

Midterm Practice Questions

1. For the following set of 15 data values,

-11, -4, 0, 1, 1, 2, 2, 3, 4, 5, 6, 7, 11, 13, 20,

- (a) give the mean, median, standard deviation and IQR and draw a modified boxplot.
 - (b) Argue in a sentence whether or not one of the measures of variation, standard variation or IQR, is better for these data.
2. In a study of 10000 elderly patients (3000 African American, 7000 white Americans), the five-year survival rate for lung cancer (the proportion surviving five years after detection of lung cancer) is 34.1%for whites and 26.4%for blacks.
 - (a) What is the five-year survival rate overall?
 - (b) Given that a patient has survived at least five years, what is the probability that the patient is black?
 3. Assume the five-year survival rate for individuals having surgery for non-small-cell lung cancer detected early is 40%.
 - (a) Nine patients in a clinic have surgery for the condition described above. What is the probability that 5 or more survive?
 - (b) If you do not have surgery, the five-year survival probability is 0.04. What is the probability that none of the nine patients survived five years without surgery?
 4. In the country of Gatesland, it is known whether or not a citizen has a home computer and is totally prepared for the year 2000 date change (called the Y2K problem) that has been in the news (*three years ago*). The probabilities of randomly selecting a citizen with certain characteristics are given below:

$$P(\text{owns computer and is prepared for year 2000}) = 0.39$$

$$P(\text{owns computer and is not prepared for year 2000}) = 0.26$$

$$P(\text{does not own computer and is prepared for year 2000}) = 0.28$$

$$P(\text{does not own computer and is not prepared for year 2000}) = 0.07$$

- (a) What is the probability that a randomly selected citizen owns a home computer?
- (b) what is the probability that a randomly selected citizen who owns a computer is totally prepared for the year 2000 date change?
- (c) Is owning a home computer independent of being totally prepared for the year 2000 date change? Why or why not?

7. Decide if the following are true, false, or unknown from the given information. Explain why. Unless stated otherwise, assume the information from each part does not carry to the next part.

(a) $\mathbb{P}(A) = 0.53$ and $\mathbb{P}(A \cap B) = 0.63$.

(b) If $\mathbb{P}(G) = 0.4$ and $\mathbb{P}(G \cap H) = 0.3$, then $\mathbb{P}(G|H) = 0.75$.

(c) If events A and B are mutually exclusive, and $\mathbb{P}(A) = \frac{1}{2}$, $\mathbb{P}(B) = \frac{1}{2}$, then $\mathbb{P}(A \cap B) = \frac{1}{4}$.

(d) Two mutually exclusive events are independent.

(e) The following is a table of the joint distribution of X and Y :

$x \backslash y$	-1	1
0	0.4	0.3
1	0.1	0.2
Total	0.5	0.5

$$\text{cov}(X, Y) = 0.1.$$

(f) The variables X and Y in part (d) are independent.

(g) The variable R with frequency function below has mean $\mu_R = -0.5$.

r	-1	0	1
$f(r)$	0.8	-0.1	0.3

8. Consider a random variable Y whose probability density function is given by

$$f(y) = cy^2 + 1, \quad 0 \leq y \leq 2,$$

and 0 otherwise, where c is an unknown constant.

(a) Find c so that the above is a genuine probability density function.