San José State University
Fall 2015
Math-8: College Algebra
Section 03: MW noon–1:15pm
Section 05: MW 4:30–5:45pm

Quiz #4

1. Expand: $(5xy + 2z)^2$

This is just a FOIL problem: $(a+b)^2 = a^2+2ab+b^2$, with $a = 5xy$ and $b = 2z$. So doing the foil we get:

$$\begin{aligned}(5xy + 2z)^2 &= (5xy)^2 + 2(5xy)(2z) + (2z)^2 \\ &= 5^2x^2y^2 + 20xyz + 2^2z^2 \\ &= 25x^2y^2 + 20xyz + 4z^2\end{aligned}$$

2. Put in general form: $(3x + 2)(3x - 2) - (2x + 5)(x - 1)$

Note that the left-hand size is a difference of squares. The right-hand side needs to be FOIL'd in the regular way. Be careful to keep the correct scope on the intervening minus sign!

$$\begin{aligned}(3x + 2)(3x - 2) - (2x + 5)(x - 1) &= ((3x)^2 - 2^2) - (2x^2 + 3x - 5) \\ &= 9x^2 - 4 - 2x^2 - 3x + 5 \\ &= (9x^2 - 2x^2) - 3x + (5 - 4) \\ &= 7x^2 - 3x + 1\end{aligned}$$

3. A box is 5 inches longer than it is wide and it is 5 inches deep. Find the *length* of the box if the total volume is 250 cubic inches.

The way the problem is worded suggests that we make w=width be our variable. Since the length is 5 inches greater than the width, $l = w + 5$. The depth is given as $d = 5$ inches. Since the formula for the volume of a box is $width \times length \times depth$, and since the total volume is 250 cubic inches:

$$\begin{aligned}5w(w + 5) &= 250 \\ w(w + 5) &= 50\end{aligned}$$

$$\begin{aligned} w^2 + 5w &= 50 \\ w^2 + 5w - 50 &= 0 \\ (w+10)(w-5) &= 0 \\ w &= -10, 5 \end{aligned}$$

Since dimensions must be positive, we discard -10 and conclude that our width is 5 inches. But, the problem asked for the length:

$$length = width + 5 = 5 + 5 = 10 \text{ inches}$$

4. You have a credit card with an 30% per year interest rate that compounds monthly. Your first statement indicates that you made $1000 in purchases, so you make a $100 payment. The second statement indicates that you made $500 in new purchases, so you make another $100 payment. The third statement says that you didn't make any new purchases, so you pay $200. What is your account balance after the last $200 payment?

This problem involves the repeated application of the compound interest formula over a couple of compounding periods. Instead of the original principle remaining the same, as in the previous problems, the principle now changes with various deposit and withdraw events.

So here is how we determine the coefficients for the polynomial:

Start of Month	Purchases	Payments	Net
1	1000	100	900
2	500	100	400
3	0	200	-200

Since the problem asks for the balance as soon as the last $200 dollar payment is made, we don't wait another whole month. Thus, the problem lasts for only 2 months, or 2 compounding periods. So, we use the coefficients to build our polynomial:

$$900x^2 + 400x - 200$$

where $x = 1 + \frac{0.30}{12}$. Plugging this into your calculator should yield the answer: $1155.56.

Note that each term in the polynomial is an instance of the compounded interest formula, telling how a deposit or withdrawal affects the balance. Positive values indicate an increase in the account value on which interest must be paid. Negative values indicate a decrease in the account value and adjust the interest accordingly.