MrF

GRADE 12 ESSENTIAL
UNIT I – PROBABILITY
EXPECTED VALUE DEMONSTRATION

Name: _____
Date: _____

The Game. You pay $2.00. You roll two die, normal six-sided fair die.

If the sum of the two die is 10 or more then you win $10.00

a. Determine your Expected Value of this game.

b. Determine how much will you win or lose if you play 40 times

a. There is only six ways to make a sum of 10 or more out of a total of 36 outcomes for the two dice. The six ways to make the favourable outcome of 10 or more are { (4,6), (5,5), (6,4), (5,6), (6,5), (6,6) }

So EV = Prob (win) *Net Gain – Prob (lose)*Loss

$$= \frac{6}{36} * (\$10 - \$2) - \frac{30}{36} * \$2$$

$$= \frac{6}{36} * (\$8) - \frac{30}{36} * \$2 \quad = \$1.3333 - \$1.66667 = \boxed{-\$0.33}$$

So you can *expect* on average a mean loss of $0.33 each play.

b. So you should expect, after 40 plays, to **lose** $13.20
(well, $13.33 if you had done it more accurately with fractions which have no rounding)

Of course, it is faintly **possible** to actually have a net overall gain of money after 40 plays, but highly unlikely!!

So that is the theory! Let us test the **theory** by *playing* the game and determining an experimental probability (or you could play the game yourself with someone to see if you both get the same result)

Your Task. Play this game 40 plays! (with a partner too if available). Use poker chips or some sort of simulated currency if you want more realism. Player starts with a simulated $20. The casino of course has unlimited $. Complete the table on the back, see how much you are '*up*' after a game with 40 plays.
Play it several times! Or just simulate it in a Spreadsheet if you are familiar with that.

Play	Cost to play	Sum of Dice	Win or Lose	Prize Amount Won	Play Net Overall Gain
1	$2	*6*	*Lose*	*0*	*-2*
2	$2	*12*	*Win*	*$10*	*$8*
3	$2				
4	$2				
5	$2				
6	$2				
7	$2				
8	$2				
9	$2				
10	$2				
11	$2				
12	$2				
13	$2				
14	$2				
15	$2				
16	$2				
17	$2				
18	$2				
19	$2				
20	$2				
21	$2				
22	$2				
23	$2				
24	$2				

Play	Cost to play	Sum of Dice	Win or Lose	Prize Amount Won	Play Net Overall Gain
25	$2				
26	$2				
27	$2				
28	$2				
29	$2				
30	$2				
31	$2				
32	$2				
33	$2				
34	$2				
35	$2				
36	$2				
37	$2				
38	$2				
39	$2				
40	$2				

Cost for 40 Plays:	Number of Wins:	Total Prize Amounts Won	Total Net Overall Gain	Expected $ Won after 40 Plays:
$80				

We are *expecting* 6.67 wins every 40 plays

Number of Losses:

Should expect **to lose $13.33,** ***on average,*** **after 40 plays**