

Should I or Shouldn't I?

I have a newspaper route and need to collect \$5 each week from each customer. One of my regulars (Harvey) offered me a deal, and I have to really think if this is a good thing for me to do. Harvey said:

He would give me the \$5 dollars each week
OR

I could draw two bills from a paper bag that contains one ten dollar bill and five one dollar bills.

The fact that I could be paid \$11 instead of \$5 is very tempting but on the other hand the fact that I might only be paid \$2 is very uncomfortable. Is this a good deal?

Family members involved in deciphering this POW are:

Parker
Leila
Bryan
Ryan (on phone, suggesting math.com)

Theoretical Probability con't

Summary of Theoretical Probabilities

According to my rainbow, organized list, graph and equation, it appears that for a total of 15 weeks, I would get more than \$11 dollars, 5 of the weeks and \$2 on the other 10 weeks for a total of \$75

$$(11 \times 5) + (10 \times 2) = \$75$$

If I collected \$5 for each of the 15 weeks, I would also earn \$75

$$5 \times 15 = \$75$$

So in theory, it would not matter if I chose bills out of the paper bag or if I collected \$5 each week.

Experimental Probability

Conduct an experiment. Be sure to explain how you did it. There needs to be 15 trials of your experiment to simulate collecting money according to Harvey's offer for 15 weeks. I took 6 pieces of paper and labeled one as \$10 and the other 5 as \$1.

I got a large paper bag and put the pieces inside. I mixed them up well. I then drew two pieces at a time and the following are my results.

\$10	\$1	\$1
1.	x	x
2.	x	x
3.	x	x

4.	x	x
5.	x	x
6.	x	x
7.	x	x
8.	x	x
9.	x	x
10.	x	x
11.	x	x
12.	x	x
13.	x	x
14.	x	x
15.	x	x

Probability Notation

Experimental
 $P(\$2) = 3/15$ or $1/5$

In a regular \$5 per week collection, I would earn \$75.

According to this experimental probability chart, by using a paper bag draw, I would collect \$57, $(3 \times 11) + (12 \times 2) = 57$. Thus, I would have to go with "shouldn't"

Final Summary

According to my experimental and theoretical probabilities, Harvey offered me a deal, that I shouldn't take. Theoretically, it wouldn't matter if I took his offer, because both ways I would end up with \$75. But experimentally, I believe that I would lose money, most likely I would lose \$18. So Harvey, join the rest of my customers and pay \$5 per week.

Theoretical Probability

What are all the possible bill combinations that might be drawn from the bag? How likely is it that the bills drawn will total more than \$5?

(Vertical) Rainbow

\$10

\$1a

\$1b

\$1c

\$1d

\$1e

By counting each arched line, this rainbow example shows there are 15 combinations of drawing two bills. The answer is still not as clear as I want it to be.

Theoretical Probability con't

Organized List

- 1. \$10 - \$1a
- 2. \$10 - \$1b
- 3. \$10 - \$1c
- 4. \$10 - \$1d
- 5. \$10 - \$1e
- 6. \$1a - \$1b
- 7. \$1a - \$1c
- 8. \$1a - \$1d
- 9. \$1a - \$1e
- 10. \$1b - \$1c
- 11. \$1b - \$1d
- 12. \$1b - \$1e
- 13. \$1c - \$1d
- 14. \$1c - \$1e
- 15. \$1d - \$1e

To tell the difference between each of the five dollar bills, we labeled each with a letter to more easily track all the probabilities

By listing each combination of drawing two bills, this list shows that the probability of drawing a bill greater than \$5, is $5/15$ or $1/3$.