I 1ST choice doesn't change option $\frac{1}{2} \cdot \frac{1}{6} =$

D 1ST does change $\frac{1}{12} \cdot \frac{1}{11}$

Geometry 13.6

Find probability of events that are mutually exclusive

Find probability of events that are not mutually exclusive (inclusive)

Find probabilities of complements

mutually exclusive (one or the other) not both

inclusive (can it be both?) could be both

complement (of an event)

100% − ( )

rain 60%

not rain 40%

$P(A \text{ and } B)$

↑

Indicates an intersection of two sample spaces.

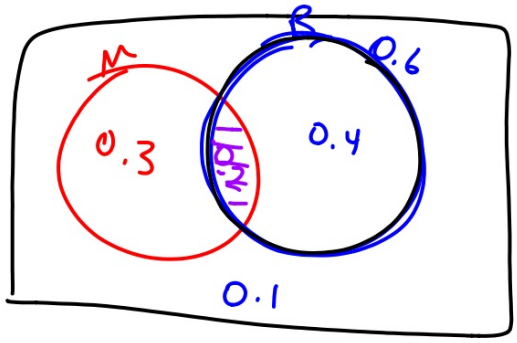
$P(A \text{ or } B)$

↑

Indicates a union of two sample spaces.

22.

100
-40
-20
-10

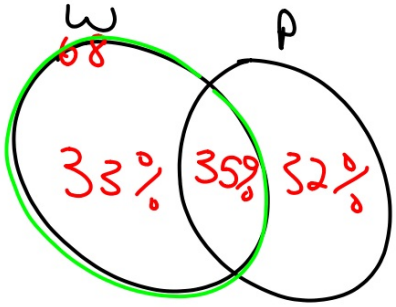


b. $\frac{0.2}{0.6} = \frac{1}{3}$

68% W

35% W + P

$\frac{35}{68} \approx 51\%$ P if W



Probabilities of Mutually Exclusive Events

Why?

- At Wayside High School, freshmen, sophomores, juniors, and seniors can all run for Student Council president. Dominic wants either a junior or a senior candidate to win the election. Trayvon wants either a sophomore or a female to win, but says, "If the winner is sophomore Katina Smith, I'll be thrilled!"

inclusive = not m.e.

Real-World Example 1 Identify Mutually Exclusive Events

ELECTIONS Refer to the application above. Determine whether the events are *mutually exclusive* or *not mutually exclusive*. Explain your reasoning.

a. a junior winning the election or a senior winning the election

Can a person be both?

b. Sophomore or a girl not ME (I)

C. Boy or junior I

d. Sophomore or senior ME

GuidedPractice

Determine whether the events are *mutually exclusive* or *not mutually exclusive*. Explain your reasoning.

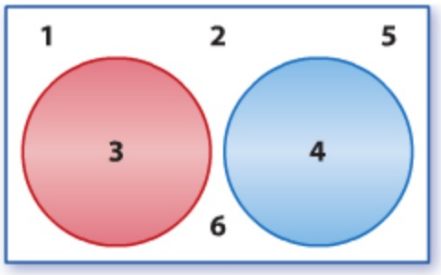
1A. selecting a number at random from the integers from 1 to 100 and getting a number divisible by 5 or a number divisible by 10

1B. drawing a card from a standard deck and getting a 5 or a heart

1C. getting a sum of 6 or 7 when two dice are rolled

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Can it be both?



P3 $= \frac{1}{6}$

P4 $= \frac{1}{6}$

P(3 or 4) $\frac{2}{6} = \frac{1}{3}$

$P_e = \frac{3}{6} = \frac{1}{2}$

Prime 2, 3, 5, 11, 17, 7

Composite

* 1 neither

$P_p = \frac{3}{6} = \frac{1}{2}$

KeyConcept Probability of Mutually Exclusive Events

Words	If two events A and B are mutually exclusive, then the probability that A or B occurs is the sum of the probabilities of each individual event.
Example	If two events A or B are mutually exclusive, then $P(A \text{ or } B) = P(A) + P(B)$.

This rule can be extended to any number of events.

$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

Real-World Example 2 Mutually Exclusive Events

PT

MUSIC Ramiro makes a playlist that consists of songs from three different albums by his favorite artist. If he lets his digital media player select the songs from this list at random, what is the probability that the first song played is from Album 1 or Album 2?

Ramiro's Playlist

Album	Number of Songs
1	10
2	12
3	13

$$\frac{10}{35} + \frac{12}{35} = \frac{22}{35}$$

Assume songs on only on one album

Dice outcomes

GuidedPractice ME

2A. Two dice are rolled. What is the probability that doubles are rolled or that the sum is 9?

$\frac{6}{36} + \frac{4}{36} = \frac{10}{36} = \frac{5}{18}$

2B. CARNIVAL GAMES If you win the ring toss game at a certain carnival, you receive a stuffed animal. If the stuffed animal is selected at random from among 15 puppies, 16 kittens, 14 frogs, 25 snakes, and 10 unicorns, what is the probability that a winner receives a puppy, a kitten, or a unicorn?

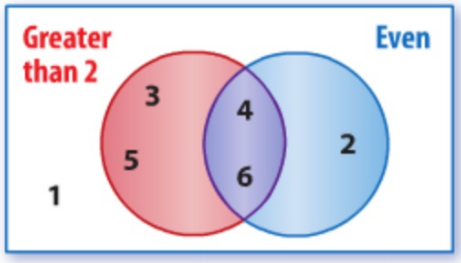
P 15
K 16
14
25
U 10

80

$\frac{15}{80} + \frac{16}{80} + \frac{10}{80} = \frac{41}{80}$

$P_{\text{not snake}} = \frac{55}{80} \longleftarrow \frac{80}{80} - \frac{25}{80}$

Can it be both?



non ME

inclusive

$$P_{4 \text{ or even}} = \frac{1}{6} + \frac{3}{6} - (\text{both})$$

$$(P_A) + (P_B) - (P_{\text{both}}) \quad \frac{1}{6} + \frac{3}{6} - \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$$

p. 958

KeyConcept Probability of Events That Are Not Mutually Exclusive

Words	If two events A and B are not mutually exclusive, then the probability that A or B occurs is the sum of their individual probabilities minus the probability that both A and B occur.
Symbols	If two events A and B are not mutually exclusive, then $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.

Can it be both? So you counted something twice...

Can it be both?

Real-World Example 3 Events That Are Not Mutually Exclusive

ART The table shows the number and type of paintings Namiko has created. If she randomly selects a painting to submit to an art contest, what is the probability that she selects a portrait or an oil painting?

Namiko's Paintings			
Media	Still Life	Portrait	Landscape
watercolor	4	5	3
oil	1	3	2
acrylic	3	2	1
pastel	1	0	5

P_P or P_O

$$\frac{10}{30} + \frac{6}{30} - \frac{3}{30} = \frac{13}{30}$$

Did I count anything twice?

Can it be both?

GuidedPractice

3. What is the probability of drawing a king or a diamond from a standard deck of 52 cards?

$$P_K + P_D - P_{KD}$$

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$$

KeyConcept Probability of the Complement of an Event

Words	The probability that an event will not occur is equal to 1 minus the probability that the event will occur.
Symbols	For an event A, $P(\text{not } A) = 1 - P(A)$.

$100 - P(A)$

30% chance of rain

Example 4 Complementary Events

PT

RAFFLE Francisca bought 20 raffle tickets, hoping to win the $100 gift card to her favorite clothing store. If a total of 300 raffle tickets were sold, what is the probability that Francisca will not win the gift card?

W^C $\quad 100 - P_{win}$

ReadingMath

Complement The complement of event A can also be noted as A^C.

$\frac{20}{300}$

$100\% - 6.7\% \quad 93.3\%$

GuidedPractice

4. If the chance of rain is 70%, what is the probability that it will not rain?

ConceptSummary Probability Rules

Types of Events	Words	Probability Rule
Independent Events	The outcome of a first event *does not affect* the outcome of the second event.	If two events A and B are independent, then $P(A \text{ and } B) = P(A) \cdot P(B)$.
Dependent Events	The outcome of a first event *does affect* the outcome of the other event.	If two events A and B are dependent, then $P(A \text{ and } B) = P(A) \cdot P(B\|A)$.
Conditional	Additional information is known about the probability of an event.	The conditional probability of A given B is $P(A\|B) = \frac{P(A \text{ and } B)}{P(B)}$.
Mutually Exclusive Events	Events *do not share* common outcomes.	If two events A or B are mutually exclusive, then $P(A \text{ or } B) = P(A) + P(B)$.
Not Mutually Exclusive Events	Events *do share* common outcomes.	If two events A and B are not mutually exclusive, then $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.
Complementary Events	The outcomes of one event consist of all the outcomes in the sample space that are not outcomes of the other event.	For an event A, $P(\text{not } A) = 1 - P(A)$.

Reduced sampole space

Can it be both? no

Can it be both? yes

100%-P