MATH 104 - EXAM II

1. A special die has 8 faces which are numbered 1, 2, 3, ..., 8. When the die is rolled, the faces are equally likely to appear on top. The die is rolled twice and the total of the two numbers on top is recorded. What is the probability the total is 11?

    (a) $\frac{3}{32}$ (b) $\frac{1}{16}$ (c) $\frac{1}{18}$ (d) $\frac{1}{9}$ (e) $\frac{11}{64}$

2. In a class on Russian literature, 12 of the students have read "War and Peace", 10 have read "Crime and Punishment" and 18 have read at least one of these two novels. What is the probability that a randomly selected student from the class has read "Crime and Punishment", given that the student has read "War and Peace"?

    (a) $\frac{1}{3}$ (b) $\frac{5}{9}$ (c) $\frac{2}{9}$ (d) $\frac{4}{9}$ (e) $\frac{2}{5}$

3. Suppose that E and F are independent events with $Pr(E) = 0.3$, $Pr(F) = 0.4$. What is $Pr(E \cup F)$?

    (a) 0.58   (b) 0.7   (c) 0.12   (d) 0.82   (e) 0.5

4. A store has 15 cartons, each containing 1 dozen eggs; five of the cartons have broken eggs in them. A shopper inspects cartons at random (he doesn't inspect the same carton twice), looking for one with no broken eggs. He intends to stop and buy the carton if he finds one, and to give up without buying eggs if 3 cartons in a row contain a broken egg. What is the probability that the shopper doesn't buy any of the 15 egg cartons?

    (a) $\frac{2}{91}$ (b) $\frac{1}{30}$ (c) $\frac{1}{3}$ (d) $\frac{47}{1264}$ (e) $\frac{2}{21}$

5. Louvers for vertical blinds are manufactured by two machines in a factory. Machine 1 produces 60% of the louvers, and fails to install a hanger in 1% of the louvers it makes. The remainder of the louvers are manufactured by machine 2, which fails to install a hanger in 2% of the louvers it makes. If a louver manufactured at the factory is found not to contain a hanger, what is the probability it was manufactured by machine 2?

(a) $\frac{4}{7}$ (b) $\frac{3}{7}$ (c) 0.014   (d) $\frac{9}{14}$ (e) 0.564

6.   The table below is the probability distribution for a random variable X

k	Pr(X=k)
-1	$\frac{1}{4}$
0	$\frac{1}{3}$
1	$\frac{5}{12}$

Which of the following is the probability distribution table for the random variable Y=2X?

(a)

k	Pr(Y=k)
-2	$\frac{1}{4}$
0	$\frac{1}{3}$
2	$\frac{5}{12}$

(b)

k	Pr(Y=k)
-2	$\frac{1}{2}$
0	$\frac{2}{3}$
2	$\frac{5}{6}$

(c)

k	Pr(Y=k)
-2	$\frac{1}{6}$
0	$\frac{2}{3}$
2	$\frac{1}{6}$

(d)

k	Pr(Y=k)
-1	$\frac{1}{2}$
0	$\frac{2}{3}$
1	$\frac{5}{6}$

(e)

k	Pr(Y=k)
-1	$\frac{1}{6}$
0	$\frac{2}{3}$
1	$\frac{1}{6}$

7.   Which of the following events is <u>least likely</u> (i.e. has the lowest probability)?
E: 1 head is obtained when a coin is tossed 2 times.
F: 2 heads are obtained when a coin is tossed 4 times.
G: 3 heads are obtained when a coin is tossed 6 times.
H: 4 heads are obtained when a coin is tossed 8 times.
(a) H (b) F   (c) G (d) E (e) all four events are equally likely

8. The following is the frequency distribution of scores by a golfer in 10 consecutive rounds of 18 holes of golf. What is the golfer's mean score for these 10 rounds?

Score	Frequency
84	2
85	3
86	4
87	1

(a) 85.4   (b) 85.5   (c) 85.6   (d) 85.7   (e) 85.8

9. A fair die is rolled 10 times. What is the probability that the number on its top face was 5 or higher (i.e. either 5 or 6) on exactly 7 of the rolls?

(a) $C(10,7) \left(\frac{1}{3}\right)^7 \left(\frac{2}{3}\right)^3$ (b) $C(10,3) \left(\frac{1}{3}\right)^3 \left(\frac{2}{3}\right)^7$ (c) $P(10,7) \left(\frac{1}{3}\right)^7 \left(\frac{2}{3}\right)^3$

(d) $P(10,3) \left(\frac{1}{3}\right)^3 \left(\frac{2}{3}\right)^3$ (e) $P(10,7) \left(\frac{1}{2}\right)^7 \left(\frac{1}{2}\right)^3$

10. An electronic device contains 5 type A transistors and 10 type B transistors. The probability that a type A (respectively type B) transistor will fail within 5000 hrs. is 0.01 (respectively, 0.02). What is the probability that at least one of the transistors in the device will fail within 5000 hrs?

(a) $1 - (0.99)^5 (0.98)^{10}$ (b) $(0.01)^5 (0.02)^{10}$ (c) $(0.99)^5 (0.98)^{10}$
(d) $1 - (0.01)^5 (0.02)^{10}$ (e) $1 - (0.01)^5 (0.98)^{10}$

11. An urn contains 3 white balls and a red ball. If two balls are selected from the urn without replacement, what is the expected number of white balls drawn?

(a) 1.5   (b) 1   (c) 2   (d) 3   (e) 0

12. The following is a probability distribution histogram for a random variable X.
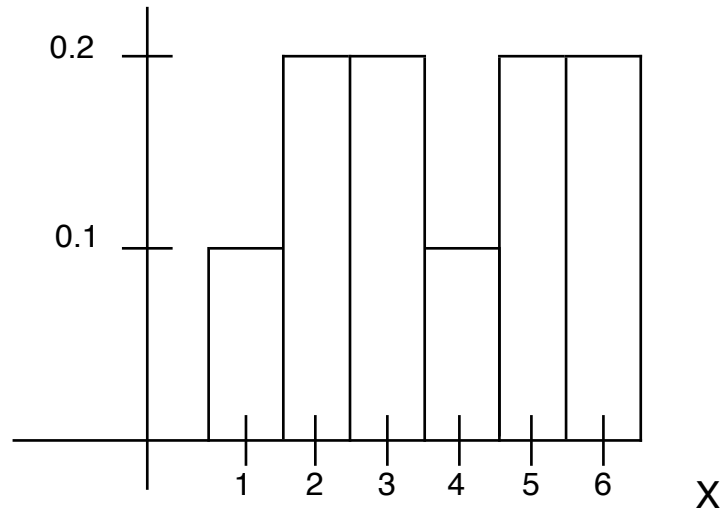
What is Pr(X ≤ 5)?

(a) 0.8   (b) 0.6   (c) 0.4   (d) 0.2   (e) 0.7

13. A random variable X is the number of successes in n Bernoulli trials with success probability p and failure probability q. The probability distribution table of X is shown below:

k	Pr(X=k)
0	$\frac{1}{81}$
1	$\frac{8}{81}$
2	$\frac{24}{81}$
3	$\frac{32}{81}$
4	$\frac{16}{81}$

Which of the following values of n, p, q give rise to this probability distribution?

(a) $n = 4$, $p = \frac{2}{3}$, $q = \frac{1}{3}$.

(b) $n = 4$, $p = \frac{1}{3}$, $q = \frac{2}{3}$.

(c) $n = 4$, $p = \frac{1}{6}$, $q = \frac{5}{6}$.

(d) $n = 5$, $p = \frac{1}{3}$, $q = \frac{2}{3}$.

(e) $n = 5$, $p = \frac{2}{3}$, $q = \frac{1}{3}$.

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14.
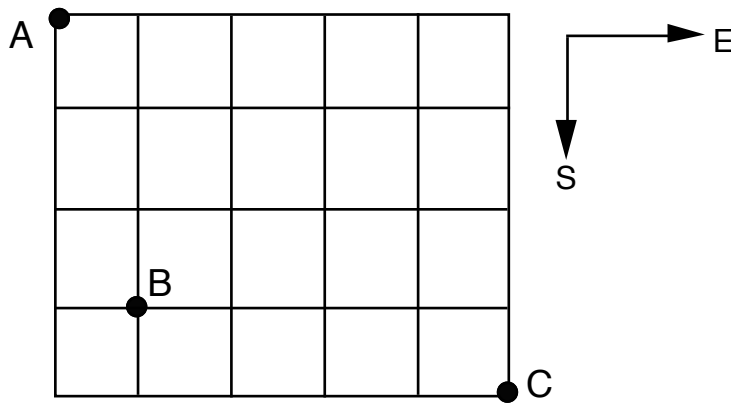
The above is a map of the roads in a country town. A motorist travels from A to C (traveling East or South only). If the motorist is equally likely to choose any of the routes from A to C, what is the probability that their car will pass through B?

(a) $\dfrac{10}{63}$ (b) $\dfrac{4}{21}$ (c) $\dfrac{1}{7}$ (d) $\dfrac{11}{63}$ (e) $\dfrac{13}{63}$

15. A magician's hat contains 3 rabbits, a squirrel and a groundhog. The magician pulls animals out of her hat at random, stopping when she runs out of animals. What is the probability that the third animal she pulls out of her hat is a groundhog?

(a) $\dfrac{1}{5}$ (b) $\dfrac{1}{10}$ (c) $\dfrac{3}{10}$ (d) $\dfrac{3}{20}$ (e) $\dfrac{1}{4}$

16. Five people, including Thelma and Louise, randomly arrange themselves in a straight line for a photograph. What is the probability that Thelma is standing next to Louise?

(a) $\dfrac{2}{5}$ (b) $\dfrac{1}{5}$ (c) $\dfrac{1}{4}$ (d) $\dfrac{3}{10}$ (e) $\dfrac{3}{20}$

17. A coin is tossed three times. What is the probability of obtaining heads three times, given that at least two heads are obtained?

(a) $\dfrac{1}{4}$ (b) $\dfrac{1}{2}$ (c) $\dfrac{3}{4}$ (d) 1   (e) $\dfrac{1}{8}$

18. The probability that a lie detector test indicates that a person is lying when they are actually telling the truth is 0.1. The probability that it indicates they are telling the truth when they are really lying is 0.2. At a given police station, 10% of the people taking a lie detector test actually lie. If a person takes the lie detector test twice, and each time it indicates that they are lying, what is the probability that they are actually lying? (Assume the results of successive tests are independent.)

(a) $\frac{64}{73}$ (b) $\frac{4}{13}$ (c) $\frac{8}{17}$ (d) $\frac{71}{73}$ (e) $\frac{128}{145}$

19. A college science library consists of 25% physics books, 35% chemistry books, and 40% biology books. The chances of a physics, chemistry or biology book being checked out at any given time are 0.04, 0.02 and 0.015 respectively. If a book a student is looking for is currently checked out, what is the probability that its a biology book?

(a) $\frac{6}{23}$ (b) $\frac{5}{23}$ (c) $\frac{4}{23}$ (d) $\frac{7}{23}$ (e) $\frac{8}{23}$

20. Harold and Maude play a card game as follows. Harold picks a card, from a standard deck of 52 cards, and Maude tries to guess its suit without looking at it. If Maude guesses correctly, Harold gives her $3.00; otherwise, Maude gives Harold $1.00. What are Maude's expected earnings for this game (assuming she is not "psychic")?

(a) $0.00   (b) $0.50   (c) $1.00   (d) -$0.50   (e) -$1.25