Warm - Up

What is the probability of ...

P(6 on a die) = $\frac{1}{6}$

P(even #s on a die) = $\frac{3}{6} = \frac{1}{2}$

P(7 on a die) = $\frac{0}{6} = 0$

P(hearts in a deck of cards) = $\frac{13}{52} = \frac{1}{4}$

P(aces and hearts in a deck of cards) = $\frac{16}{52}$

4 13

A♡ is counted 2x.

$= \frac{4}{13}$

COMPARING EXPERIMENTAL AND THEORETICAL PROBABILITIES

EXAMPLE 1 [1]

Marc, Jenny, and Otto have each won a t-shirt from West49 at a store Grand Opening event. Each shirt will be randomly assigned to the three winners; one is red, one is black, and one is green. What is the probability that Marc will receive the black t-shirt?

Use R, B, and G to represent the colours of the t-shirts.

In the table, record all the different possible ways the t-shirts can be given to the three people.

Marc	Jenny	Otto
R	B	G
R	G	B
G	R	B
G	B	R
B	R	G
B	G	R

a) In how many different ways can the three t-shirts be distributed?

6

b) In how many of these arrangements does Marc receive the black t-shirt?

2

c) What is the probability that Marc will receive the black t-shirt?

$\frac{2}{6} = \frac{1}{3}$

EXAMPLE 2 [1]

What is the probability of rolling DOUBLES with a PAIR of dice? Complete the table below showing all possible outcomes.

# on Second Die \ # on First Die	1	2	3	4	5	6
1	1, 1	2, 1	3, 1	4, 1	5, 1	6, 1
2	1, 2	2, 2	3, 2	4, 2	5, 2	6, 2
3	1, 3	2, 3	3, 3	4, 3	5, 3	6, 3
4	1, 4	2, 4	3, 4	4, 4	5, 4	6, 4
5	1, 5	2, 5	3, 5	4, 5	5, 5	6, 5
6	1, 6	2, 6	3, 6	4, 6	5, 6	6, 6

a) In how many ways can the two dice be rolled (how many possible outcomes)?

36

b) In how many ways can doubles be rolled?

6

c) What is the probability of rolling doubles?

$\frac{6}{36} = \frac{1}{6}$

→ only for 2 different colour dice

Toss Coins

1. If you toss a coin 10 times, how many times do you expect to turn up heads? Explain your reasoning.

2. **Table is given to you.**

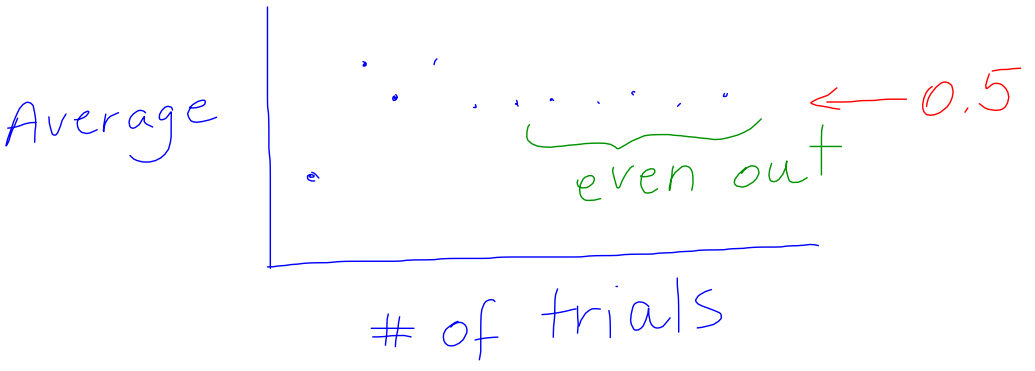
3. Toss a coin 10 times. In row 1, record the number of times that heads turns up in the second column. The 10 tosses represent one trial. For this row, the average number of heads will be the same as the number of heads.

4. Repeat the experiment. In row 2, record the number of times that heads turns up in the second column. For this row, the average number of heads will be the sum of the first two values in the Number of Heads column divided by 2, the number of trials.

5. Repeat step 4 until you have completed 10 rows of the table. For each row, the average number of heads will be the sum of the values in the Number of Heads column, divided by the number of trials.

6. Draw a scatter plot of Number of Trials versus Average Number of Heads.

trial	# of heads	total	Ave
1	4		$\frac{4}{10}=0.4$
2	5	9	$\frac{9}{20}=0.45$
3	7	16	$\frac{16}{30}=0.53$



What did you notice on your graph?

Evens out close to the end

Why do you think this happens?

more trials we have the closer we get to the theoretical probability

Do you think this is always the case?

yes → as long as it is a fair coin or die

Darts

A modified dart board has equally spaced sectors containing the numbers 1 -20.

a. What is the theoretical probability of hitting the numbers 18, 19, or 20?

$\frac{3}{20} = 0.15$

b. In 75 of the first 80 throws, a dart player hit the numbers 18, 19, or 20. What is the experimental probability of hitting 18, 19, or 20?

$\frac{75}{80} = 0.94$

c. Would you expect the experimental probability to approach the theoretical probability if the number of throws are increased?

It should but the person was aiming at 18, 19, 20

∴ the probabilities are not the same for each section.

On the Boards...

EXAMPLE 3 [2]

Complete the table below showing all possible outcomes for the **SUM** of two dice.

# on Second Die \ # on First Die	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

a) How many possible outcomes are there?

36

b) In how many ways can the sum of the two dice add to SEVEN?

6

c) What is the probability of rolling SEVENS with a pair of dice?

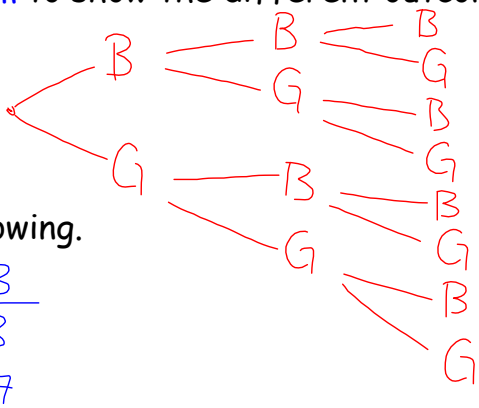
$\frac{6}{36} = \frac{1}{6}$

d) What is the probability of rolling ODDS?

$P(3,5,7,9,11) = \frac{18}{36} = \frac{1}{2}$

In a family with 3 children...

Draw a tree diagram to show the different outcomes of boys and girls.



Determine the following.

P(2G and 1B) = $\frac{3}{8}$

P(at least 1G) = $\frac{7}{8}$

P(3G) = $\frac{1}{8}$

P(B first and G second) = $\frac{2}{8} = \frac{1}{4}$

Homework

Handout
Odds of Winning & More

Answers to Handout

1. a. 1/81

b. 1/9

c. 36/81

d. 4/81

2. a. 5/36

b. approx. 7 times

c. 7 times ... spends $7
wins $5
lose of $2

3. a. 1/6

b. 1/2

4. 1/10

5. a. 1/2

b. 5/11

Attachments

Theoretical Probability Practice.doc

MoreTheoreticalProbability.pdf

More Theoretical Probability - day 2.doc

Probability Quest.doc

Odds of Winning & More - Theoretical Practice.doc