STA 2e: Sect. 8.1 Worksheet #1 Name answer Key
PROBABILITY DISTRIBUTIONS 4/15/19

1. A *random variable* is defined to be a variable that takes on numerical values that describe the outcomes of some random phenomenon.

2. The *probability distribution* of a random variable gives two values: possible values (outcomes)
probabilities associated with each value

3. The *sampling distribution* of a statistic tells us what values the statistic takes in repeated samples from the same population and how often it takes those values.

Which of the following could be considered random variables?

4. the number of days in a year No
5. the number of aces in a dealt hand of 13 cards, dealt from 52 playing cards Yes
6. the number of women chosen for a jury of 12 people, from a list of 200 eligible people Yes
7. the number of minutes in your statistics class each period No

(doesn't change - would only have 1 outcome - not random)

Determine which of the following could be a probability distribution. If it is not, explain why not.

8.

x	0	1	2	3
p	0.2	0.2	0.2	0.3

No, the sum of the probabilities is 0.9

9.

x	−2	−1	0	1	2	3
p	0.1	0.3	0.2	−0.2	0.4	0.2

No, you can't have a negative probability

Find the missing probability needed in order for the distribution to be a probability distribution.

10.

x	0	1	2	3
p	0.125	k	0.375	0.125

k = .375

11.

x	0	1	2	3	4
p	0.1296	0.3456	0.3456	?	0.0256

k = .1536

12.

x	−2	−1	2	5
p	k	k	0.3	0.4

k = .15

must be the same since the same letter

13.

x	−5	−2	0	1	3
p	k	k	k	0.17	0.32

k = .17

must be the same

14. Find the expected value for #10. Show the substitutions into the formula.

expected value = (0)(.125) + (1)(.375) + (2)(.375) + (3)(.125) = 1.5

15. Find the expected value for #12. Show the substitutions into the formula.

expected value = (−2)(.15) + (−1)(.15) + (2)(.3) + (5)(.4) = 2.15

0 tails 1 tail

HH TH
HT TT possible outcomes

1 tail 2 tails

16. Imagine that you flip 2 coins — a penny and a nickel. Let T = number of tails showing.

a. Explain why T is a random variable. it is numerical & flipping a coin is random

b. Write the sample space for T. 0, 1, 2

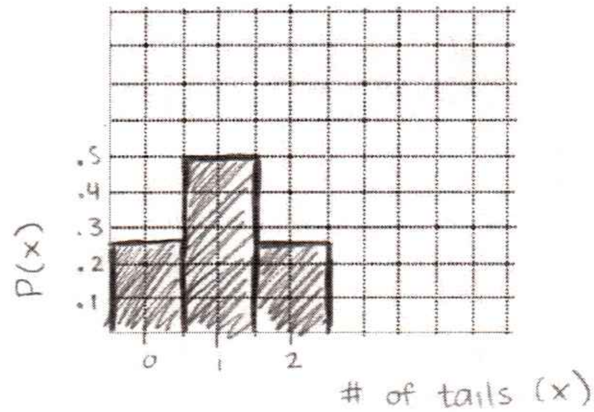
\# of tails

c. Display the probability distribution of T in a table.

x	0	1	2
P(x)	.25	.5	.25

1/4 2/4 1/4

d. Construct a histogram that shows the probability distribution of T.

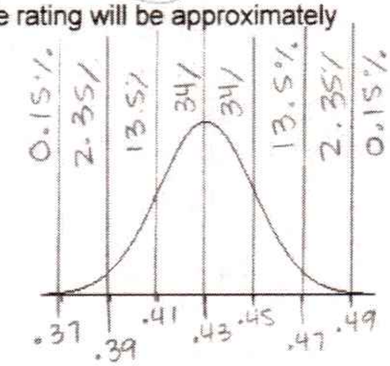


e. Find the expected value. 1

Explain what this expected value means.

On average, there is 1 tail showing when you flip a penny and a nickel.

13. In a recent poll of 500 registered voters, the president was given a favorable rating by 41% of the voters. Suppose that the true proportion of all adults who give the president a favorable rating is 43%. In a large number of samples, the proportion $\hat{p}$ who would give the president a favorable rating will be approximately normally distributed with mean 0.43 and standard deviation of 0.02.



a. Using the values given, label the normal curve at the right with the mean and mean ± st. dev., mean ± 2 st. dev. and mean ± 3 st. dev.

b. What percent of many samples who favor the president will have a sample proportion between 0.39 and 0.47? (Use the 68-95-99.7 rule.) 95%

c. What percent of many samples who favor the president will have a sample proportion less than 0.41? (Use the 68-95-99.7 rule.) 16%

d. What is the probability that $\hat{p}$ lies between 0.37 and 0.49? (Use the 68-95-99.7 rule.) .997

e. What is the probability that $\hat{p}$ does not lie between 0.37 and 0.49? .003

f. Would you be surprised if the sample proportion of those who would give the president a favorable rating was $\hat{p}$ = 55%? Explain your answer.

Yes, 99.85% of samples have a favorable rating of 47% or lower; this means a favorable rating of 55% is extremely uncomman.