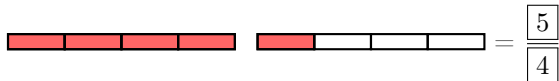# FRACTIONS

A DEFINITIONS

A.1 FINDING FRACTIONS

Ex 1: A bar represents 1. Find the fraction that represents the shaded part:

$$\text{(bar diagram)} = \frac{5}{4}$$

Answer:

- A bar (1) is divided into 4 equal parts:
- 5 parts are shaded.
- So, $\frac{5}{4} =$ (bar diagram)

Ex 2: A bar represents 1. Find the fraction that represents the shaded part:

$$\text{(bar diagram)} = \frac{5}{3}$$

Answer:

- A bar (1) is divided into 3 equal parts:
- 5 parts are shaded.
- So, $\frac{5}{3} =$ (bar diagram)

Ex 3: A bar represents 1. Find the fraction that represents the shaded part:

$$\text{(bar diagram)} = \frac{8}{3}$$
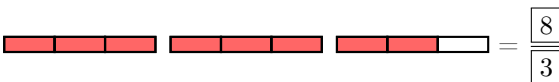
Answer:

- A bar (1) is divided into 3 equal parts:
- 8 parts are shaded.
- So, $\frac{8}{3} =$ (bar diagram)

Ex 4: A circle represents 1. Find the fraction that represents the shaded part:
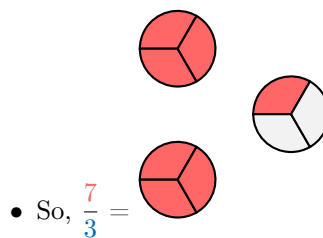
$$\text{(circle diagram)} = \frac{7}{4}$$
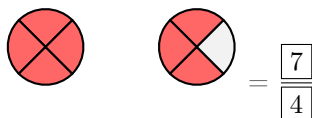
Answer:

- A circle (1) is divided into 4 equal parts.
- 7 parts are shaded.
- So, $\frac{7}{4} =$ (circle diagram)

Ex 5: A circle represents 1. Find the fraction that represents the shaded part:

$$\text{(circle diagram)} = \frac{7}{3}$$
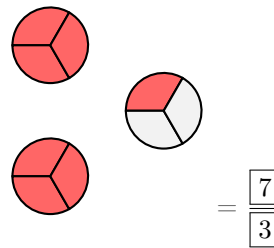
Answer:

- A circle (1) is divided into 3 equal parts.
- 7 parts are shaded.
- So, $\frac{7}{3} =$ (circle diagram)

A.2 WRITING FRACTIONS FROM WORDS

Ex 6: Write as fraction:

$$\text{one over four} = \frac{1}{4}$$

Answer:

- one over four $= \frac{1}{4} =$ (bar diagram)

Ex 7: Write as fraction:

$$\text{three over five} = \frac{3}{5}$$

Answer:

- three over five $= \frac{3}{5} =$ (bar diagram)

Ex 8: Write as fraction:

$$\text{three quarters} = \frac{3}{4}$$

Answer:

- three quarters $= \frac{3}{4} =$ (bar diagram)

Ex 9: Write as fraction:

$$\text{six over hundred} = \frac{6}{100}$$

Answer:

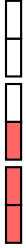- six over hundred (six thousandths) $= \frac{6}{100}$

B FRACTION AS QUOTIENT

B.1 CONVERTING DIVISION TO FRACTIONS

Ex 10: Write as a fraction:

$$3 \div 2 = \boxed{\dfrac{\boxed{3}}{\boxed{2}}}$$

Answer:

- $3 \div 2 = $ ▮
- $3 \div 2 = \dfrac{3}{2}$

Ex 11: Write as a fraction:

$$2 \div 5 = \boxed{\dfrac{\boxed{2}}{\boxed{5}}}$$

Answer:

- $2 \div 5 = $ ▮
- $2 \div 5 = \dfrac{2}{5}$

Ex 12: Write as a fraction:

$$3 \div 4 = \boxed{\dfrac{\boxed{3}}{\boxed{4}}}$$

Answer:

- $3 \div 4 = $ ▮
- $3 \div 4 = \dfrac{3}{4}$

Ex 13: Write as a fraction:

$$5 \div 3 = \boxed{\dfrac{\boxed{5}}{\boxed{3}}}$$

Answer:

- $5 \div 3 = $ ▮
- $5 \div 3 = \dfrac{5}{3}$

B.2 CONVERTING FRACTIONS TO DIVISION EXPRESSIONS

Ex 14: Convert the fraction into a division expression:

$$\frac{2}{5} = \boxed{2} \div \boxed{5}$$

Answer: The fraction $\dfrac{2}{5}$ can be written as the division $2 \div 5$.

Ex 15: Convert the fraction into a division expression:

$$\frac{4}{7} = \boxed{4} \div \boxed{7}$$

Answer: The fraction $\dfrac{4}{7}$ can be written as the division $4 \div 7$.

Ex 16: Convert the fraction into a division expression:

$$\frac{3}{8} = \boxed{3} \div \boxed{8}$$

Answer: The fraction $\dfrac{3}{8}$ can be written as the division $3 \div 8$.

Ex 17: Convert the fraction into a division expression:

$$\frac{6}{9} = \boxed{6} \div \boxed{9}$$

Answer: The fraction $\dfrac{6}{9}$ can be written as the division $6 \div 9$.

B.3 CONVERTING FRACTIONS TO WHOLE NUMBERS

Ex 18: Convert the fraction into a whole number:

$$\frac{4}{2} = \boxed{2}$$

Answer:

- $\dfrac{4}{2} = 4 \div 2$

  $= 2$

- ▮ $= 2$

Ex 19: Convert the fraction into a whole number:
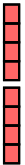$$\frac{9}{3} = \boxed{3}$$

Answer:

- $\frac{9}{3} = 9 \div 3$
  $$= 3$$

- $= 3$

Ex 20: Convert the fraction into a whole number:
$$\frac{8}{4} = \boxed{2}$$

Answer:

- $\frac{8}{4} = 8 \div 4$
  $$= 2$$

- $= 2$

Ex 21: Convert the fraction into a whole number:
$$\frac{5}{5} = \boxed{1}$$

Answer:

- $\frac{5}{5} = 5 \div 5$
  $$= 1$$

- $= 1$

B.4 FINDING FRACTIONS IN WORD PROBLEMS

Ex 22: Four friends share 3 cakes equally. What fraction does each friend get?
$$\boxed{\frac{3}{4}} \text{ of a cake}$$

Answer:

- When you share equally, you divide the 3 cakes by 4 friends:
  $$3 \div 4 = \frac{3}{4}$$
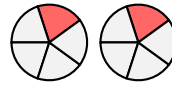
-

- So, each friend gets $\frac{3}{4}$ of a cake.

Ex 23: Five friends share 2 pizzas equally. What fraction does each friend get?
$$\boxed{\frac{2}{5}} \text{ of a pizza}$$

Answer:

- When you share equally, you divide the 2 pizzas by 5 friends:
  $$2 \div 5 = \frac{2}{5}$$

-

- So, each friend gets $\frac{2}{5}$ of a pizza.

Ex 24: A couple shares 5 chocolate bars equally. What fraction of a chocolate bar does each person get?
$$\boxed{\frac{5}{2}} \text{ of a chocolate bar}$$

Answer:

- When you share equally, you divide the 5 chocolate bars by 2 people:
  $$5 \div 2 = \frac{5}{2}$$

-

- So, each person gets $\frac{5}{2}$ chocolate bars, which is 2 whole bars and half of another one.
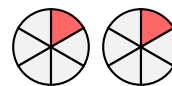
Ex 25: Six family members share 2 apple pies equally. What fraction of a pie does each family member get?
$$\boxed{\frac{2}{6}} \text{ of a pie}$$

Answer:

- When you share equally, you divide the 2 apple pies by 6 family members:
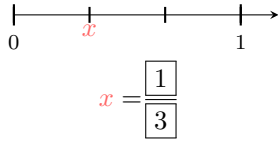 $$2 \div 6 = \frac{2}{6}$$

-

- So, each family member gets $\frac{2}{6}$ of an apple pie.
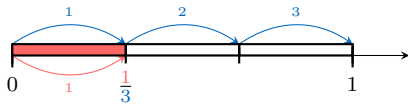
C ON THE NUMBER LINE

C.1 FINDING FRACTIONS

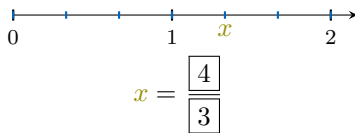**Ex 26:** Find the value of x

$$x = \boxed{\dfrac{1}{3}}$$

Answer:

- 1 is divided in 3 equals parts.

- x is located at 1 part from 0.

- So, $x = \dfrac{1}{3}$.

Ex 27: Find the value of x

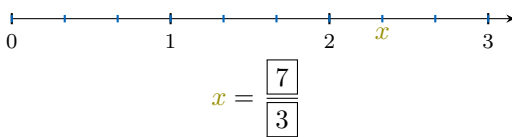$$x = \boxed{\dfrac{4}{3}}$$

Answer:

- 1 is divided in 3 equals parts.

- x is located at 4 parts from 0.
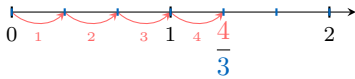
- So, $x = \dfrac{4}{3}$.

Ex 28: Find the value of x

$$x = \boxed{\dfrac{7}{3}}$$

Answer:

- 1 is divided in 3 equal parts.

- x is located at 7 parts from 0.
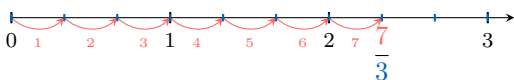
- So, $x = \dfrac{7}{3}$.

Ex 29: Find the value of x

$$x = \boxed{\dfrac{7}{4}}$$

Answer:

- 1 is divided in 4 equal parts.

- x is located at 7 parts from 0.
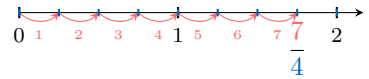
- So, $x = \dfrac{7}{4}$.

Ex 30: Find the value of x

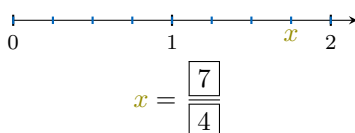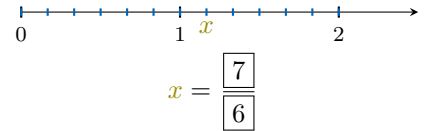$$x = \boxed{\dfrac{7}{6}}$$

Answer:

- 1 is divided into 6 equal parts.

- x is located at 7 parts from 0.
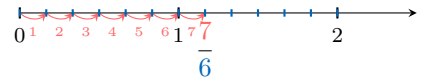
- So, $x = \dfrac{7}{6}$.

D EQUIVALENT FRACTIONS

D.1 FINDING THE MISSING NUMERATOR

Ex 31:

$$\frac{2}{4} = \boxed{\dfrac{1}{2}}$$

Answer:

- $\dfrac{2}{4} = \dfrac{1 \times \cancel{2}}{2 \times \cancel{2}}$

   $= \dfrac{1}{2}$

- $\blacksquare = \dfrac{2}{4} = \dfrac{1}{2} = \blacksquare$ $\div 2$ ... $\div 2$

- The second denominator 2 is the first denominator 4 divided by 2 : $4 \times 2 = 2$.

- To keep the fractions equivalent, the numerator must also be divided by 2.

- This means: $2 \div 2 = 1$, so the missing numerator is 1.

Ex 32:

$$\frac{9}{6} = \boxed{\dfrac{3}{2}}$$

Answer:

- $\dfrac{9}{6} = \dfrac{3 \times \cancel{3}}{2 \times \cancel{3}}$

  $= \dfrac{3}{2}$

- $= \dfrac{9}{6} \;\overset{\div 3}{=}\; \dfrac{3}{2} =$

- The second denominator 2 is the first denominator 6 divided by 3 : $6 \div 3 = 2$.

- To keep the fractions equivalent, the numerator must also be divided by 3.

- This means: $9 \div 3 = 3$, so the missing numerator is 3.

Ex 33:

$$\dfrac{5}{10} = \dfrac{\boxed{1}}{2}$$

Answer:

- $\dfrac{5}{10} = \dfrac{1 \times \cancel{5}}{2 \times \cancel{5}}$

  $= \dfrac{1}{2}$

- $= \dfrac{5}{10} \;\overset{\div 5}{=}\; \dfrac{1}{2} =$
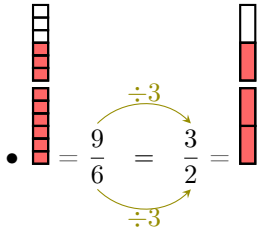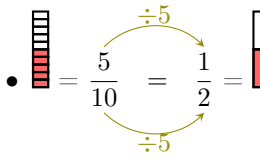
- The second denominator 2 is the first denominator 10 divided by 5 : $10 \div 5 = 2$.

- To keep the fractions equivalent, the numerator must also be divided by 5.

- This means: $5 \div 5 = 1$, so the missing numerator is 1.

Ex 34:

$$\dfrac{16}{12} = \dfrac{\boxed{4}}{3}$$

Answer:

- $\dfrac{16}{12} = \dfrac{4 \times \cancel{4}}{3 \times \cancel{4}}$

  $= \dfrac{4}{3}$

- $= \dfrac{16}{12} \;\overset{\div 4}{=}\; \dfrac{4}{3} =$

- The second denominator 3 is the first denominator 12 divided by 4 : $12 \div 4 = 3$.

- To keep the fractions equivalent, the numerator must also be divided by 4.

- This means: $16 \div 4 = 4$, so the missing numerator is 4.

Ex 35:

$$\dfrac{4}{10} = \dfrac{\boxed{2}}{5}$$

Answer:

- $\dfrac{4}{10} = \dfrac{2 \times \cancel{2}}{5 \times \cancel{2}}$

  $= \dfrac{2}{5}$

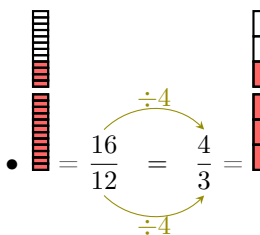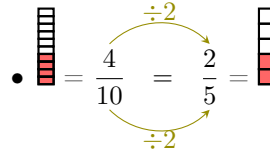- $= \dfrac{4}{10} \;\overset{\div 2}{=}\; \dfrac{2}{5} =$

- The second denominator 5 is the first denominator 10 divided by 2 : $10 \div 2 = 5$.

- To keep the fractions equivalent, the numerator must also be divided by 2.

- This means: $4 \div 2 = 2$, so the missing numerator is 2.

D.2 FINDING THE MISSING NUMERATOR

Ex 36:

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

Answer:

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

  $= \dfrac{2}{4}$

- $= \dfrac{1}{2} \;\overset{\times 2}{=}\; \dfrac{2}{4} =$
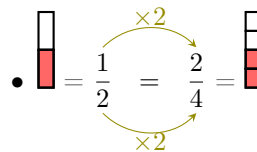
Ex 37:

$$\dfrac{4}{3} = \dfrac{\boxed{20}}{15}$$

Answer:

- $\dfrac{4}{3} = \dfrac{4 \times 5}{3 \times 5}$

  $= \dfrac{20}{15}$

- $= \dfrac{4}{3} \;\overset{\times 5}{=}\; \dfrac{20}{15} =$

Ex 38:

$$\frac{3}{4} = \frac{\boxed{9}}{12}$$

Answer:

- $\frac{3}{4} = \frac{3 \times 3}{4 \times 3}$

  $= \frac{9}{12}$

- $= \frac{3}{4} \xrightarrow{\times 3} = \frac{9}{12} \xrightarrow{\times 3} =$

Ex 39:

$$\frac{5}{6} = \frac{\boxed{10}}{12}$$

Answer:

- $\frac{5}{6} = \frac{5 \times 2}{6 \times 2}$

  $= \frac{10}{12}$

- $= \frac{5}{6} \xrightarrow{\times 2} = \frac{10}{12} \xrightarrow{\times 2} =$
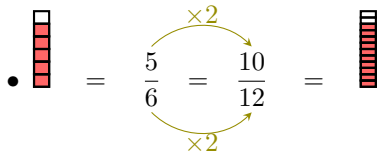
Ex 40:

$$\frac{7}{8} = \frac{\boxed{28}}{32}$$

Answer:

- $\frac{7}{8} = \frac{7 \times 4}{8 \times 4}$

  $= \frac{28}{32}$

- $= \frac{7}{8} \xrightarrow{\times 4} = \frac{28}{32} \xrightarrow{\times 4} =$
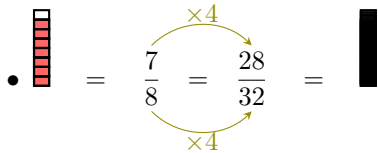
D.3 FINDING THE MISSING DENOMINATOR

Ex 41:

$$\frac{4}{10} = \frac{2}{\boxed{5}}$$

Answer:

- $\frac{4}{10} = \frac{2 \times 2}{5 \times 2}$

  $= \frac{2}{5}$

- $= \frac{4}{10} \xrightarrow{\div 2} = \frac{2}{5} \xrightarrow{\div 2} =$

- The second numerator 2 is the first numerator 4 divided by 2 : $4 \div 2 = 2$.

- To keep the fractions equivalent, the denominator must also be divided by 2.

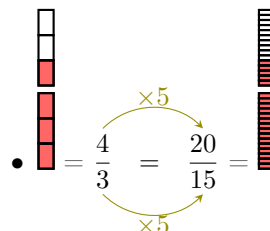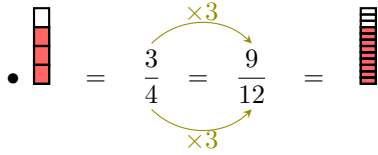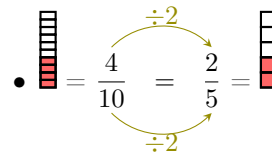- This means: $10 \div 2 = 5$, so the missing denominator is 5.

Ex 42:

$$\frac{6}{12} = \frac{1}{\boxed{2}}$$

Answer:

- $\frac{6}{12} = \frac{1 \times 6}{2 \times 6}$

  $= \frac{1}{2}$

- $= \frac{6}{12} \xrightarrow{\div 6} = \frac{1}{2} \xrightarrow{\div 6} =$

- The second numerator 1 is the first numerator 6 divided by 6 : $6 \div 6 = 1$.

- To keep the fractions equivalent, the denominator must also be divided by 6.

- This means: $12 \div 6 = 2$, so the missing denominator is 2.

Ex 43:

$$\frac{9}{6} = \frac{3}{\boxed{2}}$$

Answer:

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

  $= \frac{3}{2}$

- $= \frac{9}{6} \xrightarrow{\div 3} = \frac{3}{2} \xrightarrow{\div 3} =$

- The second numerator 3 is the first numerator 9 divided by 3 : $9 \div 3 = 3$.

- To keep the fractions equivalent, the denominator must also be divided by 3.

- This means: $6 \div 3 = 2$, so the missing denominator is 2.

Ex 44:

$$\frac{12}{10} = \frac{6}{\boxed{5}}$$

Answer:

- $\dfrac{12}{10} = \dfrac{6 \times 2}{5 \times 2}$

  $= \dfrac{6}{5}$

- $\boxed{} = \dfrac{12}{10} \xrightarrow{\div 2} \dfrac{6}{5} \xleftarrow{\div 2} = \boxed{}$
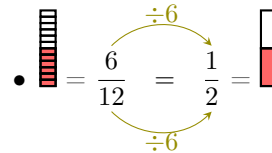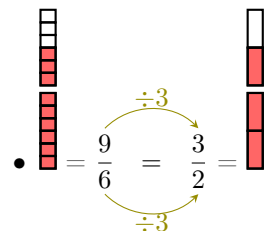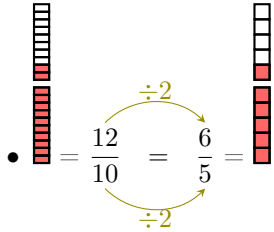
- The second numerator 6 is the first numerator 12 divided by 2 : $12 \div 2 = 6$.

- To keep the fractions equivalent, the denominator must also be divided by 2.

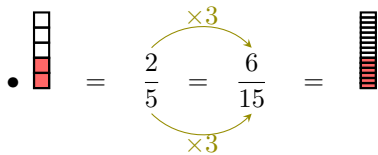- This means: $10 \div 2 = 5$, so the missing denominator is 5.

D.4 FINDING THE MISSING DENOMINATOR

Ex 45:

$$\frac{2}{5} = \frac{6}{\boxed{15}}$$

Answer:

- $\dfrac{2}{5} = \dfrac{2 \times 3}{5 \times 3}$

  $= \dfrac{6}{15}$

- $\boxed{} = \dfrac{2}{5} \xrightarrow{\times 3} \dfrac{6}{15} \xleftarrow{\times 3} = \boxed{}$

Ex 46:

$$\frac{2}{3} = \frac{8}{\boxed{12}}$$

Answer:

- $\dfrac{2}{3} = \dfrac{2 \times 4}{3 \times 4}$

  $= \dfrac{8}{12}$

- $\boxed{} = \dfrac{2}{3} \xrightarrow{\times 4} \dfrac{8}{12} \xleftarrow{\times 4} = \boxed{}$

Ex 47:

$$\frac{3}{5} = \frac{9}{\boxed{15}}$$

Answer:

- $\dfrac{3}{5} = \dfrac{3 \times 3}{5 \times 3}$

  $= \dfrac{9}{15}$
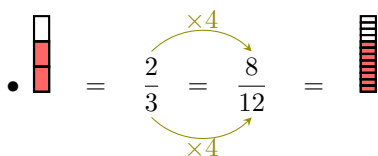
- $\boxed{} = \dfrac{3}{5} \xrightarrow{\times 3} \dfrac{9}{15} \xleftarrow{\times 3} = \boxed{}$
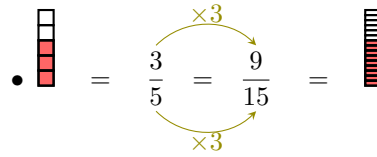
Ex 48:

$$\frac{4}{7} = \frac{12}{\boxed{21}}$$

Answer:

- $\dfrac{4}{7} = \dfrac{4 \times 3}{7 \times 3}$

  $= \dfrac{12}{21}$

- $\boxed{} = \dfrac{4}{7} \xrightarrow{\times 3} \dfrac{12}{21} \xleftarrow{\times 3} = \boxed{}$
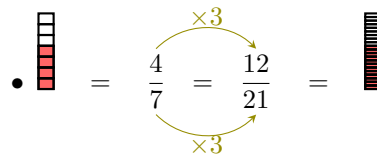
Ex 49:

$$\frac{5}{9} = \frac{20}{\boxed{36}}$$

Answer:

- $\dfrac{5}{9} = \dfrac{5 \times 4}{9 \times 4}$

  $= \dfrac{20}{36}$

- $\boxed{} = \dfrac{5}{9} \xrightarrow{\times 4} \dfrac{20}{36} \xleftarrow{\times 4} = \boxed{}$

E SIMPLIFICATION

E.1 SIMPLIFYING FRACTIONS

Ex 50: Simplify:

$$\frac{4}{6} = \frac{\boxed{2}}{\boxed{3}}$$

Answer:

-

$$\frac{2}{4} = \frac{1 \times 2}{2 \times 2}$$

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

$$\bullet \quad \frac{4}{6} \overset{\div 2}{\underset{\div 2}{=}} \frac{2}{3}$$

Ex 51: Simplify:

$$\frac{24}{16} = \boxed{\frac{3}{2}}$$

Answer:

-
$$\frac{24}{16} = \frac{3 \times \cancel{8}}{2 \times \cancel{8}}$$
$$= \frac{3}{2}$$

$$\bullet \quad \frac{24}{16} \overset{\div 8}{\underset{\div 8}{=}} \frac{3}{2}$$

Ex 52: Simplify:

$$\frac{12}{20} = \boxed{\frac{3}{5}}$$

Answer:

-
$$\frac{12}{20} = \frac{3 \times 4}{5 \times 4}$$
$$= \frac{3}{5}$$

$$\bullet \quad \frac{12}{20} \overset{\div 4}{\underset{\div 4}{=}} \frac{3}{5}$$

Ex 53: Simplify:

$$\frac{30}{100} = \boxed{\frac{3}{10}}$$

Answer:

-
$$\frac{30}{100} = \frac{3 \times 10}{10 \times 10}$$
$$= \frac{3}{10}$$

$$\bullet \quad \frac{30}{100} \overset{\div 10}{\underset{\div 10}{=}} \frac{3}{10}$$

Ex 54: Simplify:

$$\frac{25}{100} = \boxed{\frac{1}{4}}$$

Answer:

-
$$\frac{25}{100} = \frac{1 \times 25}{4 \times 25}$$
$$= \frac{1}{4}$$

$$\bullet \quad \frac{25}{100} \overset{\div 25}{\underset{\div 25}{=}} \frac{1}{4}$$

F CROSS MULTIPLICATION

F.1 SOLVING PROPORTIONS USING CROSS-MULTIPLICATION

Ex 55: Solve x for $\frac{12}{4} = \frac{x}{6}$ (you can use a calculator).

$$x = \boxed{18}$$

Answer:

$$\frac{12}{4} = \frac{x}{6}$$
$$4 \times x = 12 \times 6 \qquad \text{(cross multiplication)}$$
$$x = 12 \times 6 \div 4 \quad \text{(dividing both sides by 4)}$$
$$x = 18$$

Ex 56: Solve x for $\frac{11}{10} = \frac{x}{5}$ (you can use a calculator).

$$x = \boxed{5.5}$$

Answer:

$$\frac{11}{10} = \frac{x}{5}$$
$$10 \times x = 11 \times 5 \qquad \text{(cross multiplication)}$$
$$x = 11 \times 5 \div 10 \quad \text{(dividing both sides by 10)}$$
$$x = 5.5$$

Ex 57: Solve x for $\frac{12}{10} = \frac{18}{x}$ (you can use a calculator).

$$x = \boxed{15}$$

Answer:

$$\frac{12}{10} = \frac{18}{x}$$
$$12 \times x = 18 \times 10 \qquad \text{(cross multiplication)}$$
$$x = 18 \times 10 \div 12 \quad \text{(dividing both sides by 12)}$$
$$x = 15$$

Ex 58: Solve x for $\frac{27}{x} = \frac{30}{10}$ (you can use a calculator).

$$x = \boxed{9}$$

Answer:

$$\frac{27}{x} = \frac{30}{10}$$
$$30 \times x = 27 \times 10 \qquad \text{(cross multiplication)}$$
$$x = 27 \times 10 \div 30 \quad \text{(dividing both sides by 30)}$$
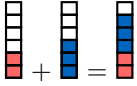$$x = 9$$

G ADDITION AND SUBTRACTION

G.1 ADDING AND SUBTRACTING FRACTIONS WITH COMMON DENOMINATORS

Ex 59:

$$\frac{2}{6} + \frac{3}{6} = \boxed{\frac{5}{6}}$$

Answer:

-
- $\frac{2}{6} + \frac{3}{6} = \frac{2+3}{6}$
  $$= \frac{5}{6}$$

Ex 60:

$$\frac{2}{3} + \frac{2}{3} = \boxed{\frac{4}{3}}$$

Answer:

-
- $\frac{2}{3} + \frac{2}{3} = \frac{2+2}{3}$
  $$= \frac{4}{3}$$

Ex 61:

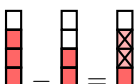$$\frac{4}{5} + \frac{2}{5} = \boxed{\frac{6}{5}}$$

Answer:

-
- $\frac{4}{5} + \frac{2}{5} = \frac{4+2}{5}$
  $$= \frac{6}{5}$$

Ex 62:

$$\frac{3}{4} - \frac{2}{4} = \boxed{\frac{1}{4}}$$

Answer:

-
- $\frac{3}{4} - \frac{2}{4} = \frac{3-2}{4}$
  $$= \frac{1}{4}$$

Ex 63:

$$\frac{4}{5} - \frac{3}{5} = \boxed{\frac{1}{5}}$$

Answer:

-
- $\frac{4}{5} - \frac{3}{5} = \frac{4-3}{5}$
  $$= \frac{1}{5}$$

Ex 64:

$$\frac{4}{3} - \frac{2}{3} = \boxed{\frac{2}{3}}$$

Answer:

-
- $\frac{4}{3} - \frac{2}{3} = \frac{4-2}{3}$
  $$= \frac{2}{3}$$

G.2 SOLVING REAL-WORLD PROBLEMS

Ex 65: Louis has a whole cake. He cuts it into 8 equal slices and eats 3 slices. What fraction of the whole cake remains?

$$\boxed{\frac{5}{8}} \text{ of the cake}$$

Answer:

- **Represent the cake as a fraction**
  The whole cake is divided into 8 slices, so the whole cake is $\frac{8}{8}$.

- **Subtract the slices eaten by Louis**
  Louis eats 3 slices, which is $\frac{3}{8}$ of the cake. Remaining cake after Louis eats:
  $$\frac{8}{8} - \frac{3}{8} = \frac{5}{8}.$$

- **Final Answer:**
  The fraction of the cake that remains is $\frac{5}{8}$.

Ex 66: Today, Louis eats $\frac{1}{2}$ of a croissant. Then, Louis eats $\frac{1}{4}$ of another croissant. How much croissant did Louis eat in total?

$$\boxed{\frac{3}{4}} \text{ of a croissant}$$

Answer:

- **Represent the croissants as fractions**
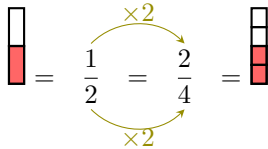 Louis eats $\frac{1}{2}$ of the first croissant and $\frac{1}{4}$ of the second croissant. To find the total, add the two fractions:
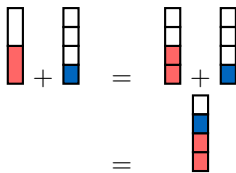
  $$\frac{1}{2} + \frac{1}{4}.$$

- **Find a common denominator**
  The denominators are 2 and 4. The least common denominator is 4. Convert $\frac{1}{2}$ to a fraction with denominator 4:

- **Add the fractions**

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

- **Final Answer:**
  Louis ate a total of $\frac{3}{4}$ of a croissant.

Ex 67: At the beginning, there are $\frac{5}{6}$ of a cake. After eating, there are $\frac{2}{3}$ of the cake. What quantity of cake did Louis eat?
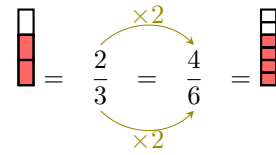
$$\boxed{\frac{1}{6}} \text{ of the cake}$$

Answer:

- **Represent the cake as fractions**
  At the beginning, there is $\frac{5}{6}$ of the cake. After eating, $\frac{2}{3}$ of the cake remains. To find the quantity Louis ate, subtract the remaining cake from the initial amount:

  $$\frac{5}{6} - \frac{2}{3}.$$

- **Find a common denominator**
  The denominators are 6 and 3. The least common denominator is 6. Convert $\frac{2}{3}$ to a fraction with denominator 6:

- **Subtract the fractions**

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

- **Final Answer:**
  Louis ate $\frac{1}{6}$ of the cake.

Ex 68: At the beginning, there are $\frac{7}{8}$ of a pizza. After eating, there are $\frac{3}{4}$ of the pizza. What quantity of pizza did Louis eat?

$$\boxed{\frac{1}{8}} \text{ of the pizza}$$

Answer:

- **Represent the pizza as fractions**
  At the beginning, there is $\frac{7}{8}$ of the pizza. After eating, $\frac{3}{4}$ of the pizza remains. To find the quantity Louis ate, subtract the remaining pizza from the initial amount:

  $$\frac{7}{8} - \frac{3}{4}.$$

- **Find a common denominator**
  The denominators are 8 and 4. The least common denominator is 8. Convert $\frac{3}{4}$ to a fraction with denominator 8:
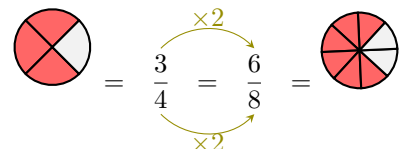
- **Subtract the fractions**

  $$\frac{7}{8} - \frac{3}{4} = \frac{7}{8} - \frac{6}{8}$$
  $$= \frac{1}{8}$$
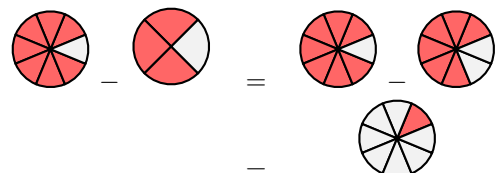
- **Final Answer:**
  Louis ate $\frac{1}{8}$ of the pizza.

Ex 69: Louis read $\frac{2}{5}$ of his book on Saturday and $\frac{3}{10}$ of his book on Sunday. How much of his book did Louis read in total?

$$\boxed{\frac{\boxed{7}}{\boxed{10}}} \text{ of the book}$$

Answer:

- **Represent the book as fractions**
  Louis read $\frac{2}{5}$ of the book on Saturday and $\frac{3}{10}$ of the book on Sunday. To find the total, add the two fractions:
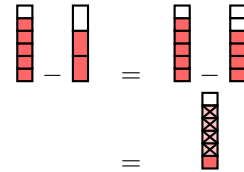 $$\frac{2}{5} + \frac{3}{10}.$$

- **Find a common denominator**
  The denominators are 5 and 10. The least common denominator is 10. Convert $\frac{2}{5}$ to a fraction with denominator 10:

  $$= \frac{2}{5} = \frac{4}{10} =$$

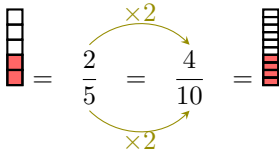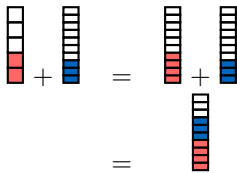- **Add the fractions**
  $$\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10}$$
  $$= \frac{7}{10}$$

- **Final Answer:**
  Louis read a total of $\frac{7}{10}$ of his book.

G.3 ADDING FRACTIONS WITH UNLIKE DENOMINATORS

Ex 70: Calculate and simplify:
$$\frac{2}{3} + \frac{3}{5} = \frac{\boxed{19}}{\boxed{15}}$$

Answer:

- **Find a common denominator**: To add fractions, they must have the same denominator.
  - Multiples of 3: 3, 6, 9, 12, **15**, ...
  - Multiples of 5: 5, 10, **15**, 20, ...
  - The smallest common denominator is **15**.

-
  $$\frac{2}{3} + \frac{3}{5} = \frac{2 \times 5}{3 \times 5} + \frac{3 \times 3}{5 \times 3}$$
  $$= \frac{10}{15} + \frac{9}{15} \quad (\text{common denominator} = 15)$$
  $$= \frac{10 + 9}{15}$$
  $$= \frac{19}{15}$$

- **Visual representation:**

Ex 71: Calculate and simplify:
$$\frac{1}{2} + \frac{2}{3} = \frac{\boxed{7}}{\boxed{6}}$$

Answer:

- **Find a common denominator**: To add fractions, they must have the same denominator.
  - Multiples of 2: 2, 4, **6**, 8, 10, ...
  - Multiples of 3: 3, **6**, 9, 12, ...
  - The smallest common denominator is **6**.

- $\frac{1}{2} + \frac{2}{3} = \frac{1 \times 3}{2 \times 3} + \frac{2 \times 2}{3 \times 2}$
  $$= \frac{3}{6} + \frac{4}{6} \quad (\text{common denominator} = 6)$$
  $$= \frac{3 + 4}{6} \quad (\text{adding numerators})$$
  $$= \frac{7}{6}$$

- **Visual representation:**

Ex 72: Calculate and simplify:

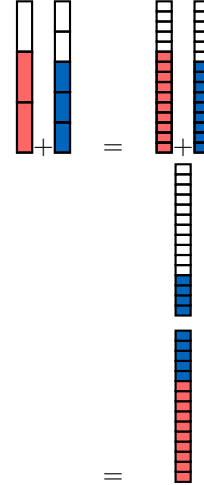$$\frac{3}{2} + \frac{4}{5} = \boxed{\frac{\boxed{23}}{\boxed{10}}}$$

Answer:

- **Find a common denominator**:To add fractions, they must have the same denominator.

    - Multiples of 2: 2, 4, 6, 8, **10**, ...
    - Multiples of 5: 5, **10**, 15, ...
    - The smallest common denominator is **10**.

-
$$\frac{3}{2} + \frac{4}{5} = \frac{3 \times 5}{2 \times 5} + \frac{4 \times 2}{5 \times 2}$$
$$= \frac{15}{10} + \frac{8}{10} \quad \text{(common denominator = 10)}$$
$$= \frac{15 + 8}{10}$$
$$= \frac{23}{10}.$$

- **Visual representation**:

Ex 73: Calculate and simplify:

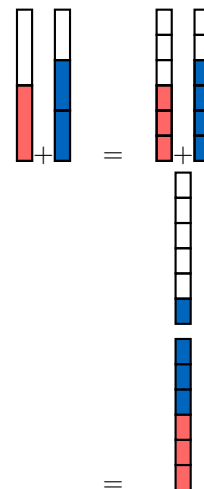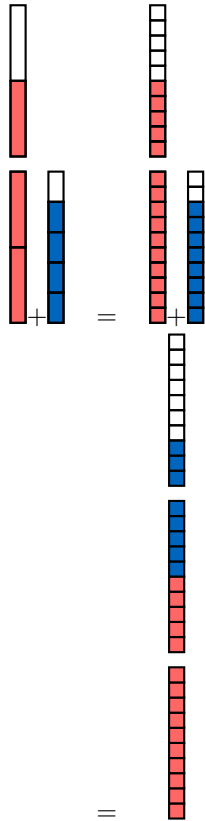$$\frac{3}{4} + \frac{5}{6} = \boxed{\frac{\boxed{19}}{\boxed{12}}}$$

Answer:

- **Find a common denominator**:To add fractions, they must have the same denominator.

    - Multiples of 4: 4, 8, **12**, 16, 20, ...
    - Multiples of 6: 6, **12**, 18, 24, ...
    - The smallest common denominator is **12**.

-
$$\frac{3}{4} + \frac{5}{6} = \frac{3 \times 3}{4 \times 3} + \frac{5 \times 2}{6 \times 2}$$
$$= \frac{9}{12} + \frac{10}{12} \quad \text{(common denominator = 12)}$$
$$= \frac{9 + 10}{12} \quad \text{(adding numerators)}$$
$$= \frac{19}{12}$$

- **Visual representation**:
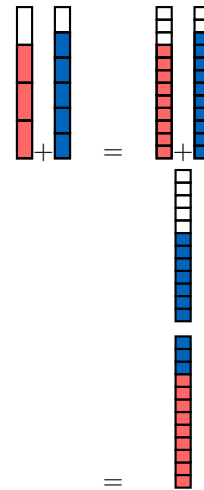
Ex 74: Calculate and simplify:

$$\frac{7}{8} + \frac{11}{6} = \boxed{\frac{\boxed{65}}{\boxed{24}}}$$

Answer:

- **Find a common denominator**:To add fractions, they must have the same denominator.

    - Multiples of 8: 8, 16, **24**, 32, ...
    - Multiples of 6: 6, 12, 18, **24**, 30, ...
    - The smallest common denominator is **24**.

- $\frac{7}{8} + \frac{11}{6} = \frac{7 \times 3}{8 \times 3} + \frac{11 \times 4}{6 \times 4}$
$$= \frac{21}{24} + \frac{44}{24} \quad \text{(common denominator = 24)}$$
$$= \frac{21 + 44}{24}$$
$$= \frac{65}{24}$$

- **Visual representation**:

$$2 \times \boxed{} = \boxed{} + \boxed{}$$
$$=$$
$$=$$
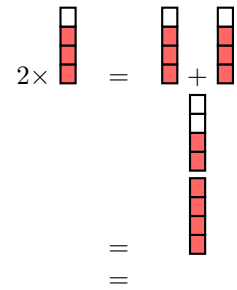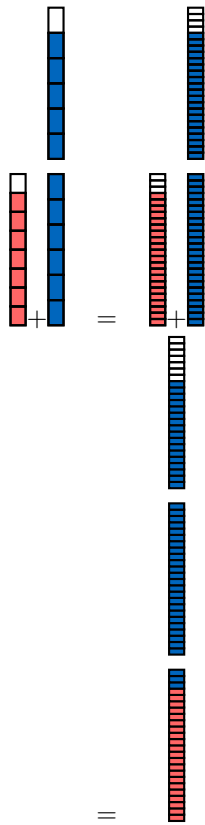
Ex 77: Calculate and simplify:

$$4 \times \frac{1}{6} = \boxed{\dfrac{2}{3}}$$

Answer:

-
$$4 \times \frac{1}{6} = \frac{4 \times 1}{6}$$
$$= \frac{4}{6}$$
$$= \frac{2 \times \cancel{2}}{3 \times \cancel{2}}$$
$$= \frac{2}{3}$$

- $4 \times \boxed{} = \boxed{} + \boxed{} + \boxed{} + \boxed{}$
$$=$$
$$=$$
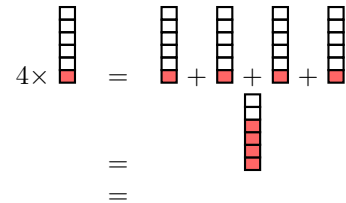
H MULTIPLICATION OF A FRACTION BY A NUMBER

H.1 MULTIPLYING OF FRACTIONS BY WHOLE NUMBERS

Ex 75: Calculate and simplify:

$$3 \times \frac{2}{5} = \boxed{\dfrac{6}{5}}$$

Answer:

-
$$3 \times \frac{2}{5} = \frac{3 \times 2}{5}$$
$$= \frac{6}{5}$$

- $3 \times \boxed{} = \boxed{} + \boxed{} + \boxed{}$
$$=$$
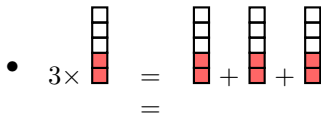
Ex 76: Calculate and simplify:

$$2 \times \frac{3}{4} = \boxed{\dfrac{3}{2}}$$

Answer:

-
$$2 \times \frac{3}{4} = \frac{2 \times 3}{4}$$
$$= \frac{6}{4}$$
$$= \frac{3 \times \cancel{2}}{2 \times \cancel{2}}$$
$$= \frac{3}{2}$$

Ex 78: Calculate and simplify:

$$6 \times \frac{2}{9} = \boxed{\dfrac{4}{3}}$$

Answer:

-
$$6 \times \frac{2}{9} = \frac{6 \times 2}{9}$$
$$= \frac{12}{9}$$
$$= \frac{4 \times \cancel{3}}{3 \times \cancel{3}}$$
$$= \frac{4}{3}$$

- $6 \times \boxed{} = \boxed{} + \boxed{} + \boxed{} + \boxed{} + \boxed{} + \boxed{}$
$$=$$
$$=$$
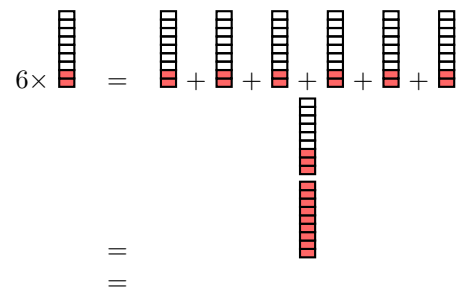
H.2 SOLVING REAL-WORLD PROBLEMS

Ex 79: Su has a big, delicious cake in front of her. Each time she eats, she takes $\frac{1}{4}$ of the cake. She does this 3 times. How much of the cake does Su eat in total?

$$\frac{\boxed{3}}{\boxed{4}} \text{ of the cake}$$

Answer:

- Su eats $\frac{1}{4}$ of the cake 3 times, so we multiply:

- $3 \times \frac{1}{4} = \frac{3 \times 1}{4}$
  $$= \frac{3}{4}$$

- Su eats $\frac{3}{4}$ of the cake.

Ex 80: A baker is making mini-muffins. Each mini-muffin requires $\frac{2}{7}$ of a cup of batter. The baker wants to make 3 batches of mini-muffins. How much batter does the baker need in total?

$$\frac{\boxed{6}}{\boxed{7}} \text{ of a cup of batter}$$

Answer:

- The baker needs $\frac{2}{7}$ of a cup of batter for each batch, and is making 3 batches, so we multiply:

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

- The baker needs $\frac{6}{7}$ of a cup of batter.

Ex 81: A track is $\frac{1}{4}$ of a mile long. If a runner runs around the track 5 times, how many miles did the runner run?

$$\frac{\boxed{5}}{\boxed{4}} \text{ miles}$$

Answer:

- Each lap is $\frac{1}{4}$ of a mile, and the runner runs 5 laps, so we multiply:

- $5 \times \frac{1}{4} = \frac{5 \times 1}{4}$
  $$= \frac{5}{4}$$

- The runner ran $\frac{5}{4}$ miles.

Ex 82: A recipe for cookies calls for $\frac{2}{3}$ of a cup of sugar. If you want to make 4 batches of cookies, how many cups of sugar do you need?

$$\frac{\boxed{8}}{\boxed{3}} \text{ cups of sugar}$$

Answer:

- We need $\frac{2}{3}$ of a cup for each batch, and we're making 4 batches, so we multiply:

- $4 \times \frac{2}{3} = \frac{4 \times 2}{3}$
  $$= \frac{8}{3}$$

- You need $\frac{8}{3}$ cups of sugar.

I MULTIPLICATION OF FRACTIONS

I.1 MULTIPLYING OF FRACTIONS

Ex 83: Calculate and simplify:

$$\frac{1}{2} \times \frac{2}{3} = \frac{\boxed{1}}{\boxed{3}}$$

Answer:

-
$$\frac{1}{2} \times \frac{2}{3} = \frac{1 \times \cancel{2}}{\cancel{2} \times 3}$$
$$= \frac{1}{3}$$

-

Ex 84: Calculate and simplify:

$$\frac{1}{2} \times \frac{3}{4} = \frac{\boxed{3}}{\boxed{8}}$$

Answer:

-
$$\frac{1}{2} \times \frac{3}{4} = \frac{1 \times 3}{2 \times 4}$$
$$= \frac{3}{8}$$

-
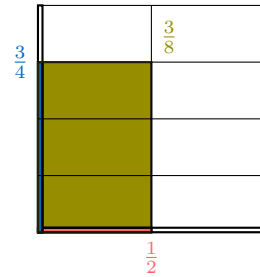
Ex 85: Calculate and simplify:

$$\frac{3}{4} \times \frac{3}{5} = \frac{\boxed{9}}{\boxed{20}}$$

Answer:

-
$$\frac{3}{4} \times \frac{3}{5} = \frac{3 \times 3}{4 \times 5}$$
$$= \frac{9}{20}$$

-

Ex 86: Calculate and simplify:

$$\frac{5}{6} \times \frac{2}{3} = \boxed{\frac{5}{9}}$$

Answer:

-

$$\frac{5}{6} \times \frac{2}{3} = \frac{5 \times 2}{6 \times 3}$$
$$= \frac{10}{18}$$
$$= \frac{5}{9}$$

-

I.2 MULTIPLYING OF FRACTIONS

Ex 87: Calculate and simplify:

$$\frac{4}{3} \times \frac{9}{5} = \boxed{\frac{12}{5}}$$

Answer:

-

$$\frac{4}{3} \times \frac{9}{5} = \frac{4 \times 9}{3 \times 5}$$
$$= \frac{36}{15}$$
$$= \frac{12 \times \cancel{3}}{5 \times \cancel{3}}$$
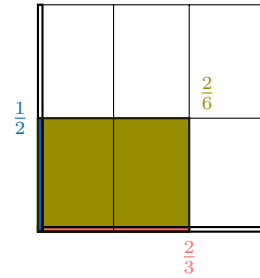$$= \frac{12}{5}$$

Ex 88: Calculate and simplify:

$$\frac{2}{5} \times \frac{5}{8} = \boxed{\frac{1}{4}}$$

Answer:

-

$$\frac{2}{5} \times \frac{5}{8} = \frac{2 \times 5}{5 \times 8}$$
$$= \frac{10}{40}$$
$$= \frac{1 \times \cancel{10}}{4 \times \cancel{10}}$$
$$= \frac{1}{4}$$

Ex 89: Calculate and simplify:

$$\frac{3}{7} \times \frac{14}{9} = \boxed{\frac{2}{3}}$$

Answer:

-

$$\frac{3}{7} \times \frac{14}{9} = \frac{3 \times 14}{7 \times 9}$$
$$= \frac{42}{63}$$
$$= \frac{2 \times \cancel{21}}{3 \times \cancel{21}}$$
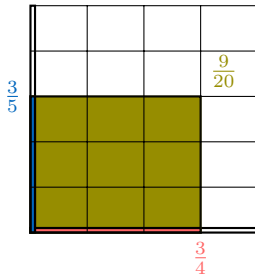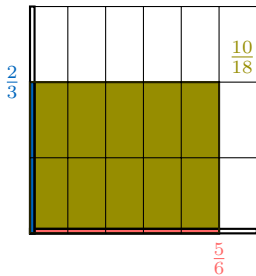$$= \frac{2}{3}$$

Ex 90: Calculate and simplify:

$$\frac{8}{15} \times \frac{3}{4} = \boxed{\frac{2}{5}}$$

Answer:

-

$$\frac{8}{15} \times \frac{3}{4} = \frac{8 \times 3}{15 \times 4}$$
$$= \frac{24}{60}$$
$$= \frac{2 \times \cancel{12}}{5 \times \cancel{12}}$$
$$= \frac{2}{5}$$

I.3 SOLVING REAL-WORLD PROBLEMS

Ex 91:
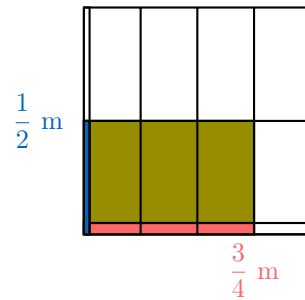
Calculate the area of the vegetable garden:

$$\boxed{\frac{3}{8}} \text{ square meters.}$$

Answer:

$$\text{Area} = \text{Length} \times \text{Width}$$
$$= \frac{3}{4} \times \frac{1}{2}$$
$$= \frac{3 \times 1}{4 \times 2}$$
$$= \frac{3}{8} \text{ m}^2$$

The garden area is $\frac{3}{8}$ square meters.

Ex 92: At Tariel High School, $\frac{4}{5}$ of the students are involved in extracurricular activities. Of these students, $\frac{2}{3}$ participate in fall activities. What fraction of the total student population at Tariel High School participates in fall activities?

$\boxed{\dfrac{8}{15}}$ of the total students.

Answer: To find the fraction of the total student population involved in fall activities, we need to find $\frac{2}{3}$ of $\frac{4}{5}$. This means we multiply the fractions:

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

Therefore, $\frac{8}{15}$ of the total student population at Tariel High School participates in fall activities.

Ex 93: A rectangular piece of fabric is used to make a banner. The fabric is $\frac{2}{3}$ meters long and $\frac{1}{4}$ meters wide. What is the area of the banner?

$\boxed{\dfrac{1}{6}}$ square meters.
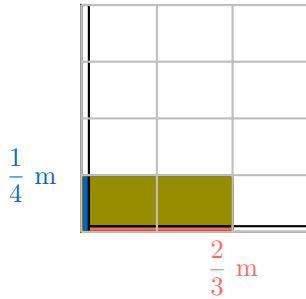
Answer:

$$\text{Area} = \text{Length} \times \text{Width}$$
$$= \frac{2}{3} \times \frac{1}{4}$$
$$= \frac{2 \times 1}{3 \times 4}$$
$$= \frac{2}{12}$$
$$= \frac{1}{6} \ \text{m}^2$$

The area of the banner is $\frac{1}{6}$ square meters.

Ex 94: A farmer has $\frac{2}{3}$ of a field planted with corn. Of that corn section, $\frac{1}{2}$ is irrigated. What fraction of the entire field is irrigated?

$\boxed{\dfrac{1}{3}}$ of the field.

Answer: To find the fraction of the entire field that is irrigated, we need to find $\frac{1}{2}$ of $\frac{2}{3}$. This means we multiply the fractions:

$$\frac{1}{2} \times \frac{2}{3} = \frac{1 \times 2}{2 \times 3}$$
$$= \frac{2}{6}$$
$$= \frac{1}{3}$$

Therefore, $\frac{1}{3}$ of the entire field is irrigated.

J DIVISION OF FRACTIONS

J.1 FINDING RECIPROCALS

Ex 95: The reciprocal of $\frac{5}{7}$ is $\boxed{\dfrac{7}{5}}$.

Answer: The reciprocal of $\frac{5}{7}$ is $\frac{7}{5}$:

$$\frac{5}{7} \times \frac{7}{5} = \frac{5 \times 7}{7 \times 5} = 1.$$

Ex 96: The reciprocal of $\frac{3}{8}$ is $\boxed{\dfrac{8}{3}}$.

Answer: The reciprocal of $\frac{3}{8}$ is $\frac{8}{3}$:

$$\frac{3}{8} \times \frac{8}{3} = \frac{3 \times 8}{8 \times 3} = 1.$$

Ex 97: The reciprocal of $\frac{7}{2}$ is $\boxed{\dfrac{2}{7}}$.

Answer: The reciprocal of $\frac{7}{2}$ is $\frac{2}{7}$:

$$\frac{7}{2} \times \frac{2}{7} = \frac{7 \times 2}{2 \times 7} = 1.$$

Ex 98: The reciprocal of 4 is $\boxed{\dfrac{1}{4}}$.

Answer: The reciprocal of 4 (which can be written as $4 = \frac{4}{1}$) is $\frac{1}{4}$:

$$4 \times \frac{1}{4} = \frac{4}{1} \times \frac{1}{4} = \frac{4 \times 1}{1 \times 4} = 1.$$

J.2 DIVIDING FRACTIONS

Ex 99: Calculate and simplify:

$$\frac{1}{2} \div \frac{3}{4} = \boxed{\dfrac{2}{3}}$$

Answer:

$$\frac{1}{2} \div \frac{3}{4} = \frac{1}{2} \times \frac{4}{3} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{1 \times 4}{2 \times 3}$$
$$= \frac{4}{6}$$
$$= \frac{2 \times \cancel{2}}{3 \times \cancel{2}}$$
$$= \frac{2}{3}$$

Ex 100: Calculate and simplify:

$$\frac{2}{3} \div \frac{1}{2} = \boxed{\dfrac{4}{3}}$$

Answer:

$$\frac{2}{3} \div \frac{1}{2} = \frac{2}{3} \times \frac{2}{1} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{2 \times 2}{3 \times 1}$$
$$= \frac{4}{3}$$

Ex 101: Calculate and simplify:

$$\frac{3}{5} \div \frac{2}{7} = \boxed{\frac{21}{10}}$$

Answer:

$$\frac{3}{5} \div \frac{2}{7} = \frac{3}{5} \times \frac{7}{2} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{3 \times 7}{5 \times 2}$$
$$= \frac{21}{10}$$
$$= 2\frac{1}{10}$$

Ex 102: Calculate and simplify:

$$\frac{4}{9} \div \frac{2}{3} = \boxed{\frac{2}{3}}$$

Answer:

$$\frac{4}{9} \div \frac{2}{3} = \frac{4}{9} \times \frac{3}{2} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{4 \times 3}{9 \times 2}$$
$$= \frac{12}{18}$$
$$= \frac{2 \times \cancel{6}}{3 \times \cancel{6}}$$
$$= \frac{2}{3}$$

J.3 DIVIDING FRACTIONS

Ex 103: Simplify:

$$\frac{\frac{1}{2}}{\frac{3}{4}} = \boxed{\frac{2}{3}}$$

Answer:

$$\frac{\frac{1}{2}}{\frac{3}{4}} = \frac{1}{2} \times \frac{4}{3} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{1 \times 4}{2 \times 3}$$
$$= \frac{4}{6}$$
$$= \frac{2 \times \cancel{2}}{3 \times \cancel{2}}$$
$$= \frac{2}{3}$$

Ex 104: Simplify:

$$\frac{\frac{4}{9}}{\frac{2}{3}} = \boxed{\frac{2}{3}}$$

Answer:

$$\frac{\frac{4}{9}}{\frac{2}{3}} = \frac{4}{9} \times \frac{3}{2} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{4 \times 3}{9 \times 2}$$
$$= \frac{12}{18}$$
$$= \frac{2 \times \cancel{6}}{3 \times \cancel{6}}$$
$$= \frac{2}{3}$$

Ex 105: Simplify:

$$\frac{\frac{4}{3}}{\frac{5}{6}} = \boxed{\frac{8}{5}}$$

Answer:

$$\frac{\frac{4}{3}}{\frac{5}{6}} = \frac{4}{3} \times \frac{6}{5} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{4 \times 6}{3 \times 5}$$
$$= \frac{24}{15}$$
$$= \frac{8 \times \cancel{3}}{5 \times \cancel{3}}$$
$$= \frac{8}{5}$$

Ex 106: Simplify:

$$\frac{\frac{4}{10}}{\frac{7}{10}} = \boxed{\frac{4}{7}}$$

Answer:

$$\frac{\frac{4}{10}}{\frac{7}{10}} = \frac{4}{10} \times \frac{10}{7} \quad \text{(multiply by the reciprocal)}$$
$$= \frac{4 \times \cancel{10}}{\cancel{10} \times 7}$$
$$= \frac{4}{7}$$

K SIGN RULES

K.1 SIMPLIFYING WITH RELATIVE NUMBERS

Ex 107: Simplify:

$$\frac{-15}{-30} = \boxed{\frac{1}{2}}$$

Answer:

$$\frac{-15}{-30} = \frac{15}{30} \quad (-) \div (-) = (+)$$
$$= \frac{1 \times \cancel{15}}{2 \times \cancel{15}}$$
$$= \frac{1}{2}$$

Ex 108: Simplify:

$$\frac{-9}{12} = \boxed{-\frac{3}{4}}$$

Answer:

$$\frac{-9}{12} = -\frac{9}{12} \qquad (-) \div (+) = (-)$$
$$= -\frac{3 \times \cancel{3}}{4 \times \cancel{3}}$$
$$= -\frac{3}{4}$$

Ex 109: Simplify:

$$\frac{-10}{-20} = \boxed{\frac{1}{2}}$$

Answer:

$$\frac{-10}{-20} = \frac{10}{20} \qquad (-) \div (-) = (+)$$
$$= \frac{1 \times \cancel{10}}{2 \times \cancel{10}}$$
$$= \frac{1}{2}$$

Ex 110: Simplify:

$$\frac{22}{-33} = \boxed{-\frac{2}{3}}$$

Answer:

$$\frac{22}{-33} = -\frac{22}{33} \qquad (+) \div (-) = (-)$$
$$= -\frac{2 \times \cancel{11}}{3 \times \cancel{11}}$$
$$= -\frac{2}{3}$$

K.2 OPERATING WITH FRACTIONS WITH RELATIVE NUMBERS

Ex 111: Calculate and simplify:

$$\frac{1}{2} - 1 = \boxed{-\frac{1}{2}}$$

Answer:

$$\frac{1}{2} - 1 = \frac{1}{2} - \frac{2}{2} \qquad \left(1 = \frac{2}{2}\right)$$
$$= \frac{1-2}{2}$$
$$= \frac{-1}{2}$$
$$= -\frac{1}{2} \qquad (-) \div (+) = (-)$$

Ex 112: Calculate and simplify:

$$\frac{3}{4} - \frac{1}{2} = \boxed{\frac{1}{4}}$$

Answer:

$$\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} \qquad \left(\frac{1}{2} = \frac{2}{4}\right)$$
$$= \frac{3-2}{4}$$
$$= \frac{1}{4}$$

Ex 113: Calculate and simplify:

$$\frac{2}{3} - \frac{3}{4} = \boxed{-\frac{1}{12}}$$

Answer:

$$\frac{2}{3} - \frac{3}{4} = \frac{8}{12} - \frac{9}{12} \qquad \left(\frac{2}{3} = \frac{8}{12} \text{ et } \frac{3}{4} = \frac{9}{12}\right)$$
$$= \frac{8-9}{12}$$
$$= \frac{-1}{12}$$
$$= -\frac{1}{12} \qquad (-) \div (+) = (-)$$

Ex 114: Calculate and simplify:

$$\frac{-2}{3} - 2 = \boxed{-\frac{8}{3}}$$

Answer:

$$\frac{-2}{3} - 2 = \frac{-2}{3} - \frac{6}{3} \qquad \left(2 = \frac{6}{3}\right)$$
$$= \frac{-2-6}{3}$$
$$= \frac{-8}{3}$$
$$= -\frac{8}{3} \qquad (-) \div (+) = (-)$$

Ex 115: Calculate and simplify:

$$\frac{-2}{3} - \frac{-4}{3} = \boxed{\frac{2}{3}}$$

Answer:

$$\frac{-2}{3} - \frac{-4}{3} = \frac{-2 - (-4)}{3}$$
$$= \frac{-2+4}{3}$$
$$= \frac{2}{3}$$

L ORDER OF OPERATIONS

L.1 CALCULATING EXPRESSIONS

Ex 116: Calculate and simplify:

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

Answer:

$$\frac{1+7}{3 \times 4} = \frac{8}{12} \qquad (\text{evaluate numerator and denominator})$$
$$= \frac{2 \times \cancel{4}}{3 \times \cancel{4}} \qquad (\text{cancel common factor})$$
$$= \frac{2}{3}$$

Ex 117: Calculate and simplify:

$$\frac{2+8}{4 \times 5} = \boxed{\frac{1}{2}}$$

Answer:

$$\frac{2+8}{4 \times 5} = \frac{10}{20} \quad \text{(evaluate numerator and denominator)}$$
$$= \frac{1 \times \cancel{10}}{2 \times \cancel{10}} \quad \text{(cancel common factor)}$$
$$= \frac{1}{2}$$

Ex 118: Calculate and simplify:

$$\frac{2+5}{3} + 1 = \boxed{\frac{10}{3}}$$

Answer:

$$\frac{2+5}{3} + 1 = \frac{7}{3} + 1 \quad \text{(evaluate the numerator)}$$
$$= \frac{7}{3} + \frac{3}{3} \quad (1 = \frac{3}{3})$$
$$= \frac{7+3}{3} \quad \text{(add the numerators)}$$
$$= \frac{10}{3}$$

Ex 119: Calculate and simplify:

$$\frac{1}{3 \times 2} + \frac{1}{3} = \boxed{\frac{1}{2}}$$

Answer:

$$\frac{1}{3 \times 2} + \frac{1}{3} = \frac{1}{6} + \frac{1}{3} \quad \text{(evaluate the first denominator)}$$
$$= \frac{1}{6} + \frac{2}{6} \quad (\frac{1}{3} = \frac{2}{6})$$
$$= \frac{1+2}{6} \quad \text{(add the numerators)}$$
$$= \frac{3}{6}$$
$$= \frac{1}{2} \quad \text{(simplify the fraction)}$$

Ex 120: Calculate and simplify:

$$\frac{1}{2} - 1 = \boxed{-\frac{1}{2}}$$

Answer:

$$\frac{1}{2} - 1 = \frac{1}{2} - \frac{2}{2} \quad (1 = \frac{2}{2})$$
$$= \frac{1-2}{2}$$
$$= \frac{-1}{2}$$
$$= -\frac{1}{2} \quad ((-) \div (+) = (-))$$