FRACTIONS

A DEFINITIONS

A.1 FINDING FRACTIONS

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



Answer:

- A bar (1) is divided into 4 equal parts:
- 5 parts are shaded.



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



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:



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:



Answer:

- A circle (1) is divided into 4 equal parts.
- 7 parts are shaded.



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



Answer:

- A circle (1) is divided into 3 equal parts.
- 7 parts are shaded.



A.2 WRITING FRACTIONS FROM WORDS

Ex 6: Write as fraction:

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

Answer:



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

Answer:

• three over five
$$=\frac{3}{5}=$$

Ex 8: Write as fraction:

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

Answer:

- three quarters $=\frac{3}{4}=$
- $\mathbf{Ex}~9\mathbf{:}$ Write as fraction:

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

Answer:

• six over hundred (six thousandths) = $\frac{o}{100}$

B FRACTION AS QUOTIENT

B.1 CONVERTING DIVISION TO FRACTIONS

Ex 10: Write as a fraction:

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

Answer:



Ex 11: Write as a fraction:

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

Answer:



Ex 12: Write as a fraction:

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

Answer:





$$5 \div 3 = 5$$

Answer:



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 $\frac{2}{5}$ 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 $\frac{4}{7}$ 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 $\frac{3}{8}$ can be written as the division $3 \div 8$.

 \mathbf{Ex} 17: 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 $6 \div 9$.

B.3 CONVERTING FRACTIONS TO WHOLE NUMBERS

Ex 18: Convert the fraction into a whole number:

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



Ex 19: Convert the fraction into a whole number:

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

Answer:





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





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

Answer:

Answer:

= 2



B.4 FINDING FRACTIONS IN WORD PROBLEMS

Ex 22: Four friends share 3 cakes equally. What fraction does each friend get?

$$\frac{3}{4}$$
 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 23: Five friends share 2 pizzas equally. What fraction does each friend get?

 $\begin{array}{|c|c|c|}\hline 2 \\\hline \hline 5 \\\hline \end{array}$ of a pizza

Answer:

• When you share equally, you divide the 2 pizzas by 5 friends:

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



Ex 24: A couple shares 5 chocolate bars equally. What fraction of a chocolate bar does each person get?

$$5$$
 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?

$$\frac{2}{6}$$
 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.



C ON THE NUMBER LINE

C.1 FINDING FRACTIONS

Ex 26: Find the value of x



Answer:

- 1 is divided in 3 equals parts.
- x is located at 1 part from 0.



• So,
$$x = \frac{1}{3}$$
.

Ex 27: Find the value of x



Answer:

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





Ex 28: Find the value of x



Answer:

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



• So, $x = \frac{7}{3}$.

Ex 29: Find the value of x



Answer:

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

• So, $x = \frac{7}{4}$.





Answer:

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

• So,
$$x = \frac{7}{6}$$
.

D EQUIVALENT FRACTIONS

D.1 FINDING THE MISSING NUMERATOR

Ex 31:



Answer:



- 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:

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





- The second denominator 2 is the first denominator 6 divided by 3 : 6 ÷ 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:

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

Answer:



- 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:



Answer:



• 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.

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

Answer:



- 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:

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

Answer:



Ex 37:



 $\binom{\bullet}{\bullet}$



Answer:

$$\frac{3}{4} =$$
nswer:

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



Ex 39:

 $\frac{5}{6} =$ 1012

9 12



Ex 40:

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

Answer:



D.3 FINDING THE MISSING DENOMINATOR

Ex 41:

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

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 42:

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

Answer:



- 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:

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

Answer:



- 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:





Answer:



- 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:





Ex 46:

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





Ex 47:







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

Answer:



Ex 49:



Answer:



E SIMPLIFICATION

E.1 SIMPLIFYING FRACTIONS

Ex 50: Simplify:

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

Answer:

•

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

7



Ex 51: Simplify:

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

Answer:



Ex 52: Simplify:



Answer:



Ex 53: Simplify:

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

Answer:

•



Ex 54: Simplify:

25		1	
100	_	4	

Answer:

•



F CROSS MULTIPLICATION

F.1 SOLVING PROPORTIONS USING CROSS-MULTIPLICATION

Ex 55: Solve
$$x$$
 for $\frac{12}{4} = \frac{x}{6}$:
 $x = 18$

Answer:

$$\frac{12}{4} \times \frac{x}{6}$$

$$4 \times x = 12 \times 6 \quad (\text{cross multiplication})$$

$$x = 12 \times 6 \div 4 \quad (\text{dividing both sides by 4})$$

$$x = 18$$

Ex 56: Solve
$$x$$
 for $\frac{11}{10} = \frac{x}{5}$:
 $x = 5.5$

Answer:

$$\frac{11}{10} \times \frac{x}{5}$$

$$10 \times x = 11 \times 5 \quad (\text{cross multiplication})$$

$$x = 11 \times 5 \div 10 \quad (\text{dividing both sides by 10})$$

$$x = 5.5$$

Ex 57: Solve
$$x$$
 for $\frac{12}{10} = \frac{18}{x}$:
 $x = 15$

Answer:

$$12 - 18 - 18 - 10$$

$$12 \times x = 18 \times 10$$
 (cross multiplication)
$$x = 18 \times 10 \div 12$$
 (dividing both sides by 12)
$$x = 15$$

Ex 58: Solve
$$x$$
 for $\frac{27}{x} = \frac{30}{10}$:
 $x = 9$

 $27 \xrightarrow{30} 10$ $30 \times x = 27 \times 10$ $x = 27 \times 10 \div 30$ x = 9

(cross multiplication) 30 (dividing both sides by 30)

G ADDITION AND SUBTRACTION

G.1 ADDING AND SUBTRACTING FRACTIONS WITH COMMON DENOMINATORS

Ex 59:

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





Ex 60:



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





Ex 61:





Ex 62:

Answer:







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

Answer:





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



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?

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- 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.

$$\frac{3}{4}$$
 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



• 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?

$$\frac{1}{6}$$
 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:

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

• 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



• Subtract the fractions



• 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?

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

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:



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• Subtract the fractions



• 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?

$$\frac{7}{10}$$
 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:

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

• Add the fractions



• 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:

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

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.

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

= $\frac{10}{15} + \frac{9}{15}$ (common denominator = 15)
= $\frac{10 + 9}{15}$
= $\frac{19}{15}$

• Visual representation:



Ex 71: Calculate and simplify:

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

- 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 72: Calculate and simplify:

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

=

Answer:

- Find a common denominator: To add fractions, they *Answer:* must have the same denominator.
 - Multiples of 2: 2, 4, 6, 8, $10, \ldots$
 - Multiples of 5: 5, **10**, 15, ...
 - The smallest common denominator is ${\bf 10}.$

- 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**.

$$\frac{3}{2} + \frac{4}{5} = \frac{3 \times 5}{2 \times 5} + \frac{4 \times 2}{5 \times 2}$$

$$= \frac{15}{10} + \frac{8}{10} \quad (\text{common denominator} = 10)$$

$$= \frac{15 + 8}{10}$$

$$= \frac{23}{10}.$$

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

$$= \frac{9}{12} + \frac{10}{12} \quad (\text{common denominator} = 12)$$

$$= \frac{9 + 10}{12} \quad (\text{adding numerators})$$

$$= \frac{19}{12}$$

Ex 73: Calculate and simplify:

3	⊥ <u>5</u> _	19	
4	6	12	







• Visual representation:

12



Ex 74: Calculate and simplify:

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

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**.

•
$$\frac{7}{8} + \frac{11}{6} = \frac{7 \times 3}{8 \times 3} + \frac{11 \times 4}{6 \times 4}$$

= $\frac{21}{24} + \frac{44}{24}$ (common denominator = 24)
= $\frac{21 + 44}{24}$
= $\frac{65}{24}$

• Visual representation:



H MULTIPLICATION OF A FRACTION BY A NUMBER

H.1 MULTIPLYING OF FRACTIONS BY WHOLE NUMBERS

 $\mathbf{Ex}\ \mathbf{75:}\ \mathbf{Calculate}\ \mathbf{and}\ \mathbf{simplify:}$

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



•



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

Ex 76: Calculate and simplify:

Answer:

•





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

Answer:

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

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Ex 78: Calculate and simplify:

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

Answer:

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

$$= \frac{12}{9}$$

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

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

$$6 \times \boxed{10} = \boxed{10} + \boxed$$

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?

$$\frac{3}{4}$$
 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?



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?

 $\frac{5}{4}$ 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?

 $\frac{8}{3}$ 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:

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



.



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Ex 84: Calculate and simplify:

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

Answer:





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

Answer:



Ex 86: Calculate and simplify:

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

Answer:



I.2 MULTIPLYING OF FRACTIONS

Ex 87: Calculate and simplify:

Answer:

•

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

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

Ex 88: Calculate and simplify:

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

Answer:

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

Ex 89: Calculate and simplify:

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

Answer:

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

 $\mathbf{Ex}~\mathbf{90:}$ Calculate and simplify:

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

Answer:

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

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Ex 91:



Calculate the area of the vegetable garden:

3 square meters.

Answer:

$$Area = Length \times Width$$

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

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?

$$\boxed{8}$$
 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?



Answer:

Area = Length
$$\times$$
 Width

$$= \frac{2}{3} \times \frac{1}{4}$$
$$= \frac{2 \times 1}{3 \times 4}$$
$$= \frac{2}{12}$$
$$= \frac{1}{6} m^{2}$$

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?

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 $\frac{7}{5}$. 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 96: The reciprocal of $\frac{3}{8}$ is $\frac{8}{3}$. 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 97: The reciprocal of $\frac{7}{2}$ is $\frac{2}{7}$. Answer: The reciprocal of $\frac{7}{2}$ is $\frac{2}{7}$. 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 98: The reciprocal of 4 is $\frac{1}{4}$.

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

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



J.2 DIVIDING FRACTIONS

 $\mathbf{Ex}~\mathbf{99:}$ Calculate and simplify:

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

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:

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

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:

$$\frac{3}{5} \div \frac{2}{7} = \boxed{\begin{array}{c} 21\\ \hline 10 \end{array}}$$

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:

Answer:

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

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

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

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

Ex 104: Simplify:

Answer:

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



 $\frac{\frac{4}{3}}{\frac{5}{6}} = \frac{4}{3} \times \frac{6}{5}$

 $= \frac{4 \times 6}{3 \times 5}$ $= \frac{24}{15}$ $= \frac{8 \times 3}{5 \times 3}$ $= \frac{8}{5}$

(multiply by the reciprocal)

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

Answer:

Ex 105: Simplify:

(multiply by the reciprocal)

Ex 106: Simplify:

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

Answer:

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

 $\binom{\bullet}{\bullet}$

K SIGN RULES

K.1 SIMPLIFYING WITH RELATIVE NUMBERS

Ex 107: Simplify:

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

Answer:

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

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:

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

 $\mathbf{Ex}\ \mathbf{110:}\ \mathbf{Simplify:}$

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

Answer:

$$\frac{22}{-33} = -\frac{22}{33} + (+) \div (-) = (-)$$
$$= -\frac{2 \times 1}{3 \times 1}$$
$$= -\frac{2}{3}$$

K.2 OPERATING WITH FRACTIONS WITH RELATIVE NUMBERS

Ex 111: Calculate and simplify:

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

Answer:

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

Ex 112: Calculate and simplify:

 $\frac{1}{2}$ -

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

Answer:

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

Ex 113: Calculate and simplify:

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

Answer:

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

Ex 114: Calculate and simplify:

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

Answer:

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

Ex 115: Calculate and simplify:

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

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

(*<u>*</u>)

L ORDER OF OPERATIONS

L.1 CALCULATING EXPRESSIONS

Ex 116: Calculate and simplify:

$$\frac{1+7}{3\times4} = \boxed{\frac{2}{3}}$$

Answer:

 $\frac{1+7}{3\times4} = \frac{8}{12}$ (evaluate numerator and denominator) $= \frac{2\times4}{3\times4}$ (cancel common factor) $= \frac{2}{3}$

Ex 117: Calculate and simplify:

$$\frac{2+8}{4\times5} = \boxed{\frac{1}{2}}$$

Answer:

 $\frac{2+8}{4\times5} = \frac{10}{20}$ (evaluate numerator and denominator) $= \frac{1\times10}{2\times10}$ (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:

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

Ex 120: Calculate and simplify:

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

Answer:

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