Math 1116, Odds and Expected Value Activity, Fall 2014 Name KEY

Instructions: For problems 1-4, find the odds for the event and the odds against the event. For problems 5-8, find the probability of the event described. For problems 9-11, calculate the expected value of each scenario.

1. The probability of an event is $p = \frac{1}{7}$.

for: 1:6 against: 6:1

2. Suppose you want to have three children. What are the odds that exactly two of the children will be boys?

$P = 3/8$

3.5

3. Suppose you draw a card from a well-shuffled deck of cards. What are the odds of drawing a face card (a jack, a queen, or a king)?

$\frac{12}{52} = \frac{3}{13}$ 3:10

4. Suppose you have a 20 sided die. What are the odds of rolling a number divisible by three?

3, 6, 9, 12, 15, 18

$\frac{6}{20}$ 6:14 or 3:7

5. The odds for an event are 11 to 15. What is the probability of the event?

11 + 15 = 26 $\frac{11}{26}$

6. The odds against an event are 71 to 4. What is the probability of the event?

71 + 4 = 75

$\frac{4}{75}$

7. The odds against an event are 11 to 20. What is the probability of the event?

11 + 20 = 31

$\frac{20}{31}$

8. The odds for an event are 1 to 1. What is the probability of the event?

1 + 1 = 2

$\frac{1}{2}$

9. In a Pick 4 game you can win $100 if you pick all 4 numbers correctly, and $5 if you get three of the numbers correct. You earn nothing otherwise, but have to pay $1 to play. What is the expected value of each ticket that you purchase?

	All 4 match	Three of 4 match	None Match
Value of Event (Winnings - $1 to play)	99	4	−1
Probability of Event	$\frac{1}{10,000}$	$\frac{36}{10,000}$	$\frac{9963}{10,000}$

$99\left(\frac{1}{10000}\right) + 4\left(\frac{36}{10000}\right) - 1\left(\frac{9963}{10000}\right) = -.972$

10. In a raffle, 250 tickets are sold. The top prize is $1000. The second prize is $200. The third prize is $50. There are 4 fourth prizes worth $10 each. It costs $10 to purchase a ticket. Complete the table below and use it to calculate the expected value of purchasing a raffle ticket.

	1st prize	2nd prize	3rd prize	4th prize	Win nothing
Value of Event (Winnings - $10 to play)	990	190	40	0	−10
Probability of Event	1/250	1/250	1/250	4/250	243/250

$990\left(\frac{1}{250}\right) + 190\left(\frac{1}{250}\right) + 40\left(\frac{1}{250}\right) + 0\left(\frac{4}{250}\right) - 10\left(\frac{243}{250}\right) = -4.84$

11. An insurance company charges $250 for a home-owner's policy. It expects to pay out $100,000 to replace the house with probability 0.0001, it expects to pay out $10,000 with probability 0.005, and it expects to pay out $500 with probability 0.03. Find the expected value of the policy.

	Replace Home	Major Damage	Minor Damage	No Damage
Value of Event (Payout - $250 for policy)	99,750	9750	250	−250
Probability of Event	.0001	.005	.03	.9649

$99{,}750(.0001) + 9750(.005) + 250(.03) - 250(.9646) = -85.225$