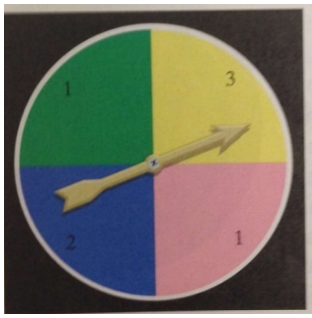
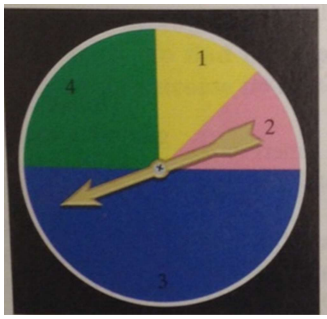
Homework 2.8 Name_____

In Exercises 1-2, the numbers that each pointer can land on and their respective probabilities are shown. Compute the expected value for the number on which each pointer lands.

1. 

Outcome	Probability
1	$\frac{1}{2}$
2	$\frac{1}{4}$
3	$\frac{1}{4}$

2. 

Outcome	Probability
1	$\frac{1}{8}$
2	$\frac{1}{8}$
3	$\frac{1}{2}$
4	$\frac{1}{4}$

The tables in Exercises 3-4 shows claims and their probabilities for the insurance company.

a. *Calculate the expected value and describe what this means in practical terms.*
b. *How much should the company charge as an average premium so that it breaks even o its claim costs?*
c. *How much should the company charge to make a profit of $50 per policy?*

3. PROBABILITIES FOR HOMEOWNERS' INSURANCE CLAIMS

Amount of Claim (to the nearest $50,000)	Probability
$0	0.65
$50,000	0.20
$100,000	0.10
$150,000	0.03
$200,000	0.01
$250,000	0.01

4. PROBABILITIES FOR MEDICAL INSURANCE CLAIMS

Amount of Claim (to the nearest $20,000)	Probability
$0	0.70
$20,000	0.20
$40,000	0.06
$60,000	0.02
$80,000	0.01
$100,000	0.01

5. An architect is considering bidding for the design of a new museum. The cost of drawing plans and submitting a model is $10,000. The probability of being awarded the bid is 0.1, and anticipated profits are $100,000, results in a possible gain of this amount minus the $10,000 cost for plans and a model. What is the expected value in this situation? Describe what this value means.
6. A construction company is planning to bid on a building contract. The bid cost the company $1500. The probability that the bid is accepted is $\frac{1}{5}$. If the bid is accepted, the company will make $40,000 minus the cost of the bid. Find the expected value in this situation. Describe what this value means.
7. It is estimated that there are 27 deaths for every 10 million people who use airplanes. A company that sells flight insurance provides $100,000 in case of death in a plane crash. A policy can be purchased for $1. Calculate the expected value and thereby determine how much the insurance company can make over the long run for each policy that it sells.
8. A 25-year-old can purchase a one-year life insurance policy for $10,000 at the cost of $100. Past history indicates that the probability of a person dying at age 25 is 0.002. Determine the company's expected gain per policy.

Exercises 9 and 10 are related to the SAT information given below.

The SAT is a multiple choice test. Each question has five possible answers. The test taker must select one answer for each question or not answer the question. One point is awarded for each correct response and ¼ point is subtracted for each wrong answer. No points are added or subtracted for answers left blank. The table summarizes the information for outcomes of a random guess on a SAT question. You will want to find the expected value to compare it to your answers for 9 and 10.

Outcome	***Gain or Loss***	***Probability***
Guess Correctly	1	$\frac{1}{5}$
Guess Incorrectly	$-\frac{1}{4}$	$\frac{4}{5}$

9. Suppose that you can eliminate one of the possible five answers. Modify the two probabilities shown in the final column by finding the probabilities of guessing correctly and guessing incorrectly under these circumstances. What is the expected point value of a random guess? Is it advantageous to guess under these circumstances?
10. Suppose that you can eliminate two of the possible five answers. Modify the two probabilities shown in the final column by finding the probabilities of guessing correctly and guessing incorrectly under these circumstances. What is the expected point value of a random guess? Is it advantageous to guess under these circumstances?
11. A store specializing in mountain bikes is to open in one of two malls. If the first mall is selected, the store anticipates a yearly profit of $300,000 if successful and yearly loss of $100,000 otherwise. The probability of success is $\frac{1}{2}$. If the second mall is selected, it is estimated that the yearly profit will be $200,000 if successful; otherwise, the annual loss will be $60,000. The probability of success at the second mall is $\frac{3}{4}$. Which mall should be chosen in order to maximize the expected profit?

12. An oil company is considering two sites on which to drill, described as follows:

    Site A- Profit if oil is found: $80 million
    Loss if no oil is found: $10 million
    Probability of finding oil: 0.2

    Site B- Profit if oil is found: $120 million
    Loss if no oil is found: $18 million
    Probability of finding oil: 0.1

Which site has the larger expected profit? By how much?

13. In a product liability case, a company can settle out of court for a loss of $350,000, or go to trial, losing $700,000 if found guilty and nothing if found not guilty. Lawyers for the company estimate the probability of non-guilty verdict to be 0.8.
    a. Find the expected value of the amount the company can lose by taking the case to court.
    b. Should the company settle out of court?
14. A service that repairs air conditioners sells maintenance agreements for $80 a year. The average costs for repairing an air conditioner is $350 and 1 in every 100 people who purchase maintenance agreements have air conditioners that require repair. Find the services expected profit per maintenance agreement.

Exercises 15-19 involve computing expected values in games of chance.

15. A game is played using one die. If the die is rolled and shows 1, the player wins $5. If the die shows any number other than 1, the player wins nothing. If there is a charge of $1 to play the game, what is the game's expected value? What does this value mean?
16. A game is played using one die. If the die is rolled and shows 1, the player wins $1; if 2, the player wins $2; if 3, the player wins $3. If the die shows 4, 5, or 6, the player wins nothing. If there is a charge of $1.25 to play the game. what is the game's expected value? What does this mean?
17. Another option in a roulette game is to bet $1 on the red. (There are 18 red compartments, 18 black compartments, and 2 compartments that are neither red nor black.) If the ball lands on red, you get to keep the $1 that you paid to play at the game and you are awarded $1. If the ball lands elsewhere, you are awarded nothing and the $1 that you bet is collected. Find the expected value for playing roulette if you bet $1 on red. Describe what this number means.
18. The spinner on a wheel of fortune can land with and equal chance on any one of the ten regions. Three regions are red, four are blue, two are yellow, and one is green. A player wins $4 if the spinner stops on red and $2 if it stops on green. The player loses $2 if it stops on blue and $3 if it stops on a yellow. What is the expected value? What does this mean if the game is played ten times?
19. For many years organized crime ran a number game that is now run legally by many state governments. The player selects a three-digit number from 000 to 999. There are 1000 such numbers. A bet of $1 is placed on a number, say number 115. If the number is selected, the player wins $500. If any number is selected, the player wins nothing. Find the expected value for this game and describe what this means.