

## The Normal Distribution

*For all questions, assume that the distribution is normal and draw the curve*

1. A survey found that mean length of time that Americans keep their cars is 5.3 years with a standard deviation of 1.2 years. If a person decides to purchase a new car, find the probability that he or she has owned the old car for
  - a) less than 2.5 years
  - b) between 3 and 6 years
  - c) more than 7 years
  - d) The length of time John keeps his car is in the 90<sup>th</sup> percentile. Determine how long John keeps his car.
2. The average waiting time at Walgreen's drive-through window is 7.6 minutes, with a standard deviation of 2.6 minutes. When a customer arrives at Walgreen's, find the probability that he will have to wait
  - a) between 4 and 6 minutes
  - b) less than 3 minutes
  - c) more than 8 minutes
  - d) Only 8% of customers have to wait longer than Mrs. Sickalot. Determine how long Mrs. Sickalot has to wait.
3. The scores on an Algebra II test have a mean of 76.4 and a standard deviation of 11.4. Find the probability that a student will score
  - a) above 78
  - b) below 60
  - c) between 80 and 85
  - d) Mr. Reeves scales his tests so that only 5% of students can receive an A. What is the minimum score Andrea can make on this test and still get an A?
4. The average life of automobile tires is 30,000 miles with a standard deviation of 2000 miles. If a tire is selected and tested, find the probability that it will have a lifetime
  - a) between 25,000 and 28,000 miles
  - b) between 27,000 and 32,000 miles
  - c) over 35,000 miles
  - d) The tire company will replace tires whose tread life falls in the lowest 15% of all tires of this model. What is the lifetime of a tire that qualifies for replacement?
5. The mean height of an American man is 69" with a standard deviation of 2.4". If a man is selected at random, find the probability that he will be
  - a) between 68" and 71" tall
  - b) shorter than 67"
  - c) taller than 72"
  - d) If Jose is in the 75<sup>th</sup> percentile, how tall is he?

Answers:

1. A survey found that mean length of time that Americans keep their cars is 5.3 years with a standard deviation of 1.2 years. If a person decides to purchase a new car, find the probability that he or she has owned the old car for

a) less than 2.5 years  $\text{normcdf}(-1E99, 2.5, 5.3, 1.2) = 0.0098$  or .98%

b) between 3 and 6 years  $\text{normcdf}(3, 6, 5.3, 1.2) = 0.6925$  or 69.25%

c) more than 7 years  $\text{normcdf}(7, 1E99, 5.3, 1.2) = 0.0783$  or 7.83%

d) The length of time John keeps his car is in the 90<sup>th</sup> percentile. Determine how long John keeps his car.  $\text{invnorm}(.9, 5.3, 1.2) = 6.84$  years

2. The average waiting time at Walgreen's drive-through window is 7.6 minutes, with a standard deviation of 2.6 minutes. When a customer arrives at Walgreen's, find the probability that he will have to wait

a) between 4 and 6 minutes  $\text{normcdf}(4, 6, 7.6, 2.6) = 0.1861$  or 18.61%

b) less than 3 minutes  $\text{normcdf}(-1E99, 3, 7.6, 2.6) = 0.0384$  or 3.84%

c) more than 8 minutes  $\text{normcdf}(8, 1E99, 7.6, 2.6) = 0.4389$  or 43.89%

d) Only 8% of customers have to wait longer than Mrs. Sickalot. Determine how long Mrs. Sickalot has to wait.  $\text{invnorm}(.92, 7.6, 2.6) = 11.25$  minutes

3. The scores on an Algebra II test have a mean of 76.4 and a standard deviation of 11.4. Find the probability that a student will score

a) above 78  $\text{normcdf}(78, 1E99, 76.4, 11.4) = 0.4442$  or 44.42%

b) below 60  $\text{normcdf}(-1E99, 60, 76.4, 11.4) = 0.0751$  or 7.51%

c) between 80 and 85  $\text{normcdf}(80, 85, 76.4, 11.4) = 0.1508$  or 15.08%

d) Mr. Reeves scales his tests so that only 5% of students can receive an A. What is the minimum score Andrea can make on this test and still get an A?  $\text{invnorm}(.95, 76.4, 11.4) = 95.15$

4. The average life of automobile tires is 30,000 miles with a standard deviation of 2000 miles. If a tire is selected and tested, find the probability that it will have a lifetime

a) between 25,000 and 28,000 miles  $\text{normcdf}(25000, 28000, 30000, 2000) = 0.1524$  or 15.24%

b) between 27,000 and 32,000 miles  $\text{normcdf}(27000, 32000, 30000, 2000) = 0.7745$  or 77.45 %

c) over 35,000 miles  $\text{normcdf}(35000, 1E99, 30000, 2000) = 0.0062$  or .62%

d) The tire company will replace tires whose tread life falls in the lowest 15% of all tires of this model. What is the lifetime of a tire that qualifies for replacement?  $\text{invnorm}(.15, 30000, 2000) = 27,928$  miles

5. The mean height of an American man is 69" with a standard deviation of 2.4". If a man is selected at random, find the probability that he will be

a) between 68" and 71" tall  $\text{normcdf}(68, 71, 69, 2.4) = 0.4592$  or 45.92%

b) shorter than 67"  $\text{normcdf}(-1E99, 67, 69, 2.4) = 0.2023$  or 20.23%

c) taller than 72"  $\text{normcdf}(72, 99, 69, 2.4) = 0.1056$  or 10.56%

d) If Jose is in the 75<sup>th</sup> percentile, how tall is he?  $\text{invnorm}(.75, 69, 2.4) = 70.6$  inches