AP Statistics
Chapter 16 (Random Variables)

Name: NOTES Per: ______

The SAT Scores Problem

A college uses SAT scores as one criterion for admission. Experience has shown that the distribution of SAT scores among its entire population of applicants is as shown in the table below.
What are the **mean** and **SD** of the total SAT score among students applying to this college?

	Mean	SD
math	**625**	**90**
verbal	**590**	**100**

$E(\text{math} + \text{verbal}) = 625 + 590 = \boxed{1215}$

$SD(M + V)$?

Since MATH & VERBAL scores are NOT independent, SD cannot be determined.

(a very studious person may score high in BOTH ...)

The Bike Store Problem

Bicycles arrive at a bike shop in boxes. The means and standard deviations for the setup phases are given:

Phase	Mean	SD
Unpacking	**4.5**	**0.7**
Assembly	**21.8**	**2.4**
Tuning	**12.3**	**2.7**

Based on past experience, the shop manager makes the following assumptions:

- *the times for the three setup phases are* ***independent***
- *the times for each phase are* ***approximately normally distributed***

A customer decides to buy a bike like one of the display models, but wants a different color. The shop has one, still in the box. The manager says they can have it ready in half an hour. Find the probability that they can get the bike setup and ready to go as promised.

$P(U + A + T \leq 30 \text{ min})$?

$E(U + A + T) = 4.5 + 21.8 + 12.3$

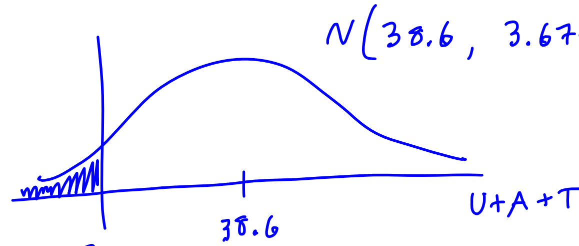
$\mu = 38.6 \text{ min}$

$SD(U + A + T) = \sqrt{0.7^2 + 2.4^2 + 2.7^2}$

$\sigma = 3.6797 \text{ min}$

USE THE NORMAL MODEL:

$N(38.6, 3.6797)$



$z = \frac{x - \mu}{\sigma}$

$= \frac{30 - 38.6}{3.6797} = -2.337\ldots$

$P(\text{total time} \leq 30 \text{ min})$

$= P(z < -2.34)$

$= \boxed{0.0096}$

(less than 1%... not good)

The Matchmaker Problem I

In a far-away society, males and females are randomly selected to be matched up with each other for life ☺

Heights	Mean	SD
Males	**69.5**	**3.2**
Females	**65**	**2.8**

We will assume that

- *the heights for adult males and females are* ***independent***
- *the heights of both males and females are* ***approximately normally distributed***

a) Find the probability that the female is paired with a shorter man.

$M < F$ ... or $M - F < 0$

(This means male is shorter than female)

☆ First find μ and σ of $(M-F)$:

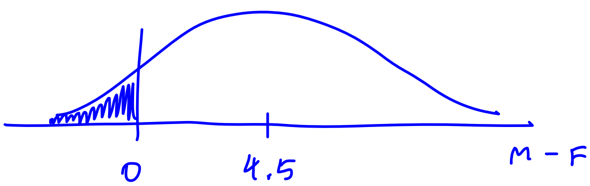
$$E(M-F) = 69.5 - 65 = 4.5$$

$$SD(M-F) = \sqrt{3.2^2 + 2.8^2} = 4.252$$

$$P(M-F<0)$$

$$= P(z < -1.0583)$$

Using $N(4.5, 4.252)$:



$$z = \frac{x-\mu}{\sigma}$$

$$= \frac{0-4.5}{4.252} = -1.0583$$

about

$$= \boxed{0.1446}$$

The Matchmaker Problem II

b) Find the probability that the man is at least 12 inches taller than his lady.

WHOA, NELLY! this means $M - F \geq 12$

STILL USING

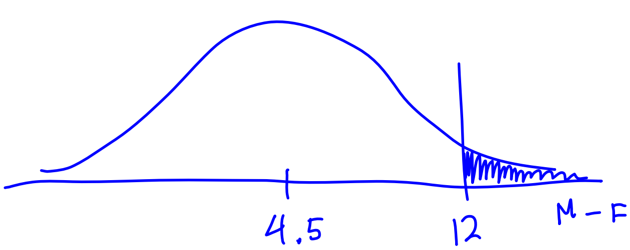
$N(4.5, 4.252)$ for "$M-F$":

$$P(M-F \geq 12)$$

$$= P(z > 1.76)$$

about

$$= \boxed{0.0392}$$



$$z = \frac{x-\mu}{\sigma}$$

$$= \frac{12-4.5}{4.252}$$

$$z = 1.76\ldots$$