#5.41
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9 members
2 to be sent

How many ways can two be selected?

$$_9C_2 = \frac{9!}{2!\,7!} = \frac{9 \cdot \cancel{8}^{\,4}}{\cancel{2}_{\,1}} = 36 \text{ possible combinations}$$

If order is important we would get

$$_9P_2 = \frac{9!}{7!} = 9 \cdot 8 = 72 \text{ possible permutations}$$

5.47 How many ways can 9 items be chosen from 20?

$${}_{20}C_9 = \frac{20!}{9!\,11!} =$$

$$= \frac{\cancel{20}\cdot 19\cdot \cancel{18}\cdot 17\cdot \overset{2}{\cancel{16}}\cdot \overset{5}{\cancel{15}}\cdot \overset{2}{\cancel{14}}\cdot 13\cdot \overset{2}{\cancel{12}}}{\cancel{9}\cdot \cancel{8}\cdot \cancel{7}\cdot \cancel{6}\cdot \cancel{5}\cdot \cancel{4}\cdot \cancel{3}\cdot \cancel{2}\cdot 1}$$

$$= 19\cdot 17\cdot 2\cdot 5\cdot 2\cdot 13\cdot 2$$

$$= 167960$$

$\boxed{5.6}$ The Binomial Distribution

To apply this distribution the variable, x, must be <u>discrete</u> and <u>dichotomous</u>.

there are two possible outcomes

each repetition is called a <u>trial</u> : yields one of two results

(Bernoulli trial)

The experiment is called a binomial experiment

"Bernouli"

There are 4 conditions that have to be met to be a binomial experiment

(1) There are n identical trials (experiment performed n times under identical circumstances)

(2) Each trial has only two possible outcomes

success or a failure

↓

The outcome we are studying

(3) The probabilities of the two outcomes must remain constant.

(4) The trials are independent.

(ex) Any numbers of coin tosses

(1) all tosses identical

(2) two possibilities $\{H, T\}$

(3) The probabilities remain constant

$$P(H) = .5 \quad , \quad P(T) = .5$$

$$P(H) + P(T) = 1$$

(4) The trials are independent.

So, This is a binomial experiment

The Binomial Distribution & The Binomial Formula

The r.v. x that represents the # of successes in n trials is called a **binomial random variable**.
We want to determine the probability of x successes in n trials

BINOMIAL FORMULA

The probability of exactly x successes in n trials is:

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

n = total # of trials
p = probability of success
$q = 1-p$ = probability of failure
x = # of successes
$n-x$ = the # of failures

SCC students with Math Anxiety
(70% of students have math anxiety)

$P(A) = .70$

$P(NNN) = .027$

$P(NNM) = .063$ $\quad .30(.30)(.70)$

$P(NMN) = .063$ $\quad .30(.70)(.30)$

$P(NMM) = .147$

$P(MNN) = .063$ $\quad .70(.30)(.30)$

$P(MNM) = .147$

$P(MMN) = .147$

$P(MMM) = .343$

$P(1) = 3(.063) = 3(.30)(.30)(.70)$
$= .189$

This is a binomial experiment.

∴ We can use the binomial formula

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

$n = 3$
$x = 1$
$p = .70$
$q = .30$
$n - x = 3 - 1 = 2$

$1 + 2 = 3$

$$P(x=1) = {}_3C_1 (.70)(.30)^2$$

$${}_3C_1 = \frac{3!}{1!\,2!} = 3$$

$$= 3(.70)(.30)(.30)$$

$$= .189$$

$$\underbrace{3 * (.7) * (.3)^2}$$

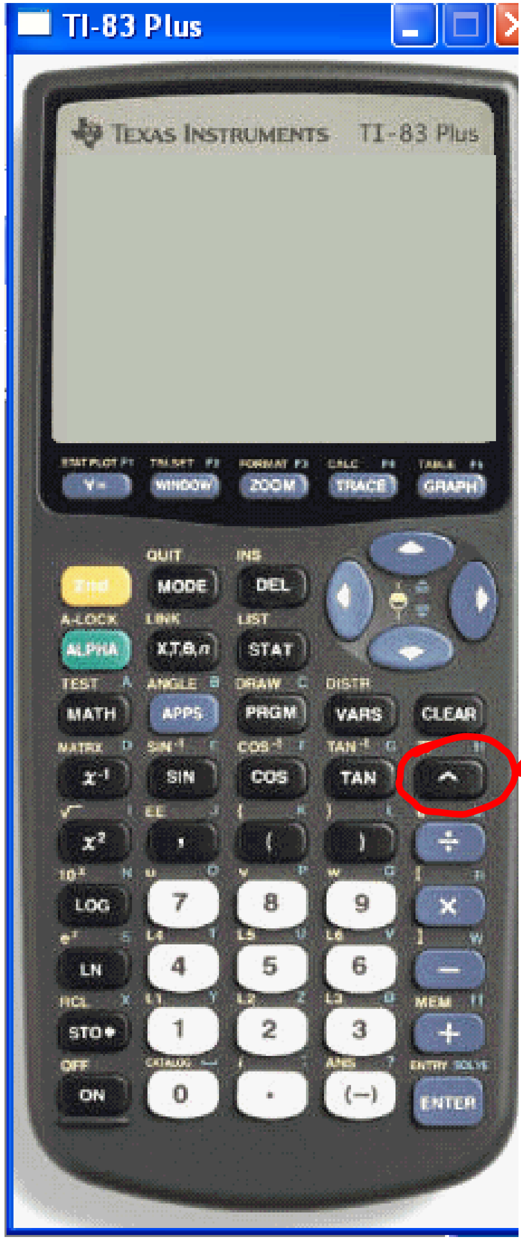
prob exactly 2 have math anxiety

$$P(x=2) = {}_3C_2 (.70)^2 (.30)^1$$

$$= \frac{3!}{2!(1!)} (.70)^2 (.30)^1$$

$$= 3(.70)\wedge 2 * .30$$

$$= .441$$



$3 \wedge 4 = 3^4 = 81$

(ex) 5.58
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49% of Americans

a) Random sample of 12
What values can x assume?
$P(x = ?)$ all possible values
12, 11, 10, 9, 8, 7, 6, 5, 4, 3,
2, 1, 0

b) Find $P(x=8) = {}_{12}C_8 \, (.49)^8 (.51)^4$
exactly 8

$$= \frac{12!}{8!\,4!}(.49)^8(.51)^4$$

$$= 495(.49)^8(.51)^4$$

$.49^8$
→ 12 nCr 8

enter on calculator = 495 * .49^8 * .51^4
= .1113

$${}_{12}C_8 = \frac{12!}{8!\;4!} = \frac{\cancel{12}\cdot 11\cdot \overset{5}{\cancel{10}}\cdot 9}{\cancel{4}\cdot\cancel{3}\cdot\cancel{2}\cdot 1}$$

$$\begin{array}{r} 55 \\ 9 \\ \hline 495 \end{array}$$

#5.66 20% hearing in danger

a) $n = 15$

exactly 5

$P(X=5) = .1032$ Yeah!

none

$P(X=0) = .0352$

$= {}_{15}C_0\,(.20)^0(.80)^{15}$

Using our calculators

$P(X = 5)$

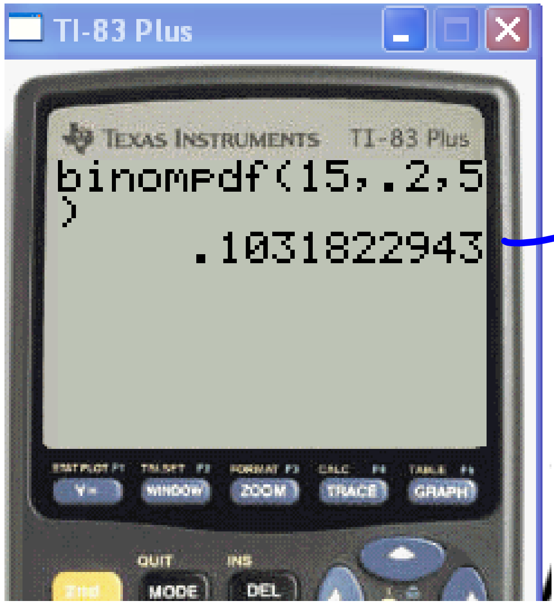
2nd dist

binompdf(n, p, x)

$\left.\begin{matrix} n \\ p \end{matrix}\right\}$ the parameters

binompdf

binomial probability distribution function



.1032

$$P(x=6) = \text{binompdf}(15, .2, 6)$$
$$= .0429$$

Probability that at most 4 worked at such a job

$$P(x=0) + P(x=1) + P(x=2) + P(x=3)$$
$$+ P(x=4)$$

$$P(x \le 4) = \text{binom}\underline{\underline{c}}\text{df}(15, .2, 4)$$

cummulative