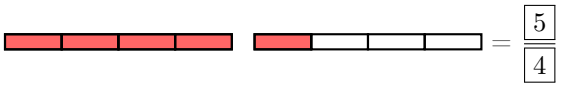
FRACTIONS

A DEFINING AND REPRESENTING FRACTIONS

A.1 FINDING FRACTIONS

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



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

Answer:

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

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

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

Answer:

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

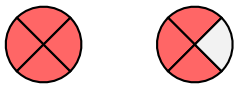
Ex 3: A bar represents 1. Find the fraction that represents the shaded part:

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

Answer:

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

Ex 4: A circle represents 1. Find the fraction that represents the shaded part:



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

Answer:

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

A.2 WRITING FRACTIONS FROM WORDS

Ex 5: Write as fraction:

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

Answer:

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

Ex 6: Write as fraction:

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

Answer:

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

Ex 7: Write as fraction:

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

Answer:

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

Ex 8: Write as fraction:

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

Answer:

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

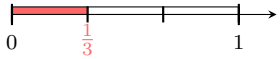
A.3 FINDING FRACTIONS WITH THE BAR MODEL

Ex 9: Find the value of x

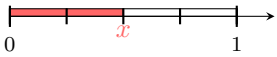
$$x = \boxed{\frac{1}{3}}$$

Answer:

- 1 is divided into 3 equals parts.
- x is at 1 part from 0.
- So, $x = \frac{1}{3}$.



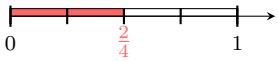
Ex 10: Find the value of x



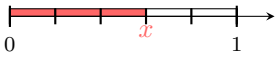
$$x = \boxed{\frac{2}{4}}$$

Answer:

- 1 is divided into 4 equals parts.
- x is at 2 parts from 0.
- So, $x = \frac{2}{4}$.



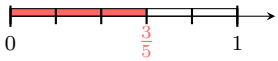
Ex 11: Find the value of x



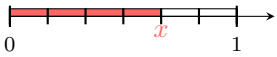
$$x = \boxed{\frac{3}{5}}$$

Answer:

- 1 is divided into 5 equals parts.
- x is at 3 parts from 0.
- So, $x = \frac{3}{5}$.



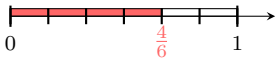
Ex 12: Find the value of x



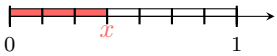
$$x = \boxed{\frac{4}{6}}$$

Answer:

- 1 is divided into 6 equals parts.
- x is at 4 parts from 0.
- So, $x = \frac{4}{6}$.



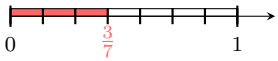
Ex 13: Find the value of x



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

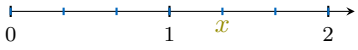
Answer:

- 1 is divided into 7 equals parts.
- x is at 3 parts from 0.
- So, $x = \frac{3}{7}$.



A.4 FINDING FRACTIONS GREATER THAN 1

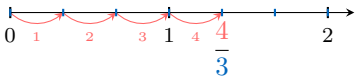
Ex 14: Find the value of x



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

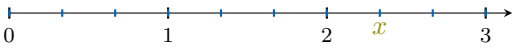
Answer:

- 1 is divided into 3 equals parts.
- x is located at 4 parts from 0.



- So, $x = \frac{4}{3}$.

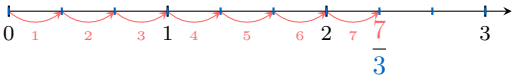
Ex 15: Find the value of x



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

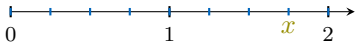
Answer:

- 1 is divided into 3 equal parts.
- x is located at 7 parts from 0.



- So, $x = \frac{7}{3}$.

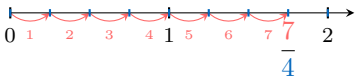
Ex 16: Find the value of x



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

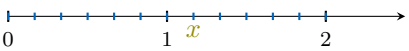
Answer:

- 1 is divided into 4 equal parts.
- x is located at 7 parts from 0.



- So, $x = \frac{7}{4}$.

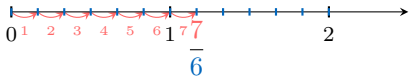
Ex 17: Find the value of x



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

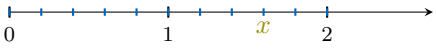
Answer:

- 1 is divided into 6 equal parts.
- x is located at 7 parts from 0.



- So, $x = \frac{7}{6}$.

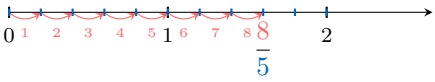
Ex 18: Find the value of x



$$x = \boxed{\frac{8}{5}}$$

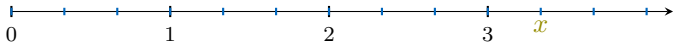
Answer:

- 1 is divided into 5 equal parts.
- x is located at 8 parts from 0.



- So, $x = \frac{8}{5}$.

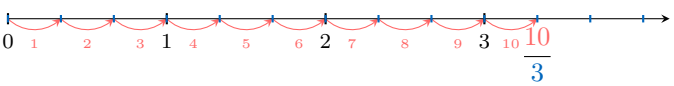
Ex 19: Find the value of x



$$x = \boxed{\frac{10}{3}}$$

Answer:

- 1 is divided into 3 equal parts.
- x is located at 10 parts from 0.



- So, $x = \frac{10}{3}$.

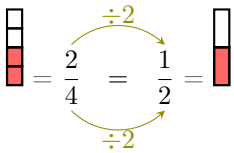
B EQUIVALENT FRACTIONS

B.1 FINDING THE MISSING NUMERATOR

Ex 20:

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

Answer:

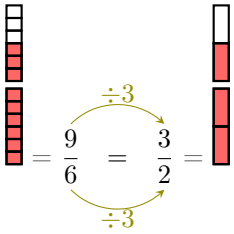
- $\frac{2}{4} = \frac{1\times\cancel{2}}{2\times\cancel{2}} = \frac{1}{2}$
- 

- The second denominator 2 is the first denominator 4 divided by 2: $4 \div 2 = 2$.
- 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 21:

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

Answer:

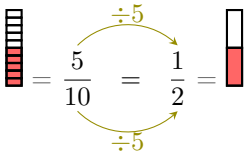
- $\frac{9}{6} = \frac{3\times\cancel{3}}{2\times\cancel{3}} = \frac{3}{2}$
- 

- 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 22:

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

Answer:

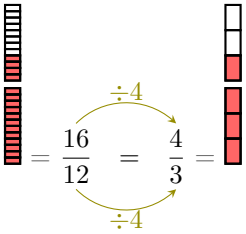
- $\frac{5}{10} = \frac{1\times\cancel{5}}{2\times\cancel{5}} = \frac{1}{2}$
- 

- 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 23:

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

Answer:

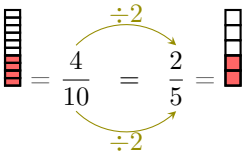
- $\frac{16}{12} = \frac{4\times4}{3\times4}$
  $= \frac{4}{3}$
- 

- 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 24:

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

Answer:

- $\frac{4}{10} = \frac{2\times2}{5\times2}$
  $= \frac{2}{5}$
- 

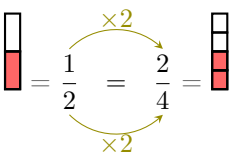
- The second denominator 5 is the first denominator 10 divided by 2: $10 \div 2 = 5$.
- To keep the fractions equivalent, the numerator must also be divided by 2.
- This means: $4 \div 2 = 2$, so the missing numerator is 2.

B.2 FINDING THE MISSING NUMERATOR

Ex 25:

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

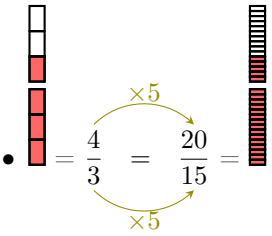
Answer:

- $\frac{1}{2} = \frac{1\times2}{2\times2}$
  $= \frac{2}{4}$
- 

Ex 26:

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

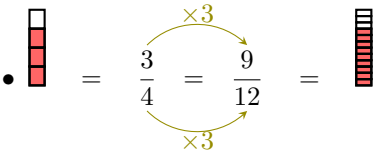
Answer:

- $\frac{4}{3} = \frac{4\times5}{3\times5}$
  $= \frac{20}{15}$
- 

Ex 27:

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

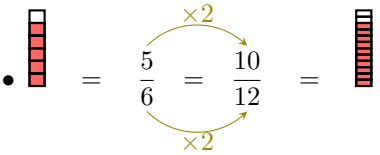
Answer:

- $\frac{3}{4} = \frac{3\times3}{4\times3}$
  $= \frac{9}{12}$
- 

Ex 28:

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

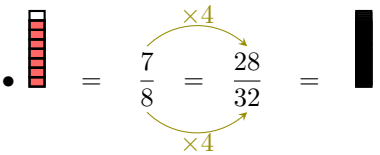
Answer:

- $\frac{5}{6} = \frac{5\times2}{6\times2}$
  $= \frac{10}{12}$
- 

Ex 29:

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

Answer:

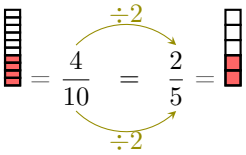
- $\frac{7}{8} = \frac{7\times4}{8\times4}$
  $= \frac{28}{32}$
- 

B.3 FINDING THE MISSING DENOMINATOR

Ex 30:

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

Answer:

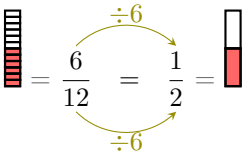
- $\frac{4}{10} = \frac{2\times\cancel{2}}{5\times\cancel{2}} = \frac{2}{5}$
- 

- 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 31:

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

Answer:

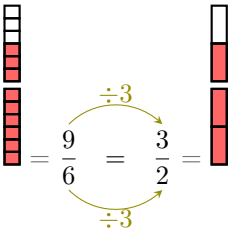
- $\frac{6}{12} = \frac{1\times\cancel{6}}{2\times\cancel{6}} = \frac{1}{2}$
- 

- 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 32:

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

Answer:

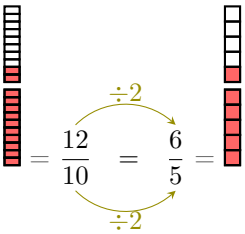
- $\frac{9}{6} = \frac{3\times\cancel{3}}{2\times\cancel{3}} = \frac{3}{2}$
- 

- 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 33:

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

Answer:

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

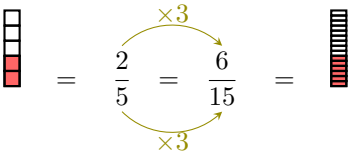
- The second numerator 6 is the first numerator 12 divided by 2: $12 \div 2 = 6$.
- To keep the fractions equivalent, the denominator must also be divided by 2.
- This means: $10 \div 2 = 5$, so the missing denominator is 5.

B.4 FINDING THE MISSING DENOMINATOR

Ex 34:

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

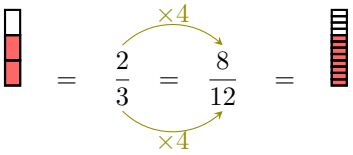
Answer:

- $\frac{2}{5} = \frac{2\times3}{5\times3} = \frac{6}{15}$
- 

Ex 35:

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

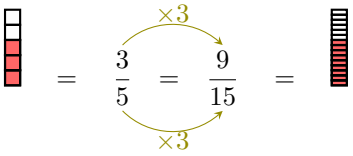
Answer:

- $\frac{2}{3} = \frac{2\times4}{3\times4}$
  $= \frac{8}{12}$
- 

Ex 36:

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

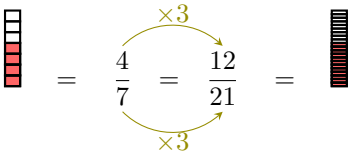
Answer:

- $\frac{3}{5} = \frac{3\times3}{5\times3}$
  $= \frac{9}{15}$
- 

Ex 37:

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

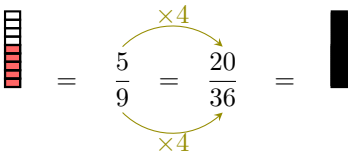
Answer:

- $\frac{4}{7} = \frac{4\times3}{7\times3}$
  $= \frac{12}{21}$
- 

Ex 38:

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

Answer:

- $\frac{5}{9} = \frac{5\times4}{9\times4}$
  $= \frac{20}{36}$
- 

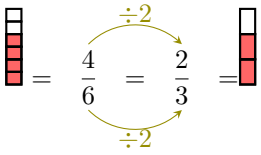
C SIMPLIFICATION

C.1 SIMPLIFYING FRACTIONS

Ex 39: Simplify:

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

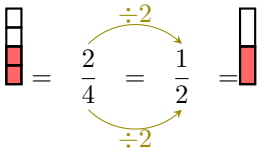
Answer:



Ex 40: Simplify:

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

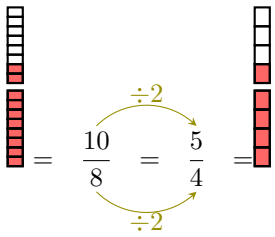
Answer:



Ex 41: Simplify:

$$\frac{10}{8} = \frac{\boxed{5}}{\boxed{4}}$$

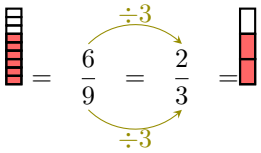
Answer:



Ex 42: Simplify:

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

Answer:



C.2 SIMPLIFYING FRACTIONS

Ex 43: Simplify:

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

Answer:

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

Ex 44: Simplify:

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

Answer:

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

Ex 45: Simplify:

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

Answer:

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

Ex 46: Simplify:

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

Answer:

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

D CROSS MULTIPLICATION

D.1 SOLVING PROPORTIONS USING CROSS-MULTIPLICATION

Ex 47: Solve x for $\frac{12}{4} = \frac{x}{6}$:

$$x = \boxed{18}$$

Answer:

$$\begin{aligned} 4\times x &= 12\times 6 && \text{(cross multiplication)}\\ x &= 12\times 6\div 4 && \text{(dividing both sides by 4)}\\ x &= 18 \end{aligned}$$

Ex 48: Solve x for $\frac{11}{10} = \frac{x}{5}$:

$$x = \boxed{5.5}$$

Answer:

$$\begin{aligned} 10\times x &= 11\times 5 && \text{(cross multiplication)}\\ x &= 11\times 5\div 10 && \text{(dividing both sides by 10)}\\ x &= 5.5 \end{aligned}$$

Ex 49: Solve x for $\frac{12}{10} = \frac{18}{x}$:

$$x = \boxed{15}$$

Answer:

$$\begin{aligned} 12\times x &= 18\times 10 && \text{(cross multiplication)}\\ x &= 18\times 10\div 12 && \text{(dividing both sides by 12)}\\ x &= 15 \end{aligned}$$

Ex 50: Solve x for $\frac{27}{x} = \frac{30}{10}$:

$$x = \boxed{9}$$

Answer:

$\frac{27}{x} = \frac{30}{10}$

$30 \times x = 27 \times 10$ (cross multiplication)

$x = 27 \times 10 \div 30$ (dividing both sides by 30)

$x = 9$

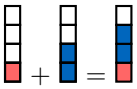
E ADDITION AND SUBTRACTION

E.1 ADDING FRACTIONS WITH COMMON DENOMINATORS

Ex 51:

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

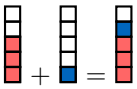
Answer:

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

Ex 52:

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

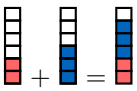
Answer:

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

Ex 53:

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

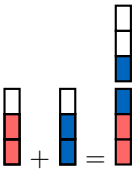
Answer:

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

Ex 54:

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

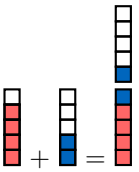
Answer:

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

Ex 55:

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

Answer:

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

E.2 SUBTRACTING FRACTIONS WITH COMMON DENOMINATORS

Ex 56:

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

Answer:

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

Ex 57:

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

Answer:

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

Ex 58:

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

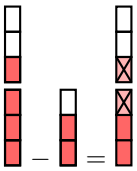
Answer:

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

Ex 59:

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

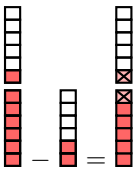
Answer:

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

Ex 60:

$$\frac{7}{6} - \frac{2}{6} = \boxed{\boxed{5}\over\boxed{6}}$$

Answer:

- 
- $\frac{7}{6} - \frac{2}{6} = \frac{7-2}{6} = \frac{5}{6}$

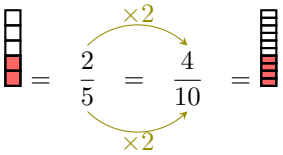
E.3 ADDING FRACTIONS WITH LIKE DENOMINATORS

Ex 61:

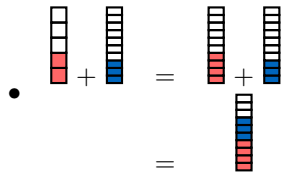
$$\frac{2}{5} + \frac{3}{10} = \boxed{\boxed{7}\over\boxed{10}}$$

Answer:

- Since $\frac{2}{5}$ and $\frac{3}{10}$ have different denominators, rewrite $\frac{2}{5}$ with the denominator 10:



This ensures the fractions have the same denominator.

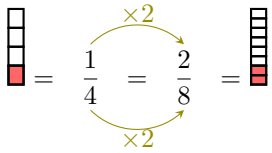
- $\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10} = \frac{7}{10}$
- 

Ex 62:

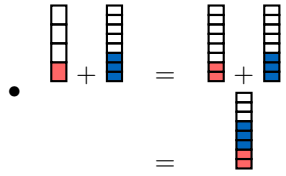
$$\frac{1}{4} + \frac{3}{8} = \boxed{\boxed{5}\over\boxed{8}}$$

Answer:

- Since $\frac{1}{4}$ and $\frac{3}{8}$ have different denominators, rewrite $\frac{1}{4}$ with the denominator 8:



This ensures the fractions have the same denominator.

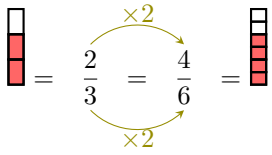
- $\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$
- 

Ex 63:

$$\frac{2}{3} + \frac{1}{6} = \boxed{\boxed{5}\over\boxed{6}}$$

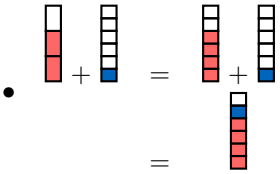
Answer:

- Since $\frac{2}{3}$ and $\frac{1}{6}$ have different denominators, rewrite $\frac{2}{3}$ with the denominator 6:



This ensures the fractions have the same denominator.

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

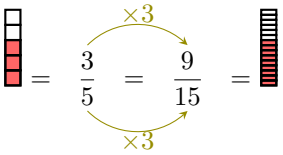
- 

Ex 64:

$$\frac{3}{5}+\frac{2}{15}=\boxed{\frac{\boxed{11}}{15}}$$

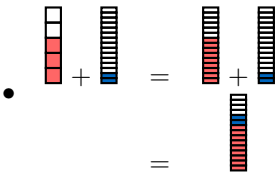
Answer:

- Since $\frac{3}{5}$ and $\frac{2}{15}$ have different denominators, rewrite $\frac{3}{5}$ with the denominator 15:



This ensures the fractions have the same denominator.

- $$\frac{3}{5}+\frac{2}{15}=\frac{9}{15}+\frac{2}{15}$$
$$=\frac{11}{15}$$

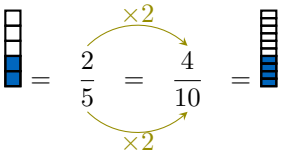
- 

Ex 65:

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

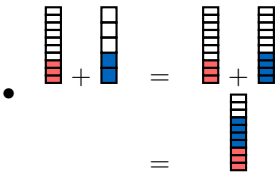
Answer:

- Since $\frac{3}{10}$ and $\frac{2}{5}$ have different denominators, rewrite $\frac{2}{5}$ with the denominator 10:



This ensures the fractions have the same denominator.

- $$\frac{3}{10}+\frac{2}{5}=\frac{3}{10}+\frac{4}{10}$$
$$=\frac{7}{10}$$

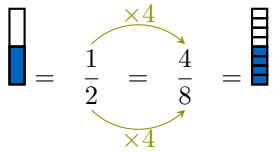
- 

Ex 66:

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

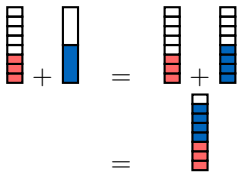
Answer:

- Since $\frac{3}{8}$ and $\frac{1}{2}$ have different denominators, rewrite $\frac{1}{2}$ with the denominator 8:



This ensures the fractions have the same denominator.

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

- 

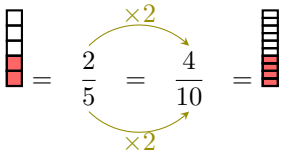
E.4 SUBTRACTING FRACTIONS WITH LIKE DENOMINATORS

Ex 67:

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

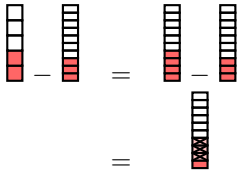
Answer:

- Since $\frac{2}{5}$ and $\frac{3}{10}$ have different denominators, rewrite $\frac{2}{5}$ with the denominator 10:



This ensures the fractions have the same denominator.

- $$\frac{2}{5}-\frac{3}{10}=\frac{4}{10}-\frac{3}{10}$$
$$=\frac{4-3}{10}$$
$$=\frac{1}{10}$$

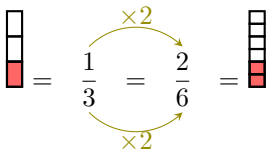
- 

Ex 68:

$$\frac{7}{6} - \frac{1}{3} = \frac{\boxed{5}}{\boxed{6}}$$

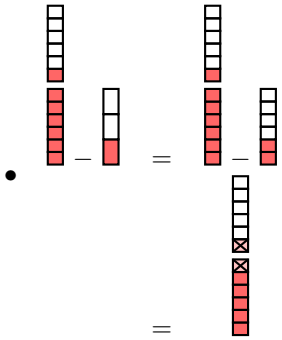
Answer:

- Since $\frac{7}{6}$ and $\frac{1}{3}$ have different denominators, rewrite $\frac{1}{3}$ with the denominator 6:



  This ensures the fractions have the same denominator.

- $$\begin{aligned}\frac{7}{6} - \frac{1}{3} &= \frac{7}{6} - \frac{2}{6} \\ &= \frac{7-2}{6} \\ &= \frac{5}{6}\end{aligned}$$

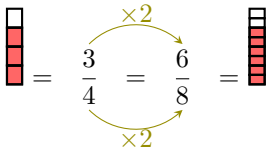
- 

Ex 69:

$$\frac{7}{8} - \frac{3}{4} = \frac{\boxed{1}}{\boxed{8}}$$

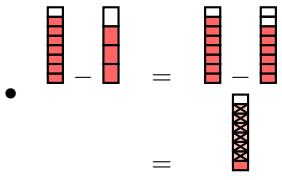
Answer:

- Since $\frac{7}{8}$ and $\frac{3}{4}$ have different denominators, rewrite $\frac{3}{4}$ with the denominator 8:



  This ensures the fractions have the same denominator.

- $$\begin{aligned}\frac{7}{8} - \frac{3}{4} &= \frac{7}{8} - \frac{6}{8} \\ &= \frac{7-6}{8} \\ &= \frac{1}{8}\end{aligned}$$

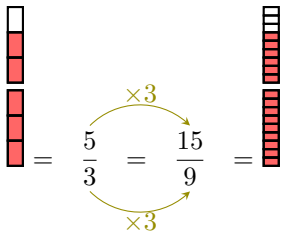
- 

Ex 70:

$$\frac{5}{3} - \frac{5}{9} = \frac{\boxed{10}}{\boxed{9}}$$

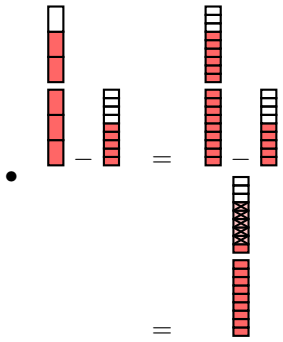
Answer:

- Since $\frac{5}{3}$ and $\frac{5}{9}$ have different denominators, rewrite $\frac{5}{3}$ with the denominator 9:



  This ensures the fractions have the same denominator.

- $$\begin{aligned}\frac{5}{3} - \frac{5}{9} &= \frac{15}{9} - \frac{5}{9} \\ &= \frac{15-5}{9} \\ &= \frac{10}{9}\end{aligned}$$

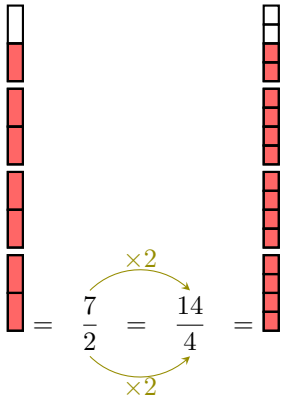
- 

Ex 71:

$$\frac{7}{2} - \frac{7}{4} = \frac{\boxed{7}}{\boxed{4}}$$

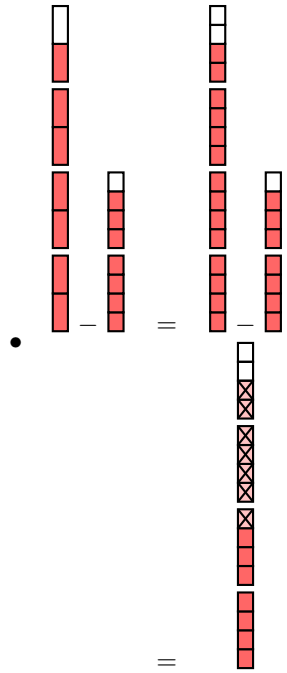
Answer:

- Since $\frac{7}{2}$ and $\frac{7}{4}$ have different denominators, rewrite $\frac{7}{2}$ with the denominator 4:



  This ensures the fractions have the same denominator.

- $$\frac{7}{2} - \frac{7}{4} = \frac{14}{4} - \frac{7}{4}$$
$$= \frac{14-7}{4}$$
$$= \frac{7}{4}$$

- 

E.5 SOLVING REAL-WORLD PROBLEMS

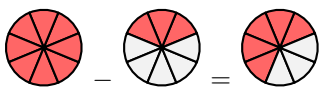
Ex 72: Louis has a whole cake. He cuts it into 8 equal slices and eats 3 slices. What fraction of the whole cake remains?

$\boxed{\frac{5}{8}}$ 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 $\frac{5}{8}$.

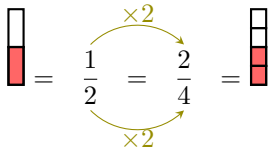
Ex 73: Today, Louis eats $\frac{1}{2}$ of a croissant. Then, Louis eats $\frac{1}{4}$ of another croissant. How much croissant did Louis eat in total?

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

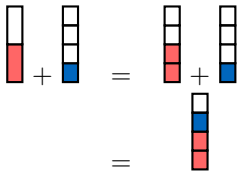
Answer:

- **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.

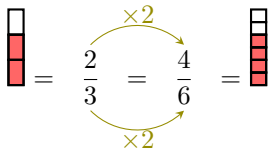
Ex 74: At the beginning, there are $\frac{5}{6}$ of a cake. After eating, there are $\frac{2}{3}$ of the cake. What quantity of cake did Louis eat?

$\boxed{\frac{1}{6}}$ of the cake

Answer:

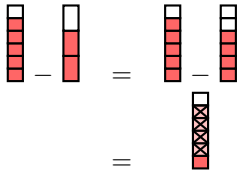
- **Represent the cake as fractions**
At the beginning, there is $\frac{5}{6}$ of the cake. After eating, $\frac{2}{3}$ of the cake remains. To find the quantity Louis ate, subtract the remaining cake from the initial amount:
$$\frac{5}{6} - \frac{2}{3}.$$

- **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 75: 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?

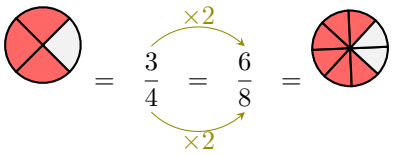
$\boxed{\frac{1}{8}}$ of the pizza

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:

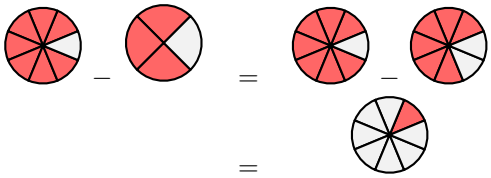
$$\frac{7}{8} - \frac{3}{4}.$$

- **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 76: 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?

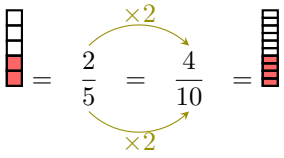
$\boxed{\frac{7}{10}}$ of the book

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:

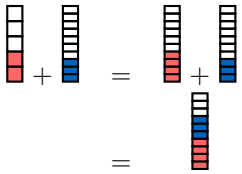
$$\frac{2}{5} + \frac{3}{10}.$$

- **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:



- **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.

E.6 ADDING FRACTIONS WITH UNLIKE DENOMINATORS

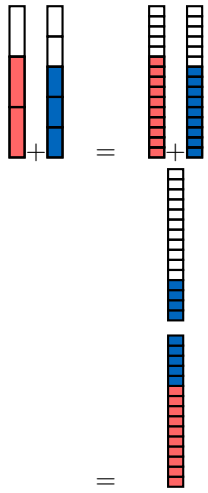
Ex 77: Calculate and simplify:

$$\frac{2}{3} + \frac{3}{5} = \boxed{\frac{19}{15}}$$

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**:

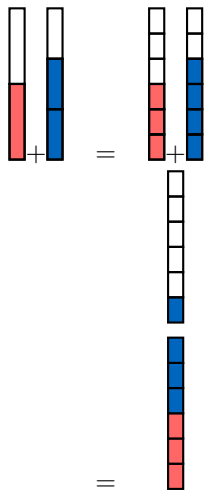


Ex 78: Calculate and simplify:

$$\frac{1}{2}+\frac{2}{3}=\boxed{\frac{7}{6}}$$

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**.
- $\frac{1}{2}+\frac{2}{3}=\frac{1\times 3}{2\times 3}+\frac{2\times 2}{3\times 2}$
  $=\frac{3}{6}+\frac{4}{6}$ (common denominator = 6)
  $=\frac{3+4}{6}$ (adding numerators)
  $=\frac{7}{6}$
- **Visual representation**:

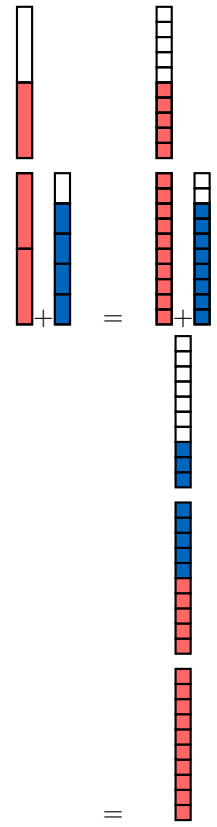


Ex 79: Calculate and simplify:

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

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**.
- $\frac{3}{2}+\frac{4}{5}=\frac{3\times 5}{2\times 5}+\frac{4\times 2}{5\times 2}$
  $=\frac{15}{10}+\frac{8}{10}$ (common denominator = 10)
  $=\frac{15+8}{10}$
  $=\frac{23}{10}$.
- **Visual representation**:



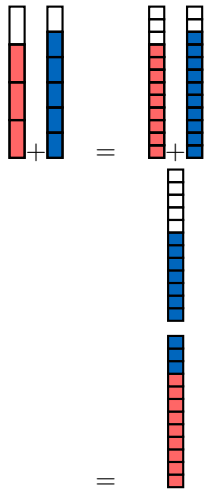
Ex 80: Calculate and simplify:

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

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

- **Visual representation**:

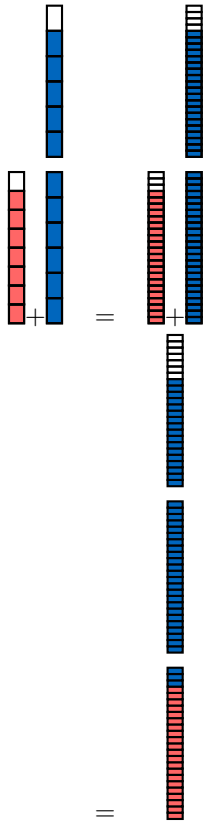


Ex 81: Calculate and simplify:

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

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**.
- $$\begin{aligned}\frac{7}{8}+\frac{11}{6}&=\frac{7\times 3}{8\times 3}+\frac{11\times 4}{6\times 4}\\&=\frac{21}{24}+\frac{44}{24}\quad\text{(common denominator = 24)}\\&=\frac{21+44}{24}\\&=\frac{65}{24}\end{aligned}$$
- **Visual representation**:



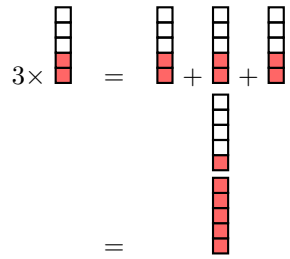
F MULTIPLYING A FRACTION BY A NUMBER

F.1 MULTIPLYING FRACTIONS BY WHOLE NUMBERS

Ex 82: Calculate and simplify:

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

Answer:

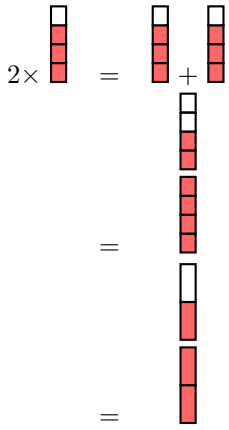
- $$\begin{aligned}3\times\frac{2}{5}&=\frac{3\times 2}{5}\\&=\frac{6}{5}\end{aligned}$$
- 

Ex 83: Calculate and simplify:

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

Answer:

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

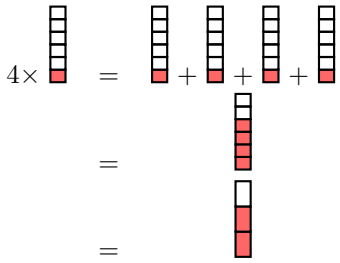


Ex 84: Calculate and simplify:

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

Answer:

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

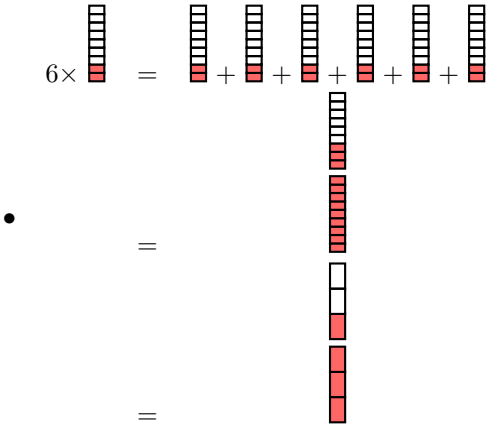


Ex 85: Calculate and simplify:

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

Answer:

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



F.2 SOLVING REAL-WORLD PROBLEMS

Ex 86: Su has a large, delicious cake in front of her. Each time she eats, she takes $\frac{1}{4}$ of the cake. She does this 3 times. What fraction of the cake does Su eat in total?

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

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 in total.

Ex 87: A baker is making mini-muffins. Each batch 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?

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

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 in total.

Ex 88: A track is $\frac{1}{4}$ of a kilometer long. If a runner runs around the track 5 times, how many kilometers did the runner run?

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

Answer:

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

- $$\begin{aligned} 5 \times \frac{1}{4} &= \frac{5 \times 1}{4} \\ &= \frac{5}{4} \\ &= 1 + \frac{1}{4} \end{aligned}$$

- The runner ran $\frac{5}{4}$ kilometers in total.

Ex 89: 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?

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

Answer:

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

- $$\begin{aligned} 4 \times \frac{2}{3} &= \frac{4 \times 2}{3} \\ &= \frac{8}{3} \end{aligned}$$

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

G MULTIPLICATION OF FRACTIONS

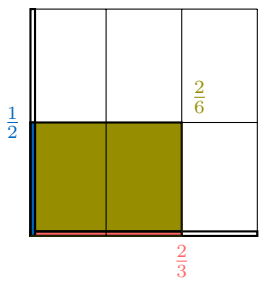
G.1 MULTIPLYING FRACTIONS

Ex 90: Calculate and simplify:

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

Answer:

- $$\begin{aligned} \frac{1}{2} \times \frac{2}{3} &= \frac{1 \times \cancel{2}}{\cancel{2} \times 3} \\ &= \frac{1}{3} \end{aligned}$$



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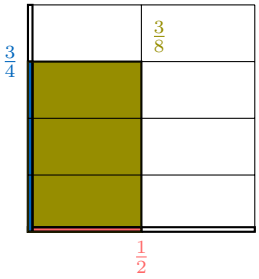
Ex 91: Calculate and simplify:

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

Answer:

- $$\begin{aligned} \frac{1}{2} \times \frac{3}{4} &= \frac{1 \times 3}{2 \times 4} \\ &= \frac{3}{8} \end{aligned}$$



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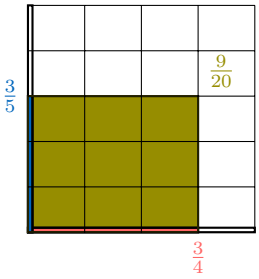
Ex 92: Calculate and simplify:

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

Answer:

- $$\begin{aligned} \frac{3}{4} \times \frac{3}{5} &= \frac{3 \times 3}{4 \times 5} \\ &= \frac{9}{20} \end{aligned}$$



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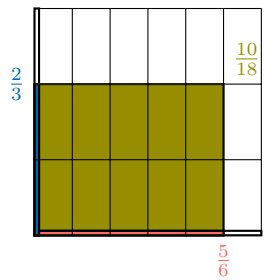
Ex 93: Calculate and simplify:

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

Answer:

- $$\begin{aligned} \frac{5}{6} \times \frac{2}{3} &= \frac{5 \times 2}{6 \times 3} \\ &= \frac{10}{18} \\ &= \frac{5 \times \cancel{2}}{9 \times \cancel{2}} \\ &= \frac{5}{9} \end{aligned}$$



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G.2 MULTIPLYING FRACTIONS

Ex 94: Calculate and simplify:

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

Answer:

- $$\begin{aligned}\frac{4}{3} \times \frac{9}{5} &= \frac{4 \times 9}{3 \times 5} \\ &= \frac{36}{15} \\ &= \frac{12 \times \cancel{3}}{5 \times \cancel{3}} \\ &= \frac{12}{5}\end{aligned}$$

Ex 95: Calculate and simplify:

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

Answer:

- $$\begin{aligned}\frac{2}{5} \times \frac{5}{8} &= \frac{2 \times 5}{5 \times 8} \\ &= \frac{10}{40} \\ &= \frac{1 \times \cancel{10}}{4 \times \cancel{10}} \\ &= \frac{1}{4}\end{aligned}$$

Ex 96: Calculate and simplify:

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

Answer:

- $$\begin{aligned}\frac{3}{7} \times \frac{14}{9} &= \frac{3 \times 14}{7 \times 9} \\ &= \frac{42}{63} \\ &= \frac{2 \times \cancel{21}}{3 \times \cancel{21}} \\ &= \frac{2}{3}\end{aligned}$$

Ex 97: Calculate and simplify:

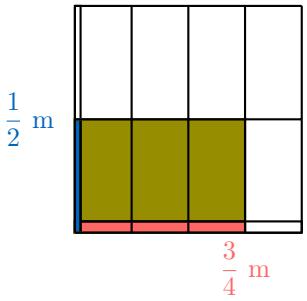
$$\frac{8}{15} \times \frac{3}{4} = \frac{\boxed{2}}{\boxed{5}}$$

Answer:

- $$\begin{aligned}\frac{8}{15} \times \frac{3}{4} &= \frac{8 \times 3}{15 \times 4} \\ &= \frac{24}{60} \\ &= \frac{2 \times \cancel{12}}{5 \times \cancel{12}} \\ &= \frac{2}{5}\end{aligned}$$

G.3 SOLVING REAL-WORLD PROBLEMS

Ex 98:



Calculate the area of the vegetable garden:

$$\frac{\boxed{3}}{\boxed{8}}\ m^2$$

Answer:

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

The area of the garden is $\frac{3}{8}$ m^2.

Ex 99: 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?

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

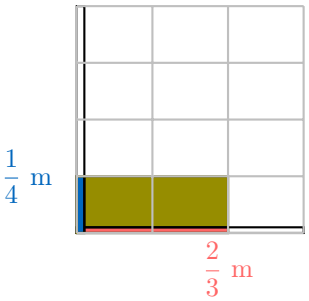
Answer: To find the fraction of the total student population participating in fall activities, we need to find $\frac{2}{3}$ of $\frac{4}{5}$. We multiply the fractions:

$$\begin{aligned}\frac{2}{3} \times \frac{4}{5} &= \frac{2 \times 4}{3 \times 5} \\ &= \frac{8}{15}\end{aligned}$$

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

Ex 100: 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?

$$\frac{\boxed{1}}{\boxed{6}}\ \text{m}^2.$$



Answer:

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

The area of the banner is $\frac{1}{6}$ m^2.

Ex 101: 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?

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

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

$$\begin{aligned}\frac{1}{2} \times \frac{2}{3} &= \frac{1 \times 2}{2 \times 3} \\ &= \frac{2}{6} \\ &= \frac{1}{3}\end{aligned}$$

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

H DIVISION OF FRACTIONS

H.1 FINDING RECIPROCALS

Ex 102: The reciprocal of $\frac{5}{7}$ is $\boxed{\frac{7}{5}}$.

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 103: The reciprocal of $\frac{3}{8}$ is $\boxed{\frac{8}{3}}$.

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 104: The reciprocal of $\frac{7}{2}$ is $\boxed{\frac{2}{7}}$.

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 105: The reciprocal of 4 is $\boxed{\frac{1}{4}}$.

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

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

H.2 DIVIDING FRACTIONS

Ex 106: Calculate and simplify:

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

Answer:

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

Ex 107: Calculate and simplify:

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

Answer:

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

Ex 108: Calculate and simplify:

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

Answer:

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

Ex 109: Calculate and simplify:

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

Answer:

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

H.3 DIVIDING FRACTIONS

Ex 110: Simplify:

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

Answer:

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

Ex 111: Simplify:

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

Answer:

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

Ex 112: Simplify:

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

Answer:

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

Ex 113: Simplify:

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

Answer:

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

I SIGN CONVENTIONS FOR FRACTIONS

I.1 SIMPLIFYING WITH SIGNED NUMBERS

Ex 114: Simplify:

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

Answer:

$$\begin{aligned}\frac{-15}{-30} &= \frac{15}{30} \qquad ((-) \div (-) = (+))\\ &= \frac{1 \times \cancel{15}}{2 \times \cancel{15}}\\ &= \frac{1}{2}\end{aligned}$$

Ex 115: Simplify:

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

Answer:

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

Ex 116: Simplify:

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

Answer:

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

Ex 117: Simplify:

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

Answer:

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

I.2 OPERATING WITH FRACTIONS WITH SIGNED NUMBERS

Ex 118: Calculate and simplify:

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

Answer:

$$\begin{aligned}\frac{1}{2}-1&=\frac{1}{2}-\frac{2}{2}\quad\left(1=\frac{2}{2}\right)\\&=\frac{1-2}{2}\\&=\frac{-1}{2}\\&=-\frac{1}{2}\end{aligned}$$

Ex 119: Calculate and simplify:

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

Answer:

$$\begin{aligned}\frac{3}{4}-\frac{1}{2}&=\frac{3}{4}-\frac{2}{4}\quad\left(\frac{1}{2}=\frac{2}{4}\right)\\&=\frac{3-2}{4}\\&=\frac{1}{4}\end{aligned}$$

Ex 120: Calculate and simplify:

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

Answer:

$$\begin{aligned}\frac{2}{3}-\frac{3}{4}&=\frac{8}{12}-\frac{9}{12}\quad\left(\frac{2}{3}=\frac{8}{12},\ \frac{3}{4}=\frac{9}{12}\right)\\&=\frac{8-9}{12}\\&=\frac{-1}{12}\\&=-\frac{1}{12}\end{aligned}$$

Ex 121: Calculate and simplify:

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

Answer:

$$\begin{aligned}\frac{-2}{3}-2&=\frac{-2}{3}-\frac{6}{3}\quad\left(2=\frac{6}{3}\right)\\&=\frac{-2-6}{3}\\&=\frac{-8}{3}\\&=-\frac{8}{3}\end{aligned}$$

Ex 122: Calculate and simplify:

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

Answer:

$$\begin{aligned}\frac{-2}{3}-\frac{-4}{3}&=\frac{-2-(-4)}{3}\\&=\frac{-2+4}{3}\\&=\frac{2}{3}\end{aligned}$$

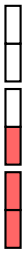
J FRACTIONS AS THE RESULT OF DIVISION

J.1 CONVERTING DIVISION TO FRACTIONS

Ex 123: Write as a fraction:

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

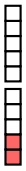
Answer:

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

Ex 124: Write as a fraction:

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

Answer:

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

Ex 125: Write as a fraction:

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

Answer:

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

Ex 126: Write as a fraction:

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

Answer:

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

J.2 CONVERTING FRACTIONS TO DIVISION EXPRESSIONS

Ex 127: Convert the fraction into a division expression:

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

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

Ex 128: Convert the fraction into a division expression:

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

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

Ex 129: Convert the fraction into a division expression:

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

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

Ex 130: Convert the fraction into a division expression:

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

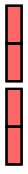
Answer: The fraction $\frac{6}{9}$ can be written as the division $6 \div 9$.

J.3 CONVERTING FRACTIONS TO WHOLE NUMBERS

Ex 131: Convert the fraction into a whole number:

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

Answer:

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

Ex 132: Convert the fraction into a whole number:

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

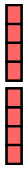
Answer:

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

Ex 133: Convert the fraction into a whole number:

$$\frac{8}{4} = \boxed{2}$$

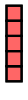
Answer:

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

Ex 134: Convert the fraction into a whole number:

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

Answer:

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

J.4 FINDING FRACTIONS IN WORD PROBLEMS

Ex 135: Four friends share 3 cakes equally. What fraction does each friend get?

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

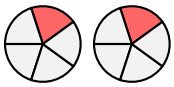
Ex 136: Five friends share 2 pizzas equally. What fraction does each friend get?

$\boxed{\frac{2}{5}}$ 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 137: A couple shares 5 chocolate bars equally. What fraction of a chocolate bar does each person get?

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

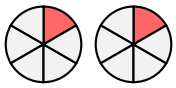
Ex 138: Six family members share 2 apple pies equally. What fraction of a pie does each family member get?

$\boxed{\frac{2}{6}}$ of a pie

Answer:

- When you share equally, you divide the 2 apple pies by 6 family members:

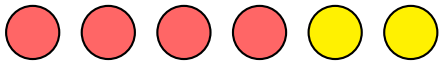
$$2 \div 6 = \frac{2}{6}$$

- 
- So, each family member gets $\frac{2}{6}$ of an apple pie.

K FRACTION AS A RATIO AND OPERATOR

K.1 IDENTIFYING FRACTIONS IN REAL-LIFE CONTEXTS

Ex 139:

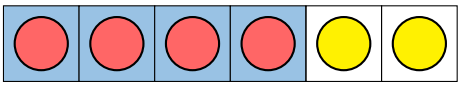


What fraction of the circles are red ? (Simplify your answer.)

$\boxed{\frac{2}{3}}$ of the circles are red.

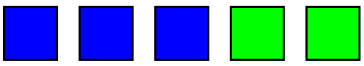
Answer:

- There are 6 circles.
- 4 of the circles are red.



- $\frac{4}{6} = \frac{2}{3}$ of the circles are red.

Ex 140:

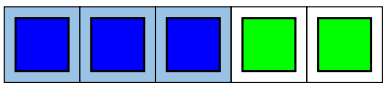


What fraction of the squares are blue? (Simplify your answer.)

$\boxed{\frac{3}{5}}$ of the squares are blue.

Answer:

- There are 5 squares.
- 3 of the squares are blue.



- $\frac{3}{5}$ of the squares are blue.

Ex 141:

What fraction of the children are girls? (Simplify your answer.)

$\boxed{\frac{1}{2}}$ of the children are girls.

Answer:

- There are 4 children.
- 2 of the children are girls.
- $\frac{2}{4} = \frac{1}{2}$ of the children are girls.

Ex 142:

What fraction of the children raised their hand? (Simplify your answer.)

$\frac{\boxed{1}}{\boxed{4}}$ of the children raised their hand.

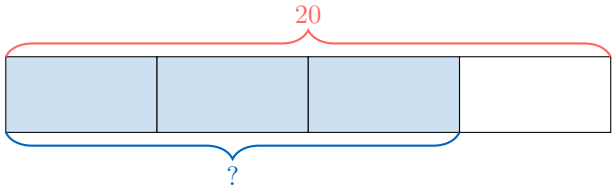
Answer:

- There are 4 children.
- 1 of the children raised their hand.
- $\frac{1}{4}$ of the children raised their hand.

K.2 CALCULATING FRACTIONS OF A WHOLE

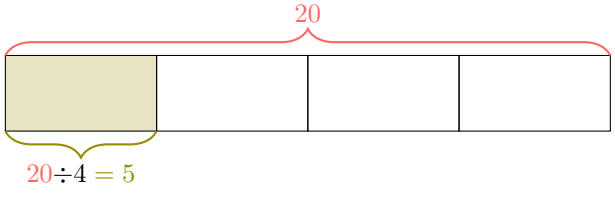
Ex 143:

$\frac{3}{4}$ of 20 = $\boxed{15}$

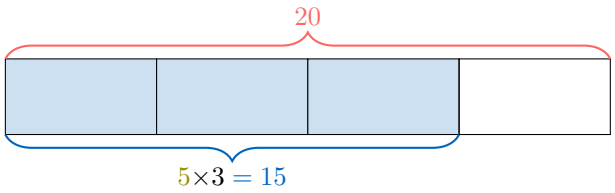


Answer:

- Find the quantity of 1 part:



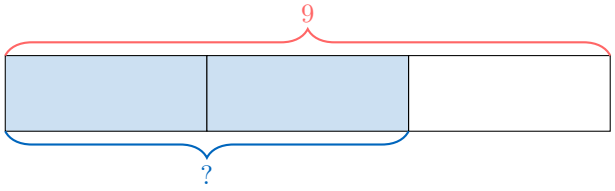
- Find the quantity of 3 parts:



- $\frac{3}{4}$ of 20 = 15

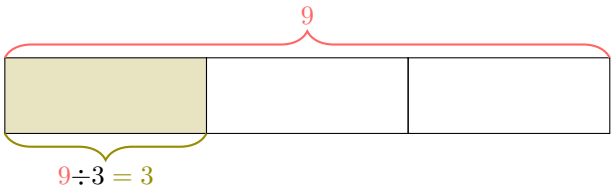
Ex 144:

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

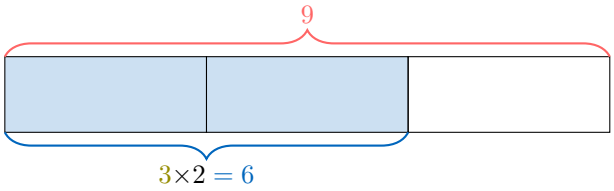


Answer:

- Find the quantity of 1 part:



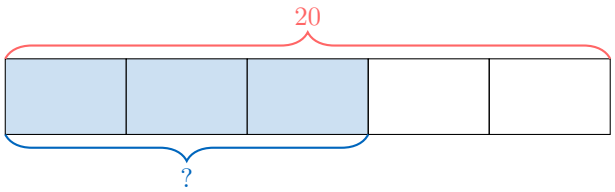
- Find the quantity of 2 parts:



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

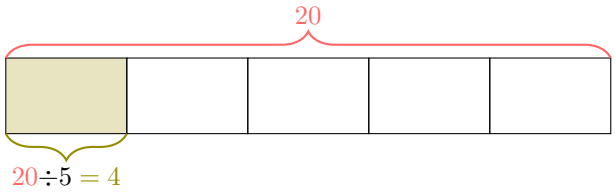
Ex 145:

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

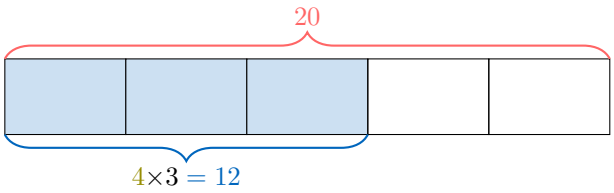


Answer:

- Find the quantity of 1 part:



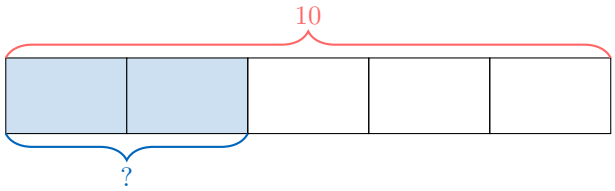
- Find the quantity of 3 parts:



- $\frac{3}{5}$ of $20 = 12$

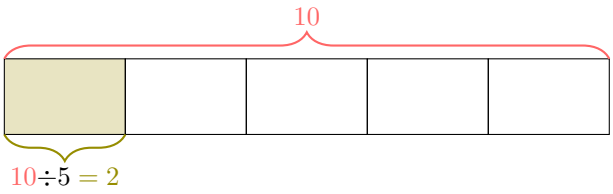
Ex 146:

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

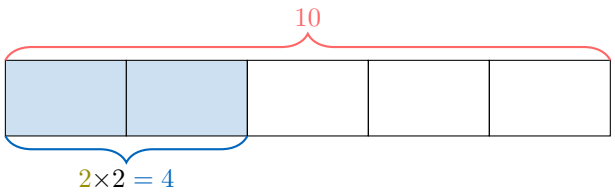


Answer:

- Find the quantity of 1 part:



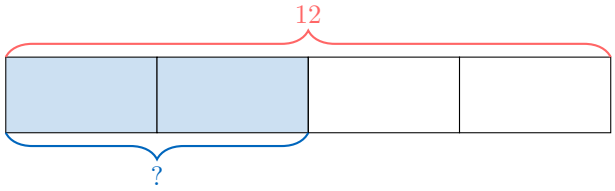
- Find the quantity of 2 parts:



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

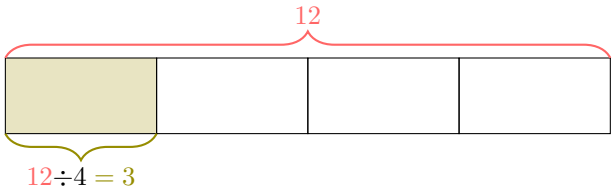
Ex 147:

$\frac{2}{4}$ of $12 = \boxed{6}$

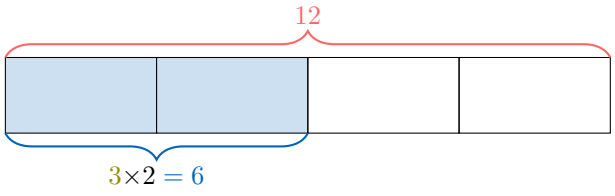


Answer:

- Find the quantity of 1 part:



- Find the quantity of 2 parts:



- $\frac{2}{4}$ of $12 = 6$

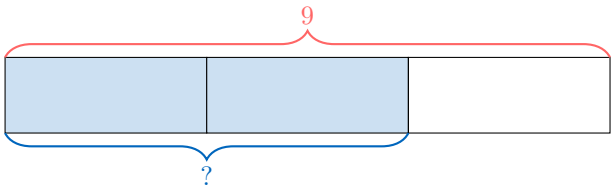
K.3 APPLYING FRACTIONS TO REAL-WORLD PROBLEMS

Ex 148: In a class of 9 students, $\frac{2}{3}$ of the students are girls. How many of the students are girls?

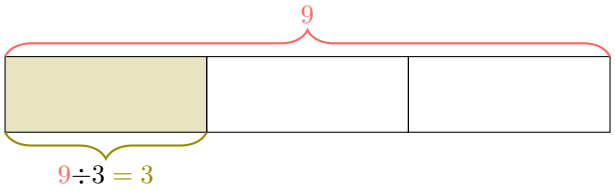
$\boxed{6}$ girls

Answer:

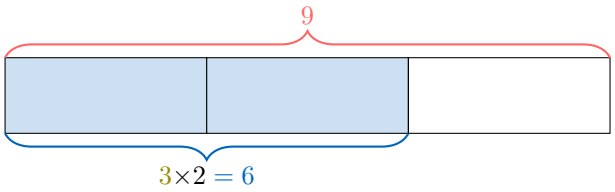
- **Method 1** (unitary method):
  - Number of girls = $\frac{2}{3}$ of 9



  - Find the quantity of 1 part:



  - Find the quantity of 2 parts:



  - $\frac{2}{3}$ of $9 = 6$
- **Method 2** (calculation using a formula):

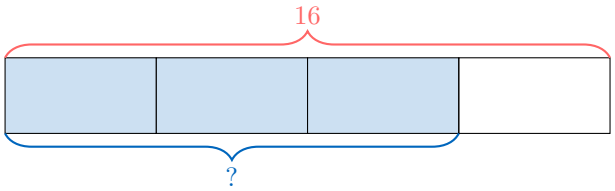
$$\begin{aligned}\text{Number of girls} &= \frac{2}{3} \text{ of } 9\\ &= \frac{2}{3} \times 9\\ &= (2 \times 9) \div 3\\ &= 6\end{aligned}$$

Ex 149: In a group of 16 fruits, $\frac{3}{4}$ of them are apples. How many of the fruits are apples?

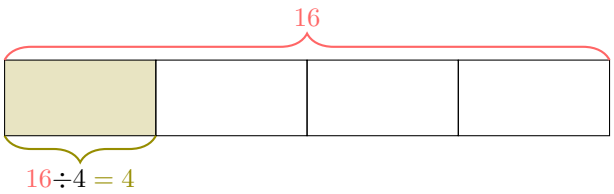
$\boxed{12}$ apples

Answer:

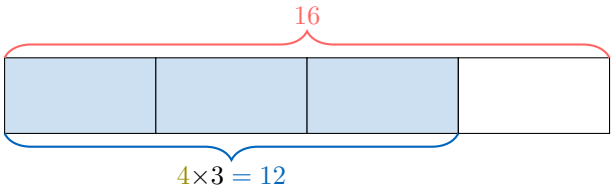
- **Method 1** (unitary method):
  - Number of apples = $\frac{3}{4}$ of 16



– Find the quantity of 1 part:



– Find the quantity of 3 parts:



– $\frac{3}{4}$ of $16 = 12$

- **Method 2** (calculation using a formula):

$$\begin{aligned}\text{Number of apples} &= \frac{3}{4} \text{ of } 16\\ &= \frac{3}{4} \times 16\\ &= (3 \times 16) \div 4\\ &= 12\end{aligned}$$

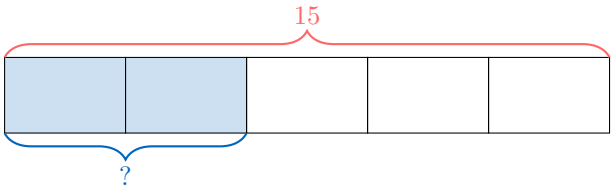
Ex 150: In a collection of 15 books, $\frac{2}{5}$ of them are novels. How many of the books are novels?

$\boxed{6}$ novels

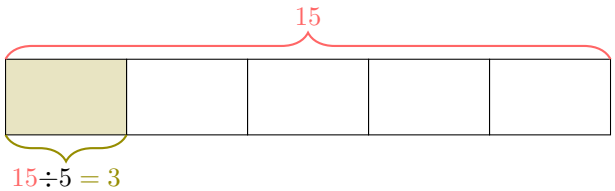
Answer:

- **Method 1** (unitary method):

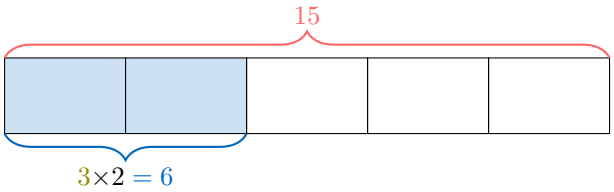
– Number of novels = $\frac{2}{5}$ of 15



– Find the quantity of 1 part:



– Find the quantity of 2 parts:



– $\frac{2}{5}$ of $15 = 6$

- **Method 2** (calculation using a formula):

$$\begin{aligned}\text{Number of novels} &= \frac{2}{5} \text{ of } 15\\ &= \frac{2}{5} \times 15\\ &= (2 \times 15) \div 5\\ &= 6\end{aligned}$$

Ex 151: For a refreshing drink recipe, the mixture consists of $\frac{1}{3}$ lemon and $\frac{2}{3}$ water for a total of 18 cl. How much lemon and water are used in the drink?

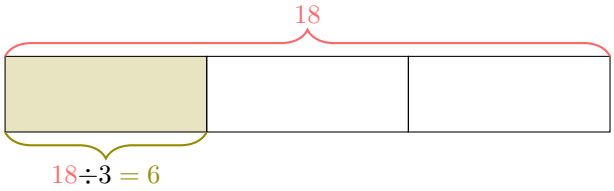
$\boxed{6}$ cl of lemon
$\boxed{12}$ cl of water

Answer:

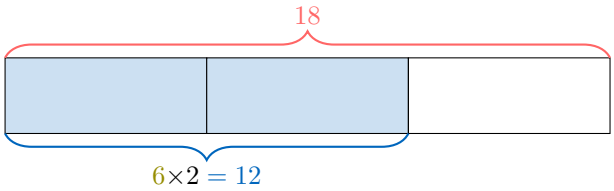
- **Method 1** (unitary method):

– Total volume = 18 cl

– Find the quantity of 1 part (which represents the lemon part):



– Find the quantity of 2 parts (which represents the water part):



– $\frac{1}{3}$ of 18 cl = 6 cl of lemon

– $\frac{2}{3}$ of 18 cl = 12 cl of water

- **Method 2** (calculation using a formula):

$$\begin{aligned}\text{Quantity of lemon} &= \frac{1}{3} \text{ of } 18\\ &= \frac{1}{3} \times 18\\ &= (1 \div 3) \times 18\\ &= 6 \text{ cl of lemon}\end{aligned}$$

$$\begin{aligned}\text{Quantity of water} &= \frac{2}{3} \text{ of } 18\\ &= \frac{2}{3} \times 18\\ &= (2 \times 18) \div 3\\ &= 12 \text{ cl of water}\end{aligned}$$

L FRACTIONS AS DECIMAL NUMBERS

L.1 CONVERTING FRACTIONS TO DECIMALS

Ex 152: Convert to a decimal number:

$$\frac{3}{4} = \boxed{0.75}$$

Answer:

- **Division Method**:

$$\begin{aligned}\frac{3}{4} &= 3 \div 4\\ &= 0.75\end{aligned}$$

$$\begin{array}{r}0.75\\ 4\overline{)3.00}\\ \underline{2.8}\\ 20\\ \underline{20}\\ 0\end{array}$$

- **Power of 10 Denominator Method**:

$$\begin{aligned}\frac{3}{4} &= \frac{3\times 25}{4\times 25}\\ &= \frac{75}{100}\\ &= 75 \div 100\\ &= 0.75\end{aligned}$$

Ex 153: Convert to a decimal number:

$$\frac{2}{5} = \boxed{0.4}$$

Answer:

- **Division Method**:

$$\begin{aligned}\frac{2}{5} &= 2 \div 5\\ &= 0.4\end{aligned}$$

$$\begin{array}{r}0.4\\ 5\overline{)2.0}\\ \underline{2.0}\\ 0\end{array}$$

- **Power of 10 Denominator Method**:

$$\begin{aligned}\frac{2}{5} &= \frac{2\times 2}{5\times 2}\\ &= \frac{4}{10}\\ &= 4 \div 10\\ &= 0.4\end{aligned}$$

Ex 154: Convert to a decimal number:

$$\frac{3}{20} = \boxed{0.15}$$

Answer:

- **Division Method**:

$$\begin{aligned}\frac{3}{20} &= 3 \div 20\\ &= 0.15\end{aligned}$$

$$\begin{array}{r}0.15\\ 20\overline{)3.00}\\ \underline{2.0}\\ 1.00\\ \underline{1.00}\\ 0\end{array}$$

- **Power of 10 Denominator Method**:

$$\begin{aligned}\frac{3}{20} &= \frac{3\times 5}{20\times 5}\\ &= \frac{15}{100}\\ &= 15 \div 100\\ &= 0.15\end{aligned}$$

Ex 155: Convert to a decimal number:

$$\frac{40}{50} = \boxed{0.8}$$

Answer:

- **Division Method**:

$$\begin{aligned}\frac{40}{50} &= 40 \div 50\\ &= 0.8\end{aligned}$$

$$\begin{array}{r}0.8\\ 50\overline{)40.0}\\ \underline{40.0}\\ 0\end{array}$$

- **Power of 10 Denominator Method**:

$$\begin{aligned}\frac{40}{50} &= \frac{40\times 2}{50\times 2}\\ &= \frac{80}{100}\\ &= 80 \div 100\\ &= 0.8\end{aligned}$$

L.2 CONVERTING DECIMALS TO FRACTIONS

Ex 156: Convert to a fraction:

$$1.3 = \frac{\boxed{13}}{\boxed{10}}$$

Answer:

$$1.3 = \frac{1.3 \times 10}{10} = \frac{13}{10}$$

Ex 157: Convert 0.3 to a fraction:

$$0.3 = \frac{\boxed{3}}{\boxed{10}}$$

Answer:

$$0.3 = \frac{0.3 \times 10}{10} = \frac{3}{10}$$

Ex 158: Convert 10.7 to a fraction:

$$10.7 = \frac{\boxed{107}}{\boxed{10}}$$

Answer:

$$10.7 = \frac{10.7 \times 10}{10} = \frac{107}{10}$$

Ex 159: Convert 0.99 to a fraction:

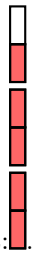
$$0.99 = \frac{\boxed{99}}{\boxed{100}}$$

Answer:

$$0.99 = \frac{0.99 \times 100}{100} = \frac{99}{100}$$

M REPRESENTING FRACTIONS GREATER THAN ONE

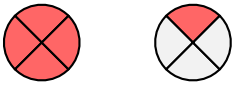
M.1 SOLVING REAL-WORLD PROBLEMS

Ex 160: I eat $\frac{5}{2}$ of a pain au chocolat:  .

So I eat $\boxed{2}$ whole pains au chocolat and $\frac{\boxed{1}}{\boxed{2}}$ of another pain au chocolat.

Answer: $\frac{5}{2} = \frac{2 \times 2 + 1}{2}$ (division by 2: $5 = 2 \times 2 + 1$)

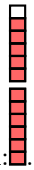
$$= \frac{2 \times \cancel{2}}{\cancel{2}} + \frac{1}{2} = 2 + \frac{1}{2}$$

Ex 161: I eat $\frac{5}{4}$ of a pizza:  .

So I eat $\boxed{1}$ whole pizza and $\frac{\boxed{1}}{\boxed{4}}$ of another pizza.

Answer: $\frac{5}{4} = \frac{1 \times 4 + 1}{4}$ (division by 4: $5 = 1 \times 4 + 1$)

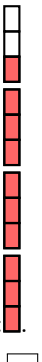
$$= \frac{1 \times \cancel{4}}{\cancel{4}} + \frac{1}{4} = 1 + \frac{1}{4}$$

Ex 162: I have $\frac{11}{6}$ of a ribbon:  .

So I have $\boxed{1}$ whole ribbon and $\frac{\boxed{5}}{\boxed{6}}$ of another ribbon.

Answer: $\frac{11}{6} = \frac{1 \times 6 + 5}{6}$ (division by 6: $11 = 1 \times 6 + 5$)

$$= \frac{1 \times \cancel{6}}{\cancel{6}} + \frac{5}{6} = 1 + \frac{5}{6} = 1\frac{5}{6}$$

Ex 163: I have $\frac{10}{3}$ of a wood plank:  .

So I have $\boxed{3}$ whole wood planks and $\frac{\boxed{1}}{\boxed{3}}$ of another wood plank.

Answer: $\frac{10}{3} = \frac{3 \times 3 + 1}{3}$ (division by 3: $10 = 3 \times 3 + 1$)

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

M.2 FINDING MIXED NUMBERS FROM BAR MODELS

Ex 164: Write the mixed number shown in the diagram:

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

Answer:

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

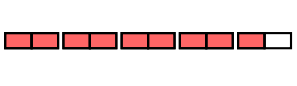
Ex 165: Write the mixed number shown in the diagram:

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

Answer:

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

Ex 166: Write the mixed number shown in the diagram:

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

Answer:

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

Ex 167: Write the mixed number shown in the diagram:

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

Answer:

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

Ex 168: Write the mixed number shown in the diagram:

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

Answer:

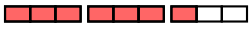
-  $= 4 + \frac{2}{5} = 4\frac{2}{5}$

M.3 FINDING FRACTIONS FROM MIXED NUMBERS

Ex 169: Convert into improper fraction:

$$2\frac{1}{3} = \frac{\boxed{7}}{\boxed{3}}$$

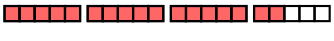
Answer:

- $2\frac{1}{3} = 2 + \frac{1}{3}$
  $= \frac{2\times3}{1\times3} + \frac{1}{3} \quad \left(2 = \frac{2}{1}\right)$
  $= \frac{6}{3} + \frac{1}{3}$
  $= \frac{7}{3}$
- 

Ex 170: Convert into an improper fraction:

$$3\frac{2}{5} = \frac{\boxed{17}}{\boxed{5}}$$

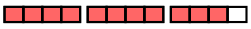
Answer:

- $3\frac{2}{5} = 3 + \frac{2}{5}$
  $= \frac{3\times5}{1\times5} + \frac{2}{5} \quad \left(3 = \frac{3}{1}\right)$
  $= \frac{15}{5} + \frac{2}{5}$
  $= \frac{17}{5}$
- 

Ex 171: Convert into an improper fraction:

$$2\frac{3}{4} = \frac{\boxed{11}}{\boxed{4}}$$

Answer:

- $2\frac{3}{4} = 2 + \frac{3}{4}$
  $= \frac{2\times4}{1\times4} + \frac{3}{4} \quad \left(2 = \frac{2}{1}\right)$
  $= \frac{8}{4} + \frac{3}{4}$
  $= \frac{11}{4}$
- 

Ex 172: Convert into an improper fraction:

$$4\frac{1}{2} = \frac{\boxed{9}}{\boxed{2}}$$

Answer:

- $4\frac{1}{2} = 4 + \frac{1}{2}$
  $= \frac{4\times2}{1\times2} + \frac{1}{2} \quad \left(4 = \frac{4}{1}\right)$
  $= \frac{8}{2} + \frac{1}{2}$
  $= \frac{9}{2}$
- 

M.4 FINDING MIXED NUMBERS FROM FRACTIONS

Ex 173: Convert into mixed number:

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

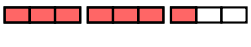
Answer:

- $\frac{3}{2} = \frac{1\times2+1}{2}$ (division of 3 by 2: $3 = 1\times2+1$)
  $= \frac{1\times\cancel{2}}{\cancel{2}} + \frac{1}{2}$
  $= 1 + \frac{1}{2}$
  $= 1\frac{1}{2}$
- $\frac{3}{2} =$  $= 1 + \frac{1}{2} = 1\frac{1}{2}$

Ex 174: Convert into a mixed number:

$$\frac{7}{3} = \boxed{2}\ \frac{\boxed{1}}{\boxed{3}}$$

Answer:

- $\frac{7}{3} = \frac{2\times 3+1}{3}$ (division of 7 by 3: $7 = 2\times 3+1$)
  $= \frac{2\times \cancel{3}}{\cancel{3}} + \frac{1}{3}$
  $= 2 + \frac{1}{3}$
  $= 2\frac{1}{3}$
- $\frac{7}{3} =$  $= 2 + \frac{1}{3} = 2\frac{1}{3}$

Ex 175: Convert into a mixed number:

$$\frac{9}{2} = \boxed{4}\ \boxed{\frac{1}{2}}$$

Answer:

- $\frac{9}{2} = \frac{4\times 2+1}{2}$ (division of 9 by 2: $9 = 4\times 2+1$)
  $= \frac{4\times \cancel{2}}{\cancel{2}} + \frac{1}{2}$
  $= 4 + \frac{1}{2}$
  $= 4\frac{1}{2}$
- $\frac{9}{2} =$  $= 4 + \frac{1}{2} = 4\frac{1}{2}$

Ex 176: Convert into a mixed number:

$$\frac{13}{5} = \boxed{2}\ \boxed{\frac{3}{5}}$$

Answer:

- $\frac{13}{5} = \frac{2\times 5+3}{5}$ (division of 13 by 5: $13 = 2\times 5+3$)
  $= \frac{2\times \cancel{5}}{\cancel{5}} + \frac{3}{5}$
  $= 2 + \frac{3}{5}$
  $= 2\frac{3}{5}$
- $\frac{13}{5} =$  $= 2 + \frac{3}{5} = 2\frac{3}{5}$

N ORDER OF OPERATIONS

N.1 EVALUATING AND SIMPLIFYING EXPRESSIONS WITH FRACTIONS

Ex 177: Evaluate and simplify:

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

Answer:

$$\begin{aligned}
3\times\frac{1}{2}+1 &= \frac{3\times 1}{2}+1 && \text{(writing 3 as numerator)}\\
&= \frac{3}{2}+\frac{2}{2} && \left(1=\frac{2}{2}\right)\\
&= \frac{3+2}{2} && \text{(adding with common denominator)}\\
&= \frac{5}{2} && \text{(simplifying the result)}
\end{aligned}$$

Ex 178: Evaluate and simplify:

$$\frac{2+\frac{1}{2}}{\frac{1}{4}} = \boxed{10}$$

Answer:

$$\begin{aligned}
\frac{2+\frac{1}{2}}{\frac{1}{4}} &= \frac{\frac{4}{2}+\frac{1}{2}}{\frac{1}{4}} && \left(2=\frac{2}{1}=\frac{4}{2}\right)\\
&= \frac{\frac{4+1}{2}}{\frac{1}{4}}\\
&= \frac{\frac{5}{2}}{\frac{1}{4}}\\
&= \frac{5}{2}\times\frac{4}{1} && \text{(multiplying by the reciprocal)}\\
&= \frac{5\times 4}{2\times 1}\\
&= \frac{20}{2}\\
&= 10 && \text{(simplifying the result)}
\end{aligned}$$

Ex 179: Evaluate and simplify:

$$\frac{3+\frac{3}{4}}{\frac{1}{2}} = \boxed{\frac{15}{2}}$$

Answer:

$$\begin{aligned}
\frac{3+\frac{3}{4}}{\frac{1}{2}} &= \frac{\frac{12}{4}+\frac{3}{4}}{\frac{1}{2}} && \left(3=\frac{12}{4}\right)\\
&= \frac{\frac{12+3}{4}}{\frac{1}{2}}\\
&= \frac{\frac{15}{4}}{\frac{1}{2}}\\
&= \frac{15}{4}\times\frac{2}{1} && \text{(multiplying by the reciprocal)}\\
&= \frac{15\times\cancel{2}}{\cancel{2}\times 2\times 1}\\
&= \frac{15}{2} && \text{(simplifying the result)}
\end{aligned}$$

Ex 180: Evaluate and simplify:

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

Answer:

$$\frac{2+\frac{1}{2}}{1+\frac{2}{3}} = \frac{\frac{4}{2}+\frac{1}{2}}{\frac{3}{3}+\frac{2}{3}} \quad \left(2=\frac{4}{2},\ 1=\frac{3}{3}\right)$$

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

$$= \frac{\frac{5}{2}}{\frac{5}{3}}$$

$$= \frac{5}{2} \times \frac{3}{5} \quad \text{(multiplying by the reciprocal)}$$

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

$$= \frac{\cancel{5} \times 3}{2 \times \cancel{5}}$$

$$= \frac{3}{2} \quad \text{(simplifying the result)}$$