Answers

Applications **Connections** **Extensions**

Investigation 1

ACE Assignment Choices

Differentiated Instruction
Solutions for All Learners
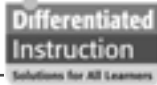
Problem 1.1
Core 1–6; 37–38
Other *Applications* 7

Problem 1.2
Core 8–18
Other *Connections* 39; *Extensions* 47, 48; unassigned choices from previous problems

Problem 1.3
Core 19–21
Other *Applications* 22, *Connections* 40–44, *Extensions* 49–52; unassigned choices from previous problems

Problem 1.4
Core 23–32, 45, 46
Other *Applications* 33–36, *Extensions* 53–58; unassigned choices from previous problems

Adapted For suggestions about adapting Exercise 20 and other ACE exercises, see the CMP *Special Needs Handbook*.
Connecting to Prior Units 37–38: *Bits and Pieces I;* 39–44: *Covering and Surrounding;* 40–43, 45, 46: *Shapes and Designs*

Applications

1. Close to 0 since 0.07 is less than 0.1.

2. Close to 1 since it is already greater than 1.

3. Close to $\frac{1}{2}$ since the midpoint between 0 and $\frac{1}{2}$ is 0.25 and 0.391 is greater than 0.25.

4. Close to 0 since 0.0999 is less than 0.1.

5. Close to 1 since it is only 0.01 away from 1.

6. Close to $\frac{1}{2}$ since the midpoint between $\frac{1}{2}$ and 1 is 0.75 and 0.599 is less than 0.75.

7. **a.** Possible answer: about $15.25;
   $8.75 + 2 + 4.25 = $15.

b. This is an overestimate since two numbers are rounded to a number greater than their value. Overestimation makes more sense because if Billie has enough money to cover the overestimation that means she can cover the actual amount. An underestimation may be misleading since the actual amount will be greater than this value and being able to cover the underestimation does not always mean that one has enough money for the actual amount.

c. She needs about $1. After material, glue, and paper, she will have about $1.95 left. The ribbon is about $3. So, the difference gives $1.

8. 9.22

9. 5.942

10. 14.4404

11. 0.473

12. 5.08

13. 1.64

14. 0.0879

15. 0.067

16. 9.842

17. 0.525 mi

18. B

19. **a.** Possible answer: $2\frac{1}{2} + 2 = 4\frac{1}{2}$

b. Possible answer: $4\frac{3}{4} - 1\frac{1}{4} = 3\frac{1}{2}$

c. Possible answer: $13 + 3\frac{1}{2} - 6 = 10\frac{1}{2}$

20. **a.** 0.54 mi   **b.** 1.44 mi

21. 11.54 seconds. Possible answer:
$48.92 - 12.35 - 13.12 - 11.91 = 11.54$ seconds

22. **a.** Karen

b. Jeff's tree

c. Lou's tree; it grew 0.168 meters from December to January.

d. Lou's tree; it grew 1.041 meters from December to April.

23. $1\frac{11}{20}$

24. $2\frac{39}{40}$

25. $5\frac{1}{2}$

26. $1\frac{13}{15}$

27. $1\frac{3}{10}$

28. $2\frac{1}{2}$

29. a. $0.8 + 0.75 = 1.55$

b. $2.6 + 0.375 = 2.975$

c. Using decimal approximation of 2 decimal places for non-terminating decimals: $1.67 + 3.83 = 5.50$. (Note that the decimal solution may not be equivalent to the fraction solution. If students had used $1.6 + 3.8$ their sum would not be 5.5. Briefly talk with students about why this happens with non-terminating decimals.)

d. Using decimal approximation of 2 decimal places for non-terminating decimals: $2.67 - 0.8 = 1.87$. (Note that the decimal solution may not be equivalent to the fraction solution. Briefly talk with students about why this happens with non-terminating decimals.)

e. $1.8 - 0.5 = 1.3$

f. $4.25 - 1.75 = 2.5$

30. a. $N = 53.95$; $22.3 + 31.65 = 53.95$; $31.65 + 22.3 = 53.95$; $53.95 - 22.3 = 31.65$; and $53.95 - 31.65 = 22.3$

b. $N = 14.46$; $18.7 - 4.24 = 14.46$; $18.7 - 14.46 = 4.24$; $14.46 + 4.24 = 18.7$; and $4.24 + 14.46 = 18.7$

31. a. 8.65

b. 106.019

c. 6.15

32. a. $N = 1.12$

b. $N = 15.35$

33. a. missing number is 9.188

b. missing number is 13.274

c. missing number is 1.77

d. missing number is 13.182

34. $1.02 + 0.19 = 1.21$

35. $3.4 + 4.17 + 0.4 = 7.97$

36. $20.5 - 4.31 = 16.19$

Connections

37. All three numbers are equivalent. All have 81 wholes, 9 tenths and no value or zero in all other place value spots.

38. D

39. $a = 1.83$ in., $b = 0.62$ in., $c = 1.82$ in., $d = 2.71$ in., $e = 2.71$ in. Perimeter $= 14.92$ in.

40. isosceles triangle, perimeter $= 1.832$ in.

41. trapezoid (assuming that the sides with lengths 8.68 and 3.06 are parallel; quadrilateral is also an acceptable answer); perimeter $= 26.63$ in.

42. quadrilateral (some students may recognize this as a kite, which is common, but not used in CMP); perimeter $= 229.2$ in.

43. pentagon; perimeter $= 3.697$ in.

44. 4.78 cm, 2.93 cm, and 4.78 cm

45. $180 - 28.1 - 53.18 = 98.72°$

**46.** $180 - 98.72 - 28.1 = 53.18°$

Extensions

47. a. We cannot add 2 hours and 45 minutes to 3 hours and 57 minutes by using $2.45 + 3.57$. This is because 0.45 in the decimal part of 2.45 means 0.45 hours. On the other hand, 45 minutes is 0.75 hours (i.e. $\frac{3}{4}$ of an hour). So, 2 hours and 45 minutes, in decimal form, is equal to 2.75, not 2.45. The idea of writing cents as decimal numbers works for money calculations because one cent written in dollar units is 0.01 dollar. Both the cent and decimal representation of the numbers have the same digits: 35 cents $=$ \$0.35 and 78 cents $=$ \$0.78.

b. Similar to part a, we cannot just add 3.7 to 5.6. This is because 7 in. is not 0.7 ft and 6 in. is not 0.6 ft.

48. The digit 2 in 3.002 means 2 thousandths, while 19 in 3.0019 means 19 ten thousandths, or 1.9 thousandths. So, 3.002 must be greater than 3.0019. An easy way to compare these kinds of numbers would be to consider 3.002 as equal to 3.0020 (the extra zero at the end does not change the value of the number) and compare 20 with 19 since both numbers now have the same number of decimal digits.

49–54. Possible answers given.

49. $0.12 + 0.21 \approx \frac{1}{3}$ or $0.22 + 0.11 \approx \frac{1}{3}$

50. $0.24 - 0.12 \approx 0.125$ or $0.23 - 0.11 \approx 0.125$

51. $0.42 - 0.13 \approx \frac{2}{7}$

52. $0.44 + 0.44 \approx 0.9$ (This is the closest one can get to 0.9 under the given restrictions.)

53. $0.32 + 0.43 = 0.75$ or $0.44 + 0.31 = 0.75$

54. $0.41 - 0.11 = 0.3$

55. a. 3.9742

   b. 3.2479

   c. 3.9724, 3.9742, 3.9274, 3.9247, 3.9472, 3.9427

   d. 3.7294, 3.7249, 3.4729, 3.4792, 3.4927, 3.4972

56. a. 16 lb

   b. 2 oz

   c. 54 oz

   d. $1\frac{1}{16}$ or 1.0625 lb

57. a. 5.25 lb

   b. Two bags. She will have lots of flour left over.

   c. About 1,000 loaves.

58. a.
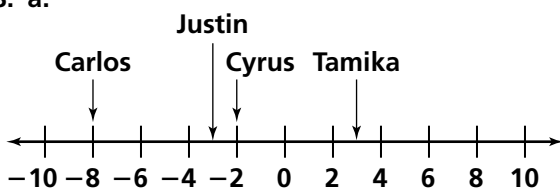
   b. −8. He is 8 kilometers behind Will.

   c. Answers will vary. Any three negative numbers are correct.

   d. Answers will vary. Any three positive numbers are cor.rect.

Possible Answers to Mathematical Reflections

1. There are several possible strategies. Rounding each decimal number to the nearest whole number is often an easy and effective strategy. If a sum involves more than two or three addends, one might take care not to round all of the numbers up (nor to round all of them down) to avoid having a sum that is much too great (or too small). For lesser sums and differences, one might estimate a decimal with a fraction that is easy to work with, then use fraction estimation skills.

2. Thinking of a decimal in terms of fractions allows us to use familiar fraction addition algorithms. To add 0.35 and 0.4, we can write: $\frac{35}{100} + \frac{4}{10} = \frac{35}{100} + \frac{40}{100} = \frac{75}{100}$. Viewed as fractions, we can see that we need to think of 0.4 as 0.40 to have a common denominator to combine with 0.35. Getting a common denominator is like lining up the place values because your numbers have the same size pieces.

3. The place-value interpretation helps to clarify the need for lining up decimal points. It is not just the decimal points that are being lined up, it is all of the place values. We need to add tenths to tenths, hundredths to hundredths, etc. when adding decimals. In the previous example, we need to add the "4" to the "3" in 0.35, not to the "5" because both the "4" and the "3" represent tenths. We would not add four dimes to 5 pennies and say that we have 9 cents.

4. Possible answer:

Place Value Algorithm: When adding or subtracting decimals, first line up the decimal points so it lines up the place value. Add or subtract as you would with whole numbers. Place the decimal between the ones and tenths place in the answer. This will happen automatically if you place a decimal in the answer so that it is lined up with the decimals in the numbers you are adding or subtracting.

Fraction Algorithm: Change the decimal numbers to fractions with powers of ten in the denominator. Next, add or subtract the fractions, using common denominators if needed. Rename the fraction answer as a decimal number.