THE FIRST ACE PROBLEM

There are 4 aces in a regular deck of 52 cards.

1. If you shuffle the cards thoroughly and turn them over one by one, how many cards would you expect to turn over on the average before you get an ace? _____

2. Try this 10 times and record the number of cards you turn over *before* you get an ace.

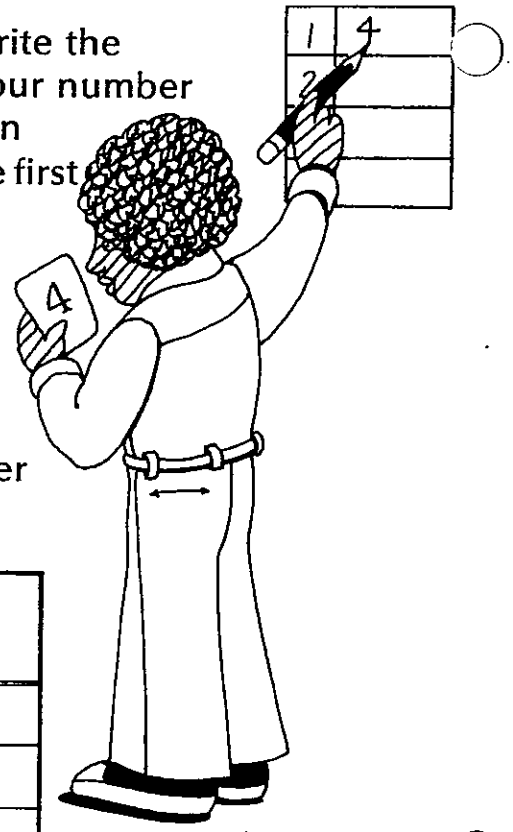
Trial	Number of Cards *Before* First Ace
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

3. Calculate the average.
Average _____

4. How close was this to your prediction? _____
Ask your teacher to help you work out the real average.

MATERIALS: regular deck of playing cards, pencil.

HOW MANY MATCHES?



You will need 10 cards numbered from 1 to 10. Write the numbers from 1 to 10 on a piece of paper. Turn your number cards face down and shuffle them thoroughly. Turn them over one by one. Record the number on the first card you turn up beside the 1 on your paper, the second card beside the 2, and so on.

1. Did you get any matches? (A match occurs when the number on the paper matches the number on the card.) _____

2. Do this experiment 10 times. Record the number of matches each time in the table below.

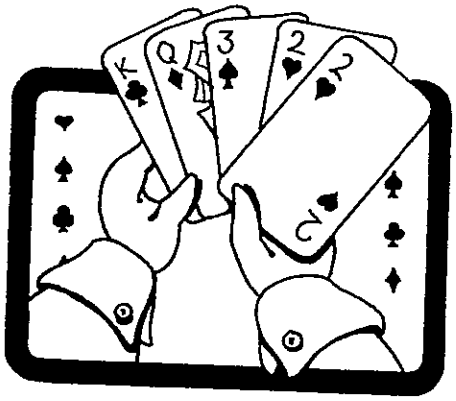
TIME	NUMBER OF MATCHES
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

There were 100 possible chances for a match.

3. How many matches did you get? _____
4. According to your results, what is the experimental probability of a match? _____
5. Express this probability as a two-place decimal. _____

MATERIALS: 10 cards (numbered 1 to 10), pencil, paper.

THE BIG DEAL



An ordinary playing card deck has 52 cards. There are 4 suits: clubs ♣, diamonds ♦, hearts ♥ and spades ♠. There are 13 cards in each suit: Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, and King.

Take a deck of cards. Shuffle the cards thoroughly. Deal out 10 hands of 5 cards each. (You will have 2 cards left).

1. How many times did you get a pair in one of the hands of 5 cards? _____
A pair is two cards with the same number. Try this 5 times (for a total of 50 hands). Keep track of the number of hands that contain pairs.

2. How many hands had a pair this time? _____

3. What fraction of your hands contained a pair? _____
This is your experimental probability.

4. Write this fraction as a two-place decimal. _____

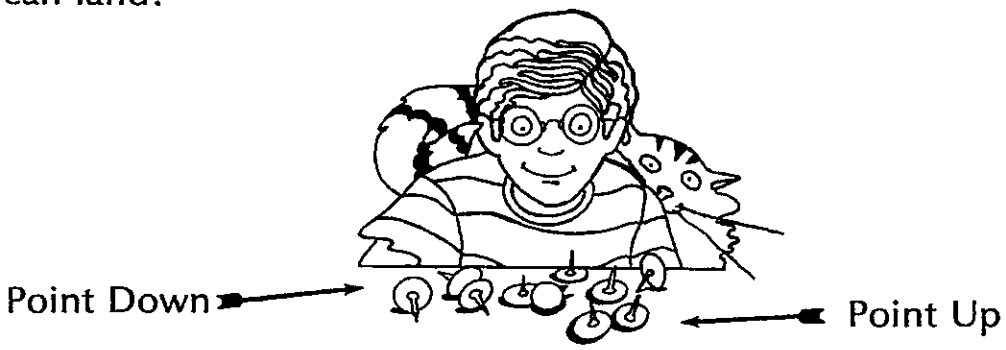
5. Would you always get this fraction in 50 hands? _____

6. Did your friends? _____

MATERIALS: playing cards, pencil.

PROBABILITY BY EXPERIMENT

Sometimes you can't tell what a probability will be until you do an experiment. For example, suppose you toss a thumbtack. There are two ways it can land:



There is no reason to suspect that these possibilities are equally likely. In fact, for most thumbtacks they aren't.

EXPERIMENT

1. Take 10 thumbtacks and a paper cup. Shake the cup and turn it face down on the desk. Count the number of thumbtacks landing point up. Do this experiment 25 times. (This means you will have results for 250 individual throws.) Record your results in the table on the right.
2. How many times did tacks land point up? _____
3. Write this number over 250, the total number of tosses. $\frac{\quad}{250}$

We call this fraction the *empirical* or *experimental* probability of a tack landing point up.

4. Write your experimental probability as a decimal. _____
5. Combine your results with those of a group or the whole class. Find the *experimental probability* for the combined data. _____

Toss	Number Point Up	Toss	Number Point Up
1		14	
2		15	
3		16	
4		17	
5		18	
6		19	
7		20	
8		21	
9		22	
10		23	
11		24	
12		25	
13		Total	

Probabilities determined by experiment are called *empirical* or *experimental probabilities*.

Extension. How do you think your results would be affected if the point of the tacks were very long—for example, 1 meter? If they were very short—for example, 1 millimeter?

MATERIALS: paper cup, 10 identical thumbtacks, pencil.