

## Homework Section 12.2.

- I. Read Exercises 68 and 69 page 688. This could be confusing: the letter P in parts (a) and (b) of exercise 66 stands for probability, while the letter P in the table stands for purple.
- A. Write a paragraph (using complete sentences), explaining the experiment in Exercise 68, following this outline. (The grader will be looking for correct answers to each of the following items.)
- i. Write the definition of an experiment, and of an outcome (see page 675).
  - ii. Explain which plants are being used in this experiment. (Be careful, it is not the purple and the white peas that are being crossed in this experiment; it is the offspring of those purple and white peas.) Say what color these plants are.
  - iii. Read Example 7 on pages 679 and 680, and the yellow “Caution” statement following it. In that example, there is a choice of two sample spaces that represent the experiment, one that consists of each pair of numbers that can come up on the dice, and the other that consists of each of the possible sums. The “Caution” explains that it is preferable to choose a sample space in which all outcomes are equally likely, so that the formula for calculating probability is useful.  
  
In this experiment, you also have a choice of two sample spaces, one in which the outcomes are the colors of the third generation plants, and the other in which the outcomes are the gene-pairs that the third generation plants inherit from their parents (as found in the Punnet square). Write sentences in which you explain this and list the outcomes in the two different sample spaces. Explain that you will calculate probabilities using the sample space of gene-pairs, since they are equally likely. (You do not need to discuss Example 7 in your paragraph.)
  - iv. Write the definition of an event (see page 676).
  - v. One event for this experiment is the event that the third-generation pea has one purple gene and one white gene. Explain this and list the outcomes from the gene-pair sample space that belong to this event.
  - vi. Conclude the paragraph by explaining how you calculate the probability of this event, and saying what that probability is.
- B. Solve Exercise 68, page 688.
- C. Note that in Exercise 69, the letter P in the Punnet square stands for a red gene, rather than a purple one. For the experiment in Exercise 69, write the Punnet square, and with each entry, write the color of the offspring.
- D. Solve Exercise 69, page 688.
- II. Exercise 66 on page 688 is an example of empirical probability. This (hypothetical) study on body types can be considered as an experiment. The experiment involved measuring the height and weight of a person; the possible outcomes are 1) tall and overweight, 2) tall and not overweight, 3) short and overweight, and 4) short and not overweight. The experiment was performed on, say, 1000 people. The given information in the problem that 24% were tall and not overweight, says that 240 people in the study were tall and not overweight. Now the way the problem is worded, we consider these percentages as probabilities; the

probability that a person selected from the population at large will be tall and not overweight is 0.24. This is an example of *empirical probability*, since the probabilities for a person from the population at large that you calculate in this problem are approximations based on data from a smaller collection of people.

- A. Draw a two-circle Venn Diagram, with one circle for tall people and one circle for overweight people. Label each of the four regions in the diagram with its corresponding outcome (from those numbered (1)-(4), above). Use the information given in the problem to find the probabilities of each outcome, and write them in the diagram. (The four numbers in the diagram should add up to 1, since there is a 100% chance that the person belongs to one of the four categories).
- B. Solve Exercise 66, page 688.