Extra Practice I: Measuring location and Normal distributions

ACT versus SAT, I There are two major tests of readiness for college, the ACT and the SAT. ACT scores are reported on a scale from 1 to 36. The distribution of ACT scores in recent years has been roughly Normal with mean \( \mu = 20.9 \) and standard deviation \( \sigma = 4.8 \). SAT scores (prior to 2005) were reported on a scale from 400 to 1600. SAT scores have been roughly Normal with mean \( \mu = 1026 \) and standard deviation \( \sigma = 209 \). The following exercises are based on this information.

1. Jose scores 1287 on the SAT. Assuming that both tests measure the same thing, what score on the ACT is equivalent to Jose's SAT score? Explain.

2. Reports on a student's ACT or SAT usually give the percentile as well as the actual score. Tonya scores 1318 on the SAT. What is her percentile? Show your method.

3. The quartiles of any distribution are the values with cumulative proportions 0.25 and 0.75. What are the quartiles of the distribution of ACT scores? Show your method.
Extra Practice II: Measuring location and Normal distributions

ACT versus SAT, II There are two major tests of readiness for college, the ACT and the SAT. ACT scores are reported on a scale from 1 to 36. The distribution of ACT scores in recent years has been roughly Normal with mean $\mu = 20.9$ and standard deviation $\sigma = 4.8$. SAT scores (prior to 2005) were reported on a scale from 400 to 1600. SAT scores have been roughly Normal with mean $\mu = 1026$ and standard deviation $\sigma = 209$. The following exercises are based on this information.

1. Maria scores 28 on the ACT. Assuming that both tests measure the same thing, what score on the SAT is equivalent to Maria's ACT score? Explain.

2. Reports on a student's ACT or SAT usually give the percentile as well as the actual score. Jacob scores 16 on the ACT. What is his percentile? Show your method.

3. The quintiles of any distribution are the values with cumulative proportions 0.20, 0.40, 0.60, and 0.80. What are the quintiles of the distribution of SAT scores? Show your method.
Answers to Extra Practice

Extra Practice I:

1. On the SAT, Jose’s $z$-score is $z = \frac{1287 - 1026}{209} = 1.25$. To find his equivalent score on the ACT, we solve $1.25 = \frac{x - 20.9}{4.8}$ for $x$ and get $x = 26.9$.

2. $z = \frac{1318 - 1026}{209} = 1.40$. Using Table A, the area to the left of $z = 1.40$ is 0.9192, so Tonya’s score is at the 92nd percentile.

3. Using Table A, the 25th percentile of the standard Normal distribution is approximately $z = 0.67$. To find the 25th percentile of the distribution of ACT scores, we solve $-0.67 = \frac{x - 20.9}{4.8}$ for $x$ and get $x = 17.7$. Similarly, for the 75th percentile, $z = 0.67$ and $x = 24.1$.

Extra Practice II:

1. On the ACT, Maria’s $z$-score is $z = \frac{28 - 20.9}{4.8} = 1.48$. To find her equivalent score on the SAT, we solve $1.48 = \frac{x - 1026}{209}$ for $x$ and get $x = 1335$.

2. $z = \frac{16 - 20.9}{4.8} = -1.02$. Using Table A, the area to the left of $z = -1.02$ is 0.1539, so Jacob’s score is at the 15th percentile.

3. Using Table A, the 20th percentile of the standard Normal distribution is approximately $z = -0.84$. To find the 20th percentile of the distribution of SAT scores, we solve $-0.84 = \frac{x - 1026}{209}$ for $x$ and get $x = 850$. Similarly, for the 40th percentile, $z = -0.25$ and $x = 974$; for the 60th percentile, $z = 0.25$ and $x = 1078$; and for the 80th percentile, $z = 0.84$ and $x = 1202$. 