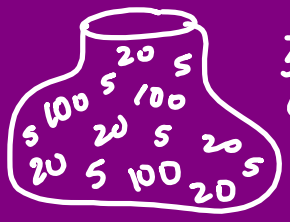
November 12, 2025

More Probability

* And vs. Or
* At least / at most
* Specific order
* Binomial prob.

Grandma's Cookie Jar



3 100's
5 20's
6 5's

Pick 3.

Prob(2 100's + 1 20 OR 3 5's)

$$\frac{{}_3C_2 \cdot {}_5C_1 + {}_6C_3}{{}_{14}C_3}$$

$$= \frac{15 + 20}{364} = \frac{35}{364} = \frac{5}{52}$$

Mutually Exclusive Event
- no common items

Select 2 from class

Prob(2 trucks OR 2 female)

5 f
2 m
3 trucks
4 cars

$$\frac{{}_3C_2 + {}_5C_2 - {}_2C_2}{{}_7C_2}$$

$$= \frac{3 + 10 - 1}{21} = \frac{12}{21} = \frac{4}{7}$$

Mutually Inclusive Events
= share common items

- Must subtract duplicates!

Select 3.

Prob (at least 1 short hair)

0 sh + 3 long } 1+2 s long OR 2+1 s long OR 3 s

Prob (at least one) = 1 − Prob (none)

$$= 1 - \frac{{}_3C_3}{{}_7C_3}$$

$$= 1 - \frac{1}{35} = \frac{34}{35}$$

Prob (no more (at most) than 2 females.)

3F } 2F + 1M OR 1F + 2M OR 0F + 3M

= 1 − Prob (3F)

November 12, 2025

Independent & Dependent Events

Dependent – the result of the 2nd event depends on the result of the 1st event

Independent – 2nd event is not influenced by the result of the 1st event (same chance every time)
Dice, Spinner,

All must be true

Combinations

1) Dependent events
2) No order (AND)
3) No replacement (AND)

Only one is true

Individual Prob. $\frac{2}{15} \cdot \frac{3}{14} \cdot \frac{1}{13}$

1) Indep events
2) Order (OR)
3) Replacement (OR)

2 Five 3 Extra
5 Juicy Fruit 4 Spearmint

Pick 3.

Prob (J.F. then Extra then Juicy fruit)

Suc / total $\frac{5}{14} \cdot \frac{3}{13} \cdot \frac{4}{12}$

$= \frac{5}{182}$ ODDS $= \frac{5}{177}$

Always do Prob. first — then find odds!

Prob (JF, put back, Five)

$\frac{5}{14} \cdot \frac{2}{14} = \frac{10}{196} = \frac{5}{98}$

Odds $\left(\frac{1}{\text{Sp}}, \frac{1}{5}, \frac{1}{\text{Sp}}\right)$

The Wrong Way!

$\frac{1}{4} \cdot \frac{1}{2} \cdot \frac{1}{3}$

$\frac{4}{10} \cdot \frac{2}{11} \cdot$

Binomial Probability

$(x+y)^5 = {}_5C_0 x^5 y^0 \; {}_5C_1 x^4 y^1 \; {}_5C_2 x^3 y^2 \ldots\ldots$

Row
1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
${}_5C_0$ ${}_5C_1$ ${}_5C_2$ ${}_5C_3$ ${}_5C_4$ ${}_5C_5$

1) 2 possible outcomes
2) Independent Events (same chance every time)

Basketball Free Throws
- Emma = free throw = 60%

What is the prob. she will hit 8 of her next 10?

Prob (at least 8)

${}_{10}C_2 H^8 M^2$

${}_{10}C_2 (0.4)^8 (0.4)^2$

≈ 0.12

${}_{10}C_2 H^8 M^2$ OR ${}_{10}C_1 H^9 M^1$ OR ${}_{10}C_8 H^{10}$

${}_{10}C_2 (0.6)^8 (0.4)^2 + {}_{10}C_1 (0.6)^9 (0.4)^1 + (0.6)^{10}$

≈ 0.167

To find one exact event

binomialpdf

At least/at most

binomialcdf

↑ cumulative