Solutions for the ninth week's homework
Math 202

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Also available as PDF.

Note: These are my approaches to these problems. There are many ways to tackle each.

1 Diophantine equations

See the previous week's solutions.

2 Problem set 6.1

Problem 2 I'm not going to draw this, but it should be fairly straight-forward. This was more an exercise in something handy for elementary classes.

Problem 6

- $\frac{20}{60} = \frac{1}{3}$
- $\frac{30}{60} = \frac{1}{2}$
- $\frac{5}{7}$
- $\frac{25}{100} = \frac{1}{4}$
- $\frac{25}{100} = \frac{1}{4}$
- $\frac{3}{12} = \frac{1}{4}$
- $\frac{2}{3}$
- $\frac{3}{4}$ (A quart is made of *quart*ers... There are four cups in a *quart*. Cooking is a source of bizarre but traditional units.)

Problem 11

- $\frac{4}{5} = \frac{6 \cdot 4}{6 \cdot 5} = \frac{24}{30}$
- $\frac{6}{9} = \frac{3 \cdot 2}{3 \cdot 3} = \frac{2}{3}$
- $\frac{-7}{25} = \frac{20 \cdot -7}{20 \cdot 25} = \frac{-140}{500}$
- $\frac{18}{3} = \frac{3 \cdot 6}{3 \cdot 1} = \frac{6}{1} = \frac{-1 \cdot 6}{-1 \cdot 1} = \frac{-6}{-1}$

Problem 12

- $\frac{18}{42} = \frac{6 \cdot 3}{6 \cdot 7} = \frac{3}{7}$.
- Here $(18, 49) = 1$ and $(5, 14) = 1$, so both are in lowest common terms. That form is unique, and these fractions differ, so these **fractions cannot be equal**. Following the text's method, you want to compare $\frac{2 \cdot 18}{2 \cdot 49} = \frac{36}{98}$ and $\frac{7 \cdot 5}{7 \cdot 14} = \frac{35}{98}$, because $\text{lcm}(49, 14) = 98$.
- $\frac{9}{25} = \frac{20 \cdot 9}{20 \cdot 25} = \frac{180}{500} \neq \frac{140}{500}$.
- $\frac{24}{144} = \frac{2}{12} = \frac{1}{6}$, $\frac{32}{96} = \frac{1}{3} = \frac{2}{6}$. **These are not equal.**

Problem 32 Yes, this is a general property. But you need to provide some examples.

3 Problem set 6.2

Problem 6

- $\frac{5}{7}$
- $\frac{10}{5} = 2$
- $\frac{20}{24} = \frac{5}{6}$
- $\frac{56}{65}$
- $\frac{76}{60} = \frac{19}{15}$
- $\frac{100}{200} = \frac{1}{2}$
- $\frac{-31}{100}$
- $\frac{321}{450} = \frac{107}{150}$

Problem 18

- 1
- $\frac{1}{4}$
- 1

Problem 13

- $3 \cdot \frac{5}{2} = \frac{15}{2}$
- $\frac{2}{3} \cdot \frac{3}{2} = 1$
- $\frac{3}{4} \cdot 2 = \frac{3}{2}$

Problem 25 For each, you proceed by solving the row, column, or diagonal that has only one open spot. Repeating suffices to fill the squares.

$\frac{1}{2}$	$\frac{1}{12}$	$\mathbf{\frac{5}{12}}$
$\frac{1}{4}$	$\mathbf{\frac{1}{3}}$	$\mathbf{\frac{5}{12}}$
$\mathbf{\frac{1}{4}}$	$\mathbf{\frac{7}{12}}$	$\mathbf{\frac{1}{6}}$

$\mathbf{\frac{8}{15}}$	$\mathbf{\frac{1}{5}}$	$\mathbf{\frac{4}{15}}$
$\mathbf{\frac{1}{15}}$	$\frac{1}{3}$	$\frac{3}{5}$
$\mathbf{\frac{2}{5}}$	$\mathbf{\frac{7}{15}}$	$\frac{2}{15}$

4 Problem set 6.3

Problem 2

- Reassociate to add the first two terms with the common denominator of 5 first.
- Commute the terms in the parenthesis and reassociate to add terms with common denominator of 4 first.
- Use the distributive property to pull out the $\frac{2}{3}$, then add the eighths.
- Commute and reassociate to multiply $\frac{3}{4} \cdot \frac{4}{3} = 1$ first.

Problem 8

- $\frac{2}{3} \cdot \frac{4}{7} + \frac{2}{3} \cdot \frac{3}{7} = \frac{2}{3} \cdot (\frac{4}{7} + \frac{3}{7}) = \frac{2}{3} \cdot 1 = \frac{2}{3}$
- $\frac{4}{5} \cdot \frac{2}{3} - \frac{3}{10} \cdot \frac{2}{3} = (\frac{4}{5} - \frac{3}{10}) \cdot \frac{2}{3} = \frac{1}{2} \cdot \frac{2}{3} = \frac{1}{3}$
- $\frac{4}{7} \cdot \frac{3}{2} - \frac{4}{7} \cdot \frac{6}{4} = \frac{4}{7} \cdot (\frac{3}{2} - \frac{6}{4}) = \frac{4}{7} \cdot 0 = 0$
- $(\frac{4}{7} \cdot \frac{2}{5}) / \frac{2}{7} = \frac{4 \cdot 2}{7 \cdot 5} \cdot \frac{7}{2} = \frac{4}{5}$

Problem 9

- adding fractions with a common denominator
- multiplying fractions
- distributing multiplication over addition
- adding fractions with a common denominator
- multiplying fractions

Problem 12

- First subtraction of 32, then multiplication by the inverse of $\frac{9}{5}$.
Celsius	-40	-20	0	10	20	45	100
Fahrenheit	-40	-13	32	50	68	104	212
- As seen in the table above, both agree at -40. If $-F = C$, then $-F = \frac{5}{9}(F - 32)$, $\frac{-9}{5}F = F - 32$, $32 = \frac{14}{5}F$, $F = \frac{80}{7} \approx 11$.