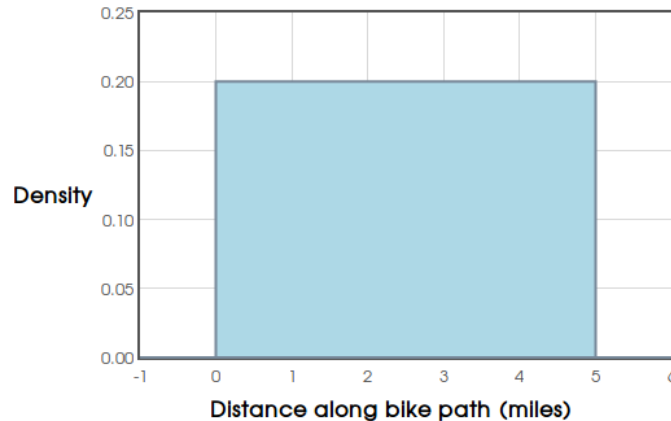1. **Accidents on a bike path.** Examining the location of accidents on a level, 5-mile bike path shows that they occur uniformly along the length of the path. The figure below displays the density curve that describes the distribution of accidents.

(a) Explain why this curve satisfies the two requirements for a density curve.

(b) 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?

(c) There is a stream alongside the bike path between the 0.8-mile mark and the 1.3-mile mark. What proportion of accidents happen on the bike path alongside the stream?

(d) The bike path is a paved path through the woods, and there is a road at each end. What proportion of accidents happen more than 1 mile from either road? (Hint: First determine where on the bike path the accident needs to occur to be more than 1 mile from either road, and then find the area.)

(e) What is the mean μ of the the above density curve.

2. 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) Draw a Normal curve on which this mean and standard deviation are correctly located. (Hint: Draw an unlabeled Normal curve, locate the points where the curvature changes, then add number labels on the horizontal axis.)

(b) What range of lengths covers almost all (99.7%) of this distribution?

(c) What percent of male fruit flies have a thorax length exceeding 0.878 mm?

3. The summer monsoon brings 80% of India's rainfall and is essential for the country's agriculture. Records going back more than a century show that the amount of monsoon rainfall varies from year to year according to a distribution that is approximately Normal with mean 852 millimeters (mm) and standard deviation 82 mm. Use the 68–95–99.7 rule to answer the following questions.

(a) Between what values do the monsoon rains fall in 95% of all years?

(b) How small are the monsoon rains in the driest 2.5% of all years?

4. The heights of women aged 20 to 29 are approximately Normal with mean 64.3 inches and standard deviation 2.7 inches. Men the same age have mean height 69.9 inches with standard deviation 3.1 inches. What are the z-scores for a woman 6 feet tall and a man 6 feet tall? Say in simple language what information the z-scores give that the original nonstandardized heights do not.

5. The summer monsoon rains in India follow approximately a Normal distribution with mean 852 millimeters (mm) of rainfall and standard deviation 82 mm.

(a) In the drought year 1987, 697 mm of rain fell. In what percent of all years will India have 697 mm or less of monsoon rain?

(b) "Normal rainfall" means within 20% of the long-term average, or between 683 mm and 1022 mm. In what percent of all years is the rainfall normal?

6. Use Table A to find the value z of a standard Normal variable that satisfies each of the following conditions. (Use the value of z from Table A that comes closest to satisfying the condition.) In each case, sketch a standard Normal curve with your value of z marked on the axis.

(a) The point z with 15% of the observations falling below it

(b) The point z with 70% of the observations falling above it

7. Use Table A to find the proportion of observations from a standard Normal distribution that fall in each of the following regions. In each case, sketch a standard Normal curve and shade the area representing the region.

(a) $z \leq -1.25$

(b) $z \geq -1.25$

(c) $z > 2.17$

(d) $-1.25 < z < 2.17$

8. The thorax lengths in a population of male fruit flies follow a Normal distribution with mean 0.800 millimeters (mm) and standard deviation 0.078 mm.

(a) What proportion of flies have thorax lengths less than 0.7 mm?

(b) What proportion have thorax lengths greater than 1 mm?

(c) What proportion have thorax lengths between 0.7 and 1 mm?