Solution Guide for Chapter 15

Here are the solutions for the "Doing the Math" exercises in *Kiss My Math*!

DTM from p.241

2. $2\times2\times2\times2\times2\times5\times5$

First, we count a total of five 2's, and also a total of two 5's, so that's:

$(2\times2\times2\times2\times2)\times(5\times5) = 2^5\times5^2$

Answer: $\mathbf{2^5\times5^2}$

3. $10\times10\times10\times10\times10\times10$

There are six 10's, so that's just: 10^6

Answer: $\mathbf{10^6}$

4. $12 \times 12 \times 7 \times 7 \times 12 \times 7 \times 12$

Here, we count a total of four 12's being multiplied, and three 7's, so:

$(12 \times 12 \times 12 \times 12) \times (7 \times 7 \times 7) = 12^4 \times 7^3$

Answer: $\mathbf{12^4 \times 7^3}$

5. $(0.2) \times (0.2) \times (0.2) \times (0.2)$ *Hint: treat (0.2) like any other number, and leave the parentheses on.*

Here, there are a total of four (0.2)'s being multiplied, so get: $(0.2)^4$

Answer: $\mathbf{(0.2)^4}$

DTM from p.248

2. $(-5^2) = ?$

The parentheses aren't separating anything from anything else, so we can drop them:

$(-5^2) = -5^2$

Now, notice that the exponent isn't touching the negative sign; it's only touching the 5. If it were written like this: $(-5)^2$, then it would affect the negative sign, but it's not. In fact, we can show that negative sign for what it really is; it's (–1) multiplying times the 5^2. So:

$(-5^2) = -5^2 = (-1)(5^2) = -25$

Answer: **–25**

3. $-5^3 - (-5)^2 = ?$

First, let's look just at the first term: -5^3

The exponent isn't touching the negative sign, so the negative sign will remain, after the exponent does its thing (of course, in this case it wouldn't make a difference since the exponent is odd): $-5^3 = -125$. Now our expression looks like:

$-125 - (-5)^2$

Now, don't be tempted to change that double negative into a plus sign; we can't because the exponent is touching the outside of the parentheses, which contain one of the negative signs! So we must let that negative sign get affected by the exponent, and since the exponent is even, the negative sign inside the parentheses will go away: $(-5)^2 = 25$

Now the entire expression looks like this: $-125 - (25)$

Now we can change the subtraction to adding a negative, and finish the problem:

$-125 - 25 = -125 + (-25\_ \quad -150$

Answer: **–150**

4. $-2^6 - 9^2 = ?$ *Hint: this will have a different answer from #1.*

Looking at just the first term, we notice that the exponent is not affecting the negative sign, so: $-2^6 = -(2\times 2\times 2\times 2\times 2\times 2) = -64$

Now our expression looks like:

$-64 - 9^2$

Again, we can notice that the exponent "2" is not affecting the negative sign in front of the 9, so our expression becomes: –64– 81.

To finish, let's rewrite the subtraction as "adding a negative":

$-64 - 81 = -64 + (-81) = -145$

Answer: **–145**

5. $(-184.5)^4 - (184.5)^4 = ?$ *Hint: you do NOT need a calculator to solve this one – don't even think about it, missy. Start by writing it out in expanded form, but don't' multiply anything out – look at the negative signs, and see what happens!*

Okay... if we're not supposed to use a calculator with such big numbers, then what's going on here? Let's write an easier version of this problem, to see what's going on.

Instead of 184.5, let's use 3:

$(-3)^4 - (3)^4 = ?$

For the first term, the exponent is touching the negative sign, so the negative signs will cancel, and we'll end up with something positive (in this case, 81). For the second term, the exponent definitely isn't touching any negative sign, so we'd end up with:

$81 - 81 = 0$.

And now you can see how it doesn't matter what (positive) number takes the place of 3; the two terms will be identical, and when they subtract, we'll always end up with zero!

Answer: **0**

DTM from p.251-2

2. $(\frac{3}{4})^2 - \frac{11}{16} = ?$

Okay, first let's deal with that first term: $(\frac{3}{4})^2$

We know from our shortcut that: $(\frac{3}{4})^2 = \frac{3^2}{4^2}$, so our expression becomes:

$\frac{9}{16} - \frac{11}{16} = ?$

And since we have the same denominator, we can just combine the numerators:

$\frac{9-11}{16} = \frac{9+(-11)}{16} = \frac{-2}{16} = -\frac{1}{8}$.

Answer: $\mathbf{-\frac{1}{8}}$

3. $(0.5)^2 - |-0.25| = ?$

Dealing with just the first term, $(0.5)^2$, we can do decimal multiplication and evaluate

$(0.5 \times 0.5) = 0.25$

(For a review of decimal multiplication, see Chapter 10 in *Math Doesn't Suck*.)

Now our expression looks like this:

$0.25 - |-0.25|$

But we know that the absolute value bars mean the "distance from –0.25 to zero", which is equal to 0.25, so, our expression now becomes:

$0.25 - 0.25 = 0$. Done!

Answer: **0**

4. $-27|-\frac{2}{3}|^3 = ?$

So our first question is: What is the exponent touching? It's touching the outside of the absolute value bars, which means we could rewrite the expression like this if we wanted:

$-27\times|-\frac{2}{3}|\times|-\frac{2}{3}|\times|-\frac{2}{3}|$. And we know that each $|-\frac{2}{3}| = \frac{2}{3}$, so now we could rewrite the expression as: $-27\times\frac{2}{3}\times\frac{2}{3}\times\frac{2}{3} = -27(\frac{2}{3})^3$

Applying our shortcut, we can bring in the exponent to the top and bottom of the fraction, and get: $-27(\frac{2^3}{3^3})$. Now we just apply the exponents, multiply, and reduce:

$-27(\frac{2^3}{3^3}) = \frac{-27}{1}(\frac{8}{27}) = -\frac{27\times 8}{1\times 27}$ (cancel common factors)$= -\frac{\cancel{27}\times 8}{1\times\cancel{27}} = -\frac{8}{1} = -8.$

Answer: **–8**

5. $-3|(-1)^2-(-1)^3|^2$ *Hint: start by simplifying just what's inside the bars!*

Remember, PEMDAS tells us to treat absolute value bars like parentheses, when deciding what to do first when simplifying an expression. Since there's a big mess inside those bars, we need to deal with that first. Just the inside: $(-1)^2-(-1)^3$ itSo, the first term will become a positive 1, since the even exponent affects it. Now the expression becomes: $1-(-1)^3$, right? Next, we see that the 3 exponent does affect the negative sign, so $(-1)^3 = -1$. Now the inside expression becomes: $1-(-1)$. Now that the exponents are gone, it's safe to let that double negative become a plus sign: $1-(-1) = 1+1 = 2$. Ah, so much better! With our new "insides", let's rewrite our original expression:

$$-3|\mathbf{(-1)^2-(-1)^3}|^2$$

$$= -3|\ \mathbf{2}\ |^2$$

Since we know that $|\ 2\ |^2 = 4$, and now the expression becomes $-3(4) = -12$.

Answer: **–12**