Assignment Guide for Problem 4.1

Applications: 1–13 | Connections: 42–43

Answers to Problem 4.1

A. **1.** $N = \frac{1}{10}$

$\frac{5}{10} - \frac{2}{5} = N$

$\frac{5}{10} - N = \frac{2}{5}$

$\frac{2}{5} + N = \frac{5}{10}$

$N + \frac{2}{5} = \frac{5}{10}$

2. $N = 5\frac{4}{15}$

$3\frac{3}{5} + 1\frac{4}{15} = N$

$1\frac{2}{3} + 3\frac{3}{5} = N$

$N - 1\frac{2}{3} = 3\frac{3}{5}$

$N - 3\frac{3}{5} = 1\frac{2}{3}$

3. Students' ways of expressing these relationships will vary greatly. Addition and subtraction are inverses, or they undo each other. In a number sentence such as $N + \frac{2}{5} = \frac{5}{10}$, you are adding an unknown number to $\frac{2}{5}$ to get $\frac{5}{10}$. In order to figure out what that number is, you can subtract $\frac{2}{5}$ from $\frac{5}{10}$, getting back to the original starting value.

B. **1.** $N = 5\frac{5}{6} - 1\frac{2}{3}$, so $N = 4\frac{1}{6}$

2. $N = \frac{17}{12} - \frac{3}{4}$, so $N = \frac{8}{12}$ or $\frac{2}{3}$

3. $N = \frac{3}{8} + \frac{1}{2}$, so $N = \frac{7}{8}$

4. Using fact families, you can find a fact in the family that expresses n as the sum or difference of the two known numbers.

Assignment Guide for Problem 4.2

Applications: 1–6 | Connections: 66

Answers to Problem 4.2

A. **1.** $\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$
$\frac{1}{5} \times \frac{2}{3} = \frac{2}{15}$
$\frac{2}{15} \div \frac{2}{3} = \frac{1}{5}$
$\frac{2}{15} \div \frac{1}{5} = \frac{2}{3}$

2. $\frac{3}{4} \times \frac{5}{8} = \frac{15}{32}$
$\frac{5}{8} \times \frac{3}{4} = \frac{15}{32}$
$\frac{15}{32} \div \frac{5}{8} = \frac{3}{4}$
$\frac{15}{32} \div \frac{3}{4} = \frac{5}{8}$

3. $\frac{3}{5} \times \frac{3}{8} = \frac{9}{40}$
$\frac{3}{8} \times \frac{3}{5} = \frac{9}{40}$
$\frac{9}{40} \div \frac{3}{8} = \frac{3}{5}$
$\frac{9}{40} \div \frac{3}{5} = \frac{3}{8}$

4. $\frac{2}{5} \times \frac{2}{3} = \frac{4}{15}$
$\frac{2}{3} \times \frac{2}{5} = \frac{4}{15}$
$\frac{4}{15} \div \frac{2}{5} = \frac{2}{3}$
$\frac{4}{15} \div \frac{2}{3} = \frac{2}{5}$
$\frac{3}{8} \times N = \frac{21}{80}$

B. **1.** $\frac{3}{8} \times N = \frac{21}{80}$
$N \times \frac{3}{8} = \frac{21}{80}$
$\frac{21}{80} \div \frac{3}{8} = N$
$\frac{21}{80} \div N = \frac{3}{8}$ so, $N = \frac{7}{10}$.

2. $\frac{2}{3} \times N = \frac{10}{15}$
$N \times \frac{2}{3} = \frac{10}{15}$
$\frac{10}{15} \div \frac{2}{3} = N$
$\frac{10}{15} \div N = \frac{2}{3}$ so, $N = \frac{5}{5} = 1$.

3. $1 \div N = \frac{2}{3}$
$1 \div \frac{2}{3} = N$
$N \times \frac{2}{3} = 1$
$\frac{2}{3} \times N = 1$ so, $N = \frac{3}{2}$.

4. $\frac{8}{15} \div N = \frac{2}{3}$
$\frac{8}{15} \div \frac{2}{3} = N$
$N \times \frac{2}{3} = \frac{8}{15}$
$\frac{2}{3} \times N = \frac{8}{15}$ so, $N = \frac{4}{5}$.

C. Marla is thinking of the relationship between the factors, 2 and N, and the product, 15. Any rearrangement that keeps the same relationship will be as true as the original sentence. So the rearrangement she has chosen is true, and it gives the value of N that makes the original sentence true.

D. **1.** $\frac{3}{5} + \frac{1}{3} = \frac{14}{15}$
$\frac{1}{3} + \frac{3}{5} = \frac{14}{15}$
$\frac{14}{15} - \frac{3}{5} = \frac{1}{3}$
$\frac{14}{15} - \frac{1}{3} = \frac{3}{5}$

2. $\frac{3}{4} \times \frac{4}{3} = 1$
$\frac{4}{3} \times \frac{3}{4} = 1$
$1 \div \frac{3}{4} = \frac{4}{3}$
$1 \div \frac{4}{3} = \frac{3}{4}$

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

4. $\frac{3}{2} \times 3 = \frac{9}{2}$
$3 \times \frac{3}{2} = \frac{9}{2}$
$\frac{9}{2} \div \frac{3}{2} = 3$
$\frac{9}{2} \div 3 = \frac{3}{2}$

ACE Assignment Guide for Problem 4.3

Applications: 23–28
Connections: 47–56

Answers to Problem 4.3

A. This is a division problem. You need to know how many eighths are in $1\frac{1}{4}$. $1\frac{1}{4} \div \frac{1}{8} = 10$. Sammy will take 10 hours to walk 114 miles.

B. This is a division problem. You need to know how many groups of $\frac{2}{3}$ are in $5\frac{1}{3}$. $5\frac{1}{3} \div \frac{2}{3} = 8$. Kalisha will need 8 sections of fence.

C. This is a subtraction problem. $3\frac{1}{2} - \frac{3}{4} = 2\frac{3}{4}$. Sasha has $2\frac{3}{4}$ pints of blueberries left over.

D. This is a multiplication problem. You need to know how much is the result of $3\frac{1}{2}$ groups with $2\frac{3}{4}$ in each group. $3\frac{1}{3} \times 2\frac{3}{4} = 9\frac{5}{8}$

E. There are two subtraction problems here. The first is to determine how many sweet rolls Christie sold. $5 - 1\frac{2}{3} = 3\frac{1}{3}$. The second is to determine how many more sweet rolls Christie sold than Leslie did. $3\frac{1}{3} - 2\frac{1}{2} = \frac{5}{6}$. Christie sold 56 dozen sweet rolls more than Leslie did. (Multiplying $\frac{5}{6} \times 12 = 10$ tells you Christie sold 10 more sweet rolls than Leslie did.)

F. First you need to subtract to find the amount remaining after Raymar ate his share of brownies. $1 - \frac{1}{4} = \frac{3}{4}$. Then you need to multiply because Kalen ate part of what was left. $\frac{1}{4} \times \frac{3}{4} = \frac{3}{16}$.

G. This question involves addition and multiplication. You can use these operations in different orders. First you can add to get the total weight of each snack pack, and then you can multiply by the number of students. Or you can multiply each item's weight by the number of students, and add to get the total weight of all the packs.

$\left(\frac{1}{4} + \frac{1}{8} + \frac{1}{16}\right)24 = \left(\frac{7}{16}\right)24 = \frac{168}{16}$

which is $10\frac{1}{2}$ pounds.

Or, you can write

$24\left(\frac{1}{4}\right) + 24\left(\frac{1}{8}\right) + 24\left(\frac{1}{16}\right) = 6 + 3 + 1\frac{1}{2}$

which is also $10\frac{1}{2}$ pounds.

H. This question involves addition and multiplication. You can use these in different orders. You can add the material for two items for each granddaughter and then multiply by three. Or you can multiply the material for each item by three and then add to get total.

3 (jacket + extra) = 10

$3\left(1\frac{5}{8} + N\right) = 10$

Or you can write $3\left(1\frac{5}{8}\right) + 3N = 10$ which is the same as $4\frac{7}{8} + 3N = 10$. Comparing these two statements to the choices, you see that choice (1) is correct. Choice (2) is also correct, because it is a rearrangement of the second strategy. Choices (3) and (4) are incorrect.

Applications

1. $\frac{1}{16}+\frac{1}{12}=N$
   $\frac{1}{12}+\frac{1}{16}=N$
   $N-\frac{1}{16}=\frac{1}{12}$
   $N-\frac{1}{12}=\frac{1}{16}$
2. $\frac{5}{4}-\frac{4}{5}=N$
   $\frac{5}{4}-N=\frac{4}{5}$
   $N+\frac{4}{5}=\frac{5}{4}$
   $\frac{4}{5}+N=\frac{5}{4}$
3. $N-1\frac{1}{3}=2\frac{2}{3}$
   $N-2\frac{2}{3}=1\frac{1}{3}$
   $1\frac{1}{3}+2\frac{2}{3}=N$
   $2\frac{2}{3}+1\frac{1}{3}=N$
4. $N+\frac{4}{3}=\frac{1}{3}$
   $\frac{4}{3}+N=\frac{1}{3}$
   $\frac{1}{3}-\frac{4}{3}=N$
   $\frac{1}{3}-N=\frac{4}{3}$
5. $1\frac{5}{12}$
6. $\frac{1}{20}$
7. $\frac{17}{20}$
8. $\frac{1}{2}$
9. $\frac{1}{8}$
10. $-\frac{1}{8}$
11. $m=\frac{6}{10}$
12. Answers will vary: $m=\frac{3}{10}$, $n=\frac{3}{10}$, or any choices of m and n with $m+n=\frac{3}{5}$, will solve the problem.
13. $m=\frac{6}{10}$
14. $\frac{2}{3}\times\frac{5}{7}=\frac{10}{21}$
    $\frac{5}{7}\times\frac{2}{3}=\frac{10}{21}$
    $\frac{10}{21}\div\frac{5}{7}=\frac{2}{3}$
    $\frac{10}{21}\div\frac{2}{3}=\frac{5}{7}$
15. $\frac{3}{4}\div1\frac{1}{2}=\frac{1}{2}$
    $\frac{3}{4}\div\frac{1}{2}=1\frac{1}{2}$
    $\frac{1}{2}\times1\frac{1}{2}=\frac{3}{4}$
    $1\frac{1}{2}\times\frac{1}{2}=\frac{3}{4}$
16. $N=\frac{2}{3}$
17. $N=\frac{2}{15}$
18. $N=\frac{2}{3}$
19. $N=\frac{3}{5}$
20. $N=7$
21. $N=\frac{1}{3}$
22. a. $m=\frac{5}{8}$
    b. $m=\frac{5}{8}$
    c. $m=\frac{5}{8}$
23. $32\frac{1}{2}$
24. 15
25. a. $24-\frac{1}{2}-1-1=21\frac{1}{2}$ buns
    b. 64 servings, with $\frac{1}{6}$ of a bun left over (which is $\frac{1}{2}$ of a serving)
26. $\frac{4}{9}$
27. $18\frac{2}{3}$
28. $1\frac{7}{44}$ hours (which is about 1 hour and 10 minutes) for one way and $2\frac{7}{22}$ hours for the round trip.

Connections

29.a. $N = \frac{6}{7}$

b. $N = \frac{3}{4}$

c. The original expressions are not equivalent. In part (a), you need to add $\frac{1}{4}$ and $\frac{1}{3}$ before multiplying by N. In part (b), you need to multiply $\frac{1}{3}$ by N before adding $\frac{1}{4}$.

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

31. 2

32. $\frac{1}{3}$

33. 3

34. $\frac{3}{2}$

35. $\frac{4}{3}$

36. $\frac{2}{5}$

37. $\frac{4}{5}$

38. $\frac{12}{7}$

39. $\frac{1}{3}$ and 3. These are reciprocals.

40. $\frac{1}{4}$ and 4. These are reciprocals.

41. $\frac{1}{2}$ and 2. These are reciprocals.

42. $\frac{1}{8} + \frac{5}{6}$ is larger. There are many ways to know this without computing. One way is to reason that you can add 1 small thing and 5 large things or 1 large thing and 5 small things. 5 large things will be larger (assuming the large things are the same size in both instances, and that the small things are also). The two sums are $\frac{23}{24}$ and $\frac{19}{24}$, respectively.

Another way to tell that $\frac{1}{8} + \frac{5}{6}$ is larger is to note that $\frac{1}{6} > \frac{1}{8}$. Thus,
$\frac{5}{6} + \frac{1}{8} = \left(\frac{1}{6} + \frac{4}{6}\right) + \frac{1}{8} > \left(\frac{1}{6} + \frac{4}{8}\right) + \frac{1}{8} = \frac{1}{6} + \frac{5}{8}$.
The two sums are $\frac{23}{24}$ and $\frac{19}{24}$, respectively.

43. $\frac{5}{6} - \frac{1}{8}$ is larger. There are many ways to know this without computing. One way is to observe that for a large difference, you want the numbers to be far apart. Because $\frac{5}{6} > \frac{5}{8}$ and $\frac{1}{8} < \frac{1}{6}$, the first difference will be greater than the second. The two differences are $\frac{17}{24}$ and $\frac{11}{24}$ respectively.

Another way to tell that $\frac{5}{6} - \frac{1}{8}$ is larger is to note that $\frac{5}{6} > \frac{5}{8}$ and $\frac{1}{6} > \frac{1}{8}$. Thus, $\frac{5}{6} - \frac{1}{8} > \frac{5}{8} - \frac{1}{8} > \frac{5}{8} - \frac{1}{6}$. (Here you use the fact that subtracting a larger number from a given number results in a smaller number.) The two differences are $\frac{17}{24}$ and $\frac{11}{24}$ respectively.

44. $N = \frac{1}{3}$

45. $N = 1$

46. In a simpler form this sentence is $1\frac{13}{24} + m + n = 3$. Using fact families to rewrite it, you have $m + n = 1\frac{11}{24}$. So now you can choose any number for m (less than $1\frac{11}{24}$ if you are working with positive numbers) and calculate n, since $n = 1\frac{11}{24} - m$. Possible solutions are $m = 1$ and $n = \frac{11}{24}$, or $m = \frac{5}{24}$ and $n = 1\frac{6}{24}$, or $m = \frac{15}{24}$ and $n = \frac{20}{24}$, and so forth.