Math 5b, homework 2.

Exercises:

1. Represent a^{36} as an exponent with the base

   $a.\ a^2;$ $b.\ a^3;$ $c.\ a^4;$ $d.\ a^6;$ $e.\ a^9;$ $f.\ a^{12};$ $g.\ a^{18}$

2. Simplify:
   Example:

   $2^7 \cdot 2^5 = 2^{7+5} = 2^{12};$ $5^{10} \cdot 5^{-4} = \frac{5^{10}}{5^4} = 5^{10-4} = 5^6;$

   $a.\ 2^{12} \cdot 2^3;$ $b.\ 5^{11} \cdot 5^7;$ $c.\ 3^8 \cdot 3^{-3};$ $d.\ c^{11} \cdot c^7;$

3. Compare the following exponents:

   $a.\ 2^6$ *and* $4^3;$ $b.\ 10^{100}$ *and* 100^{10}

   $c.\ 32^{12}$ *and* $64^{10};$ $d.\ 31^{16}$ *and* $17^{20};$ $e.\ 125^3$ *and* 5^{10}

4. Prove that

   $4^{14} + 2^{22}$ is divisible by 13

5. Write the numbers 45 and 165 in binary system.
   Example:
   $55 = 32 + 16 + 4 + 2 + 1 = 2^5 \cdot 1 + 2^4 \cdot 1 + 2^3 \cdot 0 + 2^2 \cdot 1 + 2^1 \cdot 1 + 2^0 \cdot 1$
   In binary system 55 should be written as 110111.

6. Write the numbers, written in the binary system in decimal system:
   Example: 10011011
   $2^7 \cdot 1 + 2^6 \cdot 0 + 2^5 \cdot 0 + 2^4 \cdot 1 + 2^3 \cdot 1 + 2^2 \cdot 0 + 2^1 \cdot 1 + 2^0 \cdot 1 = 128 + 16 + 8 + 2 + 1$
   $= 189$

   $a.\ 1011011;$ $b.\ 101101,$ $c.\ 111111$

7. Write the number 520 in 3-based place-value system. Remember, that in this system you will have only 0, 1, 2 as digits.

3^0	3^1	3^2	3^3	3^4	3^5
1	3	9	27	81	243

Example: 535

$535 = 243 \cdot 2 + 81 \cdot 0 + 27 \cdot 1 + 9 \cdot 2 + 3 + 1$

$= 3^5 \cdot 2 + 3^4 \cdot 0 + 3^3 \cdot 1 + 3^2 \cdot 2 + 3^1 \cdot 1 + 3^0 \cdot 1$

In the based 3 system 535 should be written as 201211.

8. *Is it possible to arrange 127 dollar bills in seven wallets so that any amount from 1 to 127 dollars can be issued without opening the wallets?

9. Evaluate:

$$\frac{0.6 + 2.4 \cdot \left(3 - 0.7 \cdot \frac{5}{7}\right) - 7 : 3\frac{1}{2}}{\left(5\frac{1}{4} \cdot 4 - \left(5.9 - 2.7 : \frac{9}{11}\right)\right) \cdot 2\frac{1}{2}}$$

(Answer is 0.1).