Investigation 2

ACE Assignment Choices

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: \(\frac{1}{2}\); 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 \(\frac{6}{20}\), or \(\frac{3}{10}\) of the garden. The impatiens cover a larger amount of land.

e. Incorrect. Possible explanation: The number sentence for the situation is \(\frac{3}{20} - \frac{1}{20} = \frac{1}{10}\). 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:

   \(\frac{3}{20} + \frac{1}{20} + \frac{1}{20} = \frac{6}{20}\), 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. \(2\frac{3}{4} - 1\frac{5}{8} = 1\frac{3}{8}\) 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) \(\left(\frac{1}{2} + \frac{1}{3}\right)\).

14. \(\frac{3}{4} + \frac{4}{5}\) is greater: \(\frac{2}{3} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} = \frac{9}{6} = 1\frac{1}{2} = \frac{10}{20}\), \(\frac{3}{4} + \frac{4}{5} = \frac{15}{20} + \frac{16}{20} = 1\frac{11}{20}\)
15. \(\frac{7}{6} - \frac{2}{3}\) is greater: \(\frac{7}{6} - \frac{2}{3} = \frac{7}{6} - \frac{4}{6} = \frac{3}{6} = \frac{1}{2} = \frac{5}{10}\) or \(\frac{25}{60}\).

16. \(\frac{1}{4} + \frac{5}{6}\) is greater: \(\frac{3}{12} + \frac{10}{12} = 1\frac{1}{12}\) or \(\frac{10}{12} + \frac{1}{12} = 1\frac{1}{12}\) or \(\frac{10}{12} + \frac{1}{12} = 1\frac{1}{12}\)
17. \(\frac{5}{4} - \frac{4}{5}\) is greater: \(\frac{1}{16} + \frac{1}{12} = \frac{3}{48} + \frac{4}{48} = \frac{7}{48}\)
18. \(\frac{35}{240}\) or \(\frac{5}{4}\) is greater: \(\frac{35}{240}\) or \(\frac{5}{4}\) is greater: \(\frac{35}{240} - \frac{5}{4} = \frac{25}{20} - \frac{16}{20} = \frac{9}{20} = \frac{108}{240}\) or \(\frac{35}{240} - \frac{5}{4} = \frac{25}{20} - \frac{16}{20} = \frac{9}{20} = \frac{108}{240}\)

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: \(\frac{5}{4} + 1\frac{1}{4} = 2\). 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: \(\frac{5}{16} + \frac{3}{16} + \frac{3}{16} + \frac{5}{16} + \frac{1}{4} = \frac{11}{4}\) 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. (Figure 2)
48. a. The magazine could charge
   \[ \frac{160}{32} = 5 \text{ for } \frac{1}{32} \text{ of a page}, \]
   \[ \frac{160}{16} = 10 \text{ for } \frac{1}{16} \text{ of a page}, \]
   \[ \frac{160}{8} = 20 \text{ for } \frac{1}{8} \text{ of a page}, \]
   \[ \frac{160}{4} = 40 \text{ for } \frac{1}{4} \text{ of a page}, \]
   \[ \frac{160}{2} = 80 \text{ for } \frac{1}{2} \text{ of a page}, \]
   \[ \$160 \text{ for a whole page}. \]
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. (Figure 2)
   c. (Figure 2)
   d. $175  
   e. \( \frac{7}{8} \)
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: \(\frac{1}{2} + \frac{1}{3} = \frac{5}{6} \cdot \frac{1}{3} + \frac{1}{2} = \frac{5}{6}\), \(\frac{5}{6} - \frac{1}{2} = \frac{1}{3}\), and \(\frac{5}{6} - \frac{1}{3} = \frac{1}{2}\).