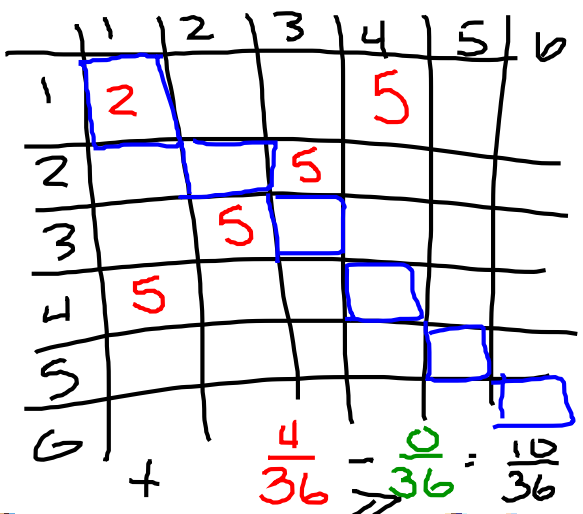
Monday, May 6, 2019

- Warm-up
  - Assuming a pair of fair dice



same on each

$\frac{6}{36}$ + $\frac{4}{36}$ − $\frac{0}{36}$ = $\frac{10}{36}$

a. Find the probability that you get doubles or a sum of 5.

b. Find the probability that you get doubles or a sum of 2.

mutually exclusive

$\frac{6}{36} + \frac{1}{36} - \frac{1}{36} = \frac{6}{36} = \frac{1}{6}$

overlap AND not 0

not mutually exclusive

$\frac{5}{16}$

- Simulations

Objectives

Content: I will use a coin random number table, and calculator to simulate an experiment.

Social: I will do my best in class.

Language: I will use the correct vocabulary during the simulations and analysis of a simulation.

Talk about quizzes

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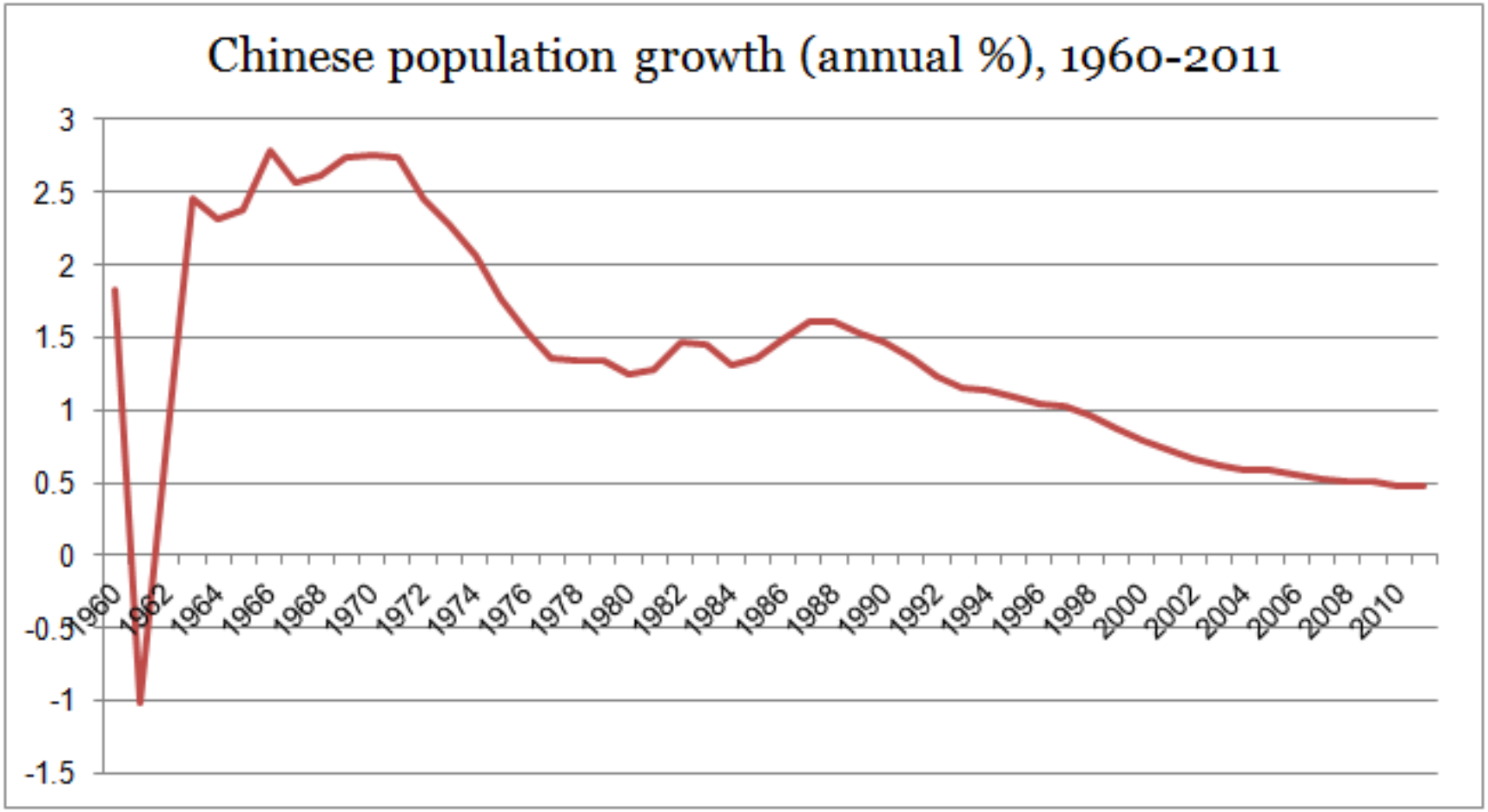
China's Population Problem



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Consider, first, the plan that assumes each family in China has exactly two children.

a. Construct a sample space of the four possible families of two children.

BB GB
GG BG

b. Use your sample space to answer these questions from the Think About This Situation:

i. What is the probability that parents will have a son?

ii. Will the total population of China grow, shrink, or stay about the same?

iii. Will China end up with more boys than girls or with more girls than boys?

iv. What is the mean number of children per family?

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Your class may have discussed the following plan for reducing population growth in rural China.

Allow parents to continue to have children until a boy is born. Then no more children are allowed.

Suppose that all parents continue having children until they get a boy. After the first boy, they have no other children. Write your best prediction of the answer to each of the following questions.

a. In the long run, will the population have more boys or more girls, or will the numbers be approximately the same?

b. What will be the mean number of children per family?

c. If all people pair up and have children, will the population increase, decrease, or stay the same?

d. What percentage of families will have only one child?

e. What percentage of the children will belong to single-child families?

Coin
H = girls
T = boys

dice roll
even = girls
odd = boys

cards
red = girls
black = boys

spinner
2 sides
4 sides

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To get a good estimate of the answers to the questions in Problem 2, you could simulate the situation. To do this, you can design a **simulation model** that imitates the process of parents having children until they get a boy.

a. Describe how to use a coin to conduct a simulation that models a family having children until they get a boy.

b. When you flip a coin to simulate one family having children until they get the first boy, you have conducted one **run** of your simulation. What is the least number of times you could have to flip the coin on a run? The most? If it takes n flips to get the first "boy", how many "girls" will be in the family?

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c. Carry out one run of your simulation of having children until a boy is born. Make a table like the one below. Make a tally mark (/) in the tally column opposite the number of flips it took to get a "boy."

Number of Flips to Get a "Boy"	Tally	Frequency (Number of Tallies)	Relative Frequency
1	111		
2	111		
3			
4	1		
5			
6			
7			
8			
9			
10			
⋮			
Total	~~200 runs~~ 100	200 runs	1.00

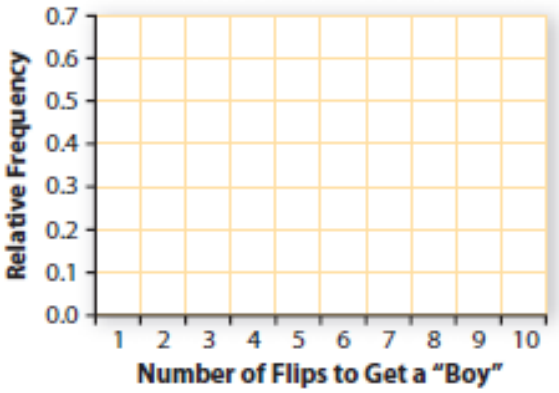
d. Continue the simulation until your class has a total of 200 "families." Record your results in the frequency table. Add as many additional rows to the table as you need.

100 families as a table

e. How many "boys" were born in your 200 "families?" How many "girls?"

f. What assumption(s) are you making in this simulation?

g. Make a relative frequency histogram on a copy of the graph shown below and describe its shape.



h. Compare the median number of children to the mean number of children in the families.

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Now reconsider the questions from Problem 2 which are reproduced below. Estimate the answers to these questions using your completed table from Problem 3.

a. In the long run, will the population have more boys or more girls, or will the numbers be approximately the same?

b. What will be the mean number of children per family?

c. If all people pair up and have children, will the population increase, decrease, or stay the same?

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