What are models and simulations?

Journal

If I flip a coin 10 times, is it possible to predict exactly how many times will come up heads?
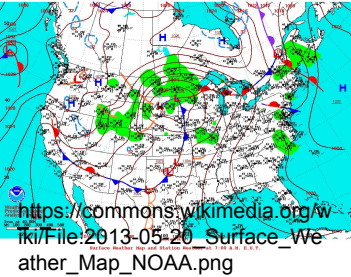
Why or why not?

Unit 4 Lesson 2

- Students will identify real-world examples of models and simulations.
- Students will understand that models and simulations are used to generate new knowledge, as well as to formulate, refine, and test hypotheses.
- Students will understand that simulations allow hypotheses to be tested without the constraints of the real world.
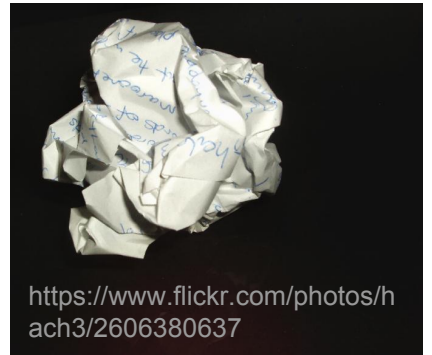
Using models and simulations

1. What is the chance it will rain tomorrow?

2. How many hits will your favorite baseball player make in the next game?

3. If you toss a crumpled sheet of paper into the recycle bin from across the classroom, how likely is it to make it in?

What information is needed to figure out the answers to these questions?
How can you make your estimate as accurate as possible?

Abstraction

Reducing the details in a problem to focus on concepts necessary to understand and solve the problem.
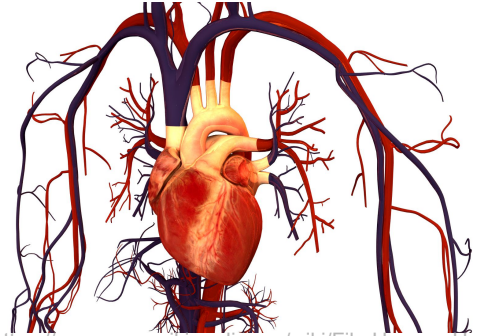
Fast **Good**
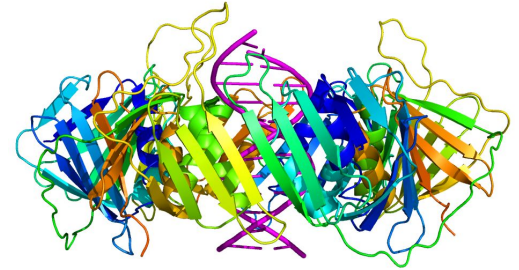
Cheap

Time and money are always practical considerations. How accurate do you NEED to be? What details are necessary?

Medical simulation: The heart Homework share-out

Human heart simulation

Multi-scale Multi-physics [Heart Simulator](#) UT-Heart (5:15)

What other simulations did you brainstorm?

https://commons.wikimedia.org/wiki/File:
Mars_Polar_Lander_parachute_descent
_illustration.jpg

Space simulation

How can you test a parachute to be used on Mars?

https://www.youtube.com/watch?v=_jOzxEOIDJg (1:11) describes the physical test.

Before they test, they create models and simulate on the computer. Why?

More Interactive Simulations

[Phet Science](#) (search "by device" - chromebook)

When you are running these simulations think about what questions these could solve.
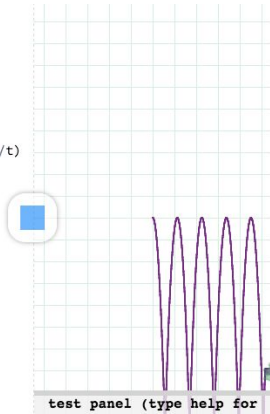
Discuss Simulations

Key vocabulary:

    Probability

    Model Simulation

    Hypothesis

Homework:
Math and Science simulations

```
1  speed Infinity
2  pen purple
3  vx = 0.2
4  vy = 0
5  t = 100
6  a = -9.8
7  forever t, ->
8    move vx, vy
9    if inside(window)
10     vy = vy + (a * 1/t)
11   else
12     vy = vy * -1
13   log vy
14
```

test panel (type help for

Bouncing Turtle

https://computationalthinkingcourse.withgoogle.com/unit?lesson=16&unit=7

The Game of Life, cellular automata

https://computationalthinkingcourse.withgoogle.com/unit?lesson=10&unit=2

		1	1	1		
		2	1	2		
1	2	5	4	5	2	1
1	1	4	4	4	1	1
1	2	5	4	5	2	1
		2	1	2		
		1	1	1		

1	2	3	2	1
2	2	4	2	2
3	4	8	4	3
2	2	4	2	2
1	2	3	2	1