Homework Unit 1

Assignment 4

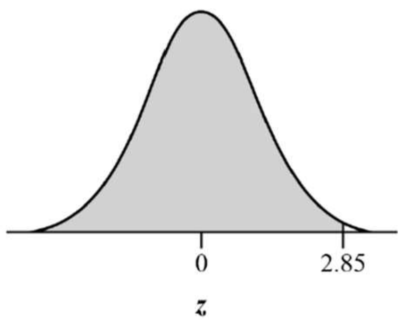
2.11 Eleanor's standardized score, $z = \dfrac{680 - 500}{100} = 1.8$ is higher than Gerald's standardized score, $z = \dfrac{27 - 18}{6} = 1.5$.

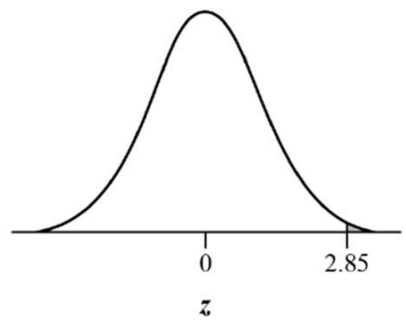
2.12 The standardized batting averages (z-scores) for these three outstanding hitters are:

Player	z-score
Cobb	$z = \dfrac{0.420 - 0.266}{0.0371} = 4.15$
Williams	$z = \dfrac{0.406 - 0.267}{0.0326} = 4.26$
Brett	$z = \dfrac{0.390 - 0.261}{0.0317} = 4.07$

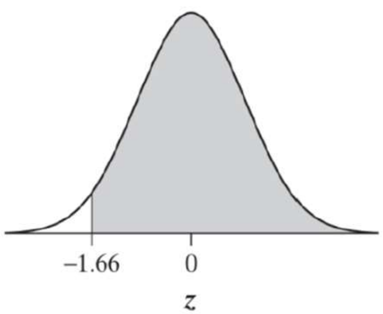
All three hitters were at least 4 standard deviations above their peers, but Williams' z-score is the highest.

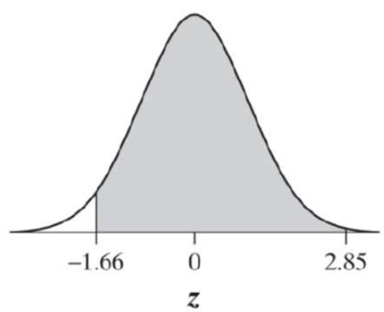
2.47 (a) 0.9978. The graph is shown below (left). (b) 1 − 0.9978 = 0.0022. The graph is shown below (right).



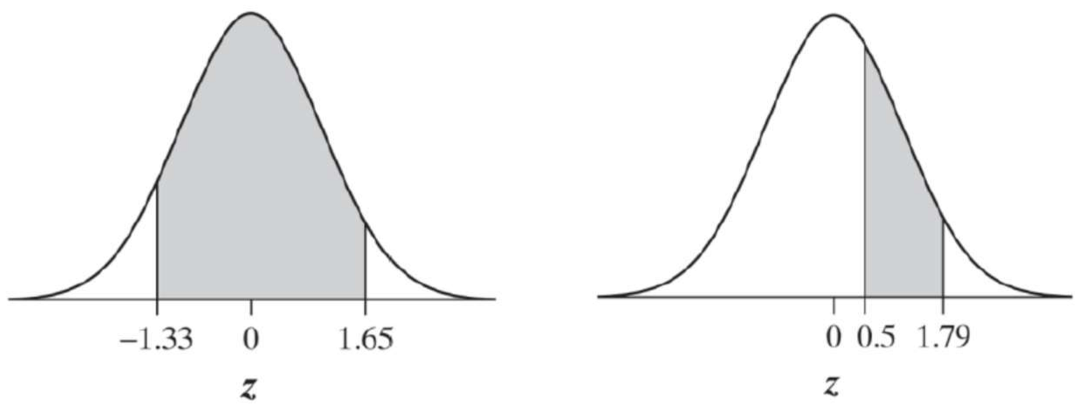


(c) 1 – 0.0485 = 0.9515. The graph is shown below (left). (d) 0.9978 – 0.0485 = 0.9493. The graph is show below (right).

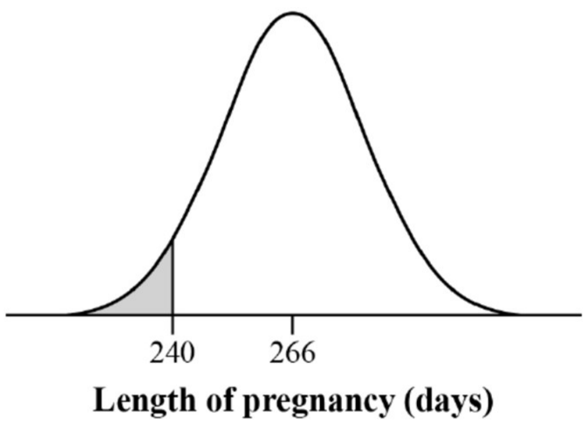




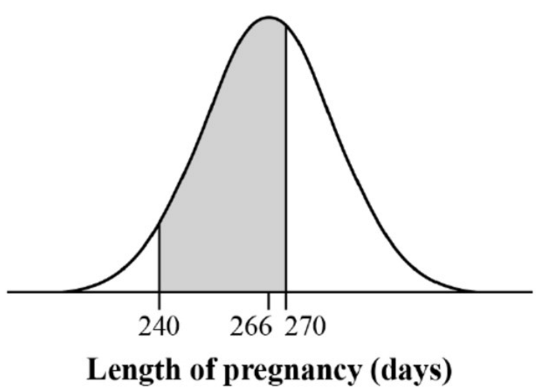
2.49 (a) $0.9505 - 0.0918 = 0.8587$. The graph is shown below (left). (b) $0.9633 - 0.6915 = 0.2718$. The graph is shown below (right).



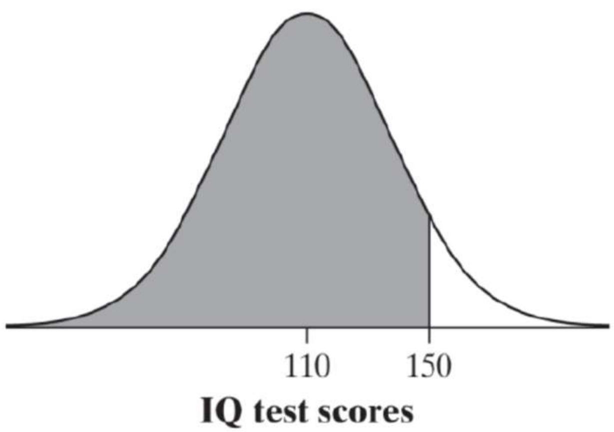
2.53 (a) **Step 1: State the distribution and values of interest.** The length of pregnancies follows a Normal distribution with $\mu = 266$ days and $\sigma = 16$ days. We want the proportion of pregnancies that last less than 240 days (see graph below). **Step 2: Perform calculations. Show your work.** The standardized score for the boundary value is $z = \dfrac{240 - 266}{16} = -1.63$. From Table A, the proportion of z-scores less than –1.63 is 0.0516. *Using technology:* The command normalcdf(lower: –1000, upper: 240, μ: 266, σ: 16) gives an area of 0.0521. **Step 3: Answer the question.** About 5% of pregnancies last less than 240 days, so 240 days is at the 5$^{\text{th}}$ percentile of pregnancy lengths.



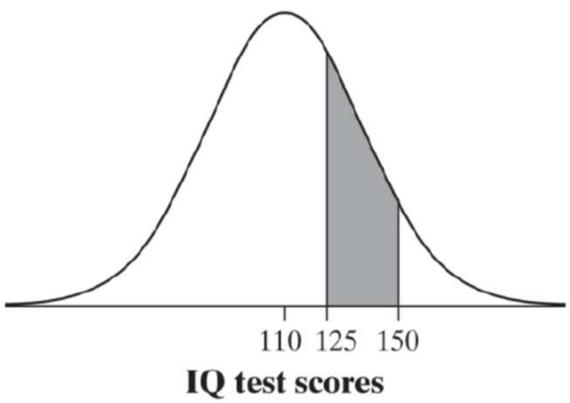
(b) **Step 1: State the distribution and values of interest.** The length of pregnancies follows a Normal distribution with $\mu = 266$ days and $\sigma = 16$ days. We want the proportion of pregnancies that last between 240 and 270 days (see graph below). **Step 2: Perform calculations. Show your work.** The standardized scores for the boundary values are $z = \dfrac{240-266}{16} = -1.63$ and $z = \dfrac{270-266}{16} = 0.25$. From Table A, the proportion of z-scores less than –1.63 is 0.0516 and the proportion of z-scores less than 0.25 is 0.5987. Thus, the proportion of z-scores between –1.63 and 0.25 is 0.5987 – 0.0516 = 0.5471. *Using technology:* The command normalcdf(lower: 240, upper: 270, μ: 266, σ: 16) gives an area of 0.5466. **Step 3: Answer the question.** About 55% of pregnancies last between 240 and 270 days.



2.54 (a) **Step 1: State the distribution and values of interest.** For the 20 to 34 age group, IQ scores follow a Normal distribution with $\mu = 110$ and $\sigma = 25$. We want the proportion of people who have scores less than 150 (see graph below). **Step 2: Perform calculations. Show your work.** The standardized score for the boundary value is $z = \frac{150-110}{25} = 1.6$. From Table A, the proportion of *z*-scores less than 1.6 is 0.9452. *Using technology:* The command normalcdf(lower: –1000, upper: 150, μ: 110, σ: 25) gives an area of 0.9452. **Step 3: Answer the question.** About 95% of people in this age group have IQ scores less than 150, so a score of 150 is at the 95^{th} percentile.

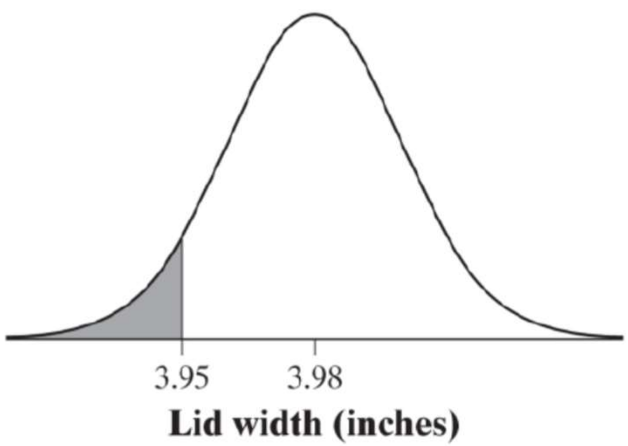


(b) **Step 1: State the distribution and values of interest.** For the 20 to 34 age group, IQ scores follow a Normal distribution with $\mu = 110$ and $\sigma = 25$. We want the percent of people in this age group with IQ scores between 125 and 150 (see graph below). **Step 2: Perform calculations. Show your work.** The standardized scores for the boundary values are $z = \dfrac{125-110}{25} = 0.6$ and $z = \dfrac{150-110}{25} = 1.6$. From Table A, the proportion of z-scores less than 1.6 is 0.9452 and the proportion of z-scores less than 0.6 is 0.7257. Thus, the proportion of z-scores between 0.6 and 1.6 is $0.9452 - 0.7257 = 0.2195$. *Using technology:* The command normalcdf(lower: 125, upper: 150, μ: 110, σ: 25) gives an area of 0.2195. **Step 3: Answer the question.** About 22% of 20 to 34 year olds have IQ scores between 125 and 150.



2.55 (a) **Step 1: State the distribution and values of interest.** For large lids, the diameter follows a Normal distribution with mean 3.98 and standard deviation 0.02. We want to find the percent of lids that have diameters less than 3.95 (see graph below). **Step 2: Perform calculations. Show your work.** The standardized score for the boundary value is

$z = \dfrac{3.95 - 3.98}{0.02} = -1.5$. From Table A, the proportion of z-scores below -1.5 is 0.0668. *Using technology:* The command normalcdf(lower: –1000, upper: 3.95, μ: 3.98, σ: 0.02) gives an area of 0.0668. **Step 3: Answer the question.** About 7% of the large lids are too small to fit.



(b) **Step 1: State the distribution and values of interest.** For large lids, the diameter follows a Normal distribution with mean 3.98 and standard deviation 0.02. We want to find the percent of lids that have diameters greater than 4.05 (see graph below). **Step 2: Perform calculations. Show your work.** The standardized score for the boundary value is $z = \dfrac{4.05 - 3.98}{0.02} = 3.5$. From Table A, the proportion of z-scores above 3.50 is approximately 0. *Using technology:* The command normalcdf(lower: 4.05, upper: 1000, μ: 3.98, σ: 0.02) gives an area of 0.0002. **Step 3: Answer the question.** Approximately 0% of the large lids are too big to fit.