

Biometrics I - Practice Exam 2

1. Identify the possible support and type of each random variable, and assign the *most appropriate* distribution to each

i. $Y = \{\text{Test Preparation Tutoring (Received or Did not)}\}$

- Support:
- Type:
- Distribution:

ii. $X = \{\text{Exam Score (0-100)}\}$

- Support:
- Type:
- Distribution:

2. Let $Q = \{\text{the number of times two dolphins surface for air in a 5-minute observation period}\}$, the distribution of Q is shown below:

q	0	1	2	3	4
$P(Q = q)$	0.15	0.35	0.28	0.14	0.08

a. Prove that this a legitimate probability distribution

b. Find $\mathbb{E}W$

c. Find $\mathbb{V}W$

3. Below is the result of a study examining voter registration by age group and political affiliation:

Age Group - Education	Democrat	Republican
18-35 - College Degree	156	87
18-35 - No College Degree	132	108
Over 35 - College Degree	97	123
Over 35 - No College Degree	84	178

- a. What's the probability that a person aged 18-35 with a college degree is registered as a Democrat?

- b. What's the probability that a voter is registered as a Republican, given that they are over 35?

4. Determine if events A and B are independent or not given that:

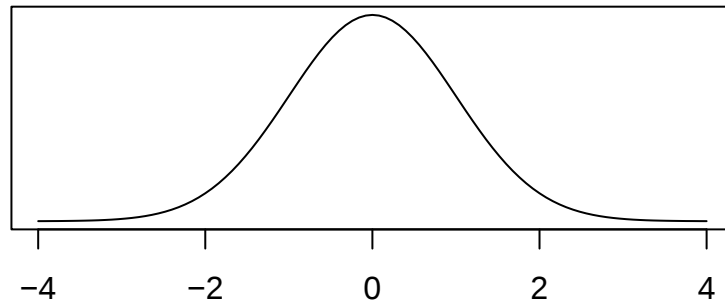
$$P(A) = 0.7, P(B \cap A^c) = 0.12, \text{ and } P(A \cup B) = 0.82$$

5. Assume A and B are independent. Given $P(B) = 0.6$ and $P(A^c \cap B^c) = 0.16$, find the following:

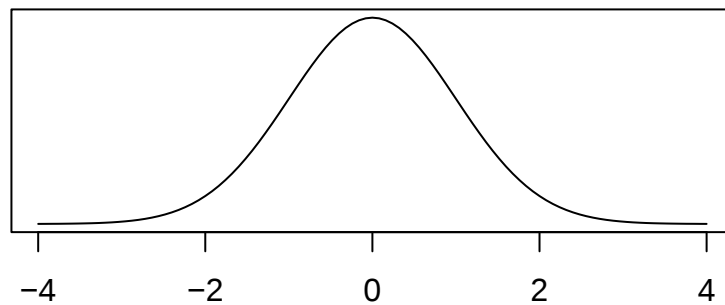
a. $P(A^c \cup B^c)$

b. $P(B|A)$

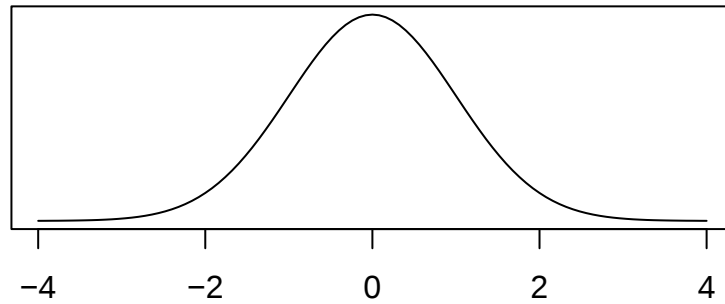
6. Find $P(-0.8 < Z < 1.25)$



7. The average weight of male elephants is 5200 kg with a standard deviation of 420 kg. The average weight of female elephants is 3500 kg with a standard deviation of 280 kg.
- a. What weight is considered 88th percentile for male elephants?



- b. What is the probability that a female elephant is under 3300 kg?



8. The daily visitors to a national park are normally distributed with a population mean of $\mu = 1200$ visitors and a standard deviation of $\sigma = 175$ visitors. If a random sample of $n = 18$ days is taken:

- a. Find the mean of the sample mean, $\mu_{\bar{x}}$.
- b. Find the standard deviation of the sample mean, $\sigma_{\bar{x}}$.
- c. Express the distribution of the sample mean $\bar{x}$ in proper notation.

9. An experiment is conducted to observe the difference between growth rates of two varieties of corn. Each variety is planted in a plot that will receive high fertilizer, and a plot that will receive low fertilizer. The plants will be measured after 45 days.

a. What is/are the EU?

b. Trt(s)?

c. Response?

d. Factors?

e. Number of EU per Trt?