Foundations of Algebra
Unit 1 Study Guide

Number Sense & Quantity

Name: KEY

What I Need to Know	Things to Remember	Practice	
1. Operations with Integers		a. Add or Subtract: $-5+3=$ **-2** $3-9=$ **-6** $4-(-8)=$ **12** $-5-4=$ **-9**	b. Multiply or Divide $4\times-5=$ **-20** $18\div-6=$ **-3** $-7\times-3=$ **21** $-8\div-2=$ **4**
		c. How do you know when the sum of a positive and negative integer will be positive? ex. $+8+-4=+4$ ↓ positive integer larger	d. c. How do you know when the sum of a positive and negative integer will be negative? ex. $-8+4=-4$ ↓ negative integer larger
2. Real World Applications of Integers		a. Represent the scenario with an integer: -You take the elevator to 14th floor. $+14$ -The temperature is seven degrees below zero. $-7°$	b. Antara jumped off the diving board that was 12 feet in the air and went 9 feet below the water's surface. How far did she travel? 12ft -9ft $+12-(-9)=21$ Feet
3. Powers of 10		a. Multiply or Divide: $5.7\times100=$ **570** $0.42\times10=$ **4.2** $5670\div1000=$ **5.67**	b. Multiply or Divide: $450\times0.01=$ **4.5** $56\div0.1=$ **560**
4. Decimal Comparison		a. Order from least to greatest: ~~2.13, 2.561, 2.098, 2.56, 2.375, 2.36~~ 2.098, 2.13, 2.36, 2.375, 2.56, 2.561	b. Compare the following decimals: 0.56 **>** 0.5 0.35 **=** 0.350
5. Decimals on a Number Line		a. Plot the following points on the number line. ~~0.48~~ 0.45 ~~1.75~~ ~~2.75~~ ~~2.5~~ ~~1.5~~ ~~1.75~~ ~~0.15~~ ~~0.5~~ ~~1~~ ~~2.71~~ 0 .1 .2 .3 .4 0.5 .6 .7 .8 .9 1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3	
7. Decimal Word Problems		a. The monthly rental for an apartment is $412.50. How much would the rent be for one year? $\$412.50\times12=$ **$4,950/year**	b. A gallon of water weighs 8.3 pounds. How many pounds does 20 gallons of water weigh? $8.3\times20=$ **166 pounds**
8. Comparing Decimals & Fractions		a. Name an equivalent fraction for each decimal: 0.6 = ~~6/10~~ 3/5 0.37 = 37/100 3.3 = 33/10 4.5 = 45/10 OR 9/2	b. Order the numbers from least to greatest: 0.48, $\frac{1}{10}$, 0.85, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{8}{10}$, and 0.25 .1 .75 .5 .8 .1, .25, .48, .5, .75, .8, .85 Then plot on the number line: 0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1

9. Benchmark Fractions

$\frac{1}{3}$ $\frac{3}{8}$ $\frac{7}{9}$ $\frac{5}{6}$ $\frac{11}{12}$ $\frac{2}{10}$ $\frac{9}{10}$ $\frac{1}{8}$ $\frac{2}{6}$ $\frac{6}{11}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{4}{9}$ $\frac{3}{7}$ $\frac{3}{4}$ $\frac{3}{6}$

$< \frac{1}{2} < \frac{1}{2}$ ≈1 ≈1 ≈1 ≈0 ≈1 ≈0 $< \frac{1}{2} > \frac{1}{2}$ ≈0 ≈1 $< \frac{1}{2} < \frac{1}{2}$ ≈1 =

10. Ordering Fractions

a. Order from least to greatest

$\frac{4}{5}$ $\frac{4}{10}$ $\frac{4}{12}$ $\frac{4}{7}$

.8, .4, $.\overline{3}$, .57

$\frac{4}{12}, \frac{4}{10}, \frac{4}{7}, \frac{4}{5}$

c. Order from least to greatest

$\frac{5}{9}$ $\frac{7}{13}$ $\frac{2}{7}$ $\frac{10}{11}$

.56, .54, .29, .9

$\frac{2}{7}, \frac{7}{13}, \frac{5}{9}, \frac{10}{11}$

12. Operations with Fractions

a. Add or Subtract

$\frac{3\times3}{5\times3} - \frac{1\times5}{3\times5} = \frac{9}{15} - \frac{5}{15} = \boxed{\frac{4}{15}}$

5	3
5	3
10	6
15	9
	10
	12
	15

$\frac{3\times4}{5\times4} + \frac{1\times5}{4\times5} = \frac{12}{20} + \frac{5}{20} = \boxed{\frac{17}{20}}$

$2\frac{2}{3} - \frac{1}{4} = \frac{8\times4}{3\times4} - \frac{1\times3}{4\times3} = \frac{32}{12} - \frac{3}{12}$

$= \boxed{\frac{29}{12}}$ OR $\boxed{2\frac{5}{12}}$

b. Multiply or Divide

$\frac{7}{10} \times \frac{2}{21} = \frac{14}{210} = \boxed{\frac{1}{15}}$

$\frac{2}{5} \div \frac{1}{6} = \frac{2}{5} \times \frac{6}{1} = \boxed{\frac{12}{5}}$

$6\frac{4}{5} \div \frac{1}{2} = \frac{34}{5} \div \frac{1}{2} = \frac{34}{5} \times \frac{2}{1}$

$= \boxed{\frac{68}{5}}$ OR $\boxed{13\frac{3}{5}}$

13. Operations with Fractions (Word Problems)

a. A stack of board is 21 inches high. Each board is $1\frac{3}{4}$ inches thick. How many boards are there?

$21 \div 1\frac{3}{4} = \frac{21}{1} \div \frac{7}{4}$

$= \frac{21}{1} \times \frac{4}{7} = \frac{84}{7}$

$= \boxed{12 \text{ boards}}$

b. DJ Gabe is going to serve $\frac{1}{3}$ of a whole pizza to each guest at his party. If he expects 24 guests, how many pizzas will he need?

$\frac{1}{3} \times \frac{24}{1} = \frac{24}{3} = \boxed{8 \text{ pizzas}}$

c. $3\frac{1}{3}$ feet are cut off a board that is $12\frac{1}{4}$ feet long. How long is the remaining part of the board?

$12\frac{1}{4} - 3\frac{1}{3}$

① $12 - 3 = 9$ ② $\frac{1\times3}{4\times3} - \frac{1\times4}{3\times4} = \frac{3}{12} - \frac{4}{12}$

$= -\frac{1}{12}$

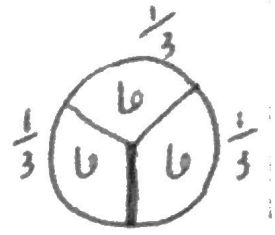
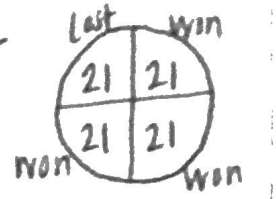
d. $\frac{3}{8}$ of the corn in the US is grown in Iowa $\frac{1}{4}$ of it is grown is Nebraska. How much of the corn supply is grown in the two states?

common denominator:

4	8
4	8
8	

$\frac{3}{8} + \frac{1\times2}{4\times2} = \frac{3}{8} + \frac{2}{8}$

$= \boxed{\frac{5}{8}}$

Using Fractions to Solve Problems		a. Use a picture to show how to divide $\frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \times \frac{4}{1} = \frac{28}{8} = \frac{1}{2}$	b. Draw a picture to solve the following 18 cookies $\frac{2}{3}$ are chocolate chip. How many of the cookies are chocolate chip? $18 \div 3 = 6$ $\frac{2}{3} = 6+6 =$ **12** 
		c. Use a picture to show how multiply $\frac{1}{2} \times \frac{4}{5} = \frac{4}{10} = \frac{2}{5}$	d. The New York Rangers hockey team won $\frac{3}{4}$ of their games last season. If they lost 21 games how many games did they play in the entire season? Won $\frac{3}{4}$ lost $\frac{1}{4}$ $21 \times 4 =$ **84** 
18. Estimating Square Roots		a. $\sqrt{43}$ is between what two whole numbers? $\sqrt{36} = 6$ and $\sqrt{49} = 7$	b. $\sqrt{71}$ is between what two whole numbers? $\sqrt{64} = 8$ and $\sqrt{81} = 9$
15. Simplify Radicals		a. Simplify $\sqrt{20}$ $\sqrt{4} \cdot \sqrt{5}$ **$2 \cdot \sqrt{5}$ OR $2\sqrt{5}$**	b. Simplify $-4\sqrt{15} \cdot \sqrt{3}$ *multiply then simplify $(-4)\sqrt{15 \cdot 3}$ $-4\sqrt{45}$ $-4 \cdot \sqrt{9} \cdot \sqrt{5}$ $-4 \cdot 3 \cdot \sqrt{5} =$ **$-12\sqrt{5}$**
16. Add or Subtract Radicals		a. $2\sqrt{6} - 2\sqrt{54}$ *cannot subtract until radicands are the same $2\sqrt{6} - 2 \cdot \sqrt{9} \cdot \sqrt{6}$ $2\sqrt{6} - 2 \cdot 3 \cdot \sqrt{6}$ $2\sqrt{6} - 6\sqrt{6}$ $(2-6)\sqrt{6} =$ **$-4\sqrt{6}$**	b. $3\sqrt{12} + 3\sqrt{3}$ *cannot add until radicands are the same $3 \cdot \sqrt{4} \cdot \sqrt{3} + 3\sqrt{3}$ $3 \cdot 2 \cdot \sqrt{3} + 3\sqrt{3}$ $6\sqrt{3} + 3\sqrt{3} = (6+3)\sqrt{3}$ $=$ **$9\sqrt{3}$**

c $\sqrt{5}(8\sqrt{12}+1)$ * Distribute.

$(\sqrt{5})(8\sqrt{12}) + (\sqrt{5})(1)$

$8\sqrt{12\cdot 5} + \sqrt{5}$

$8\sqrt{60} + \sqrt{5}$

$8\cdot\sqrt{4}\cdot\sqrt{15} + \sqrt{5}$

$8\cdot 2\cdot\sqrt{15} + \sqrt{5} = \boxed{16\sqrt{15}+\sqrt{5}}$

d $3\sqrt{20} - 4\sqrt{5} + 8\sqrt{3}$

$3\cdot\sqrt{4}\cdot\sqrt{5} - 4\sqrt{5} + 8\sqrt{3}$

$3\cdot 2\sqrt{5} - 4\sqrt{5} + 8\sqrt{3}$

$6\sqrt{5} - 4\sqrt{5} + 8\sqrt{3}$

$(6-4)\sqrt{5} + 8\sqrt{3} = \boxed{-7\sqrt{5}+8\sqrt{3}}$

17 Rational & Irrational Numbers

a Explain the outcome of $\sqrt{4} + \sqrt{16}$.

$2 + 4 = \boxed{6}$

b Explain the outcome of $2\sqrt{2}(5+\sqrt{2})$.

$(2\sqrt{2})(5) + (2\sqrt{2})(\sqrt{2})$

$(2\cdot 5)\sqrt{2} + 2\sqrt{2\cdot 2}$

$10\sqrt{2} + 2\sqrt{4}$

$10\sqrt{2} + 2\cdot 2$

$\boxed{10\sqrt{2}+4}$