



# CS 149

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(adapted from slides originally developed by Alvin Chao)



# Quick Review Quiz

Evaluate these expressions:

a)  $12 + \text{" dogs are barking"}$

b)  $12 + 24 + \text{" dogs are barking"}$

c)  $\text{"There are " + 12 + 24 + " dogs barking"}$

d)  $\text{"there are " + 24/10 + " dogs barking"}$



# Learning Objectives

- Learn about the modulo operator
- Working with input from the user

# Circle math

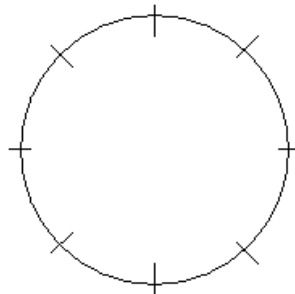
- Counting on a Line:



- $x+a$  moves you  $a$  units to the right of  $x$
- $x-b$  moves you  $b$  units to the left of  $x$

- Counting on a Circle

- $(x+a)$  moves you  $a$  units clockwise of  $x$
- $(x-b)$  moves you  $b$  units counterclockwise of  $x$





# Clock Arithmetic

- Background:
  - A 24-hour clock (00 - 23)
- It is now 17. What time will it be in 12 hours?
- The Naive Approach:
  - $17+12$  is 29. So, we have advanced a day. That means the time is actually  $29-24$  or 5.
- A Shortcoming of this Approach:
  - We might advance more than one day! (For example, advancing 93 hours from now.)



# The Modulo (%) Operator

- A Better Way
  - Use arithmetic on a circle(that goes from 0 to 23)
- Using int variables and % (modulo operator)
  - `future = (current + change) % 24;`

Modulo operator equates to the remainder of the division.

See section 3.7 in the textbook for more information.





# Even/Odd Numbers

- Definition
  - A number is even if it can be divided by 2 with no remainder
- Observe
  - If we think of all numbers as being either even or odd we can conceptualize this as a circle with two items in the cycle.
  - We can use the `%` operator to do this.
    - Does  $x \% 2$  equal 0?



# Input from the User

Input device: Keyboard

What types of things can a user type in?

- Strings
- integers
- doubles





# Scanner Class/Object

JAVA provided package for reading input from the user (section 3.2 of your book).

To use a class (besides String and System), you need to import the class. For Scanner, this is done as follows:

```
import java.util.Scanner;
```

Import statements go at the very top of your program (just underneath your first comment block).



# Creating a Scanner

```
Scanner in;
```

```
in = new Scanner(System.in);
```

When creating an object, we use the word `new`. When reading input, we need to tell scanner where to get the input? **System.in** means read it from the keyboard.



# Use Scanner

I want to read in an integer?

```
int myAge;
```

```
System.out.print("Enter your age?");
```

```
myAge = in.nextInt();
```

I want to read in a number with a decimal point?

```
double fahrenheit ;
```

```
System.out.print("Enter the temperature?");
```

```
fahrenheit = in.nextDouble();
```

Note that it is common to use **System.out.print** so that the cursor is left blinking next to the text.