AP Statistics –	6.2B	Name:
Goal: Combining Random Variables		Date:
I. Example #1: CYU (page 370):		
• Always st X = Y = T = B = 1. Find and	ate what your random variables are and distributions given OF CARS SOLD DURING IST HOUR OF CARS LEASED OTAL # OF CARS SOLD OR LEASED MANAGERS BONUS = 500 × + 300 Y	Ţ≈x+Y
6 _T	σ_t showing work clearly (X and Y must be independed) $z^2 = 6z^2 + 6z^2 = (943)^2 + (664)^2 = 1.2$ $z^2 = \sqrt{1.299} = 1.14$	99
Bonu	μ_b and σ_b showing work clearly 5: $500/C_a$ le $$300/LEASED$ = $500 M_X + 300 M_Y = 500(1.1) + 300$ = $(5006_X)^2 + (3006_Y)^2 = [500.943]^2 + $	$(.7) = M_B = 760 $[300 \cdot .64]^2 = 259, 176.25$ $[6] = 509.09
II. <u>Example #2:</u> CYU (page 372):		
• Define random variables. X, Y and B were Defined in Example 1 D = X - Y The difference between cars sold and cars leased?		
1. Find and	nterpret μ_d : $\mu_X - \mu_Y = 1.1 - 0.7 = 0.4$ AVERAGE, THIS DEALERSHIP SELLS EASES DURING THE FIRST HOUR OF	O.4 CARS MORE THA
2. Calculate	Showing work clearly. How does this compare with Example $6x^2 + 6x^2 = (.943)^2 + (.64)^2 = 1.299$ The variances	mple # 2
A.1	a_b and a_b showing work clearly. $B \cdot 500 \times -300 \text{ Y}$ $= 500 \text{ M}_{\text{X}} - 300 \text{ M}_{\text{Y}} = 500 (1.1) - 300 \text{ M}_{\text{Y}}$ $= \sqrt{(500.943)^2 + (300.64)^2} = 500 (1.1)$	0(.7) = (75-10)
D		THE ABOVE 3.

IV. Example #3

Random variables. Given independent random variables with means and standard deviations as shown, find the mean and standard deviation of:

a)
$$2Y + 20$$

c)
$$0.25X + Y$$

d)
$$X - 5Y$$

e)
$$X_1 + X_2 + X_3$$

$$E(2Y+20) = 2My+20 = Z(1z)+20 = [M=44]$$

 $SD(2Y+20) = 2Gy = Z(3) = G=6$

Constant does Not Change Ucriability

$$E(3x) = 3 \cdot \mu_X = 3(80) = \mu = 240$$

 $SD(3x) = 3 \cdot 6_X = 3(12) = 6 = 36$

VAR (.25X+Y) = (.25
$$\frac{2}{x}$$
 + .6 $\frac{2}{y}$ = (.25.12) $\frac{2}{x}$ + $\frac{3^2}{6}$ = 18 $\frac{1}{6}$ = 4.24

$$VAR(X-5Y) = G_X^2 + (5G_Y)^2 = 12^2 + (5.3)^2 = 369$$

$$E = (x_1 + x_2 + x_3) = u_x + u_x + u_x = 80 + 80 + 80$$

$$VAR (x_1 + x_2 + x_3) = 6x^2 + 6x^2 + 6x^2 = 12^2 + 12^2 + 12^2 = 432$$

V. Example 4 "Apples"

Suppose that the weights of a certain variety of apples have weights that are approximately Normally distributed with a mean of 9 ounces and a standard deviation of 1.5 ounces. If bags of apples are filled by randomly selecting 12 apples, what is the probability that the sum of the weights of the 12 apples is less than 100 ounce

LET A = a rendomly selected apple with N(9,1.5)

T= total weight for 12 randomly selected apples T=A,+Az+...+A12

* since the apples are rendomly selected, we have 12 independent voricbles.

normal coff (-E99,100,108,5.2)

4 FIND PAOB. Zscore optional

1) FIND P (T < 100) = .062 (2) SKETCH GRAPH

(2) SKETCH GRAPH
TNN(108, 5.2)

3 FIND LT + 6T

GT= 1.52+1.52+ ...+1.52

GT=5.202

[5] Conclude:

There is about a 6% chance that 12 randomly selected apples will have a total weight of less than 100 ources.

VI. Example 5 "Speed Dating"

Suppose that the height M of male speed daters follows a Normal distribution with a mean of 70 inches and a standard deviation of 3.5 inches and the height F of female speed daters follows a Normal distribution with a mean of 65 inches and a standard deviation of 3 inches. What is the probability that a randomly selected male speed dater is taller than the randomly selected female speed dater with whom he is paired?

Ma neight of a mole speed deter - N(70, 3.5)

F= height of a female speed deter - N (65,3)

: Assume m and F are independent

P(M > F) = P(M - F > 0)LET D = M - F (mole is taller than female) UD = MM - MF = 70 - 65 = |5|N $6^2D = 6^2M + 6F^2 = \sqrt{3.5^2 + 3^2}$ |6D = 4.61|N

D: N(S, H.LI)

area P(D

area P(D>0) = .861

normal cdf (0, E99, 5, 4.61)

Conclude: THERE IS ABOUT AN 86% CHANCE
THAT A RANDOMLY SELECTED MALE SPEED
DATER WILL BE THUER THAN THE FEMALE HE IS
RANDOMLY PAIRED WITH.

OR IN ABOUT 86% OF SPEED DATING COUPLES THE MALE WILL BE TALLER THAN THE FEMALE.

Example 3 "Apples"

,0618

Suppose that the weights of a certain variety of apples have weights that are approximately Normally distributed with a mean of 9 ounces and a standard deviation of 1.5 ounces. If bags of apples are filled by randomly selecting 12 apples, what is the probability that the sum of the weights of the 12 apples is less than 100 ounces?

LET A = A RANDOMLY SELECTED APPLE. WITH N(9,1.5) T = TOTAL WEIGHT AI + AZ + A3 ... A 12* * THE APPLES ARE RANDOMLY SELECTED SO WE HAVE 12 INDEPENDENT UARIABLES

 $P(T < 100) \qquad N(108 5.2) \qquad M_T = M_{A_1} + M_{A_2} + ... + M_{A_{12}}$ $= P(Z < \frac{100 - 108}{5.2}) \qquad T$ $= P(Z < -1.54) = .0618 \qquad = 1.52 + ... + 6_{A_{12}}$ = 1.52 + ... + 1.52 = 2701 = 1.52 + ... + 1.52 = 2701

Conclude: There is about a 6.2% chance that the 12 randomly selected apples will have a total weight of less than 100 ounces

VI. Example 3 "Speed Dating"

108

Suppose that the height M of male speed daters follows a Normal distribution with a mean of 70 inches and a standard deviation of 3.5 inches and the height F of female speed daters follows a Normal distribution with a mean of 65 inches and a standard deviation of 3 inches. What is the probability that a randomly selected male speed dater is taller than the randomly selected female speed dater with whom he is paired?

m = height of male speed dater with whom he is paired?

F = height of female speed dater - N (70, 3.5)

Assume m and F are independent

P(M > F) = P(M - F > 0)

LET: D= m-F UD = Um - LF = 70 - 65 = (5in) $6^{2} = 6^{2} + 6^{2} = \sqrt{3.5^{2} + 3^{2}} = 4.61$ inches

N(5,4,61) SIN

 $Z = \frac{0-5}{4.61} = -1.08$ P(Z>-1.08) = .8599 normaledf(-1.08, E99,0,1)

CONCLUDE: THERE IS ABOUT AN 86% CHANCE THAT A RANGOMLY MALE SPEED DATER WILL BE TALLER THAN FEMALE HE IS RANDOMLY PAIRED WITH. TOR IN ABOUT 86% OF SPEED DATING COMPLES THE MALE WILL BE TALLER THAN THE FE MALE.