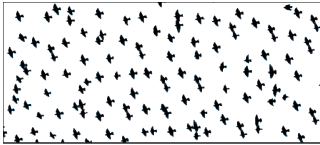## Student Guide

Questions 1–23 (SG pp. 234–242)

1.* Answers may vary. About 125 birds

2.* Explanations may vary. It looks like about 5 of the smaller pictures could cover the larger picture. $5 \times 25 = 125$ birds.

3. Both problems give an exact count of a smaller quantity to use as a basis for determining the larger amount.

4. $50 \times 4 = 200$

5.* Answers may vary. About 880 people. $11 \times 80 = 880$ people

6. A.* $142 - 130 = 12$ marbles

   B.* $50 - 38 = 12$ marshmallows

   C.* Linda's marble estimate is a better estimate than her marshmallow estimate. Being "off" by 12 out of 142 is a closer estimate than 12 out of 38.

Using Estimation

Mystery Jars

Linda took this photograph of a flock of birds.

Then she copied part of her picture using a computer and made the smaller picture at the right. Linda says that the smaller picture has about 25 birds.

1. Use the number of birds in the small picture as a reference number to help you estimate the number of birds in the larger picture.

2. Explain how you reached your estimate.

One way to make good estimates is to compare the quantity you want to estimate with a known number of objects.

Tanya made a mystery jar filled with marbles. Then she put 50 other marbles in a plastic bag. Tanya showed the jar and the bag of marbles to the other students. She asked them to guess how many marbles were in her mystery jar.

3. How is Tanya's mystery jar problem like Linda's picture problem?

Jacob said the small bag of marbles helped him to guess how many were in the large jar. He said, "It looks like I could fit about 4 of these bags of marbles into the big jar. So I'm going to say my estimate is 200 marbles in the big jar."

4. How did Jacob decide on his estimate of 200 marbles?

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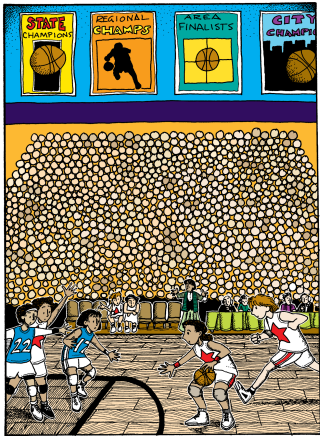
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Look at the picture of the basketball game below. Do you think there are more or less than 100 people in the crowd? Do you think there are more or less than 500 people? Are there more or less than 1000 people? Are there more or less than 2000 people?

Use the small picture on the left to help you estimate. There are about 80 people in the small picture.

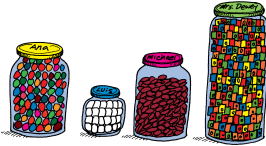5. Estimate the number of people watching the game. How did you decide on your estimate?

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Discuss

Three students in Mrs. Dewey's room made mystery jars for homework and brought them to class. Mrs. Dewey made a mystery jar of centimeter connecting cubes.

Linda and Romesh estimated the number of objects in each jar and recorded their estimates in data tables. Here are Linda's estimates:

Linda's Data Table

Object	Estimate
marbles	130
marshmallows	50
beans	350
cubes	500

6. The actual number of marbles is 142. The actual number of marshmallows is 38.

   A. What is the difference between Linda's estimate of the number of marbles and the actual number?

   B. What is the difference between Linda's estimate of the number of marshmallows and the actual number?

   C. Is Linda's estimate for the number of marbles better than her estimate for the number of marshmallows? Why or why not?

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*Answers and/or discussion are included in the lesson.

Here are Romesh's estimates:

Romesh's Data Table

Object	Estimate
marbles	120
marshmallows	35
beans	375
cubes	600

7. The actual number of marbles is 142. The actual number of marshmallows is 38.
   A. What is the difference between Romesh's estimate of the number of marbles and the actual number?
   B. What is the difference between Romesh's estimate of the number of marshmallows and the actual number?
   C. Is Romesh's estimate for the number of marbles better than his estimate for the number of marshmallows? Why or why not?

8. The actual number of beans is 363. The actual number of cubes is 583.
   A. Look at the estimates that Linda and Romesh made for the number of beans. Which one made the better estimate? Show or tell how you decided.
   B. Look at both of their estimates for the number of cubes. Which one made the better estimate? Show or tell how you decided.

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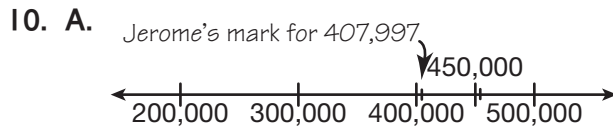
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9. For each estimate below, tell whether the estimate is close enough. Explain your thinking for each.
   A. A carpenter is making a door. The opening for the door is 74 cm wide. The carpenter estimated the door should be about 70 cm wide.
   B. Keenya brings $30 to the store. She estimated that the groceries in her cart cost about $30. The actual cost is $32.49.
   C. Mr. Benson estimated there would be 300 players in a soccer league when he bought uniforms before the season started. There were 291 students that signed up for the league.
   D. Coach Salazar estimated there would be 20 players on her softball team when she bought uniforms before the season started. There were 11 players on her team.

It's About . . .

Jerome brought in an article with a number for the Newswire. Mrs. Dewey asked him to share the numbers he found. "My article says that 407,997 people visited the planetarium during 2006 and 458,156 people visited during 2007," said Jerome.

"Can anyone estimate the total number of people who visited the planetarium during these two years?" asked Mrs. Dewey.

We often use round numbers in estimating because they are convenient. Round numbers such as tens, hundreds, or thousands end in zeros. They are one type of convenient number. A number line is helpful when rounding.

200,000   300,000   400,000 450,000 500,000
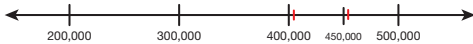
10. A. Jerome estimated where 407,997 would be on the number line. He knew that it would be between 400,000 and 500,000 so he chose these two numbers as his **benchmarks.** Locate the mark Jerome made on the number line showing 407,997.
    B. Is 407,997 closer to 400,000 or 500,000?
    C. Round 407,997 to the nearest 100,000.

11. A. Jerome used the same two benchmarks to estimate where 458,156 is on the number line. Find the mark Jerome made for 458,156.
    B. Is it closer to 400,000 or 500,000?
    C. Round 458,156 to the nearest 100,000.

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7. **A.** $142 - 120 = 22$ marbles

   B. $38 - 35 = 3$ marshmallows

   C. Romesh's estimate for the number of marshmallows was better than his marbles estimate. Being "off" by 3 out of 38 is a closer estimate than 22 out of 142 marbles.

8. **A.** Both their estimates are reasonable for the number of beans. Romesh's estimate is slightly better because he was only 12 away from the actual number and Linda was 13.

   B. Romesh has a better estimate for the number of cubes. He was 17 away and Linda is 83 away.

9. **A.** Estimate is not close enough. There will be too large of a gap between the door and the opening.

   B.* Keenya's estimate is close, but too low. In this case, a good estimate should be greater than the actual cost so that Keenya will have enough money.

   C. Answers may vary. This estimate seems reasonably close relative to the total number of players.

   D. Answers may vary. Even though the difference between the estimate and the actual number is the same as in Part C, the difference is larger relative to the total number of players since there are only 11 players on the team. Therefore this estimate is not close enough.
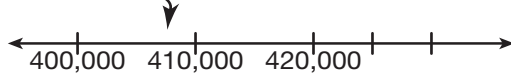
10. **A.**

Jerome's mark for 407,997
450,000
200,000   300,000   400,000   500,000

   B. 400,000

   C. 400,000

11. **A.**

450,000
200,000   300,000   400,000   500,000
Jerome's mark for 458,156

   B. 500,000

   C. 500,000

*Answers and/or discussion are included in the lesson.
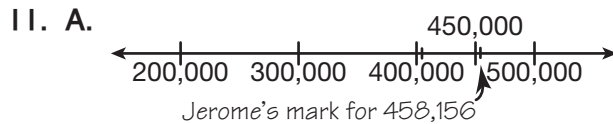
12.* 450,000 or 460,000

13. A.

Ana's mark for 407,997

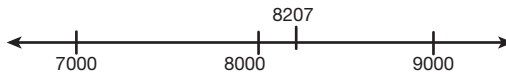400,000 410,000 420,000

  B. 400,000 and 410,000

14. A.* 400,000 + 500,000 = 900,000

  B.* 410,000 + 460,000 = 870,000

  C.* Both students are correct. Jerome's estimate is easier to compute. Ana's is more exact.
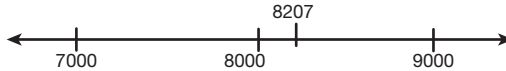
15. Estimates will vary. If rounding to ten thousands, then the attendance grew about 50,000.
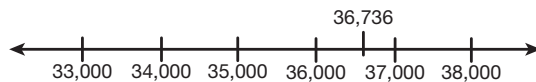
16. A. 8000

8207

7000 8000 9000

  B. 8000 and 9000

17. A. 8200

8207

7000 8000 9000

  B. 8200 and 8300

  C. 8200 is closer.

  D.* 8200

18. A. 37,000

36,736

33,000 34,000 35,000 36,000 37,000 38,000

  B. 36,000 and 37,000

  C. 40,000

36,736
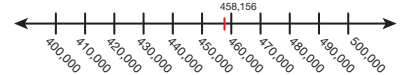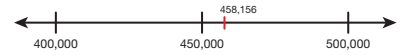
30,000   40,000
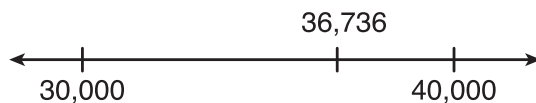
  D.* 37,000

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12. Ana did not round 458,156 to the nearest hundred thousand. She rounded 458,156 in two other ways. She used these two number lines.

Using these two number lines, give two other ways to round 458,156.

13. A. Use Ana's strategy and the second number line in Question 12 to round 407,997 to the nearest 10,000. Point to where 407,997 is on the number line.

 **B.** What benchmarks did you use?

14. Jerome estimated the total number of people who visited the planetarium over the last two years as 900,000. Ana's estimate was 870,000 people.

  A. Write a number sentence to show how Jerome found his estimate.

  B. Write a number sentence to show how Ana found her estimate.

  C. Which student is correct?

15. Use rounded numbers to estimate the increase in attendance from 2006 to 2007. Show or tell your strategy.
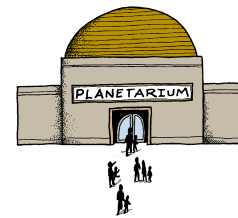
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Explore

Practice rounding the numbers in each problem below.

16. A. Use this number line to round 8207 to the nearest thousand.

7000   8000   9000

  B. What two benchmarks did you use?

17. A. Round 8207 to the nearest hundred using this number line.

8000   8100   8200   8300   8400

  B. What two benchmarks did you use?

  C. Compare this rounded number with the rounded number you found in Question 16. Which one is closer to the exact number?

  D. Last year, 8207 people attended a high school play. The school expects about the same number to attend this year's show. Which rounded number would be best to use to plan refreshments for this year's show?

18. A. Use this number line to round 36,736 to the nearest thousand.

33,000   34,000   35,000   36,000   37,000   38,000
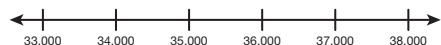
  B. What two benchmarks did you use?

  C. Round 36,736 to the nearest 10,000. Draw a number line showing the benchmarks that you use.

  D. Last year 36,736 tickets were sold at a fun fair. The planning committee needs to order tickets for this year's fair. Tickets come in rolls of 1000. If they expect about the same number of tickets to be sold, which rounded number should they use to order the tickets?

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*Answers and/or discussion are included in the lesson.

Estimating Sums and Differences

Discuss

Ming and Keenya were researching the national parks in the United States. They found that Yellowstone National Park, established in 1872, was the world's first national park.

Ming organized some of the national park information they found in a table.

National Parks

National Park	State	Established	Area
Acadia	Maine	1929	46,051 acres
Badlands	South Dakota	1978	242,756 acres
Carlsbad Caverns	New Mexico	1930	46,776 acres
Denali	Alaska	1980	4,740,911 acres
Everglades	Florida	1934	1,398,902 acres
Grand Canyon	Arizona	1919	1,217,403 acres
Mammoth Cave	Kentucky	1941	52,830 acres
Mesa Verde	Colorado	1906	52,122 acres
Petrified Forest	Arizona	1962	93,533 acres
Rocky Mountain	Colorado	1915	265,769 acres
Wind Cave	South Dakota	1903	28,295 acres

19. A. Ming estimated that there are about 1,300,000 acres of national park land in Arizona. Ming wrote this number sentence showing the convenient numbers he chose:

1,200,000 + 100,000 = 1,300,000 acres

Explain how Ming arrived at his estimate.

B. Find another estimate for the amount of park land in Arizona. Write a number sentence to show how you estimated.

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Explore

Use Ming and Keenya's table to answer Questions 20–22. Write a number sentence showing how you found each estimate.

20. Estimate the number of acres of national park land in Colorado.

21. Which state, Arizona or Colorado, has more national park land? Estimate the difference.

22. Mammoth Cave is the longest known cave network in the world. Estimate the difference in size between Mammoth Cave National Park and Wind Cave National Park.

Raising Money

The Parent-Teacher Club at Bessie Coleman School wants to purchase computers for the school over a two-year period. The club's goal is to purchase computer equipment for 25 stations. Club members made a table to show what they wanted to buy:

Quantity	Item	Total Cost ($)
25	14-inch monitors	7469.00
25	extended keyboards	3127.00
25	personal computers	30,716.00
25	color printers	14,054.00

✓ **Check-In: Question 23**

23. Use estimation to set a goal for the amount of money the Parent-Teacher Club needs to earn. Write a paragraph explaining how you arrived at your estimate. Use the *Math Practices* page in the Reference section to help you write your paragraph.

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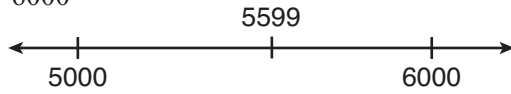
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19. A.* Explanations will vary. Ming rounded to the nearest hundred thousand.

 B.* Estimates will vary. One possible solution is to round to the nearest 10,000. $1,220,000 + 90,000 = 1,310,000$ acres.

20. Estimates will vary. One possible solution is to round to the nearest 10,000.

$50,000 + 270,000 = 320,000$ acres.

21. Arizona. One possible solution is to round to the nearest 10,000; $1,310,000 - 320,000$ is about 990,000 or about 1,000,000 acres.

22. Answers will vary. One possible solution is to round to the nearest 10,000;

$50,000 - 30,000 = 20,000$ acres.

23.* Estimates will vary. Rounding to the nearest thousand will yield: $55,000 ($7000 + $3000 + $31,000 + $14,000 = $55,000). However, since this is a cost estimate, it may be necessary to overestimate. A choice which is easy to compute: $8000 + $3000 + $30,000 + $15,000 = $56,000. Students should justify their choices.

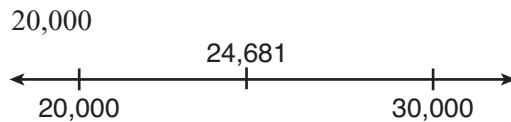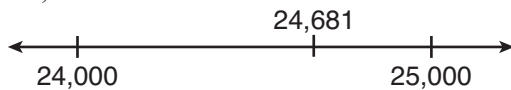*Answers and/or discussion are included in the lesson.

Homework

Questions 1–12 (SG pp. 243–244)

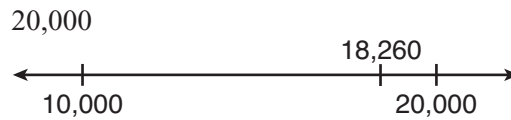Answers will vary for Question 1. Two possible solutions are shown for each.

1. A. 6000

5599
5000 ——— 6000

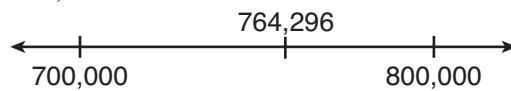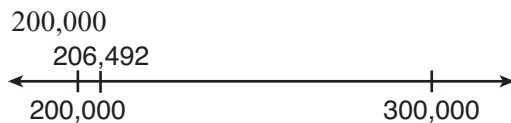5600

5599
5500 ——— 5600

B. 25,000

24,681
24,000 ——— 25,000

20,000

24,681
20,000 ——— 30,000

C. 18,000

18,260
18,000 ——— 19,000

20,000

18,260
10,000 ——— 20,000

D. 800,000

764,296
700,000 ——— 800,000

750,000

764,296
750,000 ——— 800,000

E. 210,000

206,492
200,000 ——— 210,000

200,000

206,492
200,000 ——— 300,000

F. 7,000,000

6,847,000
6,000,000 ——— 7,000,000
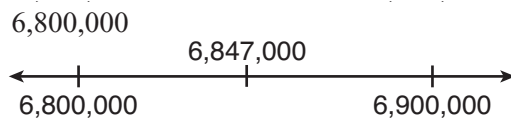
6,800,000

6,847,000
6,800,000 ——— 6,900,000
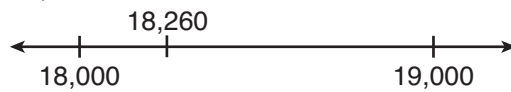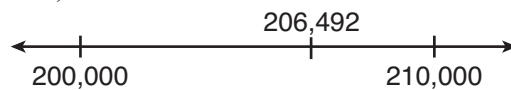
Homework

1. Find at least two ways to round each of these numbers.
   • Draw a number line for each rounded number.
   • Label your line with the benchmarks you chose.
   • Estimate the location of the actual number on the number line.

   A. 5599   **B.** 24,681   **C.** 18,260

   D. 764,296   **E.** 206,492   **F.** 6,847,000

Use this number line to answer Questions 2–4.

1,500,000   1,600,000   1,700,000   1,800,000   1,900,000

2. According to an article Linda hung on the Newswire, 1,858,766 people visited the aquarium last year. Use the number line to round 1,858,766 to the nearest hundred thousand.

3. The Willis Tower Skydeck had 1,510,063 visitors in one year. Use the number line to round 1,510,063 to the nearest hundred thousand.

4. During one season, a total of 1,697,398 people attended home games of the Chicago White Sox. Use the number line to round 1,697,398 to the nearest hundred thousand.

Addition and Subtraction Practice with Paper and Pencil

Solve the following problems using paper and pencil. Find exact answers. Show all your work. Use estimation to look back and see if your answers are reasonable. Show how you estimated.

5.	9436	6.	4302	7.	7407
	+ 4831		+ 3005		− 3822

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2. 1,900,000

3. 1,500,000

4. 1,700,000

5. 14,267. One possible estimate is: $9000 + 5000 = 14,000$.

6. 7307. One possible estimate is: $4000 + 3000 = 7000$.

7. 3585. One possible estimate is: $7000 − 4000 = 3000$

Estimate the answers to the following problems. Show the round numbers you used.

8. 23,065
   − 9,638

9. 94,378
   − 76,893

10. 80,025
    − 9,559

11. The United States has 12,383 miles of coastline along four different oceans. The Atlantic coast is 2069 miles long, the Arctic coast is 1060 miles long, and the coast of the Gulf of Mexico is 1631 miles long. About how long is the Pacific coast of the United States?

12. The United States has a total area of 3,787,319 square miles. Water covers 251,041 square miles. About how much of the United States area is land?

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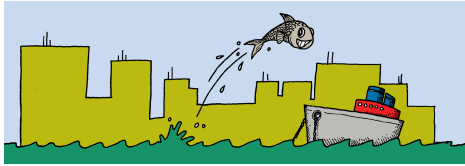
8. Answers will vary. One possible solution is: $20{,}000 - 10{,}000 = 10{,}000$.

9. Answers will vary. One possible solution is: $95{,}000 - 75{,}000 = 20{,}000$.

10. Answers will vary. One possible solution is: $80{,}000 - 10{,}000 = 70{,}000$.

11. Answers will vary. About 7000 miles.

    $2000 + 1000 + 2000 = 5000$; $12{,}000 - 5000 = 7000$

12. Answers will vary. About 3,500,000 square miles.

    $3{,}800{,}000 - 300{,}000 = 3{,}500{,}000$