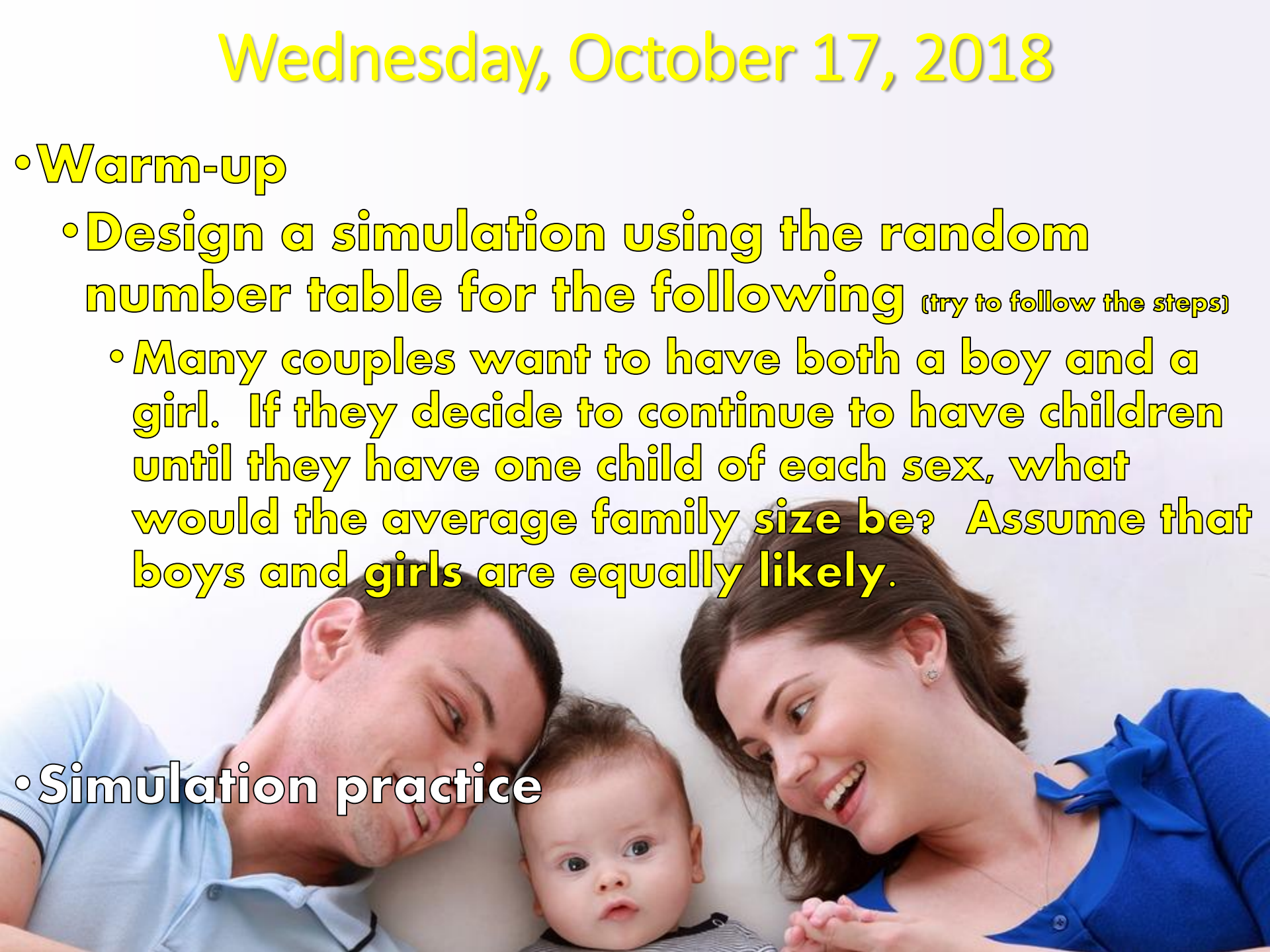
Wednesday, October 17, 2018

- Warm-up
  - Design a simulation using the random number table for the following (try to follow the steps)
    - Many couples want to have both a boy and a girl. If they decide to continue to have children until they have one child of each sex, what would the average family size be? Assume that boys and girls are equally likely.



- Simulation practice

Check homework

9. Play the lottery.

If the lottery is random, it doesn't matter if you play the same favorite "lucky" numbers or if you play different numbers each time. All numbers are equally likely (or, rather, UNLIKELY) to win.

2 → 1, 1
3 → 2, 1 1, 2
4 → 2, 2 3, 1 1, 3

10. Play it again, Sam.

If the lottery is random, it doesn't matter if you play random numbers or not. All numbers are equally likely (or, rather, UNLIKELY) to win.

11. Bad simulations

a) The outcomes are not equally likely. For example, the probability of getting 5 heads in 9 tosses is not the same as the probability of getting 0 heads, but the simulation assumes they are equally likely.

b) The even-odd assignment assumes that the player is equally likely to score or miss the shot. In reality, the likelihood of making the shot depends on the player's skill.

c) Suppose a hand has four aces. This might be represented by 1,1,1,1, and any other number. The likelihood of the first ace in the hand is not the same as for the second or third or fourth. But with this simulation, the likelihood is the same for each.

12. More bad simulations.

a) The numbers would represent the sums, but the sums are not all equally likely. For example, the probability of rolling a 7 is 6/36, but the probability of getting a 2 is only 1/36. The simulation assumes they are equally likely.

b) The number of boys in a family of 5 children is not equally likely. For example, having a total of 5 boys is less likely than having 3 boys out of 5 children. The simulation assigns the same likelihood to each event.

c) The likelihood for out, single, double, triple, and home run are not the same. The outcome of an at bat depends on the player's skill. The simulation assumes that these outcomes are equally likely.

Check homework

3. **The lottery.**

   In state lotteries, a machine pops up numbered balls. If the lottery were truly random, the outcome could not be predicted and the outcomes would be equally likely. It is random only if the balls generate numbers in equal frequencies.

4. **Games**

   Answers may vary.

   Rolling one or two dice: If the dice are fair, then each outcome, 1 through 6 should be equally likely.

   Spinning a spinner: Each outcome should be equally likely, but the spinner might be more likely to land on one outcome than another due to friction or design.

   Shuffling cards and dealing a hand: If the cards are shuffled adequately (7 times for riffle shuffling), the cards will be approximately equally likely to be in any given hand.

5. **Birth defects.**

   Answers may vary. Generate two-digit random numbers, 00-99. Let 00-02 represent a defect. Let 03-99 represent no defect.

6. **Colorblind.**

   Answers may vary. Generate random digits 0-9. Let 0 represent colorblind. Let 1-9 represent no color perception defect.

7. **Geography.**

   a) Looking at pairs of digits, the first state number is 45, Vermont. The next set is ignored since there is no 92nd state. The next state number is 10, Georgia.

   b) Continuing along, the next state number is 17, Kentucky. The next state number, 10, is ignored, since Georgia was already assigned. The final state number is 22, Michigan.

8. **Get rich.**

   Looking at pairs of digits, you would choose 43, ignore 68, since it is not a possible lottery pick, choose 09, ignore 87, choose 50, choose 13, ignore 09, since you already chose that number, choose 27. Your numbers are 43, 9, 50, 13, 27.

Objectives

- Content Objective: I will design a simulation, following the steps outlined.
- Social Objective: I will work well with a partner, making sure both of us understand and can explain the simulation.
- Language Objective: I will use correct vocabulary in discussing my simulation with my partner and in preparation to explain it to the class.

Many couples want to have both a boy and a girl. If they decide to continue to have children until they have one child of each sex, what would the average family size be? Assume that boys and girls are equally likely.

Model a boy or girl child.

Using a random digit table,

odd = boy, even = girl

1-5 = boy, 6-9+0 = girl

0-4 = boy, 5-9 = girl

73735	45963	78134	63873
02965	58303	90708	20025
98859	23851	27965	62394
33666	62570	64775	78428
81666	26440	20422	05720

Keep checking until each a boy and girl are represented. (start at top)

Record number of "children"

6, 3, 3, 3, 2

not including parents

$\frac{17}{5} = 3\frac{2}{5} = 3.4$ children is the average size

What?

How?

When to stop?

Answer?

Do it!

1. Identify the component to be repeated.
2. Explain how you will model the component's outcome.
3. Explain how you will combine the components to model a trial.
4. State clearly what the response variable is.
5. Run several trials.
6. Collect and summarize the results of all the trials.
7. State your conclusion.

[ ] ← optional

How will the calculator do?

1-10

Scratchpad

A

:D

menu

- **STEP 1: SEED the calculator…**

Number -> Rand( )
decimals 0-1

* Integer -> RandInt(min, max, quantity)
Binomial -> allows to set probability
Normal -> follows normal probability

Probability
L> Random

optional

Many couples want to have both a boy and a girl. If they decide to continue to have children until they have one child of each sex, what would the average family size be? Assume that boys and girls are equally likely.

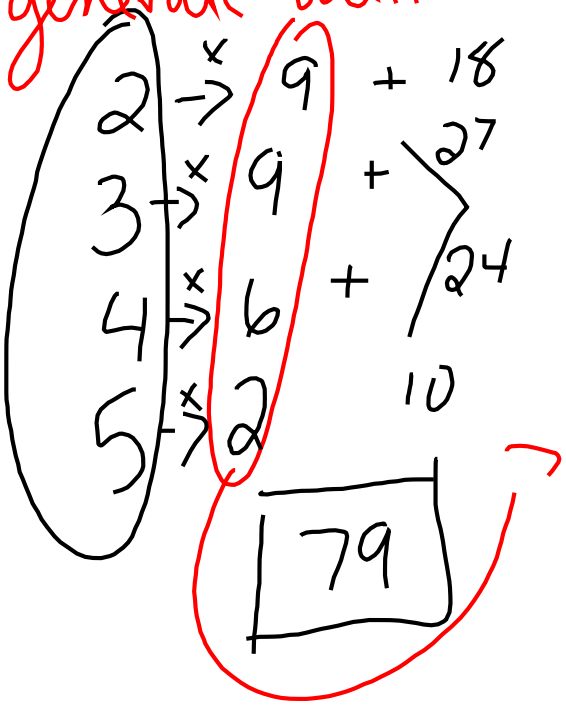
using the random number generator in calculator

RandInt(1, 2)

1 = girls

2 = boys

generate until each are represented



$\frac{79}{26} = 3.03$

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4. State clearly what the response variable is.
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Practice

- We will play a game where we begin with a standard deck of playing cards. We shuffle the cards thoroughly, and then draw a card; replace the card in the deck, shuffle the deck, and draw a card again. We will continue until we draw an ace, or until we draw 10 cards, whichever comes first. What is the probability of drawing an ace within those 10 draws, and, on average, how many cards would we expect to draw to get an ace?

$P(\text{Ace}) = \frac{4}{52} \rightarrow \frac{1}{13}$

Grading

1. **The Method**
   - **E:** Randomizes simulation correctly
   - **P:** Randomizes somewhat correctly
   - **I:** Uses and inappropriate model
2. **The Simulation**
   - **E:** Explains procedure well, clearly displays the simulation process, counts the components of the trials correctly
   - **P:** meets only 2 requirements
   - **I:** meets fewer than 2 requirements
3. **Interpretation**
   - **E:** Establishes a standard of proof consistent with the simulation and justifies conclusion based on that standard.
   - **P:** Fails to justify the decision rule OR confuses the model with reality
   - **I:** Fails to address the issue of statistical significance

Poster Project

- Create a poster explaining your simulation, the results, and how those results answered your question.

- Select your partner
- I will give you a problem

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Homework

P 265 (15, 16)