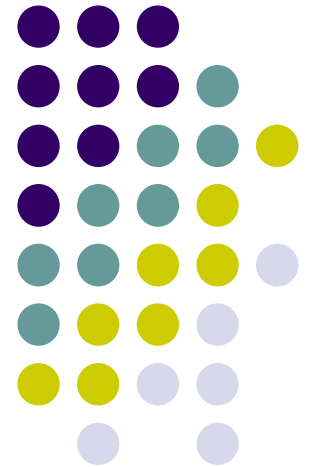
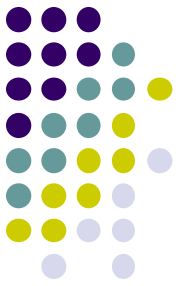
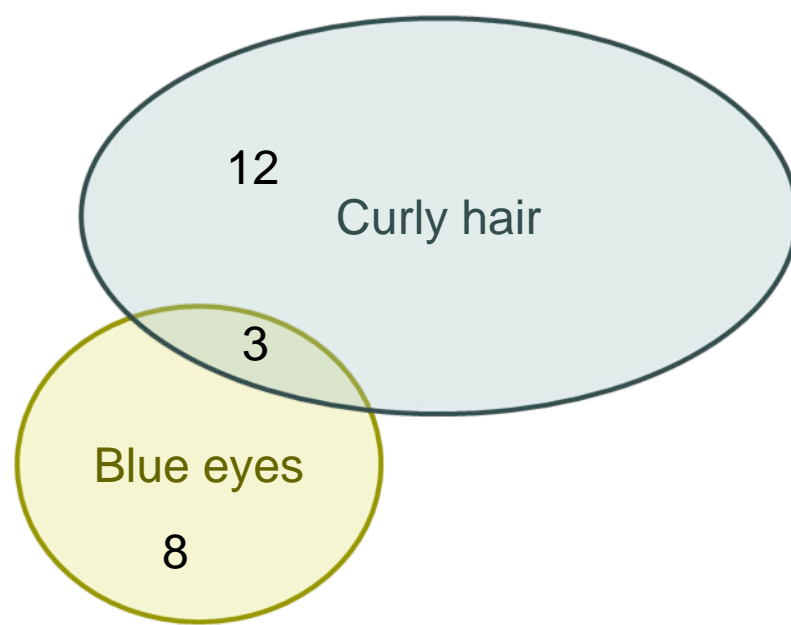


Whole numbers

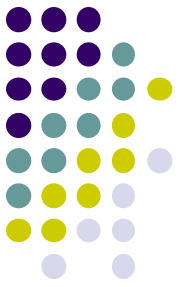


Quiz #2



1. $C = \{\text{people in Room 135 with curly hair}\}$, $B = \{\text{people in Room 135 with blue eyes}\}$
 1. Shade the union of sets B and C.
 2. How many people have blue eyes?
 3. If a person has brown eyes and curly hair where do they fit into the diagram (shade that portion)?
 4. What is the complement of $B \cup C$?
2. What does it mean that there is a 1-1 correspondence between two sets? Give an example of two sets that are equivalent.

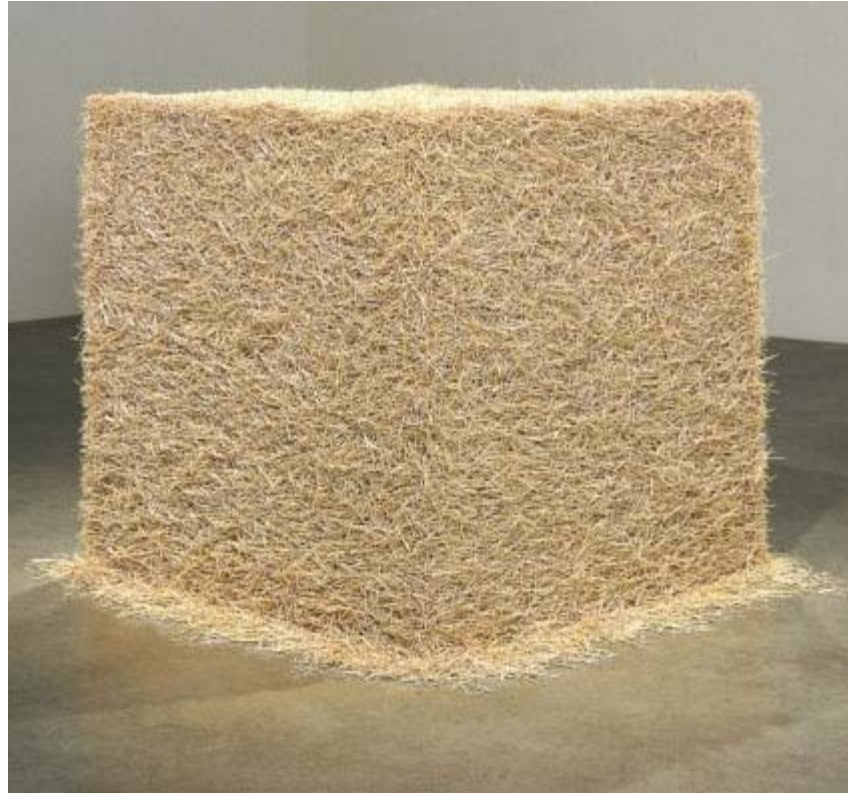
Caramel factory revisited



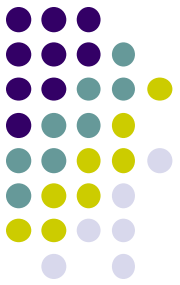
- The workers changed and now they can only count up to 3.
- How many caramels do you have on your table (a number should look as if you are filling an order, or in other words it should be in base 3)?



Discuss with your partner

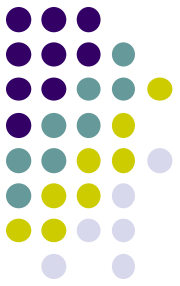


How would you count all these toothpicks?
How would you record how many there are?



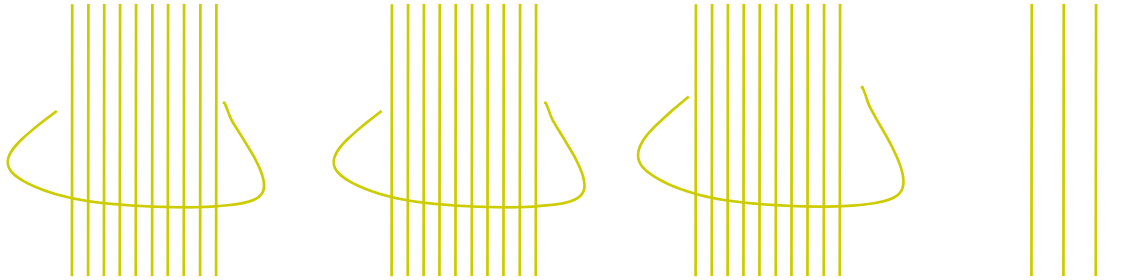
Hindu Arabic system

- Digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
- Grouping by 10s (decimal system):
 - Ten 1s are one 10.
 - 10 is called the base of the system



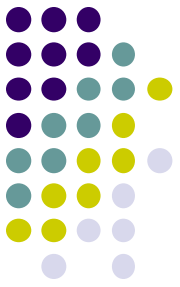
Models

- Sticks and bundles: 34



- Base ten blocks:





Place value

- Every place in a numeral has its value:

- 7839

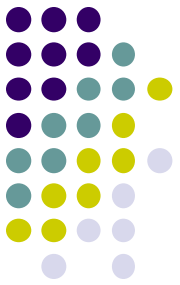
- 9 ones
- 3 tens
- 8 hundreds
- 7 thousands

1000	100	10	1
7	8	3	9



Caramel factory – base 4

- Write first 15 numerals in base 4 system.
- What is the number that comes after $23_{(4)}$?
- Express $132_{(4)}$ in base 10.
- What is 173 in base 4?



Decimal system

- It is both multiplicative and additive:

$$\begin{aligned}8397 &= 8 \cdot 1000 + 3 \cdot 100 + 9 \cdot 10 + 7 \cdot 1 = \\ &= 8 \cdot 10^3 + 3 \cdot 10^2 + 9 \cdot 10 + 7\end{aligned}$$

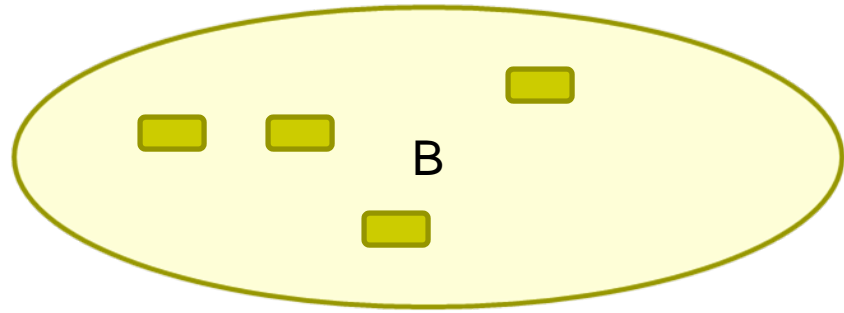
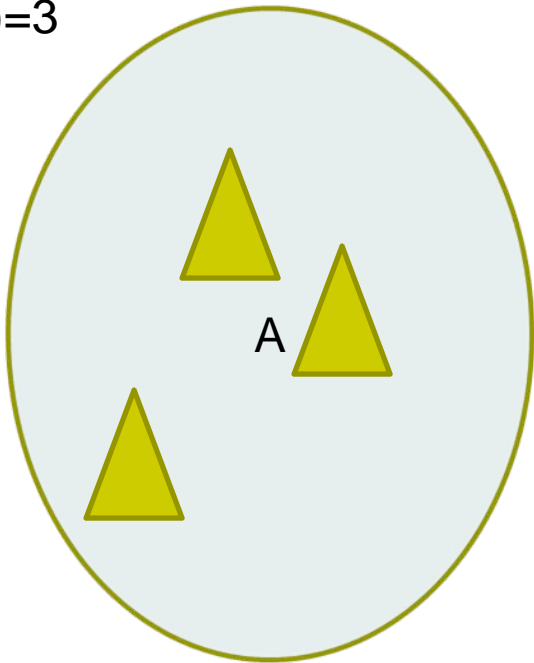
Expanded form



Sets --- numbers

- Set operations --- number operations?

$n(A)=3$



$n(B)=4$

What is $n(A \cup B)$?

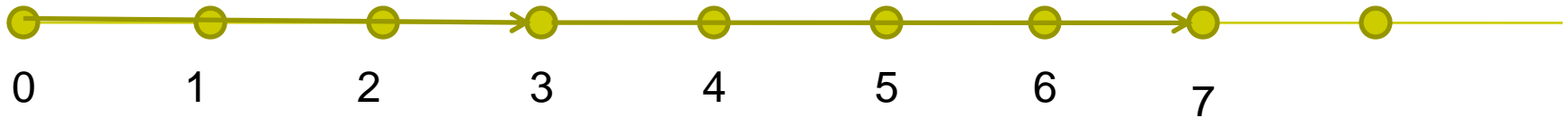
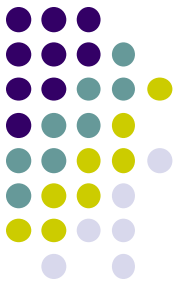
Would any two sets give us an answer that we expected?



Definition

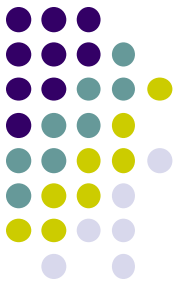
- Let a and b be any two whole numbers. If A and B are two disjoint sets with $n(A)=a$ and $n(B)=b$, then we define *sum of a and b* to be the whole number $n(A \cup B)$, and we denote it by $a+b$.
- a and b are called *summands* or *addends*.

Measurement model



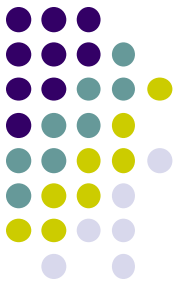
- Place two arrows tail to head.
- Add 3 and 4:

Does addition of whole numbers have properties we are used to?



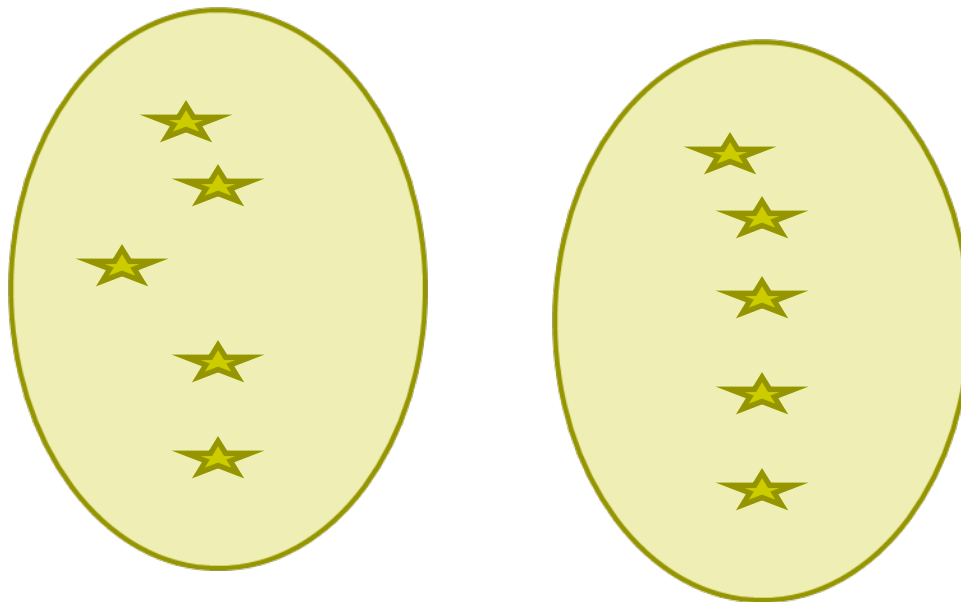
- If you add two whole numbers what kind of number do you get?
 - Whole
- Why?
- We say that the set of whole numbers is *closed under addition*.

Questions



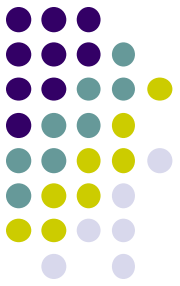
- Is the set of even numbers closed under additions? Why or why not?

We have shown three proofs. The last one I wrote was admittedly the least understandable. You might want to go back to the either algebraic one or the picture one. To do the picture just make it so that either number is not a specific one. I think we drew one of the numbers like this:



If we add few dots into each one, and make sure to note that two sets are equivalent. Then this could serve as a diagram representation of any even number. We can do similar thing for the other Even number, and proceed as we did in class.

Question:



- Is the set of odd numbers closed under addition? Why or why not?