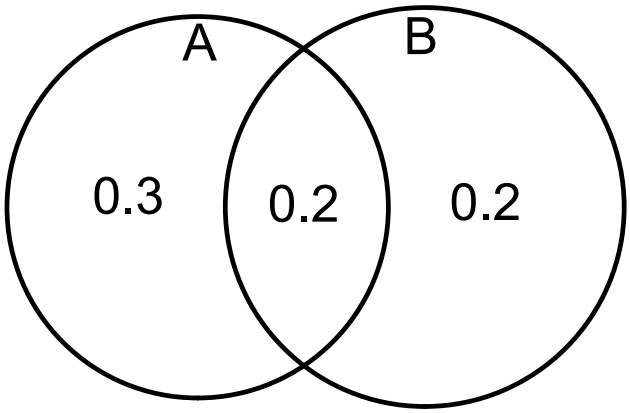
Bellwork: What is P(A|B)?




Bellwork: In your own words, explain what makes two events independent, and what makes them mutually exclusive.

## Homework 7.2 Solutions

1.

a.

| Grade | Preferred pet | | | | Totals |
|---|---|---|---|---|---|
| | Bird | Cat | Dog | Fish | |
| 9 | 3 | 49 | 53 | 22 | 127 |
| 10 | 7 | 36 | 64 | 10 | 117 |
| Totals | 10 | 85 | 117 | 32 | 244 |

b. There were 22 9th-graders in the survey whose preferred pet is a fish.

c.

i. $\frac{127}{244} \approx 0.520$

ii. $\frac{85}{244} \approx 0.348$

iii. $\frac{64}{244} = \frac{16}{61} \approx 0.262$

iv. $\frac{170}{244} = \frac{85}{122} \approx 0.697$

v. $\frac{22}{127} \approx 0.173$

vi. $\frac{22}{32} = \frac{11}{16} \approx 0.688$

vii. $\frac{42}{244} = \frac{21}{122} \approx 0.172$

viii. $\frac{36}{244} = \frac{9}{61} \approx 0.148$

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2.

a. $\frac{20}{50} = \frac{2}{5} = 0.4$

b. $\frac{16}{50} = \frac{8}{25} = 0.32$

c. $\frac{34}{50} = \frac{17}{25} = 0.68$

d. $\frac{6}{50} = \frac{3}{25} = 0.12$

e. $\frac{2}{50} = \frac{1}{25} = 0.04$

f. $\frac{28}{50} = \frac{14}{25} = 0.56$

g. $\frac{38}{50} = \frac{19}{25} = 0.76$

h. $\frac{16}{18} = \frac{8}{9} \approx 0.889$

i. $\frac{2}{18} = \frac{1}{9} \approx 0.111$

j. $\frac{34}{50} = \frac{17}{25} = 0.68$

k. $\frac{48}{50} = \frac{24}{25} = 0.96$

l. $\frac{8}{50} = \frac{4}{25} = 0.16$

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★ 3. 41 teen non-fiction books

# Lesson 7.3 Objectives

I can find probability of compound events, including independent and mutually exclusive events.

Events are **independent** if knowing the outcome of one does not affect the probability that the other will occur.

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

$P(A|B) = P(A) = \frac{P(A \cap B)}{P(B)} = \frac{P(A) \cdot P(B)}{P(B)}$

$P(B|A) = P(B)$

Events are **mutually exclusive** if they cannot occur at the same time (on the same probability trial)

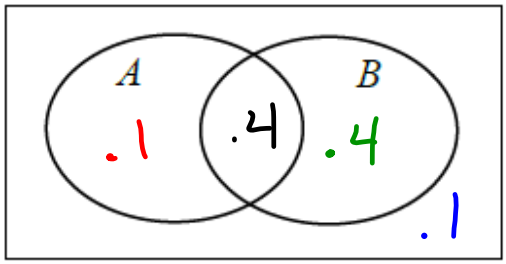
$P(A \cap B) = 0$

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

Some important equations you will need!

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

**1.** Events $A$ and $B$ are independent. $P(A) = 0.5$ and $P(B) = 0.8$. Fill in the Venn Diagram appropriately.

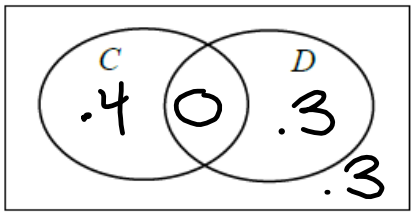



$.5(.8) = .4$

$.1 + .4 = .5$

$.4 + .4 = .8$

**2.** Events $C$ and $D$ are mutually exclusive. $P(C) = 0.4$ and $P(D) = 0.3$. Fill in the Venn Diagram appropriately.



3. The two-way table below shows counts of parts produced by a company's three factories, categorized by whether or not they passed inspection. If a part is chosen at random, identify each pair of events as independent, mutually exclusive, or neither.

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

a) Failed vs. Factory A

Independent

b) Passed vs. Factory C

neither

c) Factory A vs. Factory B

mutally exclusive

| | Passed | Failed | |
|---|---|---|---|
| Factory A | 45 | 5 | 50 |
| Factory B | 63 | 8 | 71 |
| Factory C | 54 | 5 | 59 |
| | 162 | 18 | 180 |

a) $P(\text{Fail} \cap \text{F.A.}) = P(\text{Fail}) \cdot P(\text{F.A.})$

$\frac{5}{180} = 0.0277 \quad \frac{18}{180} \cdot \frac{50}{180} = .0277$

b) $P(\text{Pass} \cap \text{F.C}) = P(\text{Pass}) \cdot P(\text{F.C.})$

$\frac{54}{180} = .3 \neq .295 = \frac{162}{180} \cdot \frac{59}{180}$

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

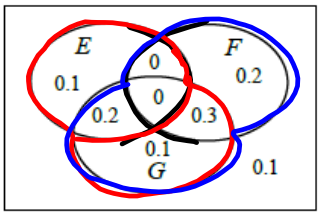
4. Using the Venn Diagram at the right…

a) name two events that are independent.

F & G

b) name two events that are mutually exclusive.

E & F




$P(E \cap G) = P(E) \cdot P(G)$

.2 $\quad (.3)(.6) = .18$

Events $C$ and $D$ are independent with $P(C)=0.6$ and $P(C \cap D)=0.24$. Find $P(C \cup D)$.

($\cap$: and, $\cup$: or)

$P(C \cup D) = P(C) + P(D) - P(C \cap D)$

$= (.6) + (.4) - .24 = \boxed{.76}$

$P(C \cap D) = P(C) \cdot P(D)$

$\frac{.24}{.6} = \frac{.6\,P(D)}{.6}$ $\quad P(D) = .4$

$P(H \cap T) = (.5)(.5) = .25$

$\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{64}$

$P(\text{Green} \cap \text{Purple})$

$\left(\frac{1}{8}\right)\left(\frac{1}{4}\right) = \frac{1}{32} = .031$

3%

If $P(L)=0.1$, $P(M)=0.9$, and $P(L \cup M)=0.89$. Prove or disprove the independence of $L$ and $M$.

$P(L \cup M) = P(L) + P(M) - P(L \cap M)$

$.89 \stackrel{?}{=} (.1) + (.9) - .09$

$1 - .09 = .91$

No.