

ECO251 QBA1
THIRD HOUR EXAM
 Nov 24, 2003

Name: KEY

Social Security Number: _____

Class Time (Circle) 10am 11am

Part I: (30+ points) Do all the following: All questions are 2 points each except as marked. Exam is normed on 50 points including take-home. (Showing your work can give partial credit on some problems!)

1. In its standardized form, the normal distribution
 - a) *has a mean of 0 and a standard deviation of 1.
 - b) has a mean of 1 and a variance of 0.
 - c) has an area equal to 0.5.
 - d) cannot be used to approximate discrete probability distributions.

2. For some value of Z , the probability that a standardized normal variable is below Z is 0.2090. The value of Z is
 - a) *- 0.81.
 - b) - 0.31.
 - c) 0.31.
 - d) 1.96.

Solution: Your diagram of the normal distribution should show a Normal curve with a mean at zero. 50% of the area is below zero, so a number with 20.9% below it must be below zero too. If the number has 20.9% below it, it must have 79.1% above it. The probability that a value of Z is above zero is 50%, so the probability between the number we want and zero is $50\% - 20.9\% = 29.1\%$. According to the Normal table, $P(0 \leq z \leq 0.81) = .2910$. This means that $P(-0.81 \leq z \leq 0) = .2910$ too. So our value is -0.81.

3. If we know that the length of time it takes a college student to find a parking spot in the library parking lot follows a normal distribution with a mean of 3.5 minutes and a standard deviation of 1 minute, find the probability that a randomly selected college student will find a parking spot in the library parking lot in less than 3 minutes. **Make a diagram!**
 - a) 0.3551
 - b) *0.3085
 - c) 0.2674
 - d) 0.1915

Solution: $x \sim N(3.5, 1)$

$$P(x \leq 3) = P\left[z \leq \frac{3 - 3.5}{1}\right] = P(z \leq -0.50)$$

$$= P(z \leq 0) - P(-0.50 \leq z \leq 0) = .5 - .1915 = .3085$$

Your diagram for X should show a Normal curve with a mean at 3.5. 3 lies to the left of 3.5. Shade the area below 3. You must take the area below 3.5 and subtract the area between 3 and 3.5. **If you make this diagram, put 3.5 in the middle, not zero!**

Your diagram for Z should show a Normal curve with a mean at zero. -0.5 lies to the left of zero. Shade the area below -0.5. You must take the area below 0 and subtract the area between -0.5 and zero. **Most people seem to be happier if they make the Z diagram instead of the X diagram.**

4. If we know that the length of time it takes a college student to find a parking spot in the library parking lot follows a normal distribution with a mean of 3.5 minutes and a standard deviation of 1 minute, find the probability that a randomly selected college student will take between 2 and 4.5 minutes to find a parking spot in the library parking lot. **Make a diagram!**
- 0.0919
 - 0.2255
 - 0.4938
 - *0.7745

Solution: $x \sim N(3.5, 1)$

$$P(2 \leq x \leq 4.5) = P\left[\frac{2 - 3.5}{1} \leq z \leq \frac{4.5 - 3.5}{1}\right] = P(-1.50 \leq z \leq 1.00)$$

$$= P(-1.50 \leq z \leq 0) + P(0 \leq z \leq 1.00) = .4332 + .3413 = .7745$$

Your diagram for X should show a Normal curve with a mean at 3.5. 2 lies to the left of 3.5, and 4.5 to the right of 3.5. Shade the area between 2 and 4.5. You must take the area between 2 and 3.5 and add the area between 3.5 and 4.5.

Your diagram for Z should show a Normal curve with a mean at zero. -1.5 lies to the left of zero, and 1 lies to the right of zero. Shade the area between -1.5 and 1. You must take the area between -1.5 and 0 and add the area between zero and 1.00.

TABLE 5-4 Not only is this almost identical to Grass2. The probabilities for x are still the same as on the last exam! Why are so many of you still trying to compute sample means and variances when there is no sample here?

The following table contains the joint probability distribution for X and Y . Show your work neatly in questions 6-9.

	X					
Y	0	1	2	3	4	5
0	.10	.20	.25	0	0	0
6	0	0	.20	.15	.05	.05
Total	.10	.20	.45	.15	.05	.05

5. Referring to Table 5-4, the probability that X is at least 1 is _____.
ANSWER: $0.90 = .20 + .45 + .15 + .05 + .05 = 1 - .10$

Work for questions 6-9 follows.

		x								
		0	1	2	3	4	5	$P(y)$	$yP(y)$	$y^2P(y)$
y	0	.10	.20	.25	0	0	0	.55	0	0
	6	0	0	.20	.15	.05	.05	.45	2.70	16.20
	$P(x)$.10	.20	.45	.15	.05	.05	=1.00	2.70	16.20
	$xP(x)$	0	.20	.90	.45	.20	.25	=2.00		
	$x^2P(x)$	0	0.20	1.80	1.35	0.80	1.25	=5.40		