

$$\frac{11}{36}$$

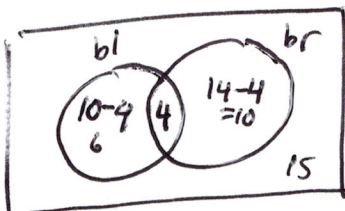
intersection

Honors Advanced Algebra: Compound Probability

In a group of 35 children, 10 have blonde hair, 14 have brown eyes, and 4 have blonde hair and brown eyes. What is the probability that the child has blonde hair or brown eyes?

$P(\text{blond hair or brown eyes})$

$$= P(\text{blond hair}) + P(\text{brown eyes}) - P(\text{blond hair and brown eyes})$$
$$= \frac{10}{35} + \frac{14}{35} - \frac{4}{35} = \frac{20}{35} = \frac{4}{7}$$



→ Venn Diagram

4

7

Honors Advanced Algebra: Compound Probability

A ten sided dice, numbered 1 to 10 is rolled. Calculate the probability that the number scored is either a prime number or a multiple of 4

Prime # set $\{2, 3, 5, 7\}$ on 10-sided dice #1-10.

Multiple of 4 set $\{4, 8\}$ on 10-sided dice #1-10

Mutually exclusive events

$$\begin{aligned} & P(\# \text{ scored prime or multiple of 4}) \\ &= P(\# \text{ scored prime}) + P(\text{multiple of 4}) \\ &= \frac{4}{10} + \frac{2}{10} = \frac{6}{10} = \frac{3}{5} \end{aligned}$$

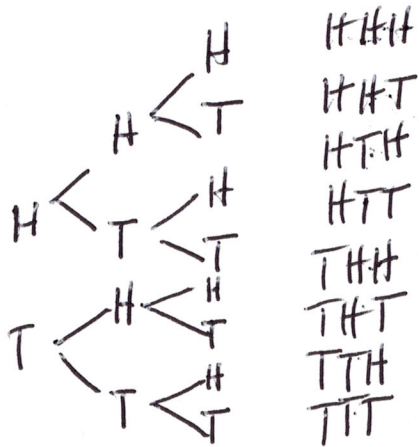
3
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5

Honors Advanced Algebra: Compound Probability

Throw 2 six-sided dice. What is the probability that both dice are odd?

$$P(A \cap B) = P(A) \cdot P(B) = \frac{3}{6} \cdot \frac{3}{6} = \frac{9}{36} = \left(\frac{1}{4}\right) \quad \text{event A, B}$$

odd # $\{1, 3, 5\}$



$$\frac{1}{4}$$

Honors Advanced Algebra: Compound Probability

Three unbiased coins are tossed one at a time and the results are noted. One possible outcome is that all the coins are heads, written as HHH. Another is that the first two coins are heads and the last is tails, written as HHT. Find the probability that the number of heads is *→ event A* greater than the number of tails. (listing the sample space will help)

$$S = \{HHH, HHT, \dots, TTT\} \quad \text{See above}$$

$$P(A) = \frac{4}{8} = \frac{1}{2}$$

1
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2

→ independent events

Honors Advanced Algebra: Compound Probability

My wardrobe contains five shirts with one blue, one brown, one red, one white, and one black. I reach into the wardrobe and choose a shirt without looking. I replace this shirt and then choose another. What is the probability that I will choose the red shirt both times?

→ event A and B

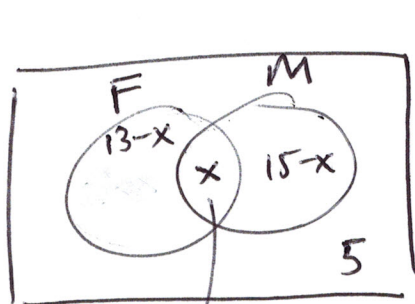
$$P(A \cap B) = P(A) P(B) = \frac{1}{5} \cdot \frac{1}{5} = \frac{1}{25}$$

1

25

Honors Advanced Algebra: Compound Probability

In a class of 25 students, 15 of them study French, 13 of them study Malay, and 5 of them study neither language. One of these students is chosen at random. What is the probability that he studies both French and Malay?



$$U=25$$

$$13-x+x+15-x+5=25$$

$$28-x+5=25$$

$$28-x=20$$

$$-x=-8 \Rightarrow x=8$$

∴ $P(F \cap M) = \frac{8}{25}$

8
—
25

Honors Advanced Algebra: Compound Probability

In a group of 80 tourists, 40 have cameras, 50 are female, and 22 are females with cameras. Find the probability that a tourist picked from this group at random is either a camera owner or female.

$$\begin{aligned} P(A \cup B) &= P(A) + P(B) - P(A \cap B) \\ &= \frac{40}{80} + \frac{50}{80} - \frac{22}{80} \\ &= \frac{68}{80} \\ &= \frac{17}{20} \end{aligned}$$

$$\frac{17}{20}$$

*Mutually
exclusive
events*

Honors Advanced Algebra: Compound Probability

In a group of 89 students, 30 are freshmen and 27 are sophomores.
Find the probability that a student picked from this group at random is
either a freshman or a sophomore.

$$\begin{aligned} P(F \cup S) &= P(F) + P(S) \\ &= \frac{30}{89} + \frac{27}{89} \\ &= \frac{57}{89} \end{aligned}$$

57



89

Honors Advanced Algebra: Compound Probability

A box contains three cards bearing the numbers 1, 2, 3. A second box contains four cards with the numbers 2, 3, 4, 5. A card is chosen at random from each box. Find the probability that the cards have the same number. (drawing the sample space will help) S

Box 1

	1	2	3
2	2,1	2,2	2,3
3	3,1	3,2	3,3
4	4,1	4,2	4,3
5	5,1	5,2	5,3

Box 2

$$P(S) = \frac{2}{12} = \frac{1}{6}$$

1 — 6

Honors Advanced Algebra: Compound Probability

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 king and a 10 in either order?

Independent events

$$P(A \cap B) = P(A) \cdot P(B) = \frac{4}{52} \cdot \frac{4}{52} = \frac{1}{169}$$

$$P(B \cap A)$$

$$P(A \cap B) + P(B \cap A) = \frac{1}{169} + \frac{1}{169} = \frac{2}{169}$$

2

169

Honors Advanced Algebra: Compound Probability

An air-to-air missile has probability of $\frac{8}{9}$ of hitting a target. If 5 missiles are launched, what is the probability that the target is not destroyed?

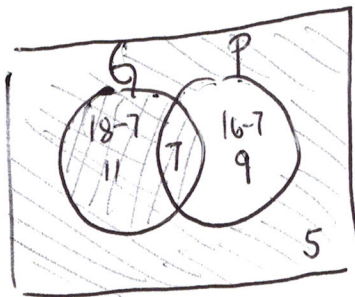
$$\begin{aligned} \circ \circ \quad P(\text{hits complement}) &= P(\text{target not destroyed}) \\ &= 1 - P(\text{destroyed}) = 1 - \frac{8}{9} = \frac{1}{9} \\ P(5 \text{ missiles}) &= \frac{1}{9} \cdot \frac{1}{9} \cdot \frac{1}{9} \cdot \frac{1}{9} \cdot \frac{1}{9} = \frac{1}{59,049} \\ &\quad \checkmark \\ &\quad \text{all independent} \end{aligned}$$

1

59049

Honors Advanced Algebra: Compound Probability

Of 32 students in a class, 18 play golf, 16 play piano, and 7 play both.
What is the probability that a student plays golf, but not the piano?



$$P(G \cap P^c) = \frac{11}{32}$$

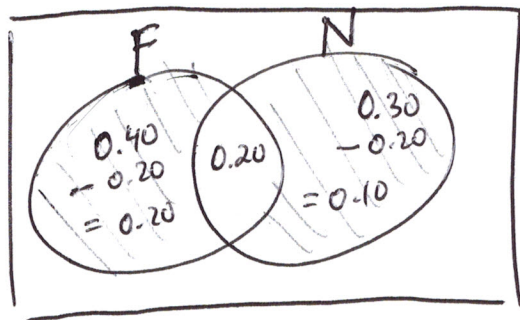
$$32 - 21 = 11$$

11

32

Honors Advanced Algebra: Compound Probability

A student goes to the library. The probability that she checks out a work of fiction is 0.40, a work of non-fiction is 0.30, and both fiction and non-fiction is 0.20. What is the probability of the student checking out a work of fiction, non-fiction, but not both?



Just F Just N

↓ ↓

$$P(F) + P(N) = 0.20 + 0.10 = 0.30$$

0.30

Honors Advanced Algebra: Compound Probability

Two events N and M are such that $P(N)=1/5$ and $P(M)=1/10$, and the $P(N \cup M) = \frac{3}{10}$. Are N and M mutually exclusive?

Yes

$$P(N \cup M) = P(N) + P(M)$$

$$\frac{3}{10} = \frac{1}{5} + \frac{1}{10}$$

$$\frac{3}{10} = \frac{2}{2} \cdot \frac{1}{5} + \frac{1}{10}$$

$$\frac{3}{10} = \frac{2}{10} + \frac{1}{10}$$

$$\frac{3}{10} = \frac{3}{10} \quad \checkmark \quad \text{Yes}$$

Yes

Honors Advanced Algebra: Compound Probability

A student goes to the library. The probability that she checks out a work of fiction is 0.40, a work of non-fiction is 0.30, and both fiction and non-fiction is 0.20. Is checking out a work of fiction independent of checking out a work of non-fiction?

$$P(F \cap N) \neq P(F) \cdot P(N)$$

$$0.20 \neq 0.40 \cdot 0.30$$

$$0.20 \neq 0.120$$

∴ No

No

Honors Advanced Algebra: Compound Probability

A large school conducts a survey of the food provided by the school cafeteria. It is found that $\frac{4}{5}$ of the students like pasta. Three students are chosen at random. What is the probability that all three like pasta?

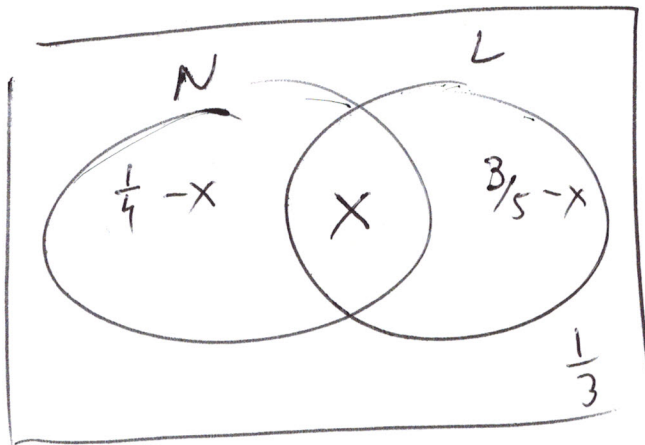
Independent events

$$P(\text{All 3 like pasta}) \\ = \frac{4}{5} \cdot \frac{4}{5} \cdot \frac{4}{5} = \frac{64}{125} = 0.512$$

0.512

Honors Advanced Algebra: Compound Probability

On a certain road, $\frac{1}{3}$ of the houses have no newspapers delivered. If $\frac{1}{4}$ have a national paper delivered, and $\frac{3}{5}$ have a local paper delivered, what is the probability that a house chosen at random has both?



$$\frac{1}{4} - x + x + \frac{3}{5} - x + \frac{1}{3} = 1$$

$$-x = \frac{-11}{60}$$

$$x = \frac{11}{60}$$

$$\frac{11}{60}$$

Honors Advanced Algebra: Compound Probability

Throw two standard six-sided dice. What is the probability that the sum is greater than 7?

Sample space

There are 15 where
sum is greater than 7

$$\frac{15}{36} = \frac{5}{12}$$

$$\frac{5}{12}$$

Honors Advanced Algebra: Compound Probability

I toss a coin and roll a six-sided die. Find the probability that I get a head on the coin, and that I don't get a 5 or 6 on the die.

$\frac{1}{2}$
Independent

means ok
1, 2, 3, 4

$$\frac{1}{2} \cdot \frac{4}{6} = \frac{1}{2} \cdot \frac{2}{3} = \frac{2}{6} = \left(\frac{1}{3}\right)$$

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3

Honors Advanced Algebra: Compound Probability

Throw two standard six-sided dice. What is the probability that at least one of the dice has a 6?

Sample space (look at it)

$$\frac{11}{36}$$