$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

If independent:

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

Name Schlansky

Mr. Schlansky

Date _____

Algebra II

Probability of Conjunctions and Disjunctions

1. $P(A) = .27$, $P(B) = .36$ and $P(A \cap B) = .11$. Find $P(A \cup B)$.

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = .27 + .36 - .11$

$P(A \cup B) = .52$

2. $P(A) = .78$, $P(B) = .49$, and $P(A \cap B) = .31$. Find $P(A \cup B)$.

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = .78 + .49 - .31$

$P(A \cup B) = .96$

3. $P(A) = .61$, $P(B) = .42$, and $P(A \cup B) = .79$. Find $P(A \cap B)$.

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$P(A \cap B) = .61 + .42 - .79$

$P(A \cap B) = .24$

4. $P(A) = .19$, $P(B) = .29$, and $P(A \cup B) = .36$. Find $P(A \cap B)$.

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$P(A \cap B) = .19 + .29 - .36$

$P(A \cap B) = .12$

5. $P(A) = .25$, $P(B) = .12$, and events A and B are independent. Find $P(A \cap B)$.

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

$P(A \cap B) = .25 \cdot .12$

$P(A \cap B) = .03$

6. $P(A) = .72$, $P(B) = .6$, and events A and B are independent. Find $P(A \cap B)$.

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

$P(A \cap B) = .72 \cdot .6$

$P(A \cap B) = .432$

7. $P(A) = .4$, $P(A \cap B) = .25$, and events A and B are independent. Find $P(B)$.

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

$\frac{.25}{.4} = \frac{.4P(B)}{.4}$

$.625 = P(B)$

8. $P(B) = .65$, $P(A \cap B) = .31$, and events A and B are independent. Find $P(A)$.

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

$\frac{.31}{.65} = \frac{P(A) \cdot .65}{.65}$

$.476\ldots = P(A)$

9. The probability of event A is 87%. The probability of event B is 70%. The probability of both events happened in 60%. What is the probability of event A or event B happens?

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = .87 + .7 - .6$

$P(A \cup B) = .97$ or 97%.

10. The probability of event A happening is 14% and the probability of event B happening is 18%, The probability that event A or event B happens is 20%. What is the probability that event A and event B happens?

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$P(A \cap B) = .14 + .18 - .2$

$P(A \cap B) = .12$ or 12%.

11. Events A and B are independent of each other. If the probability of event A happening is 10% and the probability of event B happening is 28%, what is the probability of event A and event B happening?

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

$P(A \cap B) = .1 \cdot .28$

$P(A \cap B) = .028$ or 2.8%.

12. Events A and B are independent of each other. If the probability of event A happening is 52% and the probability of event A and B happening is 23%, what is the probability of event B happening?

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

$\frac{.23}{.52} = \frac{.52P(B)}{.52}$

$.4423\ldots = P(B)$

$P(B) \approx 44\%$

13. The probability that a student in Jacqua High School is in band is $\frac{127}{466}$ and the probability that a student is on the track team is $\frac{82}{466}$. If the probability that they are on the track team and in band is $\frac{74}{466}$, what is the probability that they are on the track ~~and~~ team or in band?

A = band
B = track

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = \frac{127}{466} + \frac{82}{466} - \frac{74}{466}$

$P(A \cup B) = \frac{135}{466}$

14. The probability that a person files their tax return in March is $\frac{127}{165}$. The probability that a person watches College Basketball in March is $\frac{98}{123}$. If the probability that a person watches College Basketball and files their tax return in March is $\frac{62}{95}$, what is the probability that a person watches College Basketball or files their tax return? Round your answer to the nearest percent.

A = tax
B = basketball

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = \frac{127}{165} + \frac{98}{123} - \frac{62}{95}$

$P(A \cup B) = .9138 \_ (100) = 91\%$

15. On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?

A = oversleep
B = pop quiz

1) 73%
2) 36%
3) 23%
4) 12%

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

$P(A \cap B) = .48 \cdot .25$

$P(A \cap B) = .12$

16. In 2015 at Sabres Prep Academy, the probability that a student passed Algebra II was 78%. The probability that a student passed Chemistry was 86%. The probability they passed Algebra II or Chemistry was 88%. What is the probability that they *did not* pass Algebra II and Chemistry?

A = Algebra II
B = Chemistry

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$ not $P(A \cap B) = 1 - P(A \cap B)$

$P(A \cap B) = .78 + .86 - .88$

$P(A \cap B) = .76$

not $P(A \cap B) = 1 - .76 = .24$

17. The probability that Chloe the cardinal shows up in the Schlansky's backyard is $\frac{12}{19}$. The probability that Chloe shows up in the Silverman's backyard is $\frac{10}{17}$. If the probability that Chloe shows up in the Schlansky's backyard or the Silverman's backyard is $\frac{12}{16}$, what is the probability that Chloe shows up in both backyards?

A = Schlansky
B = Silverman

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$P(A \cap B) = \frac{12}{19} + \frac{10}{17} - \frac{12}{16}$

$P(A \cap B) = \frac{607}{1292}$

18. There are 24 students in a math class. 15 of them play a sport and 20 of them play an instrument. 22 play a sport or play an instrument. What is the probability that a student chosen at random will play a sport and play an instrument?

A = sport
B = instrument
$P(A) = \frac{15}{24}$
$P(B) = \frac{20}{24}$
$P(A \cup B) = \frac{22}{24}$

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$P(A \cap B) = \frac{15}{24} + \frac{20}{24} - \frac{22}{24}$

$P(A \cap B) = \frac{13}{24}$

19. Over the past 30 nights, Baxter barked 8 nights and cried 15 nights. He barked or cried 11 nights. How many nights did he bark and cry?

A = bark
B = cry
$P(A) = \frac{8}{30}$
$P(B) = \frac{15}{30}$
$P(A \cup B) = \frac{11}{30}$

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$P(A \cap B) = \frac{8}{30} + \frac{15}{30} - \frac{11}{30}$

$P(A \cap B) = \frac{12}{30}$

20. Suppose events A and B are independent and $P(A \text{ and } B)$ is 0.2. Which statement could be true? $.4 \cdot .3 = .12$

1) $P(A) = 0.4, P(B) = 0.3, P(A \text{ or } B) = 0.5$
2) $P(A) = 0.8, P(B) = 0.25$ $.8 \cdot .25 = .2$ ✓
3) $P(A|B) = 0.2, P(B) = 0.2$ $P(A) = P(A|B)$
4) $P(A) = 0.15, P(B) = 0.05$ $.15 \cdot .05 = .0075$

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

$.2 = P(A) \cdot P(B)$