Maths Applied 3/4 - Chance Investigation

Odds Backing the Field to win

Part A
There are six horses in a race with the given odds

Horse	Odds
Flash	**6-1**
Mutiple Hit	**7-2**
Rainlover	**5-1**
Fallover	**8-1**
Notawinner	**12-1**
Bestabet	**11-3**

A punter invests $10 with a bookmaker on each horse to win.

(a) Copy and complete the table
(b) Which horse should win in the best interest of the bookmaker?
(c) Which horses' win will result in the boobmaker's biggest loss?
(d) With which horse will the book maker break even?

Horse	Payout for a win	Total collected by bookmaker	Bookmaker's profit(+) loss(-)
Flash	$70	$60	-$10
Multiple Hit			
Rainlover			
Fallover			
Notawinner			
Bestabet			

Part B
Select a race from the local newspaper with the published odds prior to the race and repeat the above exercise.
For the above race you have selected get the actual results and determine if you or the bookmaker would have won.
Provide evidence for the above (ie newspaper cuttings and your table of calculations)

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MAP 3/4 - Chance Investigation

Who really wins?

Go for a spin on this game of chance.

To understand Roulette, you must become familiar with the Roulette "Wheel" and the Roulette "Board".

THE ROULETTE WHEEL – Includes the numbers from 0 to 36. All numbers from 1 to 36 are coloured either red or black, with the number 0 coloured green. Each Black number has a red number either side and vice versa.

THE ROULETTE BOARD – The board shows all numbers and is organised with the number zero at the top, then the remaining numbers organised in groups of three (shown above).
To play Roulette, simply place your chip(s) on the bet of your choice, be it a number, colour (red or black), Evens or Odds, or one of the other many choices available.

BET	DESCRIPTION	PAYS
Red or Black	A bet that the winning number will be red or black	Evens
Even or Odd	A bet that the winning number would be even or Odd	Evens
Low or High	A bet that the winning number will be low (1 through 18) or high (19 through 36)	Evens
Dozen	You can bet on a group of twelve numbers, marked as 1st 12, 2nd 12 or 3rd 12	2 / 1
Column	There are three boxes marked "2 to 1" at the bottom of the table. By choosing this option you receive the twelve numbers vertically above it.	2 / 1
Corner	Corner bets cover four numbers (the corner of four different numbers)	8 / 1
Split	A bet placed between two numbers (therefore betting on two numbers)	17 / 1
Straight Up	A bet placed on any individual number	35 / 1

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(a) Based on the given information above calculate the probability and odds against of each event (described in the table) happening.

Event	Probability	Odds Against	Event	Probability	Odds Against
RED			**DOZEN**		
BLACK			**COLUMN**		
HIGH			**CORNER**		
LOW			**SPLIT**		
ODDS			**STRAIGHT UP**		
EVENS					

(b) What do you notice about the odds against for each event when compared to the amount that is paid out for a win?

(c) A new game, like roulette, has been developed. It consists of a wheel with all the numbers from 0 to 24. Like roulette the half the numbers from 1 to 24 are red and the other half black. You have been asked to construct the design for the wheel and produce the pay outs for each type of bet.

(i) When constructing the wheel, what angle will each number require if all numbers receive an equal chance of being spun?

(ii) What pay outs do you think are reasonable for each type of bet. Fill in the following table and provide your explanations underneath.

Event	Probability	Pays	Event	Probability	Pays
RED			**DOZEN**		
BLACK			**COLUMN**		
HIGH			**CORNER**		
LOW			**SPLIT**		
ODDS			**STRAIGHT UP**		
EVENS					

Explanation and reasoning towards pay outs given:

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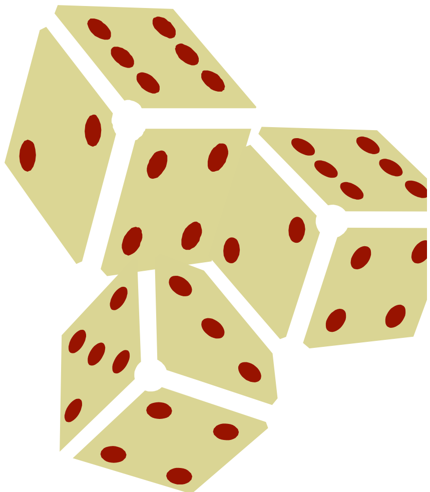
"Chuck-a-Luck"



This is a game involving probability and profit.

The game:

3 dice are rolled. Before they are rolled the player nominates a number.

If the number appears 3 times the player wins $3;
If the number appears twice the player wins $2;
If the number appears once the player wins $1;
If the number does not appear the player concedes (loses) $1.

Does this sound like a fair game? Why? ____

____

You've been given $10 to play the game.

Construct the following table:

Game										
Win										
Lose										
(1) Total won										
(2) Total lost										
(1) – (2)										

Play the game until you have either won another $10 or lost the $10 you started with. Fill in the table as you go.

Here is an example of a game:

Game	1	2	3	4	5
Win		1	2		3
Lose	1			1	
(1) Total won	0	1	3	3	6
(2) Total lost	1	1	1	2	2
(1) – (2)	-1	0	2	1	4

etc

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We can look at the logistics of this game using theoretical probability.

Firstly lets consider a singular dice;

(a) Calculate the following probabilities as fractions:

P(success) = ____/6 p (fail) = ____/6

Now lets consider two dice;

(b) If we think about the probability of our number appearing twice we take the probability of success for each dice and multiply;

1/6 x (1/6) = _____ /_____

This means, if we want our number to appear twice with two dice, there are ______ successful outcomes out of __ possible outcomes.

(c) To calculate the probability of a number appearing once, and only once we take the probability that one dice will succeed and one dice will fail and multiply; (we also multiply by 2 since it can happen two different ways i.e. the success will be either on the first dice or the second)

2 x (1/6) x (5/6) = ___ / _____

This means, if our number is to appear only once with two dice, there are _______ successful outcomes out of _____ possible outcomes.

Now consider three dice (Which is what the game is about);

(d) To calculate the probability of our number appearing three times we take the probability of success for each of the three dice and multiply;

(_____/ 6) x (______ / 6) x (______ / 6) = _______ / _____

which means _______ successful outcomes out of ________ possible outcomes.

(e) To calculate the probability of our number appearing twice we take the probability that two dice will succeed and the other will fail and multiply; (This can happen three different ways so we also multiply it by three).

3 x (________ / 6) x (______ / 6) x (_____ / 6) = _______ / ____

which means _______ successful outcomes out of ________ possible outcomes.

(f) To calculate the probability of our number appearing only once we take the probability that one dice will succeed and the other two will fail and multiply; (The number can appear on each of three different dice so it is multiplied by three).

3 x (________ / 6) x (______ / 6) x (______ / 6) = _______ / _____

which means _______ successful outcomes out ____ possible outcomes.

(g) To calculate the probability of our number not appearing at all we take the probability of each dice failing and multiply:

(_____ / 6 ___) x (___ / 6) x (______ / 6) = _______ / _____

which means _______ successful outcomes out of ________ possible outcomes.

(h) To summarise:

P (3) = ______ / 216

P (2) = ______ / 216

P (1) = ______ / 216

P (O) = ______ / 216 Check that these added together give 1.

(i) Out of 216 games:

how many times would we expect to win $3? ______

how many times would we expect to win $2? ______

how many times would we expect to win $1? ______

how many times would we expect to lose $1? _____

(j) Use this information to calculate your expected takings over the 216 games:

____

(k) What does this work out to *per game?* ________________________

A PLAYER CAN EXPECT TO WIN/LOSE ________________ ON EACH PLAY OF THE GAME

(l) Does this game favour the player or the "house"? Discuss.

Maths Applied 3/4 C Investigation – Chance

To compare the probabilities (both experimental and theoretical) of throwing numbers 1-12 when using a 12 sided die and two six sided dice.

Criteria Assessed: 1, 2 and 8
Practical.
Toss the twelve sided die fifty times and record the number thrown in the table below.
Toss two six sided dice together and record the total score thrown in the table.
Collect data from other groups in the class and record the total class scores in the table.

Calculate the experimental probability of throwing each number for
(i) your scores and
(ii) the class scores and record in the table.

Results table

Score	1	2	3	4	5	6	7	8	9	10	11	12
Your results 12 sided die												
Experimental Probability												
Class results 12 sided die												
Experimental probability												
Your results two 6 sided dice												
Experimental probability												
Class results two 6 sided dice												
Experimental probability												

List the sample space for the 12 sided die.

What is the theoretical probability of throwing each number in the sample space for the 12 sided die.

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Comment on the comparison between the theoretical and experimental values for the 12 sided die.

Draw a tree diagram for the two six sided dice and list the sample space.

What is the theoretical probability of throwing each number in the sample space for the two 6 sided dice.

Comment on the comparison between the theoretical and experimental values for the two 6 sided dice.

Comment on the comparison between the probabilities of throwing numbers 1-12 when using a 12 sided die and two six sided dice.