Homework:
Random Variables

MATH 150

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Sepehr Akbari

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Problem 1

Which of the following represent random variables? Briefly justify/explain.

(a) The speed of a randomly-selected car on the highway

(b) The amount of gas in a randomly-selected car's tank

(c) The height of the statue of liberty

(d) The average of fifty randomly-selected numbers, each between 0 and 1.

Answer

(a) Random. As the speed of a car on the highway can depend on the car model, specific highway etc. Therefore it can take a different outcome based on a random event.

(b) Random. Similar to (a) the amount of gas in each car varies, and therefore it is a random event with an outcome depending on it.

(c) Not Random. The height of the statue of liberty is a fixed numeric value, of course it can vary based on measuring technique etc. but it does not change outcome based on a random event.

(d) Random. As the average will depend on the specific values of the 50 randomly chosen numbers. While each number is between 0 and 1, the particular combination of those numbers will determine the final average, making it a random variable.

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Problem 2

A college's IT department determines that the number of internet-connected devices carried by a randomly-selected student at the college has the following distribution.

| X	0	1	2	3	4
P(X)	0.4%	17.2%	52.2%	24.7%	??

(a) Fill in the missing value. Assume that no student has more than 4 internet-connected devices.

(b) What is the probability that a random-selected student has no more than 2 devices?

(c) What is the probability that a random-selected student has more than 2 devices?

Answer

(a) The probability of all events have to add up to 100% or 1, so $P(4) = 100 - (0.4 + 17.2 + 52.2 + 24.7) = 5.5$

(b) $P(0) + P(1) + P(2) = 69.8\%$

(c) $P(3) + P(4) = 30.2\%$

Problem 3

A random-number generator prints out integers from 1 to 5 with probabilities given by the following histogram.
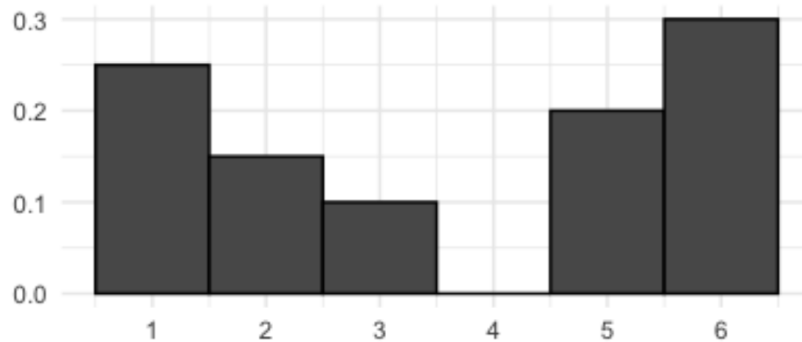
(a) What is the probability that the next number generated is 2?

(b) What is the probability that the next number generated is 1 or 5?

(c) If 80 numbers are generated, about how many 2's would you expect? Briefly explain your reasoning.

Answer

(a) 0.15

(b) $0.25 + 0.2 = 0.45$

(c) As there is a 15% chance that an individual number is 2, I would expect 15% of the 80 numbers to be 2's. $0.15 \times 80 = 12$