Date Completed: _____
Mentor Initials: _____

Probability & Counting (Intermediate)

1. Two fair coins are repeatedly tossed simultaneously. What is the probability that both coins land heads up on the 47th toss?

A. $\frac{1}{188}$

B. $\frac{1}{141}$

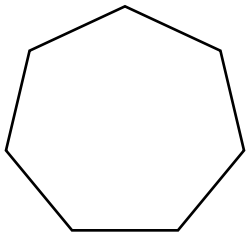
C. $\frac{1}{47}$

D. $\frac{1}{9}$

E. $\frac{1}{4}$

2. How many diagonals does a heptagon, shown below, have?

A. 7
B. 14
C. 28
D. 42
E. 49



3. Erika is in Ms. Lang's class. To choose 5 students from her class of 26 students to answer questions, Ms. Lang will put 26 cards, each with the name of a different student from her class on it, in a box. Next, Ms. Lang will randomly draw 5 cards from the box without replacing any of the cards. What is the probability that Erika's card will NOT be drawn?

A. $\frac{1}{26}$

B. $\frac{5}{26}$

C. $\frac{19}{26}$

D. $\frac{21}{26}$

E. $\frac{25}{26}$

4. License plates on cars in a certain state consist of 3 letters taken from the 26 letters, A through Z, followed by 3 digits taken from the 10 digits, 0 through 9. Which of the following expressions gives the number of distinct license plates that are possible given that repetition of both letters and digits is allowed?

A. $(3+3)^{26+10}$
B. $2(10!)^3 \cdot (26!)^3$
C. $(10+26)^3$
D. $10^3 \cdot 26^3$
E. $(26! \cdot 10!)^3 + (26! \cdot 10!)^3$

5. Each of 100 distinct playing cards is one of four solid colors and is numbered with one integer. There are 25 each of blue, red, yellow, and green cards numbered 1 to 25. One of the 100 cards will be selected at random. What is the probability that the selected card will be red OR numbered 13?

A. $\frac{2}{50}$
B. $\frac{27}{100}$
C. $\frac{7}{25}$
D. $\frac{29}{100}$
E. $\frac{3}{10}$

6. A weather channel predicts that there is a 20% chance of rain on each individual day for the next 4 days. What is the probability that it rains on at least 1 of the 4 days?

A. $\frac{1}{5}$
B. $\frac{256}{625}$
C. $\frac{369}{625}$
D. $\frac{3}{5}$
E. $\frac{4}{5}$

7. Which of the following expressions gives the number of permutations of 13 objects taken 4 at a time?

A. $13(4)$

B. $(13-4)!$

C. $\frac{13!}{4!}$

D. $\frac{13!}{(13-4)!}$

E. $\frac{13!}{(13!)(13-4)!}$

8. A writer has 2 short stories that she will be submitting to 2 different competitions. She estimates that the first story has a 55% change of winning, while the second story has a 40% change of winning. Using her estimates, what is the probability that the writer will *lose* both competitions?

A. 15%
B. 22%
C. 27%
D. 28%
E. 39%

9. A committee will be selected from a group of 14 women and 11 men. The committee will consist of 4 women and 4 men. Which of the following expressions gives the number of different committees that could be selected from these 25 people?

A. $({}_{25}P_{8})$
B. $({}_{14}P_4)({}_{11}P_4)$
C. $({}_{25}C_8)$
D. $({}_{25}C_4)({}_{25}C_4)$
E. $({}_{14}C_4)({}_{11}C_4)$

10. At a local high school, the Journal club will be selecting the positions of President, Vice-President, and Treasury for the next year. Given that there are 20 members of the club, how many different ways could these three positions be chosen?

A. 6
B. 20
C. 60
D. 720
E. 6,840

11. To win a prize on a game show, a person must correctly answer 6 trivia questions correctly. Each question has 3 total answer choices, only 1 of which is correct. The person answers the first two questions correctly, but they then have to randomly guess on the final 4 questions. What is the probability the person will get all 6 questions correct?

A. $\frac{1}{256}$

B. $\frac{1}{81}$

C. $\frac{1}{64}$

D. $\frac{1}{6}$

E. $\frac{1}{4}$

12. A box contains 12 solid-colored pieces of paper−4 yellow, 6 blue and 2 purple. Each paper has a single number printed on it. The yellow papers are numbered $1-4$ (each number is used once), the blue papers are numbered $1-6$ (each number is used once), the purple papers are numbered 1 and 2 (each number is used once). A paper will be drawn at random from the basket. What is the probability that the paper that is drawn will be purple *or* have a 2 printed on it?

A. $\frac{1}{12}$

B. $\frac{2}{12}$

C. $\frac{3}{12}$

D. $\frac{4}{12}$

E. $\frac{5}{12}$

13. A certain acting company has 90 actors, 65 of whom are classically trained. Of the actors who are classically trained, 25 are under the age of 40. There are 12 actors who are not classically trained and are also not under the age of 40. One actor will be selected at random to star in the latest Hollywood blockbuster. What is the probability that the selected actor will be under the age of 40?

A. $\frac{25}{90}$

B. $\frac{37}{90}$

C. $\frac{38}{90}$

D. $\frac{65}{90}$

E. $\frac{77}{90}$

14. Lincoln High Band has a total of 66 band members. Of those 66, 17 are seniors who play the trumpet, 19 are seniors who play the flute, 14 are juniors who play the trumpet, and 16 are juniors who play the flute. Suppose 2 of these students will be chosen at random to represent the band at a local music event. Which of the following expressions gives the probability that both chosen students will be from the same grade and play the same instrument?

A. $\frac{17(16)}{66(65)} + \frac{19(18)}{66(65)} + \frac{14(13)}{66(65)} + \frac{16(15)}{66(65)}$

B. $\frac{1}{4}(\frac{17}{66} + \frac{19}{66} + \frac{14}{66} + \frac{16}{66})$

C. $\frac{17(14)}{66(65)} + \frac{19(16)}{66(65)}$

D. $\frac{17(19)}{66(65)} + \frac{14(16)}{66(65)}$

E. $\frac{1}{4}(\frac{1}{4})$

15. A six-sided die is rolled 3 times. What is the probability that the die will show an odd number exactly twice?

A. $\frac{1}{8}$

B. $\frac{2}{8}$

C. $\frac{3}{8}$

D. $\frac{4}{8}$

E. $\frac{5}{8}$