NS3-30 Skip Counting by 5s and 10s

Page 7

Curriculum Requirement:

AB: required

BC: required

MB: required

ON: required

Goals:

Students will practice skip counting forwards by 5s and 10s and will identify patterns in the skip counting.

Students will add by skip counting by 5s.

Prior Knowledge Required:

Can skip count forwards by 2s, 4s, and 10s

Can perform repeated addition

Knows the connection between repeated addition and skip counting forwards

Can identify the ones digit of numbers

Vocabulary: column, even, odd, ones digit, ones place, pattern, row, skip count, sum, tens digit, tens place

Materials:

BLM Skip Counting Chart (p. G-75)

transparency of **BLM Skip Counting Chart** (p. G-75)

overhead projector

BLM Hundreds Charts (p. K-2)

Mental math minute. Have students skip count forwards by 2s or 4s, starting from different numbers within 1000 for 2s and starting from multiples of 4 within 100 for 4s. Students can count in unison or individually and do jumping jacks as they count.

Skip counting by 5s. Write the numbers from 0 to 20 on the board. Have a volunteer underline zero, skip four numbers, underline the fifth number, and repeat. The final picture should look like this:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

SAY: When you skip count forwards by 5s starting at 0, you say these numbers. ASK: What pattern do you see in the ones digit? (0, 5, and then it repeats) Provide each student with **BLM Skip Counting Chart** and project a transparency of the chart on the board. Write “5s” in the blank in the first cell and have students do the same. Start filling in the first few rows together for

skip counting by 5s. Then have students complete the chart on their own. The first six completed rows are shown below:

Skip Count by 5s	Tens	Ones	Even or Odd?
0	0	0	even
5	0	5	odd
10	1	0	even
15	1	5	odd
20	2	0	even
25	2	5	odd

The chart will go up to 100 if completely filled.

ASK: Can you see a pattern in the ones place? (yes) What is the pattern when you look down the Ones column? (the ones switch between 0 and 5) ASK: What pattern can you see in the tens place? (the tens digit stays the same for two numbers, then goes up by 1) Is there a pattern in whether the numbers are odd or even? (yes, the numbers switch between even and odd)

Exercises: Skip count forwards by 5s.

- a) 5, _____, _____, _____
- c) 20, _____, _____, _____
- e) 80, _____, _____, _____
- g) 50, _____, _____, _____
- i) 100, _____, _____, _____
- k) 300, _____, _____, _____
- m) 140, _____, _____, _____
- o) 670, _____, _____, _____

- b) 15, _____, _____, _____
- d) 40, _____, _____, _____
- f) 95, _____, _____, _____
- h) 65, _____, _____, _____
- j) 125, _____, _____, _____
- l) 215, _____, _____, _____
- n) 515, _____, _____, _____

Bonus: 890, _____, _____, _____

Answers: a) 10, 15, 20; b) 20, 25, 30; c) 25, 30, 35; d) 45, 50, 55; e) 85, 90, 95; f) 100, 105, 110; g) 55, 60, 65; h) 70, 75, 80; i) 105, 110, 115; j) 130, 135, 140; k) 305, 310, 315; l) 220, 225, 230; m) 145, 150, 155; n) 520, 525, 530; o) 675, 680, 685; Bonus: 895, 900, 905

Skip counting by 5s to add to a multiple of 5 other than 5. Write on the board:

$$10 + 5 + 5 + 5 = \underline{\hspace{2cm}}$$

$$25 + 5 + 5 + 5 = \underline{\hspace{2cm}}$$

SAY: Start skip counting forwards at the first number, and keep going for each 5 you add. Have students find the answer individually, then have volunteers show the answers on the board. The picture should look like this:

$$\begin{array}{|c|c|} \hline 15 & 20 \\ \hline \end{array} \quad 10 + 5 + 5 + 5 = \underline{25}$$

$$\begin{array}{|c|c|} \hline 30 & 35 \\ \hline \end{array} \quad 25 + 5 + 5 + 5 = \underline{40}$$

Exercises: Skip count forwards to add. Use boxes to keep track.

- a) $5 + 5 + 5 =$ _____ b) $5 + 5 + 5 + 5 =$ _____ c) $15 + 5 + 5 =$ _____
d) $30 + 5 + 5 + 5 =$ _____ e) $80 + 5 + 5 + 5 =$ _____ f) $65 + 5 + 5 + 5 =$ _____
g) $20 + 5 + 5 + 5 =$ _____ h) $35 + 5 + 5 + 5 =$ _____ i) $45 + 5 + 5 + 5 =$ _____

Answers: a) 10, 15; b) 10, 15, 20; c) 20, 25; d) 35, 40, 45; e) 85, 90, 95; f) 70, 75, 80;
g) 25, 30, 35; h) 40, 45, 50; i) 50, 55, 60

Distribute a hundreds chart from **BLM Hundreds Charts** to each student. Have the class skip count forwards by 5s by colouring squares, starting at 5 and going up to 100. As a class, identify any patterns that you find. (all the numbers are in two columns; they all end in 5 or 0)

Connecting skip counting by 10s and skip counting by 5s. Have students start at 5 and skip count by 5s to 80 as you write the numbers on the board. Then skip count by 10s together, and circle each number when you say it, as shown below:

5, (10) 15, (20) 25, (30) 35, (40) 45, (50) 55, (60) 65, (70) 75, (80)

SAY: When we skip count by 10s, we skip over every second number in the list we made from skip counting by 5s. ASK: Can you see a pattern in the ones place when skip counting by 10s and starting from 0? (the ones place is always zero) Can you see a pattern in the tens place? (skip counting by 10s makes the tens place go up by 1) Are the numbers even, odd, or both? (all numbers are even)

Exercises: Skip count by 10s to add. Keep track of the sums.

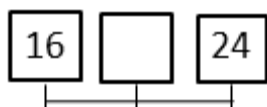
- a) $10 + 10 + 10 =$ _____ b) $10 + 10 + 10 + 10 =$ _____ c) $20 + 10 + 10 =$ _____
d) $50 + 10 + 10 =$ _____ e) $100 + 10 + 10 + 10 =$ _____ f) $90 + 10 + 10 =$ _____
g) $60 + 10 + 10 =$ _____ h) $20 + 10 + 10 + 10 =$ _____ i) $80 + 10 + 10 + 10 =$ _____

Bonus:

- j) 90, _____, _____, _____ k) 100, _____, _____, _____ l) 330, _____, _____, _____
m) 220, _____, _____, _____ n) 150, _____, _____, _____ o) 160, _____, _____, _____

Answers: a) 20, 30; b) 20, 30, 40; c) 30, 40; d) 60, 70; e) 110, 120, 130; f) 100, 110; g) 70, 80;
h) 30, 40, 50; i) 90, 100, 110; Bonus: j) 100, 110, 120; k) 110, 120, 130; l) 340, 350, 360;
m) 230, 240, 250; n) 160, 170, 180; o) 170, 180, 190

Filling in missing numbers in skip counting by 5s or 10s. Draw on the board:



SAY: In the last lesson, we solved problems like this; we found the number to skip count by and filled in the missing numbers. Ask students to recall what methods they could use to decide which number to skip count by. One method they used was to try different numbers and see which number works. In this example, skip counting by 2s does not work because it gives 16, 18, 24, which is not correct. So, they should try 4. Skip counting by 4s gives 16, 20, 24, which is

correct. Another method is to look at the gap between the two numbers, because the gap is double the number we skip count by. The gap here is $24 - 16 = 8$, and 8 is the double of 4, which means skip counting by 4s is the answer.

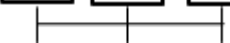
Change the numbers in the squares on the board to 20 and 30. ASK: Which number do you think this is skip counting by, 5s or 10s? (5s) How do you know? (5 works because 20, 25, 30 is the correct way of skip counting forwards by 5s from 20; 10 is the double of 5, so it fits with skip counting by 5) PROMPT: What is the gap between the first and the third number? (10)

Repeat with the numbers 70 and 90 in the squares on the board. (the gap is 20, which is the double of 10, so it is skip counting by 10s)

Exercises: Yu is skip counting by 5s or 10s and has left some numbers blank. Say what she is skip counting by, and fill in the missing numbers.

a)

10		20
----	--	----


 Counting by _____

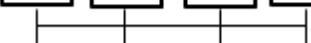
b)

30		50
----	--	----


 Counting by _____

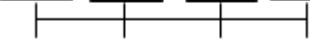
c)

10			40
----	--	--	----


 Counting by _____

d)

60			75
----	--	--	----


 Counting by _____

Answers: a) 15, counting by 5s; b) 40, counting by 10s; c) 20, 30, counting by 10s; d) 65, 70, counting by 5s

Finding mistakes in a skip counting pattern. Write on the board:

205, 210, 220, 225

SAY: Anton skip counts forwards by 5s and writes this pattern. ASK: Is this a correct skip counting pattern? (no) What mistake do you see? (215 is missing between 210 and 220) Repeat with 315, 320, 326, 330. (325 instead of 326)

Exercises: Zara skip counts by 5s and makes some mistakes. What is the correct pattern and what mistakes does she make?

a) 65, 75, 80, 85 b) 95, 100, 105, 111, 115, 120 c) 675, 680, 690, 695, 700

Answers: a) 70 is missing, b) 111 instead of 110, c) 685 is missing

Extensions

1. a) Create a chart with 10 columns.
 - The first row shows counting by 1 up to 10.
 - The second row shows skip counting by 10s up to 100.
 - The third row shows skip counting by 5s up to 50.
- b) Identify any patterns in the columns.

Answers:

a)

1	2	3	4	5	6	7	8	9	10
10	20	30	40	50	60	70	80	90	100
5	10	15	20	25	30	35	40	45	50

b) In any column, the tens place in the second row is the same as the ones place in the first row. In any column, the second row is double the third row.

2. **Skip counting by 50s.** Write on the board:

0, 25, 50, 75, 100

ASK: What are we skip counting by? (50s) Have students continue skip counting by 50s until they reach 300. ASK: If you know the sequence of skip counting forwards by 5s, how can you get the numbers of skip counting forwards by 50s? (it is the same, just write “0” to the right of each number)

a) Write the next three numbers in the pattern. 500, 550, 600, _____, _____, _____

b) Add by skip counting by 50s. $300 + 50 + 50 + 50 + 50 =$ _____

Answers: a) 650, 700, 750; b) 500

3. A book costs 5 dollars. Alex buys 6 books. Use skip counting to find out how many dollars he spends.

1 book 2 books 3 books 4 books 5 books

Answer: 5, 10, 15, 20, 25, 30; Alex spends 30 dollars.

NS3-31 Skip Counting by 3s

Pages 8–9

Curriculum Requirement:

AB: required

BC: required

MB: required

ON: required

Goals:

Students will practice skip counting by 3s and will identify patterns in skip counting.

Students will identify the number they skip count by and fill in numbers in sequences of skip counting by 2s, 3s, 4s, 5s, and 10s.

Students will identify mistakes in sequences of skip counting forwards by 3s.

Students will learn the term “multiples” as numbers obtained by skip counting forwards starting at zero.

Prior Knowledge Required:

Can skip count forwards by 2s, 4s, 5s, and 10s

Can perform repeated addition

Knows the connection between repeated addition and skip counting forwards

Can subtract two-digit numbers

Knows doubles of one-digit numbers

Can determine whether a number is even or odd

Vocabulary: even, **multiples**, odd, pattern, repeated addition, sequence, skip count

Materials:

BLM Hundreds Charts (p. K-2)

BLM Skip Counting Chart (p. G-75), two copies per student

transparency of **BLM Skip Counting Chart** (p. G-75)

overhead projector

Mental math minute. Have students skip count forwards by 2s, 4s, 5s, or 10s.

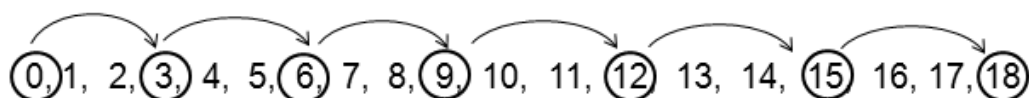
- For 2s and 10s, start from even or odd numbers within 1000.

- For 5s, start from multiples of 5 within 1000.

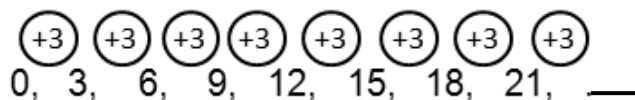
- For 4s, start from multiples of 4 within 100.

Students can count in unison or individually and do jumping squats as they count.

Skip counting by 3s. Write the numbers from 0 to 18 on the board. SAY: We can skip count by 3s just as we skip count by 2s, except we add 3 every time instead of 2. Draw arrows and circles on the board to show skip counting by 3s starting at zero, as shown below:



Rewrite the numbers that you circled in a new sequence, and ask students to make the sequence longer by adding 3 to the last number as shown below:



Introduce multiples. SAY: The numbers that you get by starting at zero and skip counting forwards by 3s are called *multiples* of 3. Look at the list of multiples of 3 we made. ASK: What is the difference, or the gap, between each number and the number after it? (3) SAY: So, this means the difference between the number 3 and the number before it must also be 3.

ASK: What number is 3 numbers before 3? (0) SAY: This is why we include 0 as a multiple of 3.

ASK: What are the multiples of 5? What are the numbers you say when skip counting by 5s starting at zero? (0, 5, 10, 15, 20, 25, 30, 35, ...) Skip count together to review the multiples of 5.

Give each student a hundreds chart from **BLM Hundreds Charts**. SAY: Circle all the multiples of 3. Ask students to look for patterns in the position of the circled numbers. (they lie on diagonals; you skip 2 going across or down; there are circles in every row and column) Ask students to shade in all the multiples of 5 on the same chart. When students have completed their charts, ASK: Are there are numbers that are multiples of both 5 and 3? (yes, for example, 15 and 30) SAY: A number can be a multiple of more than one number.

Exercises: Which numbers are multiples of 3?

a) 0, 3, 5, 9, 11, 12, 14, 18, 20 b) 1, 6, 7, 8, 9, 15, 22, 24

Answers: a) 0, 3, 9, 12, 18; b) 6, 9, 15, 24

Finding patterns in skip counting by 3s. Draw on the board:

3	6	9
12	15	18
21	24	27
30		

SAY: This table shows the first multiples of 3 starting from 3. I want to see if there are any patterns in this table. When I look across each row, I get the next number in the row by adding 3. Let's see if we can find patterns down the columns. Students might notice that each column was made by adding 9 each time. SAY: Let's try to find more patterns in the columns. Let's look at the ones digits and the tens digits. To see the patterns in the digits clearly, I should fill in the tens digits for all the numbers. ASK: How many tens are in 3? (0) Explain that you will write the number 3 as "03" to show that the tens digit is 0. Write "0" in the chart, and then repeat with 6 and 9.

Have students look at the ones digits in each column. ASK: What pattern do you see? (the numbers go down by 1) Can you predict the ones digits in the missing numbers that go in the empty places? (3 in the middle column and 6 in the right-hand column) Repeat with the tens digits. (the numbers go up by 1, so the tens digit is 3 in both missing numbers) SAY: So, the next two numbers are 33 and 36.

ASK: How can we check if we are correct? (find the next two multiples of 3) If I add 3 to 30, what do I get? (33) SAY: This means 33 is the next multiple of 3. ASK: What is the next multiple of 3 after 33? (36) How do you know? ($33 + 3 = 36$) SAY: I cannot continue this pattern in the first column because the ones digit is already 0; I cannot make it any smaller. Let's add a column to the right instead. Extend the chart, as shown below:

03	06	09	
12	15	18	
21	24	27	
30	33	36	

ASK: What is the next multiple of 3 after 36? (39) Explain that you want to start a new column with the 39. SAY: This makes sense, because you add 3 to get each next number in the row. Write "39" in the top cell of the fourth column.

SAY: Let's try to use the pattern in the ones digits and in the tens digits to fill in the next row. For each cell in the fifth row, ask students to say the ones digit and the tens digit. You might have students signal the answers. Invite volunteers to fill in the cells. The chart should look like this:

03	06	09	
12	15	18	
21	24	27	
30	33	36	39
	42	45	48

Have students check that these are indeed the next three multiples of 3. Have them copy the table and fill in the remaining two rows on their own. (51, 54, 57; 60, 63, 66)

Using skip counting to do repeated addition. Remind students that they can use skip counting to do repeated addition. Write on the board:

$$3 + 3 + 3 + 3 + 3 = \underline{\quad}$$

Ask students to explain how they added similar questions with 2s, 4s, 5s, and 10s. (draw boxes above the 3s and skip count as you add each new number) Have volunteers do this on the board. (6, 9, 12, 15) Repeat with $36 + 3 + 3 + 3 = \underline{\quad}$. (45)

Exercises: Use skip counting to add. Draw boxes to keep track of skip counting if you need to.

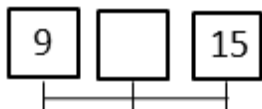
a) $24 + 3 + 3 + 3 + 3 + 3 + 3 + 3$

b) $48 + 3 + 3 + 3 + 3 + 3$

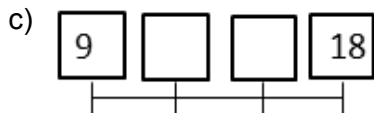
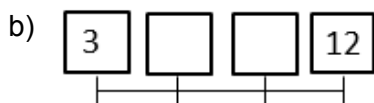
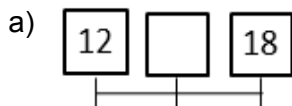
Bonus: $90 + 3 + 3 + 3 + 3$

Answers: a) 42, b) 60, Bonus: 99

Missing numbers in skip counting. Write on the board:



SAY: This picture shows skip counting by 3s. ASK: What is the missing number? (12) Write “12” in the empty box. Write on the board:

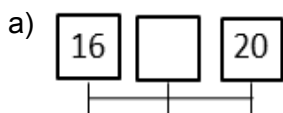


Using the same method, have volunteers from the class fill in the empty boxes. (a) 15; b) 6, 9; c) 12, 15)

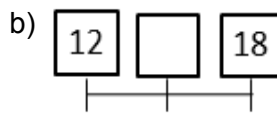
Finding numbers in skip counting by different numbers. Review the methods for identifying the number skip counted by when there are missing numbers. Be sure to discuss all of the following:

- Try different numbers and see if you get the correct skip counting sequence.
- Find the difference between numbers at the gap (if only one number is missing), and use the fact that the gap is double the number you skip count by.

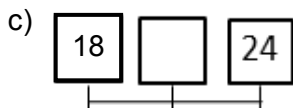
Write the examples below on the board and explain that, in these questions, you can use any of the numbers they skip counted by so far: 2, 3, 4, 5, or 10. Have volunteers come to the board to solve the problems. Have them explain the answer for each problem.



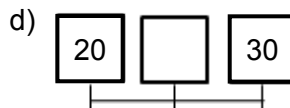
Counting by _____



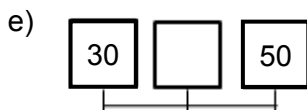
Counting by _____



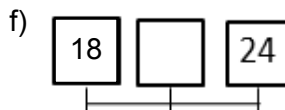
Counting by _____



Counting by _____



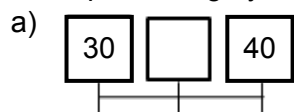
Counting by _____



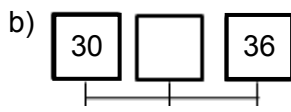
Counting by _____

(a) 18, counting by 2s; b) 15, counting by 3s; c) 21, counting by 3s; d) 25, counting by 5s; e) 40, counting by 10s; f) 21, counting by 3s)

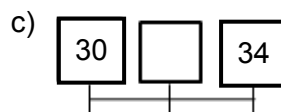
Exercises: Eric skip counts by 2s, 3s, 4s, 5s, or 10s and leaves some numbers blank. What is he skip counting by? Fill in the numbers.



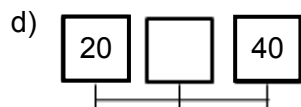
Counting by _____



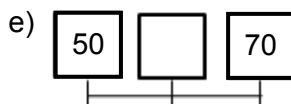
Counting by _____



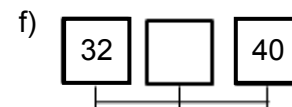
Counting by _____



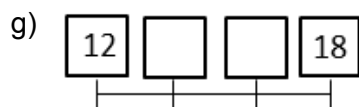
Counting by _____



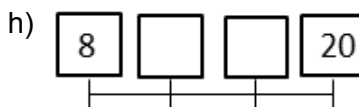
Counting by _____



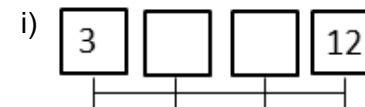
Counting by _____



Counting by _____



Counting by _____



Counting by _____

Answers: a) 35, counting by 5s; b) 33, counting by 3s; c) 32, counting by 2s; d) 30, counting by 10s; e) 60, counting by 10s; f) 36, counting by 4s; g) 14, 16, counting by 2s; h) 12, 16, counting by 4s; i) 6, 9, counting by 3s

Correcting mistakes in skip counting by 3s. SAY: In the next exercises, the sequences show skip counting by 3s, but they have some mistakes. Some numbers might be missing, some numbers might be incorrect. You need to find all the mistakes.

Exercises: Lela skip counts by 3s but she makes mistakes. Find her mistakes.

a) 3, 6, 12, 14, 17 b) 30, 33, 36, 37, 42, 48 c) 60, 66, 69, 73, 76

Answers: a) 9 is missing between 6 and 12, the last two numbers should be 15, 18;
b) 37 should not be there, 45 is missing between 42 and 48; c) 63 is missing between 60 and 66, the last two numbers should be 72, 75

Give each student **BLM Skip Counting Chart** and project a copy of the BLM on the board. Write “3s” in the blank in the first cell and have students do the same. SAY: Complete the chart by skip counting by 3s from 0 to 30. Start by filling in the first two rows on the board, as shown below:

Skip Count by 3s	Tens	Ones	Even or Odd?
0	0	0	even
3	0	3	odd

Have students continue skip counting to 30. When students have completed the chart, project a completed chart on the board, as shown below:

Skip Count by 3s	Tens	Ones	Even or Odd?
0	0	0	even
3	0	3	odd
6	0	6	even
9	0	9	odd
12	1	2	even
15	1	5	odd
18	1	8	even
21	2	1	odd
24	2	4	even
27	2	7	odd
30	3	0	even

ASK: Is there a pattern in the last column? (yes) What is the pattern? (the numbers switch between even and odd) Do you notice anything about the ones column? (it contains all the digits from 0 to 9) PROMPT: Are there any digits missing, or are all the digits between 0 and 9 there? ASK: Do you think there is a pattern in the ones digits? (no) SAY: We can’t see the pattern yet because our chart isn’t long enough, but if we keep going, we will see the pattern: 0, 3, 6, 9, 2, 5, 8, 1, 4, 7, and then repeat.

Exercises: Skip count by 3s.

- a) 0, ____, ____, ____ b) 9, ____, ____, ____
c) 27, ____, ____, ____ d) 30, ____, ____, ____
e) 60, ____, ____, ____ f) 120, ____, ____, ____
g) 33, ____, ____, ____ h) 42, ____, ____, ____
i) 48, ____, ____, ____

Answers: a) 3, 6, 9; b) 12, 15, 18; c) 30, 33, 36; d) 33, 36, 39; e) 63, 66, 69; f) 123, 126, 129; g) 36, 39, 42; h) 45, 48, 51; i) 51, 54, 57

Extensions

1. John starts at 0 and skip counts by 3s. All his numbers are even. Does he skip count correctly? How do you know?

Answer: No. Skip counting by 3s starting at 0 should switch between even and odd numbers.

2. Give students another copy of BLM Skip Counting Chart. SAY: Complete the chart by skip counting by 6s, from 0 to 60. (see completed chart below)

Skip Count by 6s	Tens	Ones	Even or Odd?
0	0	0	even
6	0	6	even
12	1	2	even
18	1	8	even
24	2	4	even
30	3	0	even
36	3	6	even
42	4	2	even
48	4	8	even
54	5	4	even
60	6	0	even

ASK: Is there a pattern in the last column? (yes) What is the pattern? (the numbers are always even) Do you notice anything about the ones column? (it only contains digits 0, 2, 4, 6, and 8; the pattern 0, 6, 2, 8, 4 repeats)

3. Skip count by 6s.

- a) 0, ____, ____, ____ b) 6, ____, ____, ____ c) 12, ____, ____, ____
d) 18, ____, ____, ____ e) 30, ____, ____, ____ f) 60, ____, ____, ____
g) 36, ____, ____, ____ h) 24, ____, ____, ____ i) 54, ____, ____, ____

Answers: a) 6, 12, 18; b) 12, 18, 24; c) 18, 24, 30; d) 24, 30, 36; e) 36, 42, 48; f) 66, 72, 78; g) 42, 48, 54; h) 30, 36, 42; i) 60, 66, 72

NS3-32 Multiplication and Repeated Addition

Pages 10–11

Curriculum Requirement:

AB: required

BC: required

MB: required

ON: required

Goals:

Students will represent repeated addition sentences as multiplication sentences.

Students will write multiplication sentences using the multiplication sign.

Prior Knowledge Required:

Can perform repeated addition

Can skip count

Vocabulary: multiplication, multiplication sentence, multiplication sign, multiply, product, repeated addition, skip count, sum, times

Materials:

ball

25 counters per pair of students

base ten blocks, at least 6 hundreds, 8 tens, and 15 ones per student (see Extension 3)

Mental math minute. Have students skip count forwards by 2s, 3s, 4s, 5s, or 10s.

- For 2s and 10s, start from even or odd numbers within 1000.

- For 5s, start from multiples of 5 within 1000.

- For 3s and 4s, start from multiples of the number they count by within 100.

Pass the ball to a student as you say the first number in the pattern. That student then says the next number in the pattern while passing the ball to another student, and so on. Each time, make sure students pass the ball to somebody who has not had a chance to answer yet.

Repeated addition as multiplication. SAY: When we do repeated addition, we add the same number several times. Write on the board:

$$5 + 5 + 5 + 5 + 5 + 5 =$$

SAY: These addition sentences can get pretty long, so mathematicians came up with a short way of writing them. ASK: How many 5s are we adding? (6) Write “6” next to the equal sign.

SAY: We are adding six 5s. Five appears in the number sentence six times. We can say for short that we add 5 six times. Write “ $\times 5$ ” beside the 6, as shown below:

$$5 + 5 + 5 + 5 + 5 + 5 = 6 \times 5$$

SAY: We write it like this, and we read it as “6 times 5.” This is called *multiplication*. Point to the multiplication sign and SAY: This looks like the letter x, but it is a *multiplication sign* and we read it as *times*. Write on the board:

$$2 + 2 + 2 =$$

ASK: How many times am I adding 2? (3 times) Write on the board:

$$3 \times 2$$

Read it aloud. SAY: In multiplication, the first number says how many times I’m adding, and the second number is the number that gets added. Write on the board:

$$5 + 5 + 5 + 5 =$$

ASK: How many times do we have 5 in the addition? (4 times) Write “4 ×” after the equal sign.

ASK: What number is being added? (5) Write “5” after the × sign. SAY: When we do a multiplication like 4 times 5, we say that we *multiply* 4 times 5, or we multiply 4 by 5.

Exercises: Write the repeated addition as a multiplication.

a) $6 + 6 + 6 + 6$ b) $4 + 4$ c) $10 + 10 + 10$ **Bonus:** $7 + 7 + 7 + 7$

Answers: a) 4×6 , b) 2×4 , c) 3×10 , Bonus: 4×7

Writing multiplication as repeated addition. SAY: Let’s do it the other way around. Write on the board:

$$5 \times 4 =$$

ASK: Which number am I adding? (4) How many times do I need to write four? (5 times)
Complete the sentence on the board by showing the repeated addition of 4, as shown below:

$$5 \times 4 = 4 + 4 + 4 + 4 + 4$$

SAY: Let’s skip count by 4s to find the answer. Skip count as a class to get 20. Add the answer to the board, as shown below:

$$5 \times 4 = 4 + 4 + 4 + 4 + 4 = 20$$

Follow the same process with two or three more examples on the board, such as 3×2 , 5×10 , and 2×6 . ($3 \times 2 = 2 + 2 + 2 = 6$; $5 \times 10 = 10 + 10 + 10 + 10 + 10 = 50$; $2 \times 6 = 6 + 6 = 12$)

SAY: The answer to an addition is called a sum. The answer to a multiplication is called a *product*. The product of 5 and 4 is 20. Write on the board:

$$5 \times 4 = 20$$

SAY: This is called a *multiplication sentence*.

Exercises:

1. Write the multiplication as a repeated addition. Skip count to find the answer.

a) 3×4

b) 4×2

c) 5×3

d) 4×4

e) 6×10

f) 3×6

g) 4×3

h) 5×2

Bonus: 13×2

Answers: a) $4 + 4 + 4 = 12$, b) $2 + 2 + 2 + 2 = 8$, c) $3 + 3 + 3 + 3 + 3 = 15$, d) $4 + 4 + 4 + 4 = 16$,
e) $10 + 10 + 10 + 10 + 10 + 10 = 50$, f) $6 + 6 + 6 = 18$, g) $3 + 3 + 3 + 3 = 12$,
h) $2 + 2 + 2 + 2 + 2 = 10$, Bonus: $2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 = 26$

2. Write the multiplication as an addition.

a) 3×117

b) 4×204

c) 3×512

d) 2×814

Answers: a) $117 + 117 + 117$, b) $204 + 204 + 204 + 204$, c) $512 + 512 + 512$, d) $814 + 814$

Identifying additions that can be written as multiplications. Write on the board:

$2 + 2 + 2 + 2$

$1 + 2 + 2$

$3 + 4 + 2$

$1 + 1 + 1 + 1$

$0 + 0 + 0$

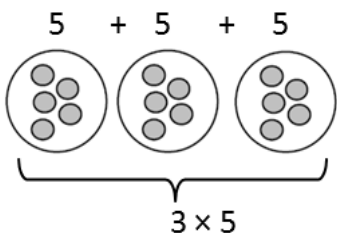
$10 + 10$

ASK: Which of these cannot be written as multiplications? Point to each addition and have students signal thumbs up or thumbs down to say which can or cannot be written as multiplications. (yes, no, no, yes, yes, yes) For each thumbs down, ASK: Why not? (we aren't always adding the same number)

Pictures that show addition and multiplication. Draw on the board:



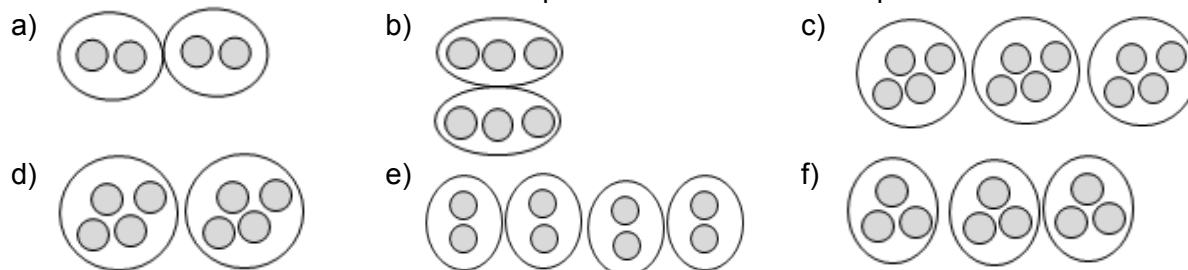
ASK: How many big circles are there? (3) How many dots are in each circle? (5) What is an addition for this picture? ($5 + 5 + 5$) Write the addition above the picture. What is a multiplication for this picture? (3×5) Write the multiplication below the picture. The final picture should look like this:



ASK: What is the final answer to either sentence? (15) Point out that you can get the multiplication straight from the picture: 5 dots are drawn 3 times, so the number of big circles is the first number in the multiplication, and the number of dots is the second number in the multiplication. Keep the picture on the board for further reference.

Exercises:

1. Write an addition sentence and a multiplication sentence for the picture.



Answers: a) $2 + 2 = 4$, $2 \times 2 = 4$; b) $3 + 3 = 6$, $2 \times 3 = 6$; c) $4 + 4 + 4 = 12$, $3 \times 4 = 12$; d) $4 + 4 = 8$, $2 \times 4 = 8$; e) $2 + 2 + 2 + 2 = 8$, $4 \times 2 = 8$; f) $3 + 3 + 3 = 9$, $3 \times 3 = 9$

2. Write an addition sentence and a multiplication sentence.

- | | |
|-------------------------------------|------------------------------------|
| a) 3 boxes
5 pencils in each box | b) 4 boxes
2 apples in each box |
| c) 7 boxes
nothing in each box | d) 10 boxes
1 toy in each box |
| e) 3 boxes
10 coins in each box | f) 6 boxes
4 books in each box |

Answers: a) $5 + 5 + 5 = 15$, $3 \times 5 = 15$; b) $2 + 2 + 2 + 2 = 8$, $4 \times 2 = 8$; c) $0 + 0 + 0 + 0 + 0 + 0 + 0 = 0$, $7 \times 0 = 0$; d) $1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 10$, $10 \times 1 = 10$; e) $10 + 10 + 10 = 30$, $3 \times 10 = 30$; f) $4 + 4 + 4 + 4 + 4 + 4 = 24$, $6 \times 4 = 24$

Drawing pictures for repeated addition. Return to the picture on the board showing 3×5 . SAY: This picture shows adding 5 three times. ASK: Where do we see 5 in the picture? (the number of dots in each circle) Where do we see 3 in the picture? (the number of big circles) Write on the board:

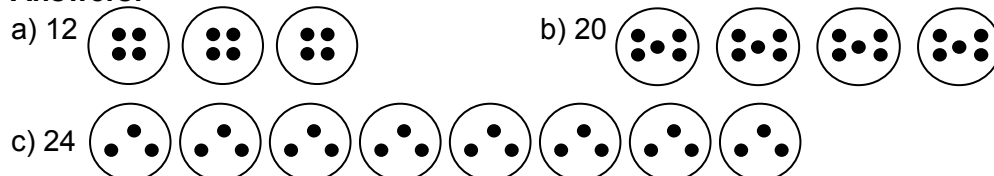
$$2 + 2 + 2 + 2$$

SAY: I want to draw a picture with dots and circles for this addition. In the picture on the board, we show adding 5s by drawing circles with five dots in it. Here we are adding 2s. ASK: How many dots should be in each circle? (2) Draw a circle with two dots inside. ASK: How many circles like that should I draw? (4) How do you know? (we add 2 four times) Have a volunteer finish the picture. Repeat with $3 + 3 + 3 + 3$, but ask students to tell you how many big circles they need first.

Exercises: Draw a picture for the addition. Use circles and dots. Finish the addition sentence.

- a) $4 + 4 + 4$ b) $5 + 5 + 5 + 5$ c) $3 + 3 + 3 + 3 + 3 + 3 + 3 + 3$

Answers:



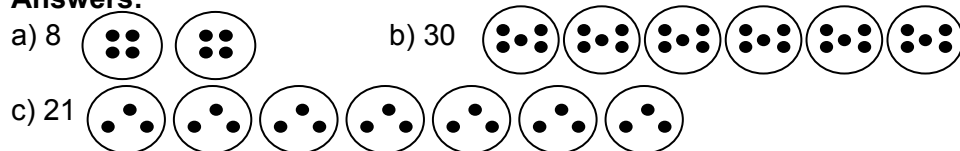
Drawing pictures for multiplication. Return to the picture on the board showing 3×5 .

SAY: The same picture shows multiplication. Now I am going to give you a multiplication, and you need to draw a picture to show it. When you read a multiplication, it tells you what to draw: when you read “three times five;” you need to draw three circles with five dots in each circle. Have a volunteer draw a picture for 3×2 , and have students signal thumbs up or thumbs down to say if the picture is correct.

Exercises: Draw a picture for the multiplication. Use circles and dots. Finish the multiplication sentence.

- a) 2×4 b) 6×5 c) 7×3

Answers:



Activity

Give each pair of students 25 counters. Player 1 writes a repeated addition in which no more than five numbers are added or a multiplication using numbers that are five or less. Player 2 models the addition or the multiplication with counters. Students can stack the counters to make groups instead of placing them in a circle.

(end of activity)

Extensions

1. a) Fill in the chart with the repeated addition and answer for each multiplication sentence.

Multiplication Sentence	Addition Sentence	Answer
6×1	$1 + 1 + 1 + 1 + 1 + 1$	6
5×1		
4×1		
3×1		
2×1		
1×1		

- b) Predict 8×1 , 23×1 , and 963×1 .

Selected answers: a) $5 \times 1 = 1 + 1 + 1 + 1 + 1 = 5$, $4 \times 1 = 1 + 1 + 1 + 1 = 4$, $3 \times 1 = 1 + 1 + 1 = 3$

Answers: b) $8 \times 1 = 8$, $23 \times 1 = 23$, $963 \times 1 = 963$

2. Change two numbers in the addition so that it can be rewritten as a multiplication. The sum must stay the same. The answer is given for part a) as an example.

a) $3 + 2 + 4 + 3 = 3 + 3 + 3 + 3 = 4 \times 3 = 12$

b) $10 + 10 + 11 + 9 + 10$

c) $5 + 4 + 5 + 6$

d) $1 + 1 + 1 + 0 + 2$

e) $6 + 6 + 6 + 6 + 6 + 4 + 8$

Bonus: $99 + 100 + 100 + 100 + 101 + 100$

Answers: b) $5 \times 10 = 50$, c) $4 \times 5 = 20$, d) $5 \times 1 = 5$, e) $7 \times 6 = 42$, Bonus: $6 \times 100 = 600$

3. Use base ten blocks to show each multiplication by stacking the blocks together. Use the model you make to find the product.

a) 3×12

b) 4×23

c) 5×110

d) 3×213

Answers: a) 36, b) 92, c) 550, d) 639

NS3-33 Multiplication and Equal Groups

Pages 12–14

Curriculum Requirement:

AB: required

BC: required

MB: required

ON: required

Goals:

Students will describe situations with equal groups as repeated addition and as multiplication.
Students will describe multiplication sentences as the total number of objects in a set of equal groups.

Students will draw pictures of equal groups to model multiplication.

Students will solve simple multiplication word problems involving equal groups.

Students will create a problem for a given multiplication.

Prior Knowledge Required:

Can model multiplication as repeated addition

Can represent equal groups as repeated addition

Can write repeated addition sentences and multiplication sentences

Vocabulary: addition sentence, **equal groups**, **group**, multiplication, multiplication sentence, multiply, product, repeated addition

Mental math minute. Have students skip count forward by 2s, 3s, 4s, 5s, or 10s.

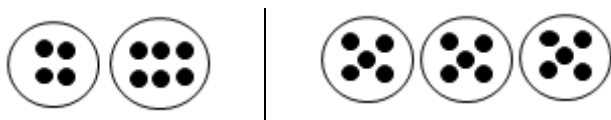
- For 2s and 10s, start from different numbers within 1000.

- For 5s, start from multiples of 5 within 1000.

- For 3s and 4s, start from multiples of the number they count by within 100.

Students can count in unison or individually and do jumping squats as they count.

Equal groups. SAY: A *group* is a collection of objects. Groups are *equal groups* if each group has the same number of objects in it. Draw on the board:



ASK: Are these equal groups or not? (on the left they are not equal; on the right they are equal)
Below the picture on the right, write on the board:

Number of groups: ____

Dots in each group: ____

Point to the picture on the right and ASK: How many groups are there, and how many dots are in each group? (3 groups, 5 dots in each) Fill in the blanks on the board. (3, 5)

Identifying the number of groups and the number of dots in a picture. Draw on the board:



Number of groups: _____

Dots in each group: _____

ASK: How many groups are there, and how many dots are in each group? (2 groups, 6 dots in each group) Fill in the blanks on the board. (2, 6)

Exercises: Draw equal groups to match the description.

a) 4 groups, 2 dots in each group

b) 3 groups, 4 dots in each group

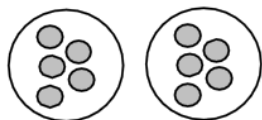
c) 2 groups, 5 dots in each group

d) 5 groups, 1 dot in each group

Selected answer:



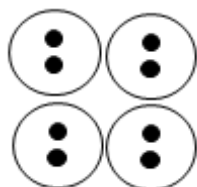
Equal groups and multiplication. Draw on the board:



ASK: How many groups are there? (2) How many dots are in each group? (5) What is the addition sentence that goes with this picture? ($5 + 5 = 10$) Remind students that they can write a multiplication sentence for any grouping of objects, as long as there is an equal number in each group. Ask a volunteer to write the multiplication sentence for the picture. ($2 \times 5 = 10$)

PROMPT: How many groups are there? (2) How many objects are in each group? (5) How can we show that as a multiplication sentence? ($2 \times 5 = 10$)

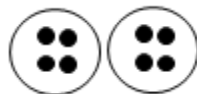
Draw more equal groups on the board and ask students to write an addition sentence and a multiplication sentence for each. (see examples below)



4 groups of 2 objects

$$2 + 2 + 2 + 2 = 8$$

$$4 \times 2 = 8$$



2 groups of 4 objects

$$4 + 4 = 8$$

$$2 \times 4 = 8$$

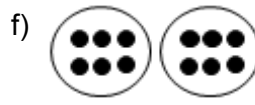
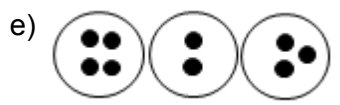
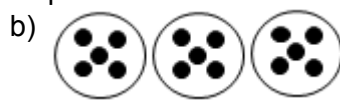
Draw on the board:



ASK: How many dots are in each group? (4, 4, 3) What addition can I write for this picture? ($4 + 4 + 3$) Is this a repeated addition? (no) Can I write a multiplication for it anyway? (no) Why not? (because when you multiply, you add the same number many times, but these groups show different numbers) SAY: When the groups don't show the same number, it isn't a repeated addition and it does not show a multiplication.

Exercises:

1. Does the picture show multiplication?



Answers: a) no, b) yes, c) no, d) yes, e) no, f) yes

2. Draw a picture to show the groups. Then write an addition sentence and a multiplication sentence.

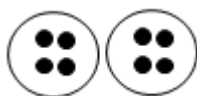
a) 2 groups, 4 dots in each group b) 4 groups, 3 dots in each group

c) 2 groups, 5 dots in each group d) 5 groups, 2 dots in each group

Selected answers: a) $4 + 4 = 8$, $2 \times 4 = 8$; b) $3 + 3 + 3 + 3 = 12$, $4 \times 3 = 12$;

c) $5 + 5 = 10$, $2 \times 5 = 10$; d) $2 + 2 + 2 + 2 + 2 = 10$, $5 \times 2 = 10$

Drawing a picture for a multiplication. Draw on the board.



2 groups of 4

$$2 \times 4 = 8$$

SAY: The first number in the multiplication shows the number of groups. Write "number of groups" above the sentence, with an arrow pointing to the 2. SAY: The second number in the multiplication shows the number of dots in each group. Write "number of dots in a group" below the sentence and draw an arrow pointing at the 4. SAY: The answer is the total number of dots. Write "total number of dots" beside the sentence and draw an arrow pointing to the 8. Keep the picture on the board for later reference.

Write the number sentences in the following exercises on the board one at a time, and ask students to tell how many circles they need to draw for this number sentence and how many

dots they need to draw in each group. Students can signal the answer. After students signal the answer to each multiplication, have a volunteer draw the appropriate picture on the board and write the total number of dots.

Exercises:

1. How many groups? How many dots in each group? How many dots in total?

- a) 3×4 b) 4×5 c) 5×2 d) 6×3

Answers: a) 3 groups, 4 dots in each, 12 dots in total; b) 4 groups, 5 dots in each, 20 dots in total; c) 5 groups, 2 dots in each, 10 dots in total; d) 6 groups, 3 dots in each, 18 dots in total

2. Draw equal groups of dots to show the multiplication. Find the product.

- a) 2×6 b) 2×7 c) 1×10 d) 3×2
e) 4×3 f) 3×6 g) 3×5

Answers: a) 12, b) 14, c) 10, d) 6, e) 12, f) 18, g) 15

Writing a multiplication for a real-world situation. ASK: What other objects often come in equal groups? (sample answers: shoes in pairs, fingers in 5s, pencils in boxes, players in teams) SAY: When you have a situation like that, you can find the total number of objects using multiplication. You can also draw a picture to model the situation, but you do not have to draw the object, you can draw dots instead. Each dot represents a finger, a shoe, a pencil, or a player in a team. This is much faster and easier. For example, you have five boxes of shoes, and two shoes in each box. ASK: How many circles will you draw? (5) How many dots will you draw in each circle? (2) Have a volunteer draw the picture and then have another volunteer write the multiplication sentence. ($5 \times 2 = 10$) Repeat with the following problem: There are six boxes of crayons. Each box has six crayons. How many crayons are there? ($6 \times 6 = 36$)

Exercises: Write a multiplication sentence and then find the answer.

- a) There are 6 stools. Each stool has 3 legs. How many legs are there in total?
b) There are 7 boats. Each boat holds 2 people. How many people are there?
c) There are 5 boxes with 4 pencils in each box. How many pencils are there?

Bonus: A sandwich uses 2 slices of bread. How many slices does Cody need to make 4 sandwiches?

Answers: a) $6 \times 3 = 18$, b) $7 \times 2 = 14$, c) $5 \times 4 = 20$, Bonus: $4 \times 2 = 8$

Making a problem for a multiplication sentence. SAY: Now I want you to do the opposite of what you just did. I gave you a problem and you wrote the multiplication for it. This time, I will give you a multiplication, and you will invent a word problem for it. Write on the board:

$$3 \times 4$$

Have several volunteers present their word problems. Prompt students who are struggling to invent a problem about something they like or are interested in. (for example, cars) ASK: Is there anything that a car has four of? (wheels)

Exercises: Make a problem for the multiplication. Draw dots and circles to show the problem. Write a multiplication sentence to solve the problem.

a) 4×3

b) 6×4

c) 3×2

d) 5×10

Selected sample answer: a) A cat owner has 4 cats. Each cat has 3 kittens. How many kittens does the owner have?



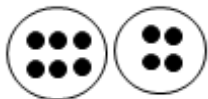
$4 \times 3 = 12$

Extensions

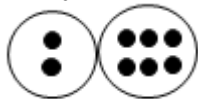
1. Have students work in groups of three to write an addition sentence and a multiplication sentence for the number of shoes people in their group are wearing. ($2 + 2 + 2 = 6$ and $3 \times 2 = 6$) Then have students write sentences for the number of left and right shoes in the group. ($3 + 3 = 6$ and $2 \times 3 = 6$) Have students write multiplication sentences for anything else everyone in the group has, such as hands, fingers, and noses.

2. Change the picture so the total number of dots stays the same but the groups are equal. What multiplication sentence does your new picture show?

a)



b)



c)



Answers: a) two groups of 5, $2 \times 5 = 10$; b) two groups of 4, $2 \times 4 = 8$; c) three groups of 3, $3 \times 3 = 9$

NAME

DATE _____

Skip Counting Chart

[illegible]

Hundreds Charts

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	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100