

- 3.1 Discrete Uniform Distribution

$$P(x) = 1/N$$

$$\mu = E(X) = \frac{b + a}{2}$$

$$\sigma^2 = \frac{(b - a + 1)^2 - 1}{12}$$

Ex:

4) Let X be a discrete uniform random variable on the interval [2; 20].

a) Find $P(X < 13)$.

b) Find the mean and standard deviation of X.

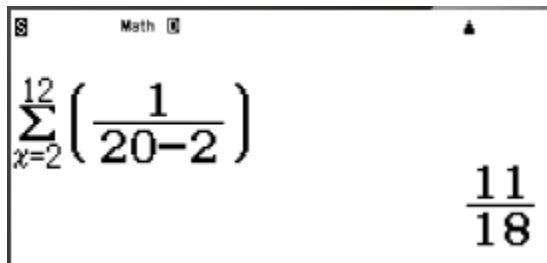
A) 0 & 30

B) 11 & 30

C) 11 & 5.477

D) None of the others

$P(X < 13)$:



$$\sum_{x=2}^{12} \left(\frac{1}{20-2} \right) = \frac{11}{18}$$

- 3.2 Binomial Distribution

$$P(x) = \text{MENU} \quad 7 \quad 4 \quad 2$$

Ex:

9. The random variable X has a binomial distribution with $n = 10$ and $p = 0.5$. Determine the following probabilities:

9.1 $P(X = 5)$ 7.2 $P(X \leq 2)$ 7.3 $P(X > 7)$

9.1.

Binomial PD	P=
x : 5	
N : 10	
p : 0.5	0.24609375

$$E(x) = np$$

$$V(x) = np(1-p)$$

- 3.3 Geometric Distribution

$$P = ((1-p)^{(x-1)}) * p$$

Ex:

13. Suppose that the random variable X has a geometric distribution with $p = 0.5$.

13.1 Determine the following probabilities: $P(X = 4)$, $P(X = 5)$, $P(X > 3)$

$P(X = 4)$:

$(1-0.5)^{4-1} \times 0.5$ $\frac{1}{16}$

$$E(x) = 1/p$$

$$V(x) = (1-p)/p^2$$

- 3.4 Negative Binomial Distribution

$$f(x) = \binom{x-1}{r-1} (1-p)^{x-r} p^r$$

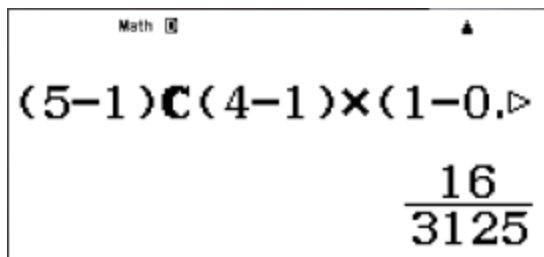
$$\mu = E(X) = r/p \quad \text{and} \quad \sigma^2 = V(X) = r(1-p)/p^2$$

Ex:

14. Suppose that X is a negative binomial random variable with $p = 0.2$ and $r = 4$. Determine the following:

14.1 $E(X)$ and $V(X)$ 14.2 $P(X=3)$ and $P(X=5)$ 14.3 $P(X>5)$

$P(X=5)$:



$$(5-1)C(4-1) \times (1-0.2)^4 \times 0.2 = \frac{16}{3125}$$

- 3.5 Poisson Distribution

$$P(x) = \text{MENU} \quad 7 \quad \frac{\Delta}{\nabla} \quad 2 \quad 2$$

21. Suppose that X has a Poisson distribution with a mean of 4. Determine the following probabilities:

21.1 $P(X=0)$ and $P(X=4)$ 21.2 $P(3 \leq X \leq 5)$ and $P(X>3)$

$P(X=0)$:

Poisson PD	P=
x : 0	
λ : 4	0.01831563889

- 3.6 Hypergeometric

$$f(x) = \frac{\binom{K}{x} \binom{N-K}{n-x}}{\binom{N}{n}}$$

$$\mu = E(X) = np \quad \text{and} \quad \sigma^2 = V(X) = np(1-p) \left(\frac{N-n}{N-1} \right)$$

16. Suppose that X has a hypergeometric distribution with $N=100, n=4$ and $K=20$. Determine the following:

16.1 $P(X=4)$ and $P(X=6)$

$P(X=4)$:

$$\frac{20C4 \times (100-20)C(4-4)}{100C4}$$

$$1.235583268 \times 10^{-3}$$

- 4.1 Basic

+Probability Density Function: $f(x)$

+Cumulative Distribution Functions: $F(x) = \int f(x)$

+Mean and variance:

- 4.2 Continuous Uniform RV

$$f(x) = 1/(b - a), \quad a \leq x \leq b$$

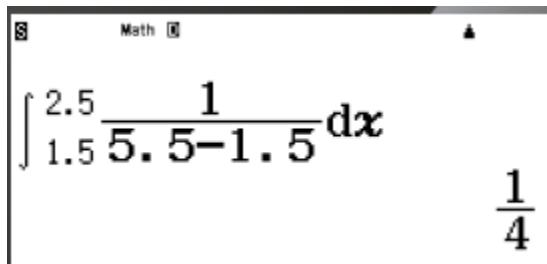
$$\mu = E(X) = \frac{(a + b)}{2} \quad \text{and} \quad \sigma^2 = V(X) = \frac{(b - a)^2}{12}$$

4. Suppose that X has a continuous uniform distribution over the interval $[1.5; 5.5]$. Determine the following:

4.1 Mean, variance, and standard deviation of X

4.2 $P(X < 2.5)$

$P(X < 2.5)$:



The image shows a handheld calculator screen with the following display:

Top: 'Math' mode icon.

Main display: $\int_{1.5}^{2.5} \frac{1}{5.5 - 1.5} dx$

Bottom right: $\frac{1}{4}$

- 4.3 Standard Normal Distribution

$$Z = \frac{X - \mu}{\sigma}$$

B1:    

B2: $P(Z < z)$:    

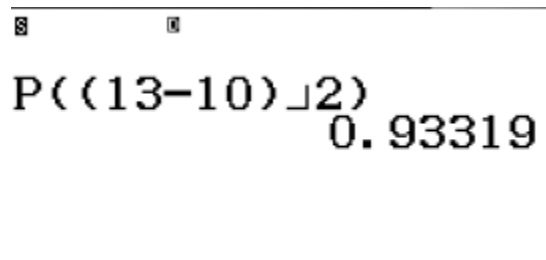
Ex:

8. Assume that X is normally distributed with a mean of 10 and a standard deviation of 2. Determine the following:

8.1 $P(X < 13)$ and $P(X > 9)$

8.2 $P(6 < X < 14)$ and $P(-2 < X < 8)$

$P(X < 13)$:



A TI-84 calculator screen showing the normal distribution function calculation. The input is $P((13-10)/2)$ and the result is 0.93319.

- 4.4 Exponential Distribution

$$f(x) = \lambda e^{-\lambda x}$$

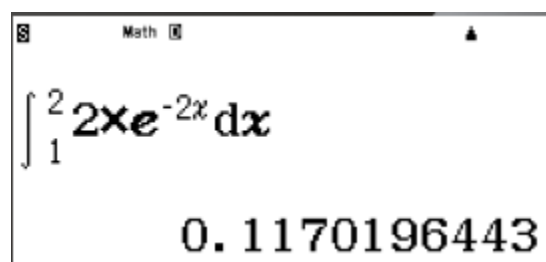
Ex:

16. Suppose that X has an **exponential** distribution with $\lambda = 2$. Determine the following:

16.1 $P(X \leq 0)$ and $P(X \geq 2)$

16.2 $P(X \leq 1)$ and $P(1 < X < 2)$





$P(1 < X < 2)$:



A TI-84 calculator screen showing the integral calculation for the exponential distribution. The input is $\int_1^2 2xe^{-2x} dx$ and the result is 0.1170196443.

- 7.1 Central Limit Theorem

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$$

B1:     (vào mode thống kê để tính xác suất phân phối chuẩn)

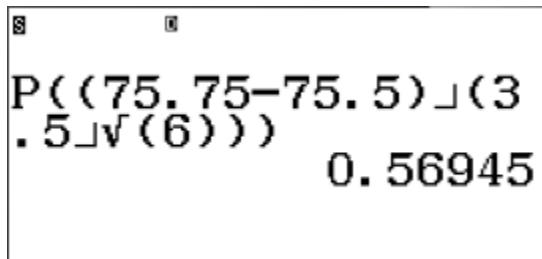
B2: $P(Z < z)$:    

Ex:

2. A synthetic fiber used in manufacturing carpet has tensile strength that is normally distributed with mean 75.5 psi and standard deviation 3.5 psi.

2.1 Find the probability that a random sample of $n = 6$ fiber specimens will have sample mean tensile strength that exceeds 75.75 psi.

2.1



$$P\left(\frac{75.75 - 75.5}{3.5 / \sqrt{6}}\right) = 0.56945$$



- 11. Simple Linear Regression and Correlation

1.2

Cost	9	2	3	4	2	5	9	10
Number	85	52	55	68	67	86	83	73

B1:    : để nhập dữ liệu

B2:

+Simple linear regression line: $y = a + bx$:  

$y=a+bx$
 $a=55.78846154$
 $b=2.788461538$
 $r=0.7077213603$

+2-variable calculation:

OPTN 2

\bar{x} =5.5
 Σx =44
 Σx^2 =320
 $\sigma^2 x$ =9.75
 σx =3.122498999
 $s^2 x$ =11.14285714

$s x$ =3.338091842
 n =8
 \bar{y} =71.125
 Σy =569
 Σy^2 =41681
 $\sigma^2 y$ =151.359375

σy =12.3028198
 $s^2 y$ =172.9821429
 $s y$ =13.15226759
 Σxy =3347
 Σx^3 =2690
 $\Sigma x^2 y$ =25117

Σx^4 =24116
 $\min(x)$ =2
 $\max(x)$ =10
 $\min(y)$ =52
 $\max(y)$ =86