Investigation 2

ACE Assignment Choices

Differentiated Instruction — Solutions for All Learners

Problem 2.1

Core 2, 29
Other *Applications* 1, *Connections* 28

Problem 2.2

Core 4, 6–12, 30–35
Other *Applications* 3, 5, 13; *Connections* 36–38; *Extensions* 48, 51; unassigned choices from previous problems

Problem 2.3

Core 14–18, 41–44
Other *Connections* 39, 40; *Extensions* 49; unassigned choices from previous problems

Problem 2.4

Core 19–25, 46, 47
Other *Applications* 26, 27; *Connections* 45; *Extensions* 50; unassigned choices from previous problems

Adapted For suggestions about adapting Exercises 5, 6, 14, and other ACE exercises, see the CMP *Special Needs Handbook.*
Connecting to Prior Units 30–44, 46, 47: *Bits and Pieces I*

Applications

1. **a.** Marigolds: $\frac{3}{20}$; Lantana: $\frac{1}{20}$; Impatiens: $\frac{3}{10}$; Petunias: $\frac{1}{10}$; Lilies: $\frac{1}{5}$; Begonias: $\frac{1}{20}$; Tulips: $\frac{1}{20}$; Daisies: $\frac{1}{20}$; Irises: $\frac{1}{20}$

   b. $\frac{4}{20} - \frac{1}{20} = \frac{3}{20}$

   c. $\frac{4}{20} + \frac{1}{20} + \frac{1}{20} = \frac{6}{20}$ or $\frac{3}{10}$

   d. Incorrect. Possible explanation: The fraction of land for marigolds and petunias ($\frac{3}{20} + \frac{2}{20}$) is $\frac{5}{20}$. The fraction of land for impatiens is $\frac{3}{10}$, or $\frac{6}{20}$ of the garden. The impatiens cover a larger amount of land.

   e. Incorrect. Possible explanation: The number sentence for the situation is $\frac{3}{20} - \frac{1}{20} = \frac{1}{10} + \frac{1}{20}$. If you work out the subtraction problem on the left of the equal sign and the addition problem on the right, the answers are not the same.

   f. Possible combinations that total $\frac{3}{10}$, the fraction planted with impatiens:

   Marigolds + Petunias + Lantana: $\frac{3}{20} + \frac{2}{20} + \frac{1}{20} = \frac{6}{20}$, or $\frac{3}{10}$

   Lilies + Petunias: $\frac{4}{20} + \frac{2}{20} = \frac{6}{20}$, or $\frac{3}{10}$

   Marigolds + Begonias + Tulips + Daisies: $\frac{3}{20} + \frac{1}{20} + \frac{1}{20} + \frac{1}{20} = \frac{6}{20}$, or $\frac{3}{10}$

2. **a.** $\frac{1}{8} + \frac{1}{16} = \frac{3}{16}$ of the page is used for ads.

   b. $1 - \frac{3}{16} = \frac{13}{16}$ of the page remains.

3. $\frac{3}{4}$ (three $\frac{1}{4}$-page ads, or $3 \times \frac{1}{4}$) plus $\frac{4}{8}$ (four $\frac{1}{8}$-page ads, or $4 \times \frac{1}{8}$) plus $\frac{10}{16}$ (ten $\frac{1}{16}$-page ads, or $10 \times \frac{1}{16}$) $= 1\frac{7}{8}$ pages

4. $2\frac{3}{4} - 1\frac{5}{8} = 1\frac{1}{8}$ pages

5. $\frac{1}{16} + \frac{1}{32} = \frac{3}{32}$ of the lasagna is eaten, leaving $\frac{29}{32}$ of the lasagna uneaten.

6. $\frac{3}{4} + \frac{1}{8} = \frac{7}{8}$ of a pizza

7. $6\frac{2}{12}$ or $6\frac{1}{6}$

8. $5\frac{6}{9}$ or $5\frac{2}{3}$

9. $7\frac{3}{8}$

10. $9\frac{1}{9}$

11. $8\frac{5}{6}$ **12.** $2\frac{11}{15}$

13. **a.** $\frac{5}{6}$ **b.** $\frac{5}{6}$ **c.** $\frac{5}{6}$

Parts (b) and (c) are equivalent to part (a) ($\frac{1}{2} + \frac{1}{3}$).

14. $\frac{3}{4} + \frac{4}{5}$ is greater: $\frac{2}{3} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} = \frac{9}{6} = 1\frac{1}{2} = 1\frac{10}{20}$; $\frac{3}{4} + \frac{4}{5} = \frac{15}{20} + \frac{16}{20} = 1\frac{11}{20}$

15. $\frac{7}{6} - \frac{2}{3}$ is greater: $\frac{7}{6} - \frac{2}{3} = \frac{7}{6} - \frac{4}{6} = \frac{3}{6} = \frac{1}{2} = \frac{5}{10}$; $\frac{3}{5} - \frac{5}{10} = \frac{6}{10} - \frac{5}{10} = \frac{1}{10}$.

16. $\frac{1}{4} + \frac{5}{6}$ is greater: $\frac{1}{4} + \frac{5}{6} = \frac{3}{12} + \frac{10}{12} = 1\frac{1}{12} = 1\frac{10}{120}$; $\frac{1}{5} + \frac{7}{8} = \frac{8}{40} + \frac{35}{40} = 1\frac{3}{40} = 1\frac{9}{120}$.

17. $\frac{5}{4} - \frac{4}{5}$ is greater: $\frac{1}{16} + \frac{1}{12} = \frac{3}{48} + \frac{4}{48} = \frac{7}{48} = \frac{35}{240}$; $\frac{5}{4} - \frac{4}{5} = \frac{25}{20} - \frac{16}{20} = \frac{9}{20} = \frac{108}{240}$.

18. $\frac{1}{16} + \frac{1}{12} = \frac{7}{48}, \frac{1}{12} + \frac{1}{16} = \frac{7}{48}, \frac{7}{48} - \frac{1}{12} = \frac{1}{16}$, and $\frac{7}{48} - \frac{1}{16} = \frac{1}{12}$

$\frac{5}{4} - \frac{4}{5} = \frac{9}{20}, \frac{5}{4} - \frac{9}{20} = \frac{4}{5}, \frac{9}{20} + \frac{4}{5} = \frac{5}{4}$, and $\frac{4}{5} + \frac{9}{20} = \frac{5}{4}$

19. **a.** $N = 1\frac{5}{12}$

b. $N = \frac{1}{20}$

c. $N = \frac{17}{20}$

20. $2\frac{5}{6} + 1\frac{1}{3} = 4\frac{1}{6}$

21. $15\frac{5}{8} + 10\frac{5}{6} = 26\frac{11}{24}$

22. $4\frac{4}{9} + 2\frac{1}{5} = 6\frac{29}{45}$

23. $6\frac{1}{4} - 2\frac{5}{6} = 3\frac{5}{12}$

24. $3\frac{1}{2} - 1\frac{4}{5} = 1\frac{7}{10}$

25. $4\frac{1}{3} - \frac{5}{12} = 3\frac{11}{12}$

26. **a.** $\frac{3}{4}$ **b.** $\frac{3}{6}$ or $\frac{1}{2}$

c. $\frac{3}{8}$ **d.** $\frac{3}{10}$

e. $\frac{3}{12}$ **f.** $\frac{3}{14}$

In all of the problems, you add unit fractions where one fraction is half the size of the other. The fraction in each part with the lesser denominator is twice the value of the unit fraction with the greater denominator. You can think of the unit fraction with the lesser denominator as two unit fractions with the greater denominator. This gives a sum with a 3 in the numerator over the greater denominator.

27. No. If $\frac{14}{16}$ of all the pizza were eaten, this would be less than one whole pizza. If there are eight sections in each pizza, then people are eating eighths. And all together they ate $\frac{14}{8}$, or $1\frac{6}{8}$ pizzas.

Connections

28. Least sum: $\frac{1}{2} + \frac{3}{4} = 1\frac{1}{4}$. To get the least sum, you want to choose the least number in each interval. Greatest sum: $\frac{3}{4} + 1\frac{1}{4} = 2$. To get the greatest sum, you want to choose the greatest number in each interval.

29. $1\frac{3}{4}$. To find a sum using benchmarks, choose the nearest benchmark to each number, then add the benchmarks.

30. $\frac{3}{12} = \frac{2}{8}$ (N = 2)

31. $\frac{3}{4} = \frac{6}{8}$ (N = 3)

32. $\frac{1}{2} = \frac{6}{12}$ (N = 6)

33. $\frac{8}{12} = \frac{2}{3}$ (N = 8)

34. $\frac{7}{8} = \frac{14}{16}$ (N = 7)

35. $\frac{5}{12} = \frac{10}{24}$ (N = 24)

36. $\frac{2}{6} = \frac{4}{12}$

37. $\frac{8}{12} = \frac{2}{3} = \frac{4}{6}$

38. $\frac{3}{9} = \frac{2}{6} = \frac{6}{18}$

39. B

40. Possible answers: Everyone in Section 19 (Foley, Theule, Burg, and Walker) and Lapp from Section 18: $\frac{5}{16} + \frac{3}{16} + \frac{3}{16} + \frac{5}{16} + \frac{1}{4} = 1\frac{1}{4}$ or 1.25; Lapp, Bouck, Theule, Walker, Burg, Fitz, Fuentes, and Krebs: $\frac{1}{4} + \frac{1}{16} + \frac{3}{16} + \frac{5}{16} + \frac{3}{16} + \frac{5}{32} + \frac{1}{16} + \frac{1}{32} = 1\frac{1}{4}$ or 1.25).

41. $18.156 < 18.17$

42. $3.184 < 31.84$

43. $5.78329 > 5.78239$

44. $4.0074 > 4.0008$

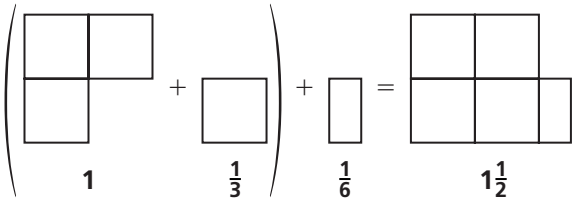
45. a. If you multiply the numerator and denominator of $\frac{7}{15}$ by 10, you get the equivalent fraction $\frac{70}{150}$. If you multiply the numerator and denominator of $\frac{2}{10}$ by 15, you get $\frac{30}{150}$.

b. Possible answer: $\frac{14}{30} + \frac{6}{30}$ and $\frac{28}{60} + \frac{12}{60}$

c. Answers will vary based on part (b). Possible answer: $\frac{14}{30} + \frac{6}{30}$ uses the least common multiple of the two denominators, so it is the easiest to add.

46. a. $\frac{4}{3}$ or $1\frac{1}{3}$ **b.** $\frac{7}{9}$

47. a.



b. (Figure 2)

Extensions

48. a. The magazine could charge
$\$160 \div 32 = \$5$ for $\frac{1}{32}$ of a page,
$\$160 \div 16 = \$10$ for $\frac{1}{16}$ of a page,
$\$160 \div 8 = \$20$ for $\frac{1}{8}$ of a page,
$\$160 \div 4 = \$40$ for $\frac{1}{4}$ of a page,
$\$160 \div 2 = \$80$ for $\frac{1}{2}$ of a page, and
\$160 for a whole page.

b. $(3 \times \$40) + (4 \times \$20) + \$10 = \$210$

c. Yes; $(2 \times \$20) + (4 \times \$10) = \$80$.

d. Possible answers:
two $\frac{1}{4}$-page ads $(2 \times \$40 = \$80)$;
four $\frac{1}{8}$-page ads $(4 \times \$20 = \$80)$;
eight $\frac{1}{16}$-page ads $(8 \times \$10 = \$80)$;
sixteen $\frac{1}{32}$-page ads $(16 \times \$5 = \$80)$;
one $\frac{1}{4}$-page ad and two $\frac{1}{8}$-page ads $(1 \times \$40 + 2 \times \$20 = \$80)$;
two $\frac{1}{8}$-page ads and four $\frac{1}{16}$-page ads $(2 \times \$20 + 4 \times \$10 = \$80)$

49. a–b. Possible answers: $\frac{1}{2} - \frac{1}{3} = \frac{1}{6}$; $\frac{1}{4} - \frac{1}{5} = \frac{1}{20}$

50. a. 2 acres **b.** $\frac{1}{4}$ of an acre
c. 24 people **d.** 48 people

51. a. The sixth-graders had lost \$100.

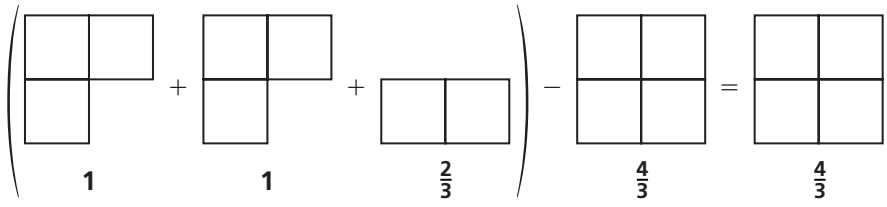
b.

c.

d. \$175

e. $\frac{7}{8}$

Figure 2



ACE ANSWERS 2

Possible Answers to Mathematical Reflections

1. Answers will vary. Look for big ideas such as the need to rename the fractions so they have the same denominator. With adding, students might talk about needing to add the whole numbers and then the fractions. They may also talk about the need to rename a quantity when the whole number and fraction quantities are combined. How students talk about subtracting fractions may vary depending on their preferred algorithm. For example, some students use a borrowing algorithm, some students use negative numbers, and other students use improper fractions.

2. When adding mixed numbers, you need to add the fractions and add the whole numbers. With subtraction, answers will vary depending on the algorithm that students are most comfortable with. For example, students who change mixed numbers to improper fractions will not talk about borrowing. Students who use a borrowing procedure should talk about the need to subtract the fractions and then the whole numbers.

3. Possible answer: $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$, $\frac{1}{3} + \frac{1}{2} = \frac{5}{6}$, $\frac{5}{6} - \frac{1}{2} = \frac{1}{3}$, and $\frac{5}{6} - \frac{1}{3} = \frac{1}{2}$.