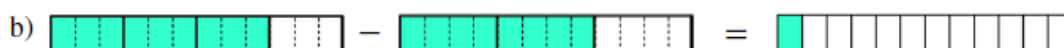# Solutions

Page 50 #s 1, 2ab, 3bd, 6ace, 7ace, 8ace, 9, 10acegik, 11

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1. Write an addition or subtraction statement that could be represented by each of the following.

a)

b)

a) $\dfrac{1}{5} + \dfrac{3}{5} = \dfrac{4}{5}$

b) $\dfrac{9}{12} - \dfrac{8}{12} = \dfrac{1}{12}$

2. Express each sum of unit fractions as a single fraction.

a) $\dfrac{1}{3} + \dfrac{1}{3}$

$$= \frac{1+1}{3}$$

$$= \frac{2}{3}$$

b) $\dfrac{1}{5} + \dfrac{1}{5} + \dfrac{1}{5}$

$$= \frac{1+1+1}{5}$$

$$= \frac{3}{5}$$

3. Express each of the following as a sum of unit fractions.

b) $\dfrac{4}{7}$

d) $2\dfrac{1}{4}$

b)

$$= \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7}$$

d) $= \dfrac{1}{4} + \dfrac{1}{4} + \dfrac{1}{4} + \dfrac{1}{4} + \dfrac{1}{4} + \dfrac{1}{4} + \dfrac{1}{4} + \dfrac{1}{4} + \dfrac{1}{4}$

1   1

6. Evaluate.

a) $\dfrac{3}{17}+\dfrac{9}{17}$

$= \dfrac{3+9}{17}$

$= \dfrac{12}{17}$

c) $\dfrac{2}{3}+\dfrac{5}{3}$

$= \dfrac{2+5}{3}$

$= \dfrac{7}{3}$

e) $-\dfrac{2}{9}+\dfrac{7}{9}$

$= \dfrac{-2+7}{9}$

$= \dfrac{5}{9}$

7. Add.

a) $\dfrac{1}{2}+\dfrac{1}{4}$

c) $\dfrac{1}{2}+\dfrac{1}{3}$

e) $-\dfrac{2}{5}+\dfrac{5}{6}$

a) $\dfrac{1}{2} \times \dfrac{2}{2} + \dfrac{1}{4}$

$= \dfrac{2}{4} + \dfrac{1}{4}$

$= \dfrac{3}{4}$

c) $\dfrac{1}{2} \times \dfrac{3}{3} + \dfrac{1}{3} \times \dfrac{2}{2}$

$= \dfrac{3}{6} + \dfrac{2}{6}$

$= \dfrac{5}{6}$

e) $-\dfrac{2}{5} \times \dfrac{6}{6} + \dfrac{5}{6} \times \dfrac{5}{5}$

$= \dfrac{-12}{30} + \dfrac{25}{30}$

$= \dfrac{13}{30}$

3

8. Subtract.

a) $\dfrac{1}{3} - \dfrac{1}{6}$ c) $\dfrac{4}{5} - \dfrac{5}{8}$ e) $\dfrac{3}{8} - \dfrac{5}{9}$

a) $\dfrac{1}{3} \times \dfrac{2}{2} - \dfrac{1}{6}$

$= \dfrac{2}{6} - \dfrac{1}{6}$

$= \dfrac{1}{6}$

c) $\dfrac{4}{5} \times \dfrac{8}{8} - \dfrac{5}{8} \times \dfrac{5}{5}$

$= \dfrac{32}{40} - \dfrac{25}{40}$

$= \dfrac{7}{40}$

e) $\dfrac{3}{8} \times \dfrac{9}{9} - \dfrac{5}{9} \times \dfrac{8}{8}$

$= \dfrac{27}{72} - \dfrac{40}{72}$

$= \dfrac{-13}{72}$

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9. Aiguo, Destiny and Claudio shared a 12-slice pizza. Aiguo ate $\dfrac{1}{3}$ of the pizza and Destiny ate $\dfrac{1}{4}$ of the pizza. Claudio ate the remaining slices.

a) What fraction of the pizza did Aiguo and Destiny eat together?
b) What fraction of the pizza did Claudio eat?
c) How many slices did each person eat?

a) $\dfrac{1}{3} + \dfrac{1}{4}$

$= \dfrac{1}{3} \times \dfrac{4}{4} + \dfrac{1}{4} \times \dfrac{3}{3}$

$= \dfrac{4}{12} + \dfrac{3}{12}$

$= \dfrac{7}{12}$

b) $1 - \dfrac{7}{12}$

$= \dfrac{12}{12} - \dfrac{7}{12}$

$= \dfrac{5}{12}$

c) Aiguo $= \dfrac{1}{3}$ of 12

$= \dfrac{12}{3}$

$= 4$ slices

Destiny $= \dfrac{1}{4}$ of 12

$= \dfrac{12}{4}$

$= 3$ slices

Claudio $= 12 - 4 - 3$

$= 5$ slices

10. Evaluate. Express each answer as a fraction in lowest terms.

a) $\dfrac{2}{9}+\dfrac{1}{3}$ c) $\dfrac{4}{11}+\dfrac{1}{3}$ e) $\dfrac{11}{4}-\dfrac{3}{2}$

g) $\dfrac{5}{3}-\dfrac{9}{2}$ i) $5-\dfrac{17}{6}$ k) $\dfrac{-7}{4}+\left(-\dfrac{15}{6}\right)$

a) $\dfrac{2}{9}+\dfrac{1}{3}\times\dfrac{3}{3}$

$=\dfrac{2}{9}+\dfrac{3}{9}$

$=\dfrac{5}{9}$

c) $\dfrac{4}{11}+\dfrac{1}{3}$

$=\dfrac{4\times3}{11\times3}+\dfrac{11\times1}{11\times3}$

$=\dfrac{12}{33}+\dfrac{11}{33}$

$=\dfrac{23}{33}$

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10. Evaluate. Express each answer as a fraction in lowest terms.

a) $\dfrac{2}{9}+\dfrac{1}{3}$ c) $\dfrac{4}{11}+\dfrac{1}{3}$ e) $\dfrac{11}{4}-\dfrac{3}{2}$

g) $\dfrac{5}{3}-\dfrac{9}{2}$ i) $5-\dfrac{17}{6}$ k) $\dfrac{-7}{4}+\left(-\dfrac{15}{6}\right)$

e) $\dfrac{11}{4}-\dfrac{3}{2}\times\dfrac{2}{2}$

$=\dfrac{11}{4}-\dfrac{6}{4}$

$=\dfrac{5}{4}\quad=1\dfrac{1}{4}$

g) $\dfrac{5}{3}\times\dfrac{2}{2}-\dfrac{9}{2}\times\dfrac{3}{3}$

$=\dfrac{10}{6}-\dfrac{27}{6}$

$=\dfrac{-17}{6}\quad=-2\dfrac{5}{6}$

10. Evaluate. Express each answer as a fraction in lowest terms.

a) $\dfrac{2}{9}+\dfrac{1}{3}$

c) $\dfrac{4}{11}+\dfrac{1}{3}$

e) $\dfrac{11}{4}-\dfrac{3}{2}$

g) $\dfrac{5}{3}-\dfrac{9}{2}$

i) $5-\dfrac{17}{6}$

k) $\dfrac{-7}{4}+\left(-\dfrac{15}{6}\right)$

i) $5-\dfrac{17}{6}$

$= \dfrac{5}{1} \times \dfrac{6}{6} - \dfrac{17}{6}$

$= \dfrac{30}{6} - \dfrac{17}{6}$

$= \dfrac{13}{6} = 2\dfrac{1}{6}$

k) $\dfrac{-7\times6}{4\times6} + \dfrac{4\times-15}{4\times6}$

$= \dfrac{-42}{24} + \dfrac{-60}{24}$

$= \dfrac{-102}{24}$

$= -4\dfrac{6}{24} \qquad = -4\dfrac{1}{4}$

11. Of the students in a class, $\dfrac{3}{4}$ take the bus to school. $\dfrac{3}{16}$ of the students in the class walk to school. The remaining students are driven to school in a car.

a) What fraction of the class is driven to school in a car?

b) What fraction of the class does not walk to school?

c) Is it possible that there is a total of 25 students in the class? Explain.

a) $1 - \dfrac{3}{4} - \dfrac{3}{16}$

$= \dfrac{16}{16} - \dfrac{3}{4}\times\dfrac{4}{4} - \dfrac{3}{16}$

$= \dfrac{16}{16} - \dfrac{12}{16} - \dfrac{3}{16}$

$= \dfrac{1}{16}$

b) $1 - $ do walk

$= 1 - \dfrac{3}{16}$

$= \dfrac{16}{16} - \dfrac{3}{16}$

$= \dfrac{13}{16}$

c) Not possible, as you can't divide 25 by 16 exactly.

17. Evaluate. Express each answer as a mixed number.

a) $3\frac{4}{5}+\left(-1\frac{7}{10}\right)$ b) $2\frac{2}{7}-4\frac{3}{5}$ i) $\frac{15}{-6}-2\frac{7}{9}$ j) $-3\frac{5}{6}-\left(-4\frac{3}{8}\right)$

a) $3+-1=2$

$\frac{4}{5}\times\frac{2}{2}+\frac{-7}{10}$

$=\frac{8}{10}+\frac{-7}{10}$

$=\frac{1}{10}$

$\Rightarrow 2+\frac{1}{10}$

$=2\frac{1}{10}$

b) $2-4=-2$

$\frac{2}{7}\times\frac{5}{5}-\frac{3}{5}\times\frac{7}{7}$

$=\frac{10}{35}-\frac{21}{35}$

$=\frac{-11}{35}$

$\Rightarrow -2+\frac{-11}{35}$

$=-2\frac{11}{35}$

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17. Evaluate. Express each answer as a mixed number.

a) $3\frac{4}{5}+\left(-1\frac{7}{10}\right)$ b) $2\frac{2}{7}-4\frac{3}{5}$ i) $\frac{15}{-6}-2\frac{7}{9}$ j) $-3\frac{5}{6}-\left(-4\frac{3}{8}\right)$

i) $0-2=-2$

$\frac{15}{-6}-\frac{7}{9}$

$=\frac{-15}{6}\times\frac{3}{3}-\frac{7}{9}\times\frac{2}{2}$

$=\frac{-45}{18}-\frac{14}{18}$

$=\frac{-59}{18}=-3\frac{5}{18}$

$\Rightarrow -2+-3\frac{5}{18}$

$=-5\frac{5}{18}$

j) $=-3\frac{5}{6}+4\frac{3}{8}$

$-3+4=1$

$\frac{-5}{6}+\frac{3}{8}$

$=\frac{-5}{6}\times\frac{4}{4}+\frac{3}{8}\times\frac{3}{3}$

$=\frac{-20}{24}+\frac{9}{24}$

$=\frac{-11}{24}$

$\Rightarrow 1+\frac{-11}{24}$

$=\frac{24}{24}+\frac{-11}{24}=\frac{13}{24}$

19. Evaluate.

a) $2\frac{7}{9}+1\frac{2}{3}-\frac{4}{5}$ b) $\frac{7}{16}+\left(\frac{5}{8}-\frac{3}{4}\right)$

a) $2+1=3$

$$\frac{7}{9}\times\frac{3}{3}\times\frac{5}{5}+\frac{2}{3}\times\frac{9}{9}\times\frac{5}{5}-\frac{4}{5}\times\frac{9}{9}\times\frac{3}{3}$$

$$=\frac{105}{135}+\frac{90}{135}-\frac{108}{135}$$

$$=\frac{87}{135}=\frac{29}{45}\implies 3+\frac{29}{45}=3\frac{29}{45}$$

b) $\frac{7}{16}+\left(\frac{5}{8}\times\frac{2}{2}-\frac{3}{4}\times\frac{4}{4}\right)$

$$=\frac{7}{16}+\left(\frac{10}{16}-\frac{12}{16}\right)$$

$$=\frac{7}{16}+\frac{-2}{16}$$

$$=\frac{5}{16}$$

22. While adding unit fractions, Jamal believed he had discovered a shortcut. He hypothesized that when adding two unit fractions, he could determine the resulting fraction's numerator by adding the original two denominators, and he could find the resulting fraction's denominator by multiplying the original two denominators.

a) Prove that Jamal's hypothesis is correct.

b) What are some drawbacks of Jamal's shortcut?

> I need to add $\frac{1}{3}+\frac{1}{5}$.
>
> $3+5=8$
>
> $3\times5=15$
>
> So, $\frac{1}{3}+\frac{1}{5}=\frac{8}{15}$

a) For a PROOF you need to show it algebraically

$$\frac{1}{x}+\frac{1}{y}$$

$$=\frac{1}{x}\times\frac{y}{y}+\frac{1}{y}\times\frac{x}{x}$$

$$=\frac{y}{xy}+\frac{x}{xy}$$

$$=\frac{y+x}{xy}$$

$$=\frac{x+y}{xy}\quad\leftarrow\text{ sum}\\ \leftarrow\text{ product}$$

b) This method only works for unit fractions. Also, the answer may need reducing.