Math 221: Test 3 - 6/23/15
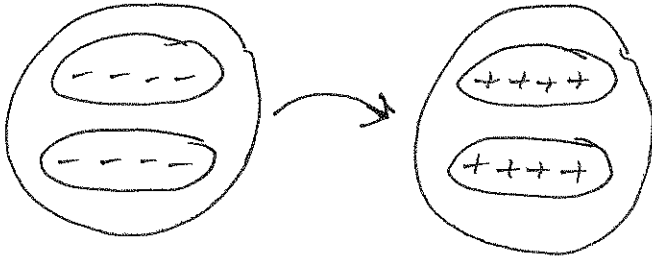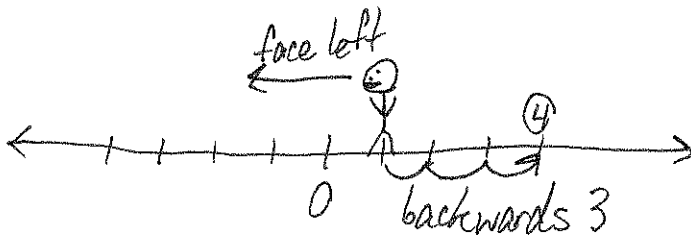
Do all work on the test below. You must show all work to receive full credit.

1. Represent $-(2 \times -4) = 8$ using the chip/charged field model. [7 Points]

2. Represent the problem $1 - -3 = 4$ on the number line. [7 Points]

face left

0   backwards 3

3. Fill in the blank with $<$, $>$, or $=$. Show your methods used to compute these, but you do not need to give a lengthy justification. Use different methods for (a) and (b). [5 Points Each]

(a) $\frac{9}{15} = \frac{12}{20}$

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

reduce

(b) $\overset{60}{\frac{6}{8}} \geq \frac{6}{10}\overset{48}{}$

or, $8 < 10$, so larger
sized, same quantity
pieces

(c) $20.\overline{15} \leq 20.1\overline{5}$

$20.1515... \leq 20.1555...$

4. Use the specified method to perform the following operations. Write your answers in simplest form and in the same form as the numbers in the problem. [8 Points Each]

(a) $\frac{5}{12} + \frac{13}{18}$ (*Least* Common Denominator)

$\frac{5}{12} \cdot \frac{3}{3} + \frac{13}{18} \cdot \frac{2}{2} = \frac{15}{36} + \frac{26}{36} = \boxed{\frac{41}{36}}$

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(b) $3\frac{2}{5} - 1\frac{8}{15}$ (No Improper Fraction Conversions)

$$3\frac{2}{5} \longrightarrow \overset{2}{\cancel{3}}\frac{\overset{21}{\cancel{6}}}{15}$$

$$-1\frac{8}{15} \qquad -1\frac{8}{15}$$

$$\boxed{1\frac{13}{15}}$$

(c) $\dfrac{18}{56} \times \dfrac{70}{3}$ (Simplify First)

$$\dfrac{\overset{3}{\cancel{\overset{6}{\cancel{18}}}}}{\underset{24^{8}}{\cancel{56}}} \times \dfrac{\overset{10^{5}}{\cancel{70}}}{\underset{1}{\cancel{3}}} = \boxed{\dfrac{15}{2}}$$

(d) $\dfrac{5}{7} \div \dfrac{10}{7} = n$ (Keep Change Flip with Careful Explanation from Class)

① $\dfrac{10}{7}n = \dfrac{5}{7}$

$\cancel{\dfrac{7}{10}} \cdot \cancel{\dfrac{10}{7}} n = \dfrac{5}{7} \cdot \dfrac{7}{10}$

$n = \dfrac{\overset{1}{\cancel{5}}}{\underset{1}{7}} \cdot \dfrac{\overset{1}{\cancel{7}}}{\underset{2}{\cancel{10}}} = \boxed{\dfrac{1}{2}}$

—or—

② $\dfrac{\frac{5}{7}}{\frac{10}{7}} \cdot \dfrac{\frac{7}{10}}{\frac{7}{10}} = \dfrac{\frac{5}{7} \cdot \frac{7}{10}}{1} = \dfrac{5}{7} \cdot \dfrac{7}{10} = \boxed{\dfrac{1}{2}}$

—or—

③ $\dfrac{5}{7} \div \dfrac{10}{7} \cdot \left(\dfrac{10}{7} \cdot \dfrac{7}{10}\right) = \dfrac{5}{7} \div \cancel{\dfrac{10}{7}} \cdot \cancel{\dfrac{10}{7}} \cdot \dfrac{7}{10} = \dfrac{5}{7} \cdot \dfrac{7}{10} = \boxed{\dfrac{1}{2}}$

5. Write how to read the decimal 2.015 in words. [5 Points]

Two and fifteen thousandths.

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6. For each of the following fractions, determine if it can be written as a terminating decimal. If so, do so by getting a power of 10 in the denominator. If not, use long division and find the repeat. [8 Points Each]

(a) $\dfrac{20}{55} = \dfrac{4}{11}$

repeating since 11 is not 2 or 5

$$11\overline{)4.0000} \quad \dfrac{0.3636\ldots}{}$$

$$\begin{array}{r} 0.3636\ldots \\ 11\,\overline{)\,4.0000} \\ -33 \\ \hline 70 \\ -66 \\ \hline 40 \\ -33 \\ \hline 70 \end{array}$$

$\boxed{0.\overline{36}}$

(b) $\dfrac{33}{60} = \dfrac{11}{20}$

$$= \dfrac{11}{2^2 \cdot 5} \cdot \dfrac{5}{5} = \dfrac{55}{10^2} = \boxed{0.55}$$

terminating since only 2's and 5's appear

7. Use the standard algorithm to calculate 10.13×1.8. [5 Points]

$$\begin{array}{r} 10.13 \\ \times \quad 1.8 \\ \hline 8104 \\ +10130 \\ \hline 18.234 \end{array}$$

$\boxed{18.234}$

8. In the problem above, explain why your decimal place is in the correct position. [5 Points]

$$10.13 \times 1.8 = \dfrac{1013}{10^2} \times \dfrac{18}{10^1} = \dfrac{18034}{10^3} = 18.034$$

The decimal places correspond to powers of 10 in the denominator. When we multiply, we add the powers and thus the decimal places.

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9. Use Long Division to calculate $2.015 \div 1.7$. Round to the nearest hundredth if necessary. [8 Points]

$$
\begin{array}{r}
1.185 \\
17\overline{)20.150} \\
-17 \\
\hline
31 \\
-17 \\
\hline
145 \\
-136 \\
\hline
90 \\
-85 \\
\hline
5
\end{array}
$$

$$\boxed{1.19}$$

The following bonus questions should not be attempted until you have solved every other question and checked your answers. Please see me if you need an additional sheet of paper to do the bonus.

Bonus 1: Prove the following theorem: $\dfrac{a}{b} - \dfrac{c}{d} = \dfrac{ad - bc}{bd}$ [5 Points]

Bonus 2: Write $0.\overline{342}$ as a fraction in simplest form. [5 Points]

Bonus 1) $\dfrac{a}{b} - \dfrac{c}{d} = \dfrac{a \cdot d}{b \cdot d} - \dfrac{c \cdot b}{d \cdot b} = \dfrac{ad}{bd} - \dfrac{bc}{bd} = \dfrac{ad - bc}{bd}$

Bonus 2) $n = 0.\overline{342}$

$1000n = 342.\overline{342}$

$1000n - n = 342.\overline{342} - 0.\overline{342}$

$999n = 342$

$n = \dfrac{342}{999} = \dfrac{114}{333} = \boxed{\dfrac{38}{111}}$