

## 1.00 Tutorial 2

Data Types, Operators, Control  
Structures

### Data Types

- Review Tutorial 1 for any questions

## Control Structures Review

- Lists of control structures:

*branching*

- *if ... else ...*

*iteration*

- *for* loop
- *while* loop
- *do ... while* loop

## if .. else example

Consider the following code...

```
if (age > 18)
    if (age <= 25)
        System.out.println("Have to pay double the
        driving insurance");
    else
        System.out.println("Not eligible to drive");
```

What was the intent?

Is the execution correct?

If not correct it

## Answer

```
if (age > 18)
{
    if (age <= 25)
        System.out.println("Have to pay double the
driving insurance");
}
else
System.out.println("Not eligible to drive");
```

## if...else tip

- Unless braces are used to explicitly denote which *if* clause is associated with an *else* clause, the *else* clause is associated with the nearest *if* clause that precedes it.

## if...else another example

```
s = 0;  
if (x>0)  
s++;  
if (y>0)  
s++;
```

```
s = 0;  
if (x>0)  
s++;  
else  
if (y>0)  
s++;
```

What is the difference between the above two statements?

## Iteration

- How would you write a *for* loop that calculates the sum of even numbers from 2 to 20?
- Can you use a *while* loop to do the calculation instead?
- The three different kinds of loops are interchangeable. Sometimes one loop might be better than the other. Do you know the differences?

## Question

```
int x = 10;
while (x < 20)
{
System.out.println("in the loop");
}
```

What is wrong with the above code fragment?

## Question

```
int x = 10;
do
{
System.out.println("in the loop");
}
while(x <5);
```

What is the output?

## Question

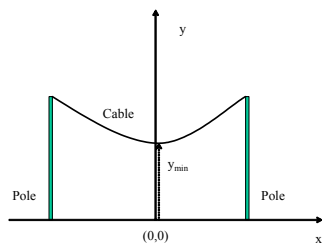
- What does the following loop print?

```
int fact = 1;
int i = 1;
for (i = 1; i < 5; i++);
fact = fact * i;
System.out.println(fact);
```

## Problem Set 2

Given  $y_{min}$ ,  $x$ ,  $y$  and cable weight  $w$ , compute the tension

Compute the height of the cable at 1m intervals

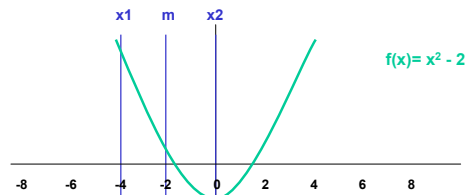


## Problem Set 2

$$f(T) = y_{\square} \frac{T_{\square}}{w} \cosh\left(\frac{wx_{\square}}{T_{\square}}\right) - y_{\min} + \frac{T}{w_{\square}}$$

- Find T by finding the root of f(T) using bisection

## Bisection (1)

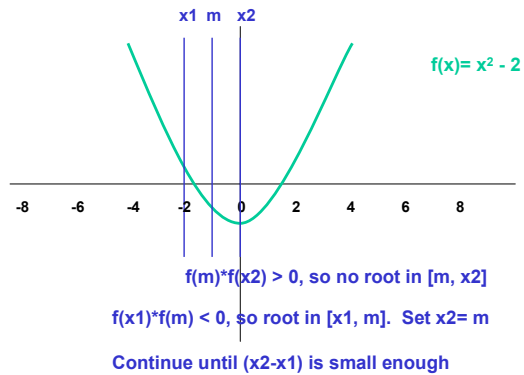


$f(x_1) \cdot f(m) > 0$ , so no root in  $[x_1, m]$

$f(m) \cdot f(x_2) < 0$ , so root in  $[m, x_2]$ . Set  $x_1 = m$

Assume/analyze only a single root in the interval (e.g.,  $[-4.0, 0.0]$ )

## Bisection (2)



## Bisection Pseudo code

```
bisect(min, max)
{
  calculate mid;
  while(interval > tolerance)
  {
    calculate mid;
    if([min, mid] contains root)
      max = mid;
    else
      min = mid;
  }
  return mid;
}
```