MATH 5: HANDOUT 4
ALGEBRAIC EXPRESSIONS

Today we discussed more rules for algebraic operations, involving subtraction:

$$a-(b+c)=a-b-c$$
$$a-(b-c)=a-b+c$$
$$a(b-c)=ab-ac$$

We also talked a little about solving word problems using equations. Here is an examples of the problem solved using equations:

Problem: An apple cost 9 cents, and an orange 15 cents. Elena bought some apples and oranges, 20 fruit in all, and paid 264 cents. How many apples and how many oranges did she buy?

Solution: Let a =number of apples; then number of oranges is $20-a$. Thus the total cost of apples is $9a$, total cost of oranges is $15(20-a)$. And the total cost of all fruits together is $9a+15(20-a)$ cents. So we have an equation

$$9a+15(20-a)=264$$
$$9a+15\times 20-15a=264$$
$$300+9a-15a=264$$
$$300-6a=264$$
$$300-264=6a$$
$$36=6a$$
$$a=6$$

Elena bought 6 apples and $20-6=14$ oranges.

SOME REVIEW ON FRACTIONS (FOR YOUR REFERENCE IF YOU NEED IT)

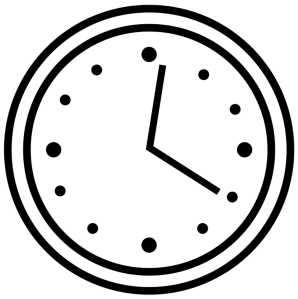
Fraction multiplication: $\frac{3}{4}\times\frac{2}{3}=$.

1. Multiply enumerators and denominators: $\frac{3}{4}\times\frac{2}{3}=\frac{(3\times 2)}{(4\times 3)}$
2. Simplify by using number prime factorization: $\frac{3}{4}\times\frac{2}{3}=\frac{(3\times 2)}{(4\times 3)}=\frac{(3\times 2)}{(2\times 2\times 3)}=\frac{1}{2}$

Fraction division: $\frac{1}{2}\div\frac{2}{3}=$

1. Find a reciprocal (inverse element) of the divisor. Reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$.
2. Turn division into multiplication and simplify by using prime factorization: $\frac{1}{2}\div\frac{2}{3}=\frac{1}{2}\times\frac{3}{2}=\frac{(1\cdot 3)}{(2\cdot 2)}=\frac{3}{4}$

COMMENT ON PREVIOUS HOMEWORK CLOCK PROBLEM



One of the problem in your homework asked you to find the angle between the two clock hands at 12:20. I want to comment that most of you got answers either 120 or 110. I considered both answers as correct. However 110 is the correct one. Let me explain why.
Every minute the minute hand rotates $\frac{360}{60}=6$ degrees. For 20 minutes it will rotate by total $20\times 6=120$ degrees. That is the most common answer that each of you gave. However what about hour hand? The hour hand in 60 minutes turns by 30 degrees. So in 20 minutes ($\frac{1}{3}$ of an hour) hour hand rotates by $\frac{30}{3}=10$ degrees. So the angle between the minute and hour hands will be $120-10=110$ degrees.

HOMEWORK

1. Compute the following sums/differences:
(a) $-7 + (-14)$
(b) $-54 - (-20)$
(c) $-(-99 + (-1))$
(d) $(-10) + (-11) + (-12)$
(e) $-15 - (13 - (-7))$

2. Compute the following products:
(a) $(-7) \times 6$
(b) $(-8) \times (-9)$
(c) $(-5) \times (6) \times (-10)$
(d) $(-1) \times (-2) \times (-3) \times (-4) \times (-5)$
(e) $2 \times 2 \times 2 \times 2 \times 2$
(f) $(-2) \times (-2) \times (-2) \times (-2) \times (-2)$

3. Compute the following expressions without calculator (utilize the distributive law $a(b + c) = ab + ac$ to save yourself lots of time):
(a) $73 \times 2 + 73 \times 8$
(b) $150 \times (-2) + (-150) \times (18)$
(c) $1846 \times 99 - (-1846)$
(d) $1569 \times 87 - 569 \times 87$

4. Open parenthesis and simplify the following expressions:
(a) $3(2x - 1)$
(b) $2 - (1 - x)$
(c) $7x - (3x + 15)$
(d) $3(2x - 1) + x$
(e) $2a + 1 + 3(a + 2)$
(f) $(2x - 1)(x + 1)$

5. Solve equations. (First - open parenthesis, second - collect all x at the left, and numbers at the right, find x. Do not forget to change the + or - sign when you move numbers or variables across the equals sign.)
(a) $3(3x - 1) = 2(2x + 11)$
(b) $5(x - 2) = 3x + 20$
(c) $2(x - 7) = x + 11$

6. Calculate (don't forget to simplify, use primary factorization if needed.):
(a) $\frac{3}{4} \times \frac{2}{3}$

(b) $\frac{5}{9} \times \frac{3}{15}$

(c) $\frac{9}{20} \times \frac{10}{27}$

(d) $\frac{9}{2} \div \frac{21}{2}$

(e) $6 \div \frac{2}{3}$

(f) $7 \div \frac{14}{3}$

(g) $\frac{2}{9} + \frac{5}{6}$

(h) $2\frac{5}{8} - \frac{3}{4}$

(i) $\frac{7}{12} + \frac{10}{27}$

(j) $\frac{5}{16} + \frac{3}{64}$

(k) $\frac{1}{24} + \frac{1}{40}$

7. An orange costs 2 cents more than an apple. A grapefruit costs as much as 3 oranges. A fruit basket consists of 10 apples, 5 oranges, and a grapefruit.

(a) Write expressions for the price of each fruit, denoting the price of an apple by letter a.

(b) If the fruit basket costs 196 cents, how much each of the fruits cost?

8. * The list below shows some dates written in Swahili:

tarehe tatu Disemba jumamosi;
tarehe pili Aprili jumanne;
tarehe nne Aprili jumanne;
tarehe tano Octoba jumapili;
tarehe tano Octoba jumatatu;
tarehe tano Octoba jumatano.

Here are their English translations (in a different order!):

October 5, Monday
April 2, Tuesday
October 5, Wednesday
October 5, Sunday
December 3, Saturday
April 4, Tuesday

Write the following dates in Swahili: April 3, Wednesday; December 2, Sunday; December 5, Monday.