## Math 4. Class Work 26

## **Combinatorics (3) and Review**

**Factorial !** = a short notation representing the multiplication of all whole numbers from 1 to the last number before the ! sign  $3! = 1 \cdot 2 \cdot 3 = 6$  $n! = 1 \cdot 2 \cdot 2 \cdot 4 \cdot \dots \cdot (n-1) \cdot n$ 

Combinations: in how many ways can we arrange or group elements of different types.

This can be done by counting all possible combinations. We must be careful if the order of the elements in the new groups matters; if the order doesn't matter, we may overestimate the number of calculations.

## Problems

1. In the United States, phone numbers are represented as 10-digit numbers, with the first 3 digits as the area code, the next 3 digits as the central office code, and the last 4 digits as the line number.

NMX	NXX	XXXX
$\smile$	$\sim$	
area code	central of fice code	line number

Area codes can't start with 0 or 1, and the middle digit can't be 9. The Central office codes can't start with 0 or 1. The Line number can have any of the 10 digits in any place. What is the number of possible phone numbers in the US?

- 2. An apartment building has 12 apartments and parking for 12 cars (each family has only one car, and all cars are different).
  - a) How many different ways are there to park these 12 cars?
  - b) Today, there were only 4 cars in the parking lot. How many different ways are there to park 4 cars on a 12-place parking lot?
- 3. Winnie the Pooh and Piglet shared a cake. Piglet whimpered that he didn't get enough. Then Pooh gave him a third of his share. From this, Piglet's amount of cake has tripled. What part of the cake did Pooh and Piglet have initially?
- 4. Students from 4<sup>th</sup> and 5<sup>th</sup> grades got 286 textbooks in the library. 5<sup>th</sup>-grade students got 20% more textbooks than 4<sup>th</sup>-grade students. How many textbooks got 5<sup>th</sup> graders?
- 5. Is the number positive or negative?

a)  $-5 \cdot 7^{24}$ ; b)  $(-5 \cdot 7)^{18}$ ; c)  $5 \cdot (-7)^7$ ; d)  $-(5 \cdot 7)^8$ ;

6. Arrange the numbers in increasing order:

a) -0.11;  $(-0.11)^2$ ;  $(-0.11)^3$ ;  $(-0.11)^4$ ;

- b)  $\left(\frac{1}{3}\right)^{30}$ ;  $\left(-\frac{1}{5}\right)^{30}$ ;  $-\left(\frac{1}{7}\right)^{30}$ ; c)  $\left(\frac{1}{8}\right)^{100}$ ;  $3.5^{0}$ ;  $-7^{22}$ ;  $(-1)^{73}$ ;  $(-8)^{30}$ ;  $(-2)^{19}$ ;  $\left(\frac{1}{8}\right)^{101}$
- 7. Remove parenthesis:
  - a) (x+3)(x+4) =
  - b)  $(2x+3) \cdot (x+1) =$

c) 
$$(3-x)(4x-2) =$$

## Start and continue next class: Properties of shape Area (S)

- I. Congruent shapes have equal areas.
- II. Any line has area zero.
- III. The area of a union of two shapes whose intersection is a line equals the sum of the areas of these shapes.
- IV. The area of a square with 1 cm sides is 1 cm<sup>2</sup>. (Any other unit may be used instead of cm)
  - 1. The rectangle **ABCD** on the drawing is split into two triangles:
    - a) Find the area of rectangle **ABCD**.
    - b) Compare areas of  $\triangle ABC$  and  $\triangle ACD$ .
    - c) Find the area of  $\triangle ABC$
  - 2. The area of the rectangle ABCD on the drawing is **x**. Show that the area of the  $\triangle DXC$  is  $\frac{1}{2}x$ .





 $S_{w} = 0$ 



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