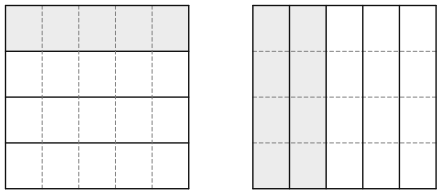
Grade 5 Unit 5 worksheet: Adding and subtracting fractions with unlike denominators (answer key)

ANSWERS AT A GLANCE

1. (a) 20 cells; one cell is $\frac{1}{20}$. (b) Left: $\frac{1}{4} = \frac{5}{20}$. Right: $\frac{2}{5} = \frac{8}{20}$. (c) $\frac{13}{20}$
2. (a) $\frac{7}{10}$ (b) $\frac{7}{12}$ (c) $\frac{17}{24}$ (d) $\frac{5}{18}$ (e) $\frac{11}{12}$ (f) $\frac{2}{15}$ (g) $\frac{2}{3}$ (h) $\frac{11}{15}$
3. $1\frac{1}{36}$ pounds
4. (a) He added the tops and added the bottoms. The correct sum is $\frac{7}{8}$, so Ben's answer is $\frac{19}{40}$ too small. (b) She changed the denominators to 24 but did not change the numerators. The correct difference is $\frac{13}{24}$.
5. $1\frac{7}{8}$ cups
6. (a) 3 (b) 4

WORKED SOLUTIONS

1. Each square below is one whole. On the left square, the solid lines cut it into fourths. On the right square, the solid lines cut it into fifths. The dashed lines cut both squares into the same small cells.



(a) How many small cells are in each square? What fraction of a square is one cell?

(b) Write the shaded part of each square as a fraction. Then write it again, counted in cells.

(c) Add the two shaded parts.

ANSWER

(a) 20 cells; one cell is $\frac{1}{20}$. (b) Left: $\frac{1}{4} = \frac{5}{20}$. Right: $\frac{2}{5} = \frac{8}{20}$. (c) $\frac{13}{20}$

SOLUTION

(a) Each square has 4 rows and 5 columns, so it has 4 × 5 = 20 cells. One cell is $\frac{1}{20}$ of the square.

(b) On the left, 1 of the 4 rows is shaded, so the shaded part is $\frac{1}{4}$. A row holds 5 cells, so $\frac{1}{4} = \frac{5}{20}$. On the right, 2 of the 5 columns are shaded, so the shaded part is $\frac{2}{5}$. A column holds 4 cells, so $\frac{2}{5} = \frac{8}{20}$.

(c) Now both parts are counted in twentieths:

$$\frac{1}{4} + \frac{2}{5} = \frac{5}{20} + \frac{8}{20} = \frac{13}{20}$$

13 and 20 share no factor except 1, so $\frac{13}{20}$ is in simplest form.

2. Add or subtract. Write each answer in simplest form.

(a) $\frac{2}{5} + \frac{3}{10}$ (b) $\frac{5}{6} - \frac{1}{4}$ (c) $\frac{1}{3} + \frac{3}{8}$ (d) $\frac{7}{9} - \frac{1}{2}$

(e) $\frac{3}{4} + \frac{1}{6}$ (f) $\frac{4}{5} - \frac{2}{3}$ (g) $\frac{5}{12} + \frac{1}{4}$ (h) $\frac{9}{10} - \frac{1}{6}$

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ANSWER

(a) $\frac{7}{10}$ (b) $\frac{7}{12}$ (c) $\frac{17}{24}$ (d) $\frac{5}{18}$ (e) $\frac{11}{12}$ (f) $\frac{2}{15}$ (g) $\frac{2}{3}$ (h) $\frac{11}{15}$

SOLUTION

(a) 10 is a multiple of 5: $\frac{4}{10} + \frac{3}{10} = \frac{7}{10}$.

(b) The least common denominator of 6 and 4 is 12: $\frac{10}{12} - \frac{3}{12} = \frac{7}{12}$.

(c) 3 and 8 share no factor except 1, so use 3 × 8 = 24: $\frac{8}{24} + \frac{9}{24} = \frac{17}{24}$.

(d) 9 and 2 share no factor except 1, so use 18: $\frac{14}{18} - \frac{9}{18} = \frac{5}{18}$.

(e) The least common denominator of 4 and 6 is 12: $\frac{9}{12} + \frac{2}{12} = \frac{11}{12}$.

(f) Use 5 × 3 = 15: $\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$.

(g) 12 is a multiple of 4: $\frac{5}{12} + \frac{3}{12} = \frac{8}{12}$. Divide the top and bottom by 4: $\frac{8}{12} = \frac{2}{3}$.

(h) The least common denominator of 10 and 6 is 30: $\frac{27}{30} - \frac{5}{30} = \frac{22}{30}$. Divide the top and bottom by 2: $\frac{22}{30} = \frac{11}{15}$.

3. At the market, Priya buys $\frac{1}{4}$ pound of grapes and $\frac{7}{9}$ pound of cherries. How many pounds of fruit is that in all? Write the answer as a mixed number.

ANSWER

$1\frac{1}{36}$ pounds

SOLUTION

Neither denominator is a multiple of the other. The least common denominator of 4 and 9 is 36, so multiply the first fraction by $\frac{9}{9}$ and the second by $\frac{4}{4}$:

$$\frac{1}{4} + \frac{7}{9} = \frac{9}{36} + \frac{28}{36} = \frac{37}{36}$$

The top is bigger than the bottom, so this is more than 1 pound. Divide: 37 ÷ 36 = 1 remainder 1, so

$$\frac{37}{36} = 1\frac{1}{36}$$

Priya buys $1\frac{1}{36}$ pounds of fruit.

4. (a) Ben writes $\frac{3}{8} + \frac{1}{2} = \frac{4}{10}$. What did he do wrong? Find the correct sum. Then find how much too small Ben's answer is.

(b) Leah writes $\frac{7}{8} - \frac{1}{3} = \frac{7}{24} - \frac{1}{24} = \frac{6}{24}$. What did she do wrong? Find the correct difference.

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ANSWER

(a) He added the tops and added the bottoms. The correct sum is $\frac{7}{8}$, so Ben's answer is $\frac{19}{40}$ too small. (b) She changed the denominators to 24 but did not change the numerators. The correct difference is $\frac{13}{24}$.

SOLUTION

(a) Ben added the tops and added the bottoms, but the denominators name the size of the pieces and do not add. 8 is a multiple of 2, so rename only $\frac{1}{2}$:

$$\frac{3}{8}+\frac{1}{2}=\frac{3}{8}+\frac{4}{8}=\frac{7}{8}$$

To compare with $\frac{4}{10}$, use 40, the least common denominator of 8 and 10:

$$\frac{7}{8}-\frac{4}{10}=\frac{35}{40}-\frac{16}{40}=\frac{19}{40}$$

Ben's answer is $\frac{19}{40}$ too small. (It is even less than $\frac{1}{2}$, one of the two parts he added.)

(b) Leah cut the pieces into twenty-fourths but kept the old counts. Cutting each eighth into 3 pieces makes 3 times as many pieces, so the top must be multiplied by 3 too: $\frac{7}{8}=\frac{21}{24}$. In the same way, $\frac{1}{3}=\frac{8}{24}$.

$$\frac{7}{8}-\frac{1}{3}=\frac{21}{24}-\frac{8}{24}=\frac{13}{24}$$

13 and 24 share no factor except 1, so $\frac{13}{24}$ is in simplest form.

5. Jack makes trail mix with $\frac{2}{3}$ cup of peanuts, $\frac{5}{6}$ cup of raisins and $\frac{3}{8}$ cup of cereal. How many cups of trail mix is that? Write the answer as a mixed number in simplest form.

ANSWER

$1\frac{7}{8}$ cups

SOLUTION

Find one denominator that 3, 6 and 8 all divide into. The smallest is 24. Rename each fraction in that size of piece and add the three numerators:

$$\frac{2}{3}+\frac{5}{6}+\frac{3}{8}=\frac{16}{24}+\frac{20}{24}+\frac{9}{24}=\frac{45}{24}$$

The top is bigger than the bottom. Divide: 45 ÷ 24 = 1 remainder 21, so $\frac{45}{24}=1\frac{21}{24}$. Written in simplest form, the fraction part is $\frac{7}{8}$.

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The trail mix is $1\frac{7}{8}$ cups.

6. Find the whole number that goes in each box.

(a) $\frac{1}{6} + \frac{\square}{4} = \frac{11}{12}$

(b) $\frac{\square}{5} - \frac{1}{3} = \frac{7}{15}$

ANSWER

(a) 3 (b) 4

SOLUTION

(a) Work in twelfths: $\frac{1}{6} = \frac{2}{12}$. The other part must be $\frac{11}{12} - \frac{2}{12} = \frac{9}{12}$. In fourths, $\frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$. The box is 3. Check: $\frac{2}{12} + \frac{9}{12} = \frac{11}{12}$.

(b) Work in fifteenths: $\frac{1}{3} = \frac{5}{15}$. The first fraction must be $\frac{7}{15} + \frac{5}{15} = \frac{12}{15}$. In fifths, $\frac{12}{15} = \frac{12 \div 3}{15 \div 3} = \frac{4}{5}$. The box is 4. Check: $\frac{12}{15} - \frac{5}{15} = \frac{7}{15}$.

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