Statistics

Lecture 12

Feb 19-8:47 AM

Consider the chart below

x	$P(x)$
1	.1
2	.15
3	.3
4	.25
5	.2

1) $P(x = 3)$

$= 1 - [.1 + .15 + .25 + .2] = \boxed{.3}$

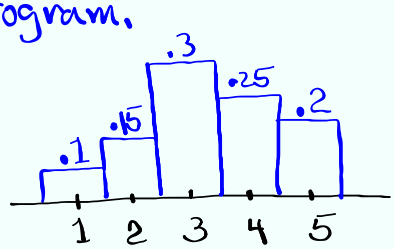
2) $P(x \geq 2) = 1 - P(x = 1)$

$= 1 - .1 = \boxed{.9}$

3) $P(x \leq 4) = 1 - P(x = 5)$

$= 1 - .2 = \boxed{.8}$

4) Draw Prob. dist. histogram.



Apr 15-1:49 PM

Find μ, σ, and σ^2.

$x \to L1$

$P(x) \to L2$

$\boxed{\text{1-Var Stats}}$

List : L1

FreqList : L2

SG 14 ✓

$\mu = \bar{x} = 3.3$

$\sigma = \sigma_x = 1.229$

$n = 1 \leftarrow$ Total prob.

σ^2 $\boxed{\text{VARS}}$ $\boxed{\text{5: Statistics}}$ $\boxed{4{:}\,\sigma x}$ $\boxed{x^2}$ $\boxed{\text{Enter}}$ $\boxed{\sigma^2 \approx 1.51}$

$\boxed{\text{Math}}$ $\boxed{1{:}\blacktriangleright\text{Frac}}$ $\boxed{\text{Enter}}$ $\frac{151}{100}$

$\mu \approx 3$, $\sigma \approx 1$

68% Range $\mu \pm \sigma \to \boxed{2 \text{ to } 4}$

95% Range $\mu \pm 2\sigma \to \boxed{1 \text{ to } 5}$

Usual Range

Apr 15-1:57 PM

I Sold 25 tickets for \$10 each.

one Ticket randomly Selected

the Selected ticket wins a Calculator worth \$100.

Find expected value per ticket Sold.

Net	P(Net)
10 − 100	1/25
10 − 0	24/25

$\boxed{\sigma^2 \approx 384}$

Net $\to$ L1, P(Net) $\to$ L2

use $\boxed{\text{1-Var Stats}}$ with L1 & L2

E.V. $= \mu = \bar{x}$

$\boxed{\$6}$

Apr 15-2:05 PM

A piggy bank has 7 pennies and 3 nickels. Randomly take 2 coins with replacements.

Sample space

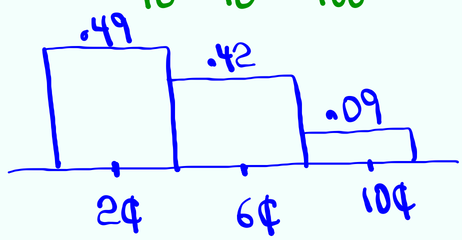
- PP → 2¢
- PN → 6¢
- NP → 6¢
- NN → 10¢

$P(2¢) = \frac{7}{10} \cdot \frac{7}{10} = \boxed{.49}$

$P(6¢) = 2 \cdot \frac{7}{10} \cdot \frac{3}{10} = \frac{42}{100} = \boxed{.42}$

$P(10¢) = \frac{3}{10} \cdot \frac{3}{10} = \frac{9}{100} = \boxed{.09}$

Net	P(Net)
2¢	.49
6¢	.42
10¢	.09



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Net → L1

P(Net) → L2

Use $\boxed{\text{1-Var Stats}}$

with L1 & L2

$\mu = 4.4$ $\quad n = 1$

$\sigma = 2.592$

$\sigma^2 = 6.72 = \frac{168}{25}$

Apr 15-2:18 PM

A piggy bank has 7 pennies and 3 nickels.
Randomly take 2 coins without replacement.

PP $\quad P(2¢) = \frac{7}{10} \cdot \frac{6}{9} = \frac{42}{90}$

PN $\quad P(6¢) = 2 \cdot \frac{7}{10} \cdot \frac{3}{9} = \frac{42}{90}$

NP

NN $\quad P(10¢) = \frac{3}{10} \cdot \frac{2}{9} = \frac{6}{90}$

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

L1	L2
2	42/90
6	42/90
10	6/90

$\mu = 4.4$

$\sigma = 2.444$

$\sigma^2 = 5.97\overline{3} = \frac{448}{75}$

SG 15 ✓

Apr 15-2:12 PM

! Factorial

$0! = 1$

$1! = 1$

$n! = n(n-1)(n-2)\cdot(n-3)\cdot \cdots 3\cdot 2\cdot 1$

$5! = 5\cdot 4\cdot 3\cdot 2\cdot 1 = \boxed{120}$

using TI

5 [Math] → PRB ↓ [4:!] [Enter]

find 12!

12 [Math] → PRB ↓ [4:!] [Enter]

479,001,600

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$${}_nC_r = \frac{n!}{r! \cdot (n-r)!}$$

$${}_5C_2 = \frac{5!}{2! \cdot \underbrace{(5-2)!}_{3!}} = \frac{5 \cdot \overset{2}{\cancel{4}} \cdot \cancel{3 \cdot 2 \cdot 1}}{\cancel{2} \cdot 1 \cdot \cancel{3 \cdot 2 \cdot 1}} = \frac{10}{1} = \boxed{10}$$

using TI

5 $\boxed{\text{Math}}$ → PRB ↓ $\boxed{3{:}\,{}_nC_r}$ 2 $\boxed{\text{Enter}}$

Find ${}_7C_4$

7 $\boxed{\text{Math}}$ → PRB ↓ $\boxed{3{:}\,{}_nC_r}$ 4 $\boxed{\text{Enter}}$ $\boxed{35}$

7 different items, there are 35 different Combinations to choose 4 of them without replacement and in any order.

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CA Lotto

choose 5 numbers in any order without replacement from 1 to 50.

1 2 3 4 5

1 2 3 4 6

1 2 3 4 7

⋮

46 47 48 49 50

How many ways Can this be done?

$${}_{50}C_5 = \boxed{2{,}118{,}760}$$

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SG 16

Binomial Prob. dist.

1) n independents trials.

2) Each trial has only two outcomes.

$$P(\text{Success}) = p \quad , \quad P(\text{Failure}) = q$$

$$p + q = 1$$

$$q = 1 - p$$

p & q remain unchanged for all n trials.

3) $x \to$ # of successes

$n - x \to$ # of failures

$$\boxed{P(x) = {}_nC_x \cdot p^x \cdot q^{n-x}}$$

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Consider a binomial prob. dist with 5 trials and prob. of success of .6 Per trial.

1) $n = 5$ 2) $p = .6$ 3) $q = 1 - p = .4$

4) $np = 5(.6) = \boxed{3}$

5) $npq = 5(.6)(.4) = \boxed{1.2}$

6) $\sqrt{npq} = \sqrt{1.2} \approx \boxed{1.095}$

7) $P(4 \text{ Successes})$

$$P(x = 4) = {}_5C_4 \cdot (.6)^4 \cdot (.4)^1 = \boxed{.259}$$

$${}_nC_x \cdot p^x \cdot q^{n-x}$$

$= 5 \boxed{\times} .6 \boxed{\wedge} 4 \boxed{\times} .4 \boxed{\wedge} 1 \boxed{\text{Enter}}$

$\to$

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Consider a binomial Prob. dist. with 10 trials and .4 prob. of Success Per trial.

1) $n = 10$ 2) $p = .4$ 3) $q = 1 - p = \boxed{.6}$

4) $np = 10(.4) = \boxed{4}$ 5) $npq = 10(.4)(.6) = \boxed{2.4}$ 6) $\sqrt{npq} = \sqrt{2.4} = \boxed{1.549}$

7) P(5 Successes)

$P(x=5) = {}_{10}C_5 \cdot (.4)^5 \cdot (.6)^5 \approx \boxed{.201}$

${}_nC_x \cdot p^x \cdot q^{n-x}$

using TI

2nd VARS ↓↓ binompdf

Trials 10
P: .4
x Value: 5
Paste Enter

.201

Your work

$P(x=5) = \text{binompdf}(10, .4, 5)$

$= .201$

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Suppose we flip a fair coin 100 times and success is to land tails.

1) $n = 100$ 2) $p = .5$ 3) $q = .5$

4) $np = 100(.5) = \boxed{50}$ 5) $npq = 100(.5)(.5) = \boxed{25}$ 6) $\sqrt{npq} = \sqrt{25} = \boxed{5}$

7) P(exactly 50 tails)

$P(x = 50) = \text{binompdf}(\overset{n}{100}, \overset{p}{.5}, \overset{x}{50}) = \boxed{.080}$

8) P(at most 50 tails)

$P(x \le 50) = P(x=50) + P(x=49) + \cdots + P(x=0)$

$= \text{binomcdf}(100, .5, 50) = \boxed{.540}$

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You are guessing on every question of a multiple-choice exam with 100 questions. Each question has 5 choices but only one correct choice.

1) $n = 100$

2) $p = \frac{1}{5} = .2$

3) $q = \frac{4}{5} = .8$

4) $np = 100(.2) = \boxed{20}$

5) $npq = 100(.2)(.8) = \boxed{16}$

6) $\sqrt{npq} = \sqrt{16} = \boxed{4}$

7) P(guess exactly 25 Correct Answers)

$P(x=25) = \text{binompdf}(100, .2, 25) \approx \boxed{.044}$

8) P(guess at most 25 Correct Answers)

$P(x \le 25) = \text{binomcdf}(100, .2, 25) = \boxed{.913}$

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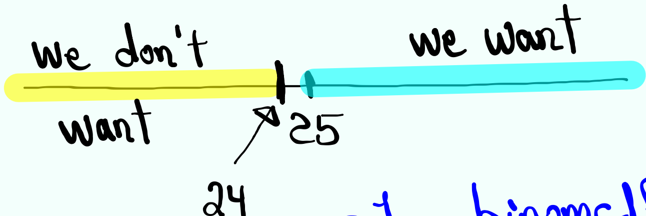
9) P(guess at least 25 Correct answers)

Total Prob.

$P(x \ge 25) = 1 - P(x \le 24)$



$= 1 - \text{binomcdf}(100, .2, 24)$

$= \boxed{.131}$

Apr 15-3:53 PM

64 newborn babies were randomly Selected

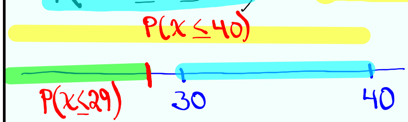
Suppose Success is having a girl.

1) $n = 64$ 2) $p = .5$ 3) $q = .5$

4) $np = \boxed{32}$ 5) $npq = \boxed{16}$ 6) $\sqrt{npq} = \sqrt{16} = \boxed{4}$

7) P(having between 30 & 40 girls, inclusive)

$P(30 \le x \le 40) = P(x \le 40) - P(x \le 29)$



$= \text{binomcdf}(64, .5, 40) - \text{binomcdf}(64, .5, 29)$

$= \boxed{.717}$

Apr 15-4:00 PM