Basic Calculations Review

I. Okay. It has been a long time since we have had to even THINK about Roman numerals vs. Arabic numerals, right? So just to refresh, a Roman numeral looks like this "XVI" but an Arabic numeral looks like this "16." In pharmacology, the apothecary system requires that we understand the use of both Roman and Arabic numerals. Just to refresh your memory, here are the commonly used Roman numerals:

| | | |
|---|---|---|
| I = 1 | L = 50 | M = 1000 |
| V = 5 | C = 100 | |
| X = 10 | D = 500 | |

Here is an entire Roman Numeral table:

**Roman Numeral Table**

| | | | |
|---|---|---|---|
| **1** I | **14** XIV | **27** XXVII | **150** CL |
| **2** II | **15** XV | **28** XXVIII | **200** CC |
| **3** III | **16** XVI | **29** XXIX | **300** CCC |
| **4** IV | **17** XVII | **30** XXX | **400** CD |
| **5** V | **18** XVIII | **31** XXXI | **500** D |
| **6** VI | **19** XIX | **40** XL | **600** DC |
| **7** VII | **20** XX | **50** L | **700** DCC |
| **8** VIII | **21** XXI | **60** LX | **800** DCCC |
| **9** IX | **22** XXII | **70** LXX | **900** CM |
| **10** X | **23** XXIII | **80** LXXX | **1000** M |
| **11** XI | **24** XXIV | **90** XC | **1600** MDC |
| **12** XII | **25** XXV | **100** C | **1700** MDCC |
| **13** XIII | **26** XXVI | **101** CI | **1900** MCM |

Let's review some Roman numeral rules:

**FIRST**: You cannot repeat a Roman numeral over three times. In otherwords, if you want to write the Arabic number "30" as a Roman numeral, you can do it like this: XXX. But if you want to write the Arabic number "40" as a Roman numeral, XXXX would be incorrect. Instead, you would document XL. Why? Well, when you place a smaller Roman numeral in front of a larger Roman numeral, this indicates subtraction. So in our "XL" example, X=10 and L=50. So really, I am saying 50-10 = 40. You do a few:

1. IV = ______________
2. IX = ______________
3. CD = ______________

**SECOND**: If smaller numerals follow larger ones, then you add. The same no repeating more than three in a row still applies. So if I want to express the number "11", I write XI. For "12" I document XII. For "15" I write XV and so on. **You try a few**:

1. Express 16 as a Roman numeral: _____________
2. Express 25 as a Roman numeral: _____________
3. Express 31 as a Roman numeral: _____________

**THIRD**: There are a few oddities with Roman numerals but the one most typically seen in pharmacology is the use of ½ which is expressed as *ss* often with a line over the top.

**FOURTH**: In pharmacology/dosage calculations, you would rarely need to use an of the higher Roman numerals.

Here is an example of what an order might look like using Roman numerals:

Give Seconal sodium gr iss p.o. stat

II. Now, on to reducing fractions. On your mathematics pretest, the primary issue was one of not knowing how to reduce fractions, it was in following directions. The directions indicated that you were to reduce the fractions to their **lowest terms**. Many of you stopped before you got to the final answer. For example, 24/30. Many of you gave an answer of 12/15 which is *not* the lowest terms. Instead, the correct answer was 3/5. This was an issue throughout the test. BE CAREFUL. Not following directions, to the letter, can not only result in test failure but more importantly, patient death.

**Let's practice some fraction reduction**. Your directions are to reduce the following fractions to the lowest terms:

1. 4/22 ___________________
2. 24/40 ___________________
3. 207/90 ___________________
4. 20/24 ___________________
5. 88/18 ___________________

III. Onward and upward! Let's talk about adding and subtracting fractions. Remember. While you will have use of a calculator, it is a basic functions calculator which will not have the nice a/b fraction key. You have to know how to do this the old fashioned way. That goes for a lot of the problems. Don't become over confident because you have a calculator in hand because it will be useless if you do not know mathematics basics or how to correctly set up the problem.

I am sure that we all have our own way of adding and subtracting fractions but let me show you the *easy* way. Besides…why work harder when you can work SMARTER!

Let's say you have this problem:

2/5 + 1/9 = ?

Well, you know we have to find a common denominator and all that time consuming stuff, right? Nope. All you have to do is multiply each side by the denominator of the other. Like this:

$$\frac{2 \times 9}{5 \times 9} + \frac{1 \times 5}{9 \times 5}$$

You get 18/45 + 5/45 = 23/45! No more searching for that least common denominator!

Let's do another one:

$$\frac{44}{10} + \frac{1}{9}$$

$$\frac{44 \times 9}{10 \times 9} + \frac{1 \times 10}{9 \times 10}$$

You get 396/90 + 10/90 = 406/90 which is an improper fraction, right? So we have to reduce it to 4 and 46/90 or 4 23/45. See how easy that is! And it works for subtraction as well. Let's look:

$\frac{11}{8} - \frac{6}{5}$ The goal is to make the denominators the same using the same technique above:

$$\frac{11 \times 5}{8 \times 5} - \frac{6 \times 8}{5 \times 8}$$

You get 55/40 – 48/40 = 7/40 VIOLA!

IV. Now—multiplying and dividing fractions is a bit trickier. To multiply a fraction, we just multiply straight across, right? So:

$\frac{3}{4} \times \frac{10}{11}$ Well, I can just multiply across and get 30/44 and then reduce. Or….

I could make my numbers a little smaller and easier to work with by reducing first:

$$\frac{3}{\cancel{4}_{(2)}} \times \frac{\cancel{10}^{(5)}}{11} = 15/22$$

Next, dividing fractions. When you divide fractions, you have to do what I call "the flip." For example, let's say you are asked to complete the following:

1/4 ÷ 1/5 = ?

You actually have to rewrite or "flip" the second fraction (now it is called the reciprocal). The problem then becomes a multiplication problem and looks like this:

1/4 x 5/1 = 5/4 or 1 1/4

Let's do another one:

1/6 ÷ 1/8 = ?

1/6 x 8/1 = 8/6 or 1 2/6 then 1 1/3 reduced to its lowest term. Right?

**You practice a few:**

1. 1/200 ÷ 1/300 = ____________________
2. 2/3 ÷ 5/7 = ____________________
3. 1 5/8 ÷ 9/27 = ____________________
4. 2/9 ÷ 3/12 = ____________________

**V.** The next section on the math pretest also caused an issue due to not following directions. You were asked to "Change the following fractions to decimals; **express your answer to the nearest tenth."** Before I go on, let's review decimal places:

| | |
|---|---|
| millions | 9,000,000.0 |
| hundred thousands | 900,000.0 |
| ten thousands | 90,000.0 |
| thousands | 9,000.0 |
| hundreds | 900.0 |
| tens | 90.0 |
| ones | 9.0 |
| tenths | 0.9 |
| hundredths | 0.09 |
| thousandths | 0.009 |
| ten thousandths | 0.0009 |
| hundred thousandths | 0.00009 |
| millionths | 0.000009 |

So, when you were asked to change 6/7 to a decimal and express your answer to the nearest tenth, many of you provided .85 as the answer. Actually, it is 0.85 rounded to the nearest tenth as 0.9. Remember I told you that in our program, we put the zero in front of the decimal do avoid confusion. Do not forget to put it there because your answer will be marked incorrect! The 0.85 would be correct if you were asked to round to the nearest hundredths.

VI. Next we need to look at identifying which fraction has the largest value. Actually, there are two ways to do this. One is to simply change the fraction to a decimal. Let's look at the following:

$\frac{3}{4}$ or $\frac{4}{5}$

0.75
0.80 The 8 is bigger than the 7 so 4/5 is the larger of the two fractions.

The other way to do this is to multiply the denominator of the first fraction by the numerator of the second fraction and repeat with the second fraction. Like this:

(15) (16)
$\frac{3}{4} \times \frac{4}{5}$

So again, 16 is bigger than 15 so 4/5 is correct! Don't you wish they would have made it this easy is school! **Let's practice a few. Use either method you would like. Which has the greatest value:**

1. 1/100 or 1/150: ____________________
2. 3/7 or 1/2 : ____________________
3. 13/20 or 3/5: ____________________
4. 1/4 or 1/10: ____________________

VII. Okay. Adding, subtracting and multiplying decimals. Easy stuff!

Adding 1.452 + 1.3

Line the decimals up:
```
  1.452
+ 1.3
```

"Pad" with zeros:
```
  1.452
+ 1.300
```

Add:
```
  1.452
+ 1.300
  2.752
```

Subtracting 0.03 – 1.1=

Line the decimals up:
```
  1.1
- 0.03
```

"Pad" with zeros:
```
  1.10
- 0.03
```

Subtract:
```
  1.10
- 0.03
------
  1.07
```

Dividing 9.1 by 7 =

Ignore the decimal point and use long division:

```
    13
7 )91
   9
   7
   21
   21
    0
```

Put the decimal point in the answer directly above the decimal point in the dividend:

```
    1.3
7 )9.1
```

Multiplying decimals like 0.03 x 1.1

Multiply  normally, ignoring the decimal points. THEN put the decimal point in the answer. It will have as many decimal places as the two original numbers combined. Just count up how many numbers are after the decimal point in *both* numbers you are multiplying and your answer should have that many numbers after its decimal point.

| | |
|---|---|
| start with: | **0.03 × 1.1** |
| multiply without decimal points: | **3 × 11 = 33** |
| 0.03 has **2 decimal places**, | |
| and 1.1 has **1 decimal place**, | |
| so the answer has **3 decimal places**: | **0.033** |

**Now you try some:**

1. 6.8 x 0.123 = ____________________
2. 52.4 x 9.345 = ____________________
3. 69 ÷ 3.2 = ____________________
4. 125 ÷ 0.75 = ____________________
5. 0.008 + 5 = ____________________

VIII. Which decimal is the largest? We have covered this a little bit already but all you have to do is line up the numbers and go number by number until you see which is largest. Example:

0.674
0.659

Here, the "6es" are equal but when we move to the right, we see a "7" and a "5". Which is larger? The 7, so 0.674 is larger than 0.659.

Here is another one:

0.652
0.729
0.13

IX: Solving for *x*. Remember when you said "Algebra…man, I am never going to use this stuff, why do I have to learn it?" Well guess what?

Solving for *x* involves a bit of algebra. In some of the examples on your pretest, you had ratios 1:3 and you had fractions 1/3. Note that a ratio and a fraction are the same thing. So 1:2 is the same as 1/2. So let's solve for *x.*

2:10::5:X This reads like this "Two is to ten as five is to x." When we have a ratio and proportion problem like this, we can solve it if by multiplying the means and the extremes. What is that you say?

2:10::5:X The means are on the inside and extremes on the outside. So $\frac{50}{2x} = \frac{\not{2X}}{\not{2x}}$

25 = x

Remember we said our goal was to get the *x* by itself, right? So we divide both sides by the number with the *x* which in this case was 2. The 2s cancel each other out, leaving only the *x* on the right side of the equation. Then 50 ÷ 2 = 25! You try a few:

1. 0.9:100::x:1000 ____________________
2. 3:5::x:10 ________________________
3. 1/10:x = ½:15 ____________________ (a fraction and ratio are the same)

X. Percentages. This seemed to cause a lot of trouble on the pretest. So let's take a closer look. First, when you see a % sign you should automatically think "100." So 2% means 2 parts of 100 and 0.9% means 0.9 parts of 100. Percents may be expressed as fractions, decimals or ratios. For example 60%.

| Percent | Fraction | Decimal | Ratio |
|---|---|---|---|
| 60% | 60/100 | 0.60 | 60:100 or 3/5 3:5 |
| 10% | 10/100 | 0.1 | 1:10 |
| 22% | 22/100 | 0.22 | 22:100 |
| 150% | 150/100 | 1.50 | 150:100 or 1.5 |

**YOUR TURN!**

| Percent | Fraction | Decimal | Ratio |
|---|---|---|---|
| 35% | | | |
| | 4/100 | | |
| | | 0.45 | |
| | | | 12.5:100 |

XI. Last thing! Finding percentages. As much as we love a sale, we would think we would be better at this, right? Let's say that you see an ad in the newspaper for 40% off all items in your favorite clothing store. How is the best way to go about calculating your savings on an item that is marked $25.00.

40/100 × 25/1 = x

Why 40/100? Because remember…when you see a % sign, you need to think 100. In this case, 40 parts of 100. So if we multiply we find that we are actually going to be able to take $10.00 off of this item and only pay $15.00.

I also like to remind students of the terms *of* and *is*. Typically in math, *of* is saying multiply and *is* means equals. So if you read the problem above, I am actually saying "40% **of** 25 **is** x."

Let’s try some others.

1. 5% of 95 _______________ or $5/100 \times 95 =$
2. ¼% of 2000 ____________ or $0.25/100 \times 2000 =$

Let’s switch it up remembering **is** and **of:**

1. 2 is what % of 600 or $2= x/100 \times 600/1$
2. 20 is what % of 100 or $20 = x/100 \times 100/1$
3. 30 is what % of 164 or $30 = x/100 \times 164$

So, that’s it! I am attaching some practice sheets for you and remember to complete chapters 1-5 in your Morris text as a review for the test you will have on the $30^{th}$. If you do not feel like you quite “have it down pat,” there are other sessions that will identical to this one and you may attend for reinforcement.