

Practice exam 3

April 17, 2014

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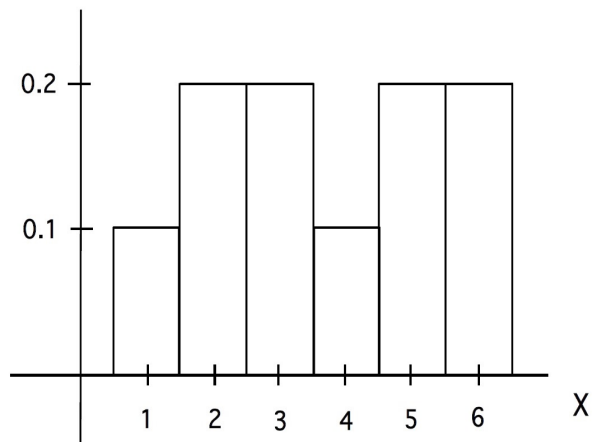
May the odds be ever in your favor!

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Tot. _____

Multiple Choice

1. (5 pts.) The picture shows the histogram for a probability distribution X . What is the expected value of X ?



- (a) 3.5 (b) 3.2 (c) 3.7 (d) 4 (e) 3

2. (5 pts.) According to Forbes, the University of Notre Dame (ND) is ranked 24 in the list of America's Top Colleges. There are 650 colleges in the list. In which percentile is ND?

- (a) 95% (b) 96% (c) 5%
(d) 4% (e) 24%

3. (5 pts.) What is the third quartile of the following scores?

6, 3, 9, 10, 10, 9, 7

- (a) 8 (b) 9
(c) 7 (d) 9.5
(e) 10

4. (5 pts.) A multiple choice exam has 10 questions, each with five options (labelled (a), (b), (c), (d) and (e)). I haven't studied for the exam, so I take a random guess (all options equally likely) at each question. What is the probability that I get exactly 3 questions right?

- (a) $(.8)^{10} + C(10, 1)(.8)^9(.2) + C(10, 2)(.8)^8(.2)^2$ (b) $1 - ((.8)^{10} + C(10, 1)(.8)^9(.2) + C(10, 2)(.8)^8(.2)^2)$
(c) $1 - (.8)^{10}$ (d) $C(10, 3)(.8)^7(.2)^3$
(e) $1 - C(10, 3)(.8)^7(.2)^3$

5. (5 pts.) Find the variance of the random variable defined by the following table

X	$P(X)$
10	0.4
30	0.2
50	0.3
80	0.1

- (a) 521 (b) 33 (c) 493
(d) 0 (e) 4877

6. (5 pts.) The College of Science assesses its professors' teaching using a "composite number" that is (somewhat mysteriously) produced from end-of-semester CIF's. The mean score for professors is 3.12, with standard deviation .21. What "composite number" do I need to have, to be better than 95% of all the professors in the College of Science? (Round your answer to two decimal places.)

- (a) 3.52 (b) 3.20 (c) 3.36 (d) 3.47 (e) 3.33

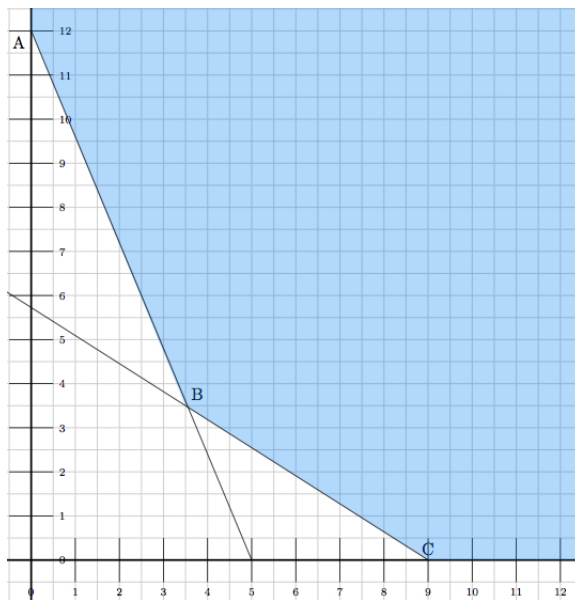
7. (5 pts.) One year the GRE test had a mean of $\mu = 459$ and a standard deviation $\sigma = 112$. The scores formed a normal distribution. Find the probability that a score lies between 400 and 550.

- (a) 32% (b) 68% (c) 49% (d) 51% (e) 9%

8. (5 pts.) What are the coordinates of the point of intersection of the two given lines?

$$\begin{aligned}5x - y &= 2 \\ -8x + 4y &= 4\end{aligned}$$

- (a) $x = 3, y = 13$ (b) $x = 2, y = 8$
(c) $x = 1/9, y = 13/9$ (d) $x = 2, y = 10$
(e) $x = 1, y = 3$



9. (5 pts.) The feasible region of a certain system of inequalities is shown above.
 What is the minimum value of the objective function $z = 20x + 30y$?

- (a) 175
- (b) 100
- (c) 180
- (d) 360
- (e) 0

10. (5 pts.) Which of the pair of values for x and y given below is in the feasible set for the given inequalities?

$$\begin{aligned} x + 2y &\geq 7 \\ 2x - y &\geq 4 \\ x &\geq 0 \\ y &\geq 0 \end{aligned}$$

- (a) $x = 0, y = 4$
- (b) $x = 3, y = -2$
- (c) $x = 2, y = 1$
- (d) $x = 7, y = 1$
- (e) $x = 1, y = 3$

Partial Credit

You must show **all of your work** on the partial credit problems to receive credit! Make sure that your answer is clearly indicated. You're more likely to get partial credit for a wrong answer if you explain your reasoning.

11. (10 pts.) The scores of top 10 finalists for the Uneven Parallel Bars at the USA Gymnastics Collegiate Nationals Event Finals 2014 are as follow:

9.85, 9.80, 9.82, 9.75, 9.70, 9.70, 9.85, 9.85, 9.80 ,9.82.

(a) Compute the mean, median and mode of the scores.

(b) Compute the variance of the scores.

(c) Compute the standard deviation of the scores.

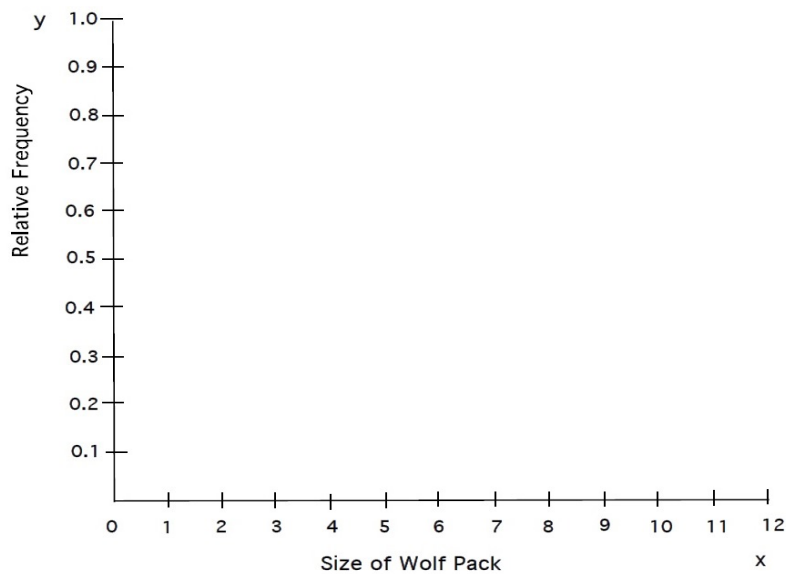
12. (10 pts.) Zoologists studying wolfpacks close to the arctic circle recorded the sizes of the packs that they found, as follows:

6, 10, 7, 5, 7, 7, 2, 4, 3, 2, 2, 3, 9, 4, 4, 2, 8, 7, 8, 4.

(a) Organize the data in a relative frequency table.

Outcome	Frequency	Rel. Freq.
Totals		

(b) Draw a histogram for the data on the axes provided below:



(c) Assuming that the samples observed represent the sizes of wolf packs accurately, use the data to estimate the probability that a randomly selected pack has size between 6 and 8, inclusive.

13. (10 pts.) A company has a machine that produces screws. The probability that the machine produces a defective screw is 10%. On a certain day, the machine produced 200 screws. Let X be the number of defective screws.

(a) What is the probability that exactly 3 of them are defective, this is, what is $P(X = 3)$?

(b) Sketch the normal curve that best approximates the probability distribution of the random variable X . Be sure to include labelled axes, and a scale. Also, say on your sketch what is the mean and standard deviation of the normal curve that you are drawing.

(c) Use the normal curve from part (b) to estimate the probability that the machine produced between 5 and 25 defective screws, inclusive.

14. (10 pts.) A box has four batteries, two of which are defective. I select batteries one at a time (without replacing them in the box), and test them. Each test takes half a minute. I keep going until I have found (and tested) *both* defective batteries, then I stop. Let X be the number of minutes this process lasts.

(a) Write down a probability distribution table for this experiment. (A tree diagram might help).

X (Number of minutes)	Probability of X

(b) Calculate the expected value of X .

(c) Calculate the variance of X .

15. (10 pts.) A soft-drink company can produce up to 5 000 bottles of soda a day, in either regular or diet variety, and has an operating budget of up to \$5 400 per day. It costs \$1 to produce each bottle of regular soda and \$1.20 to produce each bottle of diet. There is 15 cents profit per bottle of regular soda and 17 cents profit per bottle of diet soda. The company knows that it can sell anything that it produces on a given day, and wishes to maximize daily profit.

(a) Set this problem up as a linear programming problem. Be sure to say what the variables represent.

(b) By drawing a graph of the feasible region, solve the linear programming problem, and calculate what the maximum possible profit is.

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