Math 5B: Classwork 11

Review

Powers: $a^n = a \times a \times a \times ... \times a$ (n times)

$a^0 = 1$ read: a-to-the-zero
$a^1 = a$ is just itself 'a'
$(ab)^n = a^n \times b^n$
$a^n a^m = a^{n+m}$
$\dfrac{a^n}{a^m} = a^{n-m}$
$a^n = \dfrac{1}{a^{-n}}$, $a^{-n} = \dfrac{1}{a^n}$

Base 4 number system: In base 4 system we have only 4 digits: 0, 1, 2, 3. When we have 4 items to count we do not have digit 4 and cannot use it. We have to use the next place value position (similarly to moving from the place value for the once to the place value for the tens in the base-10 number system). Let's name 4 items with a □, and 16 items with □□□□. Check your class notes.

Classwork

1. Simplify the following and show the answer in the exponent (power) form

(a) $\dfrac{3^7 \cdot 2^7}{2^3 \cdot 2^4} =$

(b) $\dfrac{6^5 \cdot 2^4}{3^5 \cdot 2^2} =$

(c) $\dfrac{7^9 \cdot 2^5}{7^2 \cdot 2^4} =$

(d) $\dfrac{11^4}{11^2 \cdot 5^2 \cdot 5^3} =$

(e) $7^4 \cdot 11^2 \cdot 11^{-5} \cdot 7^2 =$

(f) $\dfrac{3^{-5} \cdot 2^7}{3^{-3} \cdot 2^4} =$

(g) $\dfrac{42^2}{6^2} =$

(h) $\dfrac{3^5 \cdot 3^{-5}}{3^9} =$

(i) $\dfrac{x^2 \cdot y^2 \cdot x^{-3}}{x^2}$

2. Solve the equations:

(a) $\dfrac{9}{13} z = 3$ (b) $|x| = 2$ (c) $|x + 11| = 2$

(d) $\dfrac{x}{2} + 1 = \dfrac{4x}{7}$ (e) $x = \dfrac{1}{4}x + 6$ (f) $\dfrac{x+3}{x+1} = 4$

3. *Optional – only if you think you need additional practice.*
   Compute, but be very attentive to signs and the order of operations (first: operations in brackets, then multiplication or addition, then addition or subtraction). Show all the steps!

   a. $(-5 - 9) \div (-2) + 7 =$

   b. $-2(-5 - 9) - 7 \times 4 =$

   c. $-9 + 14 \div (-2) + 7 =$

   d. $(-2) \times (-2) \times (-2) \times (-2) \times (-2) =$

   e. $-16 \div (-8) =$

   f. $-16 \div 8 =$

   g. $16 \div (-8) =$

4. Anna has 60 coins which should be identical but one of them is fake. The fake one looks the same as all other coins but is lighter. Using balance scales, but not weights so you should put coins on both platforms, what is the fastest way to finding the fake coin? What would you do if you do not know whether the fake coin is lighter or heavier than the real ones?

5. A fish head weighs as much as the tail and half of the body together. The body weighs as much as the head and tail together. If the tail weighs 1 kg, how heavy is the fish?

6. Base 4 numbers:

a) add two base 4 numbers together:

$$123 \qquad\qquad 3201$$
$$\underline{+\ 321} \qquad\qquad \underline{+\ 2310}$$

*[Do not add in base 10 and translate the result to base 4, try performing addition in base 4, **think base 4**]*

b) Write a formula, instruction, or algorithm on how to translate base 4 number **abcd** to base 10 number, where **a**, **b**, **c**, **d** can be 0, 1, 2, or 3.

c) Translate the numbers and the results from a) into the base-10 system

7. Here are phrases in Swahili with their English translations:
   atakupenda – He will love you.
   nitawapiga – I will beat them.
   atatupenda – He will love us.
   anakupiga – He beats you.
   nitampenda – I will love him.
   unawasumbua – You annoy them.

Translate the following into Swahili:
   You will love them.
   I annoy him.