You must show clear work where asked to receive full credit. This exam is worth 100 points.

1. \(/5\) pts/ Correctly spell the part of a fraction that must be in common in a fraction addition problem, then explain clearly why this is so.

   denominator
   same-size
   \(\text{It tells how many pieces each whole must be cut into, so that size will be common throughout the entire computation.}\)

2. \(/10\) pts/ If the rectangle below represents \(4/5\) of a whole, draw a rectangle that would represent \(3/2\) of the same whole. You may draw intermediate diagrams if you wish. Clearly indicate your FINAL answer; you need not explain.

   \[
   \begin{array}{cccc}
   \frac{1}{5} & \frac{1}{5} & \frac{1}{5} & \frac{1}{5} \\
   \frac{1}{5} & \frac{1}{5} & \frac{1}{5} & \frac{1}{5} \\
   \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \\
   \end{array}
   \]

   \[
   \text{original } = \frac{4}{5} \\
   \text{whole } = \frac{5}{5}
   \]

   \[
   3/2 \text{ of the whole} \\
   \text{(answer)}
   \]
3. [6 pts] In the list of fractions below, CIRCLE the largest and put a BOX around the smallest. Show brief work/reasoning. You may NOT convert to decimals or percents.

\[
\frac{80}{51} = \frac{4800}{3060} \quad \text{improper (smallest)}
\]

\[
\frac{71}{90} \quad \text{proper}
\]

\[
\frac{73}{60} \quad \text{improper}
\]

OR

\[
\frac{80}{51} \quad \text{improper}
\]

\[
\frac{73}{60} \quad \text{proper}
\]

\[
\frac{80}{51} \quad \text{improper}
\]

\[
\frac{73}{60} \quad \text{proper}
\]

\[
4800 > 3723
\]

\[
\text{so } \frac{80}{51} > \frac{73}{60}
\]

4. (a) [4 pts] What does the FLF (Fundamental Law of Fractions) say?

It says that you can multiply (or divide) top + bottom of any fraction by the same nonzero amount and end up with an equivalent fraction to another fraction with the same amount.

(b) [3 pts] Illustrate this Law on the fractions 5/4 and 50/40.

\[
\frac{5}{4} \cdot \frac{10}{10} = \frac{50}{40}
\]

5. [8 pts] Demonstrate complete "pre-cancelling" in the following computation, so that your answer is immediately in lowest terms. Show neat, clear work.

\[
\frac{50}{60} \times \frac{30}{45} \div \frac{25}{15}
\]

\[
\frac{2}{3} \times \frac{30}{45} \times \frac{15}{25} = \frac{1}{3}
\]
6. [4 pts] Demonstrate the “short-cut” for converting $5\frac{3}{8}$ to a fraction. What do we call the kind of fraction you have created?

\[ 5\frac{3}{8} = \frac{8 \cdot 5 + 3}{8} = \frac{43}{8} \]

improper fraction

7. (a) [6 pts] Compute $7\frac{1}{6} - 4\frac{3}{8}$ entirely in mixed number notation. Show clear work.

\[ 7\frac{1}{6} = \frac{1}{6} \times \frac{8}{8} \rightarrow \frac{8}{48} \]

\[ 4\frac{3}{8} = \frac{3}{8} \times \frac{6}{6} \rightarrow \frac{18}{48} \]

\[ \frac{8}{48} - \frac{18}{48} = \frac{38}{48} \text{ or } 2\frac{19}{48} \]

(b) [6 pts] Multiply $8 \times 2\frac{1}{4}$ using the Distributive Property. Show clear work.

\[ 8 \times 2\frac{1}{4} = 8 (2 + \frac{1}{4}) \]

\[ = 8 \cdot 2 + 8 \cdot \frac{1}{4} \]

\[ = 16 + 2 \]

\[ = 18 \]
9. [4 pts - 2 each] Choose the best estimate for each computation below.

(a) \[ \frac{16}{31} + \frac{8}{9} - \frac{5}{21} \approx \frac{1}{2} + 1 - \frac{1}{4} \]

Choices: 0 \[ \frac{1}{2} \] \[ \frac{1}{4} \] 3

(b) \[ \frac{99}{31} \cdot \frac{8}{90} \]

\[ \approx 3 \cdot \frac{1}{10} = \frac{3}{10} \]

Choices: \[ \frac{1}{4} \] 1 3 24

-or-

\[ \approx \frac{99}{31} \cdot \frac{8}{90} \]

\[ \approx \frac{99}{31} \cdot \frac{8}{90} \approx 1 \]
10. (a) 2 pts/ I'm thinking of two numbers. Their product is $\frac{1}{3}$. One of them is a little more than 12. Estimate the other.

$$x \times 12 = \frac{1}{3}$$

$$\frac{1}{360}$$

The 2 pts/ Is your estimate bigger or smaller than my actual number?

bigger

My #s: a little $> 12$ and a little $< \frac{1}{360}$ to hit $\frac{1}{3}$ exactly.

11. 10 pts/ Draw and label a diagram representing $3\frac{1}{4} \div \frac{3}{4}$. Tell how to separately see EACH digit of the answer from your diagram.

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

Each slice is $\frac{1}{4}$.

How many groups of $\frac{3}{4}$ does it take to make $3\frac{1}{4}$?

It takes 4 full groups + part of another.

That part is 1 slice, but we need 3 slices to make a full group, so we have $\frac{1}{3}$ of another group.

Answer: $4\frac{1}{3}$
12. [8 pts] Kathy’s cookie recipe calls for $\frac{1}{3}$ cup of flour and $\frac{1}{4}$ cup sugar; the recipe also includes dry cocoa. If Kathy always uses exactly 1 cup of these dry ingredients altogether, how much dry cocoa does she use? Show work. You may NOT convert to decimals or percents.

\[
\frac{1}{3} \text{ c. flour} \\
\frac{1}{4} \text{ c. sugar} \\
? \text{ c. cocoa}
\]

\[
\frac{1}{3} + \frac{1}{4} = \\
\frac{1}{3} \cdot \frac{4}{4} = \frac{4}{12} \\
\frac{1}{4} \cdot \frac{3}{3} = \frac{3}{12}
\]

Total = $\frac{7}{12}$, leaving

\[
\frac{5}{12} \text{ c. for cocoa.}
\]

13. [12 pts - 3 each] Write a complete number sentence that fits each clue below. If not possible, say so. You may not use decimals.

(a) The subtrahend is 3 and the difference is $2\frac{1}{2}$.

\[
5\frac{1}{2} - 3 = 2\frac{1}{2}
\]

(b) The only factor is $\frac{5}{3}$.

\[
\frac{5}{3} \times \frac{5}{3} = \frac{25}{9}
\]

(c) The dividend and quotient are equal.

\[
4 \div 1 = 4
\]

(d) $\frac{2}{3}$ is one addend.

\[
\frac{2}{3} + \frac{1}{3} = \frac{3}{3} = 1
\]