Grading on a (Normal Model) Curve

Scores on a 100 point statistics exam are modeled using a normal model with \( \mu = 72 \) and \( \sigma = 8 \).

1. Suppose the professor uses a straight percentage scale, that is 90 and above is an A, 80 up to 90 is a B, 70 up to 80 is a C, 60 up to 70 is a D and below 60 is an F.

(a) With this scale, what proportion of students will get F's?

\[
Z = \frac{60 - 72}{8} = \frac{-12}{8} = -1.5
\]

Table Z : 0.0668

6.68%

(b) With this scale, what proportion of students will get A's?

\[
Z = \frac{90 - 72}{8} = \frac{18}{8} = 2.25
\]

Table Z : 0.9878

\[1 - 0.9878 = 0.0122\]

1.22%

(c) With this scale, what proportion of students will get C's?

\[
z_1 = \frac{70 - 72}{8} = \frac{-2}{8} = -0.25 \quad z_2 = \frac{80 - 72}{8} = \frac{8}{8} = 1.00
\]

Table Z : 0.4013 \quad Table Z : 0.8413

\[0.8413 - 0.4013 = 0.4400\]

44%
2. Suppose the professor wants to set a scale so that 18% of students get A's, 26% of students get B's, 38% of students get C's, 14% of students get D's and 4% of students get F's.

(a) What should the cutoff for A's be?

\[ z = 0.92 \]

\[ 0.92 = \frac{\text{cutoff} - 72}{8} \]

\[ \text{cutoff} = 72 + 0.92(8) = 79.36 \]

All students with scores above 79.36 will get A’s.

(b) What is the cutoff for an F?

\[ z = -1.75 \]

\[ -1.75 = \frac{\text{cutoff} - 72}{8} \]

\[ \text{cutoff} = 72 - 1.75(8) = 58 \]

All students with scores below 58 will get F’s.

(c) What is the lowest score you can get, and still get a C?

4% + 14% = 18% of students will get F’s and D’s.

\[ z = -0.92 \]

\[ -0.92 = \frac{\text{cutoff} - 72}{8} \]

\[ \text{cutoff} = 72 - 0.92(8) = 64.64 \]

Students who get above 64.64 will get at least a C.