Group Warm-up

On a road trip, four friends shared the driving. **Kelly** did *1/3* of the driving, and **Rami** did *3/8* of the driving. Since **Ryan** wasn't feeling well, he only did *1/12* of the driving. The ***remainder*** of the driving was done by **Melanie.**

Determine the total fraction of the trip each friend drove.

If the total driving time was 11 hours and 12 minutes, how long did each person drive?

Kelly + Rami + Ryan

$= \frac{1}{3} + \frac{3}{8} + \frac{1}{12}$ LCD = 24

$= \frac{1}{3} \times \frac{8}{8} + \frac{3}{8} \times \frac{3}{3} + \frac{1}{12} \times \frac{2}{2}$

$= \frac{8}{24} + \frac{9}{24} + \frac{2}{24}$

$= \frac{19}{24}$

$\Rightarrow$ Melanie $= 1 - \frac{19}{24}$

$= \frac{24}{24} - \frac{19}{24}$

$= \frac{5}{24}$

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Determine the total fraction of the trip each friend drove.

If the total driving time was 11 hours and 12 minutes, how long did each person drive?

Total time $= 11 \times 60 + 12$

$= 672$ minutes

Kelly drove for $\frac{1}{3} \times 672 = 224$ mins

Ryan drove for $\frac{1}{12} \times 672 = 56$ mins

Rami drove for $\frac{3}{8} \times 672 = 252$ mins

Melanie drove for $\frac{5}{24} \times 672 = 140$ mins

[check $224 + 56 + 252 + 140 = 672$ ✓]

MTH1W Grade 9 Mathematics

2.2 Multiplying and Dividing Fractions and Mixed Numbers

Goal(s) *- To multiply and divide positive and negative fractions*

- Use order of operations with fractions and mixed numbers

- Evaluate powers of fractions and mixed numbers

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Warm-up Part II

State the order in which the operations must be applied in the expression: $3(12 - 5)^2 + 7$

Give an example of a **mixed number**: $4\frac{3}{7}$

Rewrite your mixed number as an **improper fraction**: $\frac{31}{7}$

mixed $\longrightarrow$ Improper

whole $\frac{\text{numerator}}{\text{denominator}} \longrightarrow \frac{\text{whole} \times \text{denom} + \text{num}}{\text{denom}}$

Multiplying Fractions

Multiply the numerators together.

Multiply the denominators together.

Reduce the final answer.

$\frac{4}{5} \times \left(\frac{-3}{8}\right) = \frac{4 \times -3}{5 \times 8}$

$= \frac{-12}{40} \Rightarrow \frac{-3}{10}$

$\frac{5}{7} \times \frac{11}{9} = \frac{5 \times 11}{7 \times 9}$

$= \frac{55}{63}$

Multiplying Fractions

Multiply the numerators together.

Multiply the denominators together.

Reduce the final answer.

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

Treat fractions as positive when converting from mixed to improper. Once converted then change to negative.

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

$2\frac{3}{4} \rightarrow \frac{2 \times 4 + 3}{4} = \frac{11}{4}$

$\Rightarrow -\frac{3}{2} \times -\frac{11}{4}$

$= \frac{-3 \times -11}{2 \times 4} = \frac{33}{8} = 4\frac{1}{8}$

Dividing Fractions

To divide by a fraction, multiply by its *reciprocal* (switch numerator and denominator).

Reciprocals are two numbers whose product is 1.

Reduce the final answer.

$\frac{-4}{5} \div \frac{2}{3} = \frac{-4}{5} \times \frac{3}{2}$

$= \frac{-12}{10} = -1\frac{2}{10} = -1\frac{1}{5}$

$\frac{7}{12} \div \frac{1}{4} = \frac{7}{12} \times \frac{4}{1}$

$= \frac{28}{12} = 2\frac{4}{12} = 2\frac{1}{3}$

$-1\frac{1}{2} \div \left(-2\frac{3}{4}\right) = \frac{-3}{2} \div \frac{-11}{4}$

$= \frac{-3}{2} \times \frac{-4}{11}$

$= \frac{12}{22} = \frac{6}{11}$

Evaluating Powers of Fractions

Remember... a power is a way to express repeated multiplication. The exponent indicates how many times to multiply the base by itself! *(Hint - It may be helpful to write the power in expanded form!)*

$\left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3} = \frac{2\times2\times2}{3\times3\times3} = \frac{8}{27}$

$\left(\frac{-3}{4}\right)^4 = \frac{(-3)^4}{4^4} = \frac{(-3)(-3)(-3)(-3)}{(4)(4)(4)(4)} = \frac{81}{256}$

$\left(\frac{6}{7}\right)^{-2} = \left(\frac{7}{6}\right)^2 = \frac{7\times7}{6\times6} = \frac{49}{36}$

$\left(2\frac{1}{5}\right)^3 = \left(\frac{11}{5}\right)^3 = \frac{11\times11\times11}{5\times5\times5} = \frac{1331}{125}$

How would we evaluate this expression?

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

When evaluating expressions involving fractions and more than one operation, follow the same rules as if the question involved integers… follow the proper order of operations, BEDMAS!

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

$$= \left(\frac{10}{15}+\frac{12}{15}\right)\times\left(\frac{-3}{8}\right)$$

$$= \frac{22}{15}\times\frac{-3}{8}$$

$$= \frac{-66}{120} \Rightarrow \frac{-11}{20}$$