Practice A

1. These events are mutually exclusive since each student can choose only one card.
2. These events are not mutually exclusive since a card can be both black and a 10.
3. $\frac{7}{12}$
4. $\frac{2}{5}$
5. $\frac{1}{3}$
6. $\frac{1}{2}$
7. 1
8. $\frac{1}{2}$
9. $\frac{2}{3}$
10. $\frac{10}{13}$ or 0.77

Answers to Mutually Exclusive and Overlapping Events. (ID: 1)

1) Mutually exclusive 2) Mutually exclusive 3) Mutually exclusive 4) Mutually exclusive
5) Not mutually exclusive 6) Not mutually exclusive 7) $\frac{5}{7} \approx 0.714$

8) $\frac{7}{9} \approx 0.778$ 9) $\frac{1}{3} \approx 0.333$ 10) $\frac{8}{11} \approx 0.727$ 11) $\frac{7}{13} \approx 0.538$

12) $\frac{7}{12} \approx 0.583$

(10) $\frac{6}{11} + \frac{5}{11} - \frac{3}{11} = \frac{8}{11}$

(12) $\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$

Analytic Geometry Unit 7: Probability Notes

Independent vs. Dependent Events

Independent Events:
Two events A and B, are independent if the fact that A occurs does not affect the probability of B occurring.

Examples:
-Landing on heads from two different coins
-Rolling a 4 on a die, then rolling a 3 on a second roll of the die

Independent Event Formula: Probability of A and B occurring: $P(A \text{ and } B) = P(A \cap B) = P(A) \cdot P(B)$

1. A coin is tossed and a 6-sided die is rolled. Find the probability of landing on the head side of the coin and rolling a 3 on the die.

$P(H) \cdot P(3)$

$\frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12} \approx .083$

2. A card is chosen at random from a deck of 52 cards. It is then replaced and a second card is chosen. What is the probability of choosing a jack and an eight?

$P(J) \cdot P(8)$

$\frac{4}{52} \cdot \frac{4}{52} = \frac{1}{169} \approx .0059$

3. A jar contains three red, five green, two blue and six yellow marbles. A marble is chosen at random from the jar. After replacing it, a second marble is chosen. What is the probability of choosing a green and a yellow marble?

$P(G) \cdot P(y)$

$\frac{5}{16} \cdot \frac{6}{16} = \frac{15}{128} \approx .117$

4. A school survey found that 9 out of 10 students like pizza. If three students are chosen at random with replacement, what is the probability that all three students like pizza?

$\frac{9}{10} \cdot \frac{9}{10} \cdot \frac{9}{10}$

$\frac{729}{1000} \approx .729$

$S_1 \quad S_2 \quad S_3$

Analytic Geometry Unit 7: Probability Notes

Dependent Events:

Two events A and B, are dependent if the fact that A occurs affects the probability of B occurring.

Examples:

-Picking a blue marble out of a bag and then picking another blue marble without putting the 1st one back in the bag.

Dependent Event Formula: Probability of A and B occurring: $P(A \text{ and } B) = P(A \cap B) = P(A) \cdot P(B \mid A)$

5. A jar contains three red, five green, two blue and six yellow marbles. A marble is chosen at random from the jar. A second marble is chosen without replacing the first one. What is the probability of choosing a green and a yellow marble?

$P(G) \cdot P(Y)$

$\frac{5}{16} \cdot \frac{6}{15} = \frac{1}{8} = .125$

6. An aquarium contains 6 male goldfish and 4 female goldfish. You randomly select a fish from the tank, do not replace it, and then randomly select a second fish. What is the probability that both fish are male?

$P(M) \cdot P(M)$

$\frac{6}{10} \cdot \frac{5}{9} = \frac{1}{3} \approx .33$

7. A random sample of parts coming off a machine is done by an inspector. He found that 5 out of 100 parts are bad on average. If he were to do a new sample, what is the probability that he picks a bad part and then, picks another bad part if he doesn't replace the first?

$P(B) \cdot P(B)$

$\frac{5}{100} \cdot \frac{4}{99} = \frac{1}{495} \approx .002$

8. Tim's goal is to run one marathon in each of the fifty states. To determine the order in which he will run the marathons, he will write the name of each state on a slip of paper and place the slips of paper in a bowl. He will draw the names of the states one at a time from the bowl until all the slips of paper have been drawn.

If there are 26 states east of the Mississippi River and 24 states west of the Mississippi River, what is the probability that the third state drawn will be east of the Mississippi, GIVEN THAT the first one drawn was east and the second one drawn was west of the Mississippi?

$\frac{26}{50} \cdot \frac{24}{49} \cdot \frac{25}{48} \approx .1327$

$P(E) \quad P(W) \quad P(E)$

Analytic Geometry Unit 7: Probability Notes

How to Determine if Two Events are Independent:

Two events are independent if the following are true:

$P(A \mid B) = P(A)$ $P(B \mid A) = P(B)$ $P(A \cap B) = P(A) \cdot P(B)$

You must prove one of the above conditions to prove two events are independent

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9. Let event G = taking a math class. Let event H = taking a science class. Then, G AND H = taking a math class and a science class. Suppose P(G) = 0.6, P(H) = 0.5, and P(G AND H) = 0.3. Are G and H independent?

$P(G) \cdot P(H)$

$.6 \cdot .5 = .3$

Yes, $P(A) \cdot P(B) = P(A \cap B)$ Independent.

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10. In a particular college class, 60% of the students are female. 50% of all students in the class have long hair. 45% of the students are female and have long hair. Let F be the event that the student is female. Let L be the event that the student has long hair. One student is picked randomly. Are the events of being female and having long hair independent?

$P(F) \cdot P(L)$

$.6 \cdot .5 = .3$ or 30%

NO, not independent $P(A) \cdot P(B) \neq P(A \cap B)$