

MATH 104 - EXAM II

1. Suppose that $\Pr(E) = 0.85$, $\Pr(F) = 0.4$ and $\Pr(E \cap F) = 0.3$. Then $\Pr(F | E') =$
- (a) $\frac{1}{5}$ (b) $\frac{5}{11}$ (c) $\frac{11}{7}$ (d) $\frac{2}{3}$ (e) none of the above
2. A certain soccer goal keeper catches 30% of penalty kicks against his team. The probability that out of five penalty kicks he catches two is?
- (a) $\binom{5}{2} (0.3)^2 (0.7)^3$ (b) $(0.3)^2$ (c) $C(5,2) (0.3)^2$ (d) $5! (0.3)^2$
(e) none of the above
3. A box contains 4 good light bulbs and 3 defective ones. Three bulbs are selected consecutively (without replacement). The probability that exactly two defective bulbs are drawn and the second defective bulb is found on the third selection is?
- (a) $\frac{8}{35}$ (b) $\frac{C(3,2)}{C(4,3)}$ (c) $\frac{C(3,2)}{C(4,2)} \frac{C(3,3)}{C(4,3)}$ (d) $\frac{3!}{4!}$
(e) none of the above.

(Hint: Use tree diagrams)

4. Two persons A and B are competing in a tournament which ends if three games are played or one of them wins two games in a row. Each game is won by either A or B i.e. no draws are possible. The winner has to win two games. The probability that A wins any game is 0.6. The probability that A wins the tournament is:

(a) 0.648 (b) 0.48 (c) 0.36 (d) $C(3,2) \times (0.6)^2 \times (0.4)$
(e) none of the above.

(Hint: Use tree diagrams)

5. In a factory, assembly lines I, II and III produce 60%, 30% and 10% of the total output, respectively. Two percent of line I's output is defective, 4% of line II's output is defective and 6% of line III's output is defective. An item is chosen at random. If the selected item is defective, what is the probability that it was produced by line III?

(a) .06 (b) $\frac{1}{5}$ (c) $\frac{1}{2}$ (d) $\frac{3}{5}$ (e) none of the above

6. Sixty percent of the students at a certain university are female. 80% of the female students are non-vegetarians, and 10% of the male students are vegetarians. Your friend tells you that she has a relative who is a student at the university and is a vegetarian. What is the probability that your friend's relative is female?

(a) $\frac{6}{10}$ (b) $\frac{5}{6}$ (c) $\frac{2}{3}$ (d) $\frac{8}{10}$ (e) $\frac{3}{4}$

7. A Notre Dame basketball player has a free-throw success rate of $\frac{2}{3}$. An experiment consists of letting him try three times, and counting the number X of successes. The probability distribution of the random variable X is

(a)

k	$\Pr(x=k)$
0	$\frac{1}{4}$
1	$\frac{1}{4}$
2	$\frac{1}{4}$
3	$\frac{1}{4}$

(b)

k	$\Pr(X=k)$
1	$\frac{1}{3}$
2	$\frac{1}{3}$
3	$\frac{1}{3}$

(c)

k	$\Pr(x=k)$
0	$\frac{1}{8}$
1	$\frac{3}{8}$
2	$\frac{3}{8}$
3	$\frac{1}{8}$

(d)

k	$\Pr(X=k)$
0	$\frac{1}{27}$
1	$\frac{6}{27}$
2	$\frac{12}{27}$
3	$\frac{8}{27}$

(e) none of the above

8. A single fair die is tossed 6 times. The probability that a "2" appears exactly 4 times is:

- (a) $\frac{25}{66}$ (b) $\frac{375}{66}$ (c) $\frac{15}{64}$ (d) $\frac{2}{3}$ (e) none of the above

9. A true-false test has 4 questions. What is the probability of getting at least 3 questions correct by guessing?

- (a) $\left(\frac{3}{4}\right)^3$ (b) $\frac{C(4,3)}{4!}$ (c) $\frac{5}{16}$ (d) $\frac{1}{2}$ (e) none of the above

10. Consider the probability distribution below

k	Pr(X=k)
-2	0.1
0	0.2
1	0.1
2	0.2
3	0.4

The $\Pr((X+1)^2=1)$ is

- (a) 0.1 (b) 0.2 (c) 0.4 (d) 0.3 (e) none of the above

11. The probability distribution of a random variable X is as follows:

k	Pr(X=k)
2	1/16
3	3/8
4	1/8
5	3/8
6	1/16

What is the mean of this distribution?

- (a) 2 (b) 1 (c) 4 (d) 4.5 (e) none of the above

12. The free throw success rate of a basketball player is $\frac{4}{5}$. An experiment consists of letting him shoot three times. If X denotes the number of successes out of the three shots, what is the expected value of X?

- (a) $\frac{12}{25}$ (b) $\frac{3}{5}$ (c) $\frac{4}{5}$ (d) $\frac{12}{5}$ (e) $\sqrt{\frac{12}{25}}$

13. Jack and Jill play the following game: Jack rolls a fair die and observes the number on the uppermost face. If a six is observed Jack gives Jill \$0.90, if any other number is observed Jill gives Jack \$0.12. What are Jill's expected earnings in this game?

- (a) \$0.05 (b) \$0.90 (c) \$0.30 (d) \$0.12 (e) none of the above

14. The probability distribution of a random variable X is as follows:

k	Pr(X=k)
6	1/6
7	1/6
10	1/3
13	1/6
14	1/6

What is the variance, σ^2 , of X? Hint: The expected value of X is 10.

- (a) 0 (b) $\sqrt{\frac{25}{3}}$ (c) $\frac{25}{3}$ (d) $\frac{15}{2}$ (e) $\sqrt{\frac{15}{2}}$

15. A sample of 10 students is surveyed and the number of hours that each spends watching T.V. on a certain week is recorded. The results of the survey are shown below.

Number of hours	Frequency
0	1
1	2
2	1
3	2
4	1
5	2
6	1

What is the sample variance, s^2 , for the number of hours spent watching T.V.? Hint: The sample mean \bar{x} , is 3.

- (a) 2 (b) 4 (c) 3.6 (d) $\sqrt{3.6}$ (e) none of the above

16. Let Z be a random variable with a standard normal distribution. Find $\Pr(Z \geq 1.95)$.

- (a) .9744 (b) .0256 (c) .5 (d) .1711 (e) .8289

17. The height of new born baby elephants is normally distributed with mean $\mu = 4$ ft. and standard deviation $\sigma = 1$ ft. Find the probability that the height of a newborn elephant is between 3.5 ft. and 4.5 ft.

- (a) .6170 (b) .6915 (c) .3085 (d) .3830 (e) .5199

18. The random variable Z has a standard normal distribution. Find a value z such that $\Pr(-z \leq Z \leq z) = .999$.

- (a) $z = 3.30$ (b) $z = 3.10$ (c) $z = 3.5$ (d) $z = 2.6$ (e) $z = 1.65$

19. Three fifths of the residents in a certain city subscribe to cable T.V. A sample of 150 residents is chosen. Use the normal approximation to the binomial to estimate the probability that the number of residents in the sample who subscribe to cable is between 80 and 97 inclusive.

- (a) .1457 (b) .8543 (c) .8254 (d) .1746 (e) .1815

20. Twenty percent of students on a certain campus read the New York Times daily. Let X denote the number of students in a random sample of size 125 who read the New York Times daily. What is the standard deviation of X ?

- (a) 100 (b) 20 (c) 5 (d) 25 (e) $\sqrt{20}$