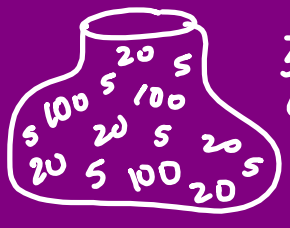
November 17, 2021

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

Select 3

AND = *
OR = +

Prob ($125 OR $30)

$$\frac{{}_3C_1 \cdot {}_5C_1 \cdot {}_6C_1 + {}_5C_1 \cdot {}_6C_2}{{}_{14}C_3}$$

$$\frac{90 + 75}{364} = \frac{165}{364}$$

Mutually Exclusive Event
- no common items

Select 2 from class

Prob (2 long sleeve OR 2 female)

$$\frac{{}_5C_2 + {}_4C_2 - {}_3C_2}{{}_7C_2}$$

$$\frac{10 + 6 + 3}{21} = \frac{19}{21}$$

Mutually Inclusive Event
= share common items
- must subtract overlaps

Select 3.

Prob (at least 1 curly)

at least

0 C + 3 S

0.2

1 C + 2 str. OR 2 C + 1 str OR 3 C

At least one = 1 − Prob(none)

= 1 − Prob(0 curly + 3 str)

$= 1 - \frac{{}_4C_3}{{}_7C_3} = 1 - \frac{4}{35} = \frac{31}{35}$

Pick 5

(At most 2 black clothing)

0 Bl or 1 Bl or 2 Bl. | 3 Bl or 4 Bl or 5 Bl

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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

Combinations

All must be true:

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

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

If only one true:

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

2 Five 3 Extra
5 Juicy Fruit 4 Spearmint

Pick 3.

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

$\frac{5}{14} \cdot \frac{3}{13} \cdot \frac{4}{12} = \frac{5}{182}$

Prob (JF, put back, Five)

Odds (1 Sp, 1 5, 1 Sp)

Prob $= \frac{4}{14} \cdot \frac{2}{13} \cdot \frac{2}{12}$

$= \frac{1}{91}$

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

Always do Prob. first - then find odds!

Binomial Probability

Pascal's △

$(x+y)^5 = 1x^5y^0 + 5x^4y^1 + 10x^3y^2 + 10x^2y^3$

$_5C_0 \quad _5C_1 \quad _5C_2$

Row 0: 1
Row 1: 1 1
Row 2: 1 2 1
Row 3: 1 3 3 1
Row 4: 1 4 6 4 1
Row 5: 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
- Gavin = free throw 83%
What is the prob. he hit 8 of his next 10.

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

$_{10}C_2 (0.83)^8 (0.17)^2 = 0.293$

Prob (at least 8)

$_{10}C_2 H^8 M^2 + {}_{10}C_1 H^9 M^1 + {}_{10}C_0 H^{10} M^0$

$_{10}C_2 (0.83)^8 (0.17)^2 + {}_{10}C_1 (0.83)^9 (0.17) + \ldots$

To find one exact event

binomialpdf

At least/at most

binomialcdf