

MORE PROBABILITY

Grandma's Cookie Jar



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

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

$$\frac{{}^3C_2 \cdot {}^1C_1 + {}^6C_3}{{}^{14}C_3} = \frac{5}{52}$$

Mutually Exclusive Event

- no common items

OR problems

Mutually Inclusive Event
= share common items

must subtract duplicate items

- * AND vs. OR
- * AT Least/at most
- * Specific order
- * Binomial prob.

Select 2 from class

Prob (2 Blue OR 2 female)

$$\frac{{}^4C_2 + {}^3C_2 - {}^2C_2}{{}^7C_2}$$

$$= \frac{8}{21}$$

3	f
4	m
1	Bl
1	G
1	Br

2 f
5 m
4 short
3 long

Select 3.

Prob (at least 1 short hair)

+0S
3L
20% | 1S
+2L 2S
+1L +3S
0L

$$1 - \text{Prob}(\binom{0}{\text{short}}) = 1 - \frac{{}^3C_3}{{}^7C_3} = 1 - \frac{1}{35} = \frac{34}{35}$$

$$\text{Prob (at least one)} = 1 - \text{Prob (none)}$$

Select 2. Prob (at most 1 male)

2m
+0F | 1m
+1F OR 0m
2F

$$1 - \frac{{}^5C_2}{{}^7C_2} = 1 - \frac{10}{21} = \frac{11}{21}$$

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

All must be true

Combinations

- 1) Dependent events
- 2) No order
- 3) No replacement

If ANY are true:

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

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

2 Five 3 Extra
5 Juicy Fruit 4 Spearmint

Pick 3.

Prob (J.F. ^{and} then Extra then Juicy Fruit)

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

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

Always do Prob. first—
then find odds!

Prob (JF, put
back, Five)

Odds (1 sp, 1 5, 1 Sp)

$$\text{Prob} = \frac{4}{14} \cdot \frac{3}{13} \cdot \frac{3}{12}$$

$$= \frac{1}{91}$$

$$\boxed{\text{Odds} = \frac{1}{90}}$$

BINOMIAL PROBABILITY

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



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

Basketball Free Throws

- William = free throw = 80%

What is the prob. he will hit 8 of his next 10?

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

$${}_{10}C_2 (0.8)^8 (0.2)^2$$

Prob (at least 8)

$${}_{10}C_2 H^8 M^2 \text{ OR } {}_{10}C_1 H^9 M^1 \text{ OR } {}_{10}C_0 H^{10}$$

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

To find one exact event

binomial_{pdf} Menu-S-S-A

At least/at most

binomial_{cdf} Menu-S-S-B