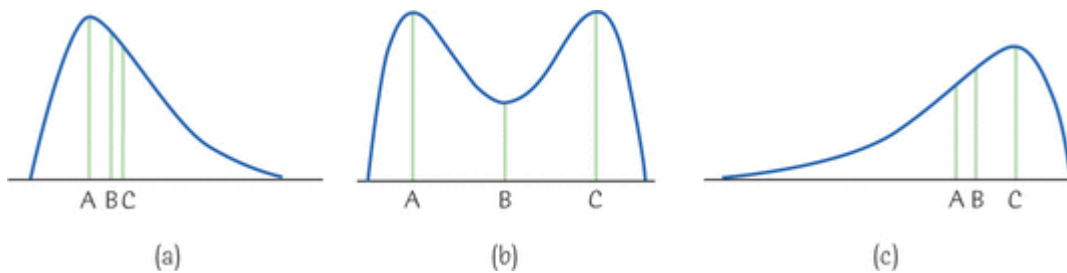


### Homework #3. Book Questions (5<sup>th</sup> edition)

**3.2 Accidents on a bike path.** Examining the location of accidents on a level, 3-mile bike path shows that they occur uniformly along the length of the path. **Figure 3.4** displays the **density curve** that describes the **distribution** of accidents.

- Explain why this curve satisfies the two requirements for a **density curve**.
- The proportion of accidents that occur in the first mile of the path is the area under the **density curve** between 0 miles and 1 mile. What is this area?
- Sue's property adjoins the bike path between the 0.8 mile mark and the 1.1 mile mark. What proportion of accidents happen in front of Sue's property?

**3.4 Mean and median.** **Figure 3.7** displays three **density curves**, each with three points marked on them. At which of these points on each curve do the **mean** and the **median** fall?



**3.6 Running a mile.** The times for the mile run of a large group of male college students are approximately Normal with **mean** 7.11 minutes and **standard deviation** 0.74 minutes. Use the 68–95–99.7 rule to answer the following questions. (Start by making a sketch like **Figure 3.10**.)

- What range of times covers almost all (99.7%) of this distribution?
- What percent of these men run a mile in less than 6.37 minutes?

**3.8 SAT versus ACT.** In 2007, when she was a high school senior, Eleanor scored 680 on the mathematics part of the SAT. The **distribution** of SAT math scores in 2007 was Normal with **mean** 515 and **standard deviation** 114. Gerald took the ACT Assessment mathematics test and scored 27. ACT math scores for 2007 were Normally distributed with **mean** 21.0 and **standard deviation** 5.1. Find the standardized scores for both students. Assuming that both tests measure the same kind of ability, who had the higher score?

**3.10 Use the Normal table.** Use **Table A** to find the proportion of observations from a **standard Normal distribution** that satisfies each of the following statements. In each case, sketch a standard Normal curve and shade the area under the curve that is the answer to the question.

- $z < 2.85$
- $z > 2.85$
- $z > -1.66$

(d)  $-1.66 < z < 2.58$

**3.12 Fruit flies.** The common fruit fly *Drosophila melanogaster* is the most studied organism in genetic research because it is small, easy to grow, and reproduces rapidly. The length of the thorax (where the wings and legs attach) in a **population** of male fruit flies is approximately Normal with **mean** 0.800 millimeters (mm) and **standard deviation** 0.078 mm.

(a) What proportion of flies have thorax length 0.9 mm or longer?

(b) What proportion have thorax length between 0.9 mm and 1 mm?

**3.27 Low IQ test scores.** Scores on the Wechsler Adult Intelligence Scale (WAIS) are approximately Normal with **mean** 100 and **standard deviation** 15. People with WAIS scores below 70 are considered mentally retarded when, for example, applying for Social Security disability benefits. According to the 68-95-99.7 rule, about what percent of adults are retarded by this criterion?

**3.32 Runners.** In a study of exercise, a large group of male runners walk on a treadmill for 6 minutes. Their heart rates in beats per minute at the end vary from runner to runner according to the  $N(104, 12.5)$  **distribution**. The heart rates for male nonrunners after the same exercise have the  $N(130, 17)$  **distribution**.

(a) What percent of the runners have heart rates above 130?

(b) What percent of the nonrunners have heart rates above 130?

**3.34 Making tablets.** A pharmaceutical manufacturer forms tablets by compressing a granular material that contains the active ingredient and various fillers. The force in kilograms (kg) applied to the tablets varies a bit, with the  $N(11.5, 0.2)$  **distribution**. The **process** specifications call for applying a force between 11.2 and 12.2 kg.

(a) What percent of tablets are **subject** to a force that meets the specifications?

(b) The manufacturer adjusts the **process** so that the **mean** force is at the center of the specifications,  $\mu = 11.7$  kg. The **standard deviation** remains 0.2 kg. What percent now meet the specifications?

**Miles per gallon.** In its *Fuel Economy Guide for 2008 model vehicles*, the Environmental Protection Agency gives data on 1152 vehicles. There are a number of **outliers**, mainly vehicles with very poor gas mileage. If we ignore the **outliers**, however, the combined city and highway gas mileage of the other 1120 or so vehicles is approximately Normal with **mean** 18.7 miles per gallon (mpg) and **standard deviation** 4.3 mpg. Exercises 3.35 to 3.38 concern this **distribution**.

**3.36 The top 10%.** How high must a 2008 vehicle's gas mileage be in order to fall in the top 10% of all vehicles? (The **distribution** omits a few high **outliers**, mainly hybrid gas-electric vehicles.)

**3.44 Grading managers.** Some companies "grade on a bell curve" to compare the performance of their managers and professional workers. This forces the use of some low performance ratings so that not all workers are listed as "above average." Ford Motor Company's "performance management process" for a time assigned 10% A grades, 80% B grades, and 10% C grades to the company's managers. Suppose that Ford's performance scores really are Normally distributed. This year, managers with scores less than 25 received C's and those with scores above 475 received A's. What are the **mean** and **standard deviation** of the scores?

**3.46 Normal is only approximate: IQ test scores.** Here are the IQ test scores of 31 seventh-grade girls in a Midwest school district<sup>9</sup>:

114	100	104	89	102	91	114	114	103	105	
108	130	120	132	111	128	118	119	86	72	
111	103	74	112	107	103	98	96	112	112	93

- (a) We expect IQ scores to be approximately Normal. Make a stemplot to check that there are no major departures from Normality.
- (b) Nonetheless, proportions calculated from a **Normal distribution** are not always very accurate for small numbers of observations. Find the **mean**  $\bar{x}$  and **standard deviation**  $s$  for these IQ scores. What proportions of the scores are within one **standard deviation** and within two **standard deviations** of the mean? What would these proportions be in an exactly Normal distribution?