Math 146 6.2 — Applications of Normal Distributions

To calculate the area under a normal distribution with mean μ and standard deviation σ, first calculate the *z*-score (from chapter 3)

$$z = \frac{x-\mu}{\sigma}$$ (round to two decimal places)

and then use Table A-2 or your calculator to calculate the areas.

EXAMPLE 1 One of the larger species of tarantulas is the *Grammostola mollicoma*, whose common name is the Brazilian Giant Tawny Red. A tarantula has two body parts. The anterior part of the body is covered above by a shell, or carapace. It has been found that the carapace length of the adult male is normally distributed with mean $\mu = 18.14$ mm and standard deviation $\sigma = 1.76$ mm.

a) Find the percentage of adult male *G. mollicoma* that have carapace lengths less than 15 mm.

b) Find the percentage of adult male *G. mollicoma* that have carapace lengths between 16 mm and 17 mm.

c) Find the percentage of adult male *G. mollicoma* that have carapace lengths exceeding 19 mm.

d) Obtain and interpret the 95th percentile for carapace length of the adult male *G. mollicoma.*

EXAMPLE 2 Two decades ago the mean distance for tee shots on the men's PGA tour for golf was $\mu = 272.2$ yards with a standard deviation of $\sigma = 8.12$ yards. Assuming that the tee shot distances were normally distributed, find the percentage of tee shots that went

a) between 260 and 280 yards

b) more than 300 yards.

c) Find the maximum distance of 20% of the shortest tee shots.

d) Find the distance that 5% of the tee shots are longer than.

WHO'S THE DADDY?

"Dear Abby" column on January 20, 1973:

Dear Abby,
You wrote in your column that a woman is pregnant for 266 days. Who said so? I carried my baby for ten months and five days, and there is no doubt about it because I know the exact date my baby was conceived. My husband is in the Navy and it couldn't possibly have been conceived any other time because I saw him only once for an hour, and I didn't see him again until the day before the baby was born.

I don't drink or run around, and there is no way this baby isn't his, so please print a retraction about the 266-day carrying time because otherwise I am in a lot of trouble.
San Diego Reader

Assume that the standard deviation of pregnancies is 16 days. How unlikely is the Reader's claim? Find the probability of a pregnancy lasting at least 10 months and 5 days.

If a premature birth is defined as "Born before the 37th week", what proportion of births are premature?

HEART RATES

The following values are the heart rates per minute from our data collection survey

70	67	61	78	68	80	67	65	82	54	88	60	61	72	82
70	68	57	76	52	81	63	75	58	69	82	72	80	77	57

Calculate the mean and standard deviation of the sample. Let's assume that the sample is normal and that the mean and standard deviation can be used for approximations of the population mean and standard deviation. (More on this later.)

a) What percentage of the population has a resting heart rate less than 60 bpm?

b) What percentage of the population has a heart rate bewteen 60 and 80 bpm?

c) Some athletes have a resting heart rate of 35bpm. Find the percentage of the population that they are lower than.

d) Doctors are concerned if your resting heart rate is too high. What heart rate is at the 99th percentile?
