

Name: _____

Date: _____ Pd: _____

Chapter 6: Normal Percentiles

1. Suppose the class took a 40-point quiz. Results show that a mean score of 30, median 32, IQR 8, standard deviation 6, min 12 and lower quartile 27. You got a 35. What happens to each of the statistics if...

- a. I decide to weight the quiz as 50 points by adding 10 points to each score. Your score is now 45.

$$\begin{array}{ll} \bar{x} = & M = \\ \text{IQR} = & s = \\ \text{min} = & Q_1 = \end{array}$$

- b. I decide to weight the quiz as 80 points by doubling each score. Your score is now 70.

$$\begin{array}{ll} \bar{x} = & M = \\ \text{IQR} = & s = \\ \text{min} = & Q_1 = \end{array}$$

- c. I decide to count the quiz as 100 points by doubling each score, then adding 20 points. Your score is now 90.

$$\begin{array}{ll} \bar{x} = & M = \\ \text{IQR} = & s = \\ \text{min} = & Q_1 = \end{array}$$

2. Consider the three athletes' performances shown below in a 3-event competition. Note that each person finishes first, second, and third one time. Who deserves the gold medal? And who gave the most remarkable performance of the competition?

Competitor	Event		
	100 m Dash	Shot Put	Long Jump
A	10.1 sec	66'	26'
B	9.9 sec	60'	27'
C	10.3 sec	63'	27' 3"
Mean	10 sec	60'	26'
St Dev	0.2 sec	3'	6"

3. Sketch a Normal model for each of the following:
- Birthweights of babies, $N(7.6 \text{ lb}, 1.3 \text{ lb})$

- ACT scores at a certain college $N(21.2, 4.4)$

4. Use your knowledge of Normal models to guess plausible standard deviations for each of the following variables.

- Height of 16-yr old girls
- Weight of high school boys
- Current price of gasoline

5. Suppose a Normal model describes the fuel efficiency of cars currently registered in Maryland. The mean is 24 mpg, with a standard deviation of 6 mpg.

- Sketch the Normal model.

- What percent of all cars get less than 15 mpg?

30 min

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a. I decide to weight the quiz as 50 points by adding 10 points to each score. Your score is now 45.

$\bar{x} = 40$	$M = 42$	$y + 10$
$IQR = 8$	$s = 6$	
$min = 22$	$Q_1 = 37$	

b. I decide to weight the quiz as 80 points by doubling each score. Your score is now 70.

$\bar{x} = 60$	$M = 64$	$2y$
$IQR = 16$	$s = 12$	
$min = 24$	$Q_1 = 54$	

c. I decide to count the quiz as 100 points by doubling each score, then adding 20 points. Your score is now 90.

$\bar{x} = 80$	$M = 84$	$2y + 20$
$IQR = 16$	$s = 12$	
$min = 44$	$Q_1 = 74$	

2. Consider the three athletes' performances shown below in a 3-event competition. Note that each person finishes first, second, and third one time. Who deserves the gold medal? And who gave the most remarkable performance of the competition?

Competitor	Event		
	100 m Dash	Shot Put	Long Jump
A	10.1 sec	66'	26'
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C	10.3 sec	63'	27' 3"
Mean	10 sec	60'	26'
St Dev	0.2 sec	3'	6"

(lower = better)

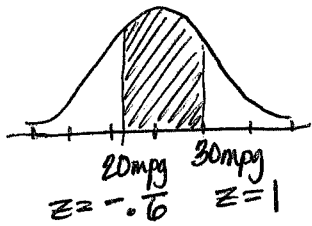
100 m Dash	Shot Put	Long Jump
$Z_A = 0.5$	$Z_A = 2$	$Z_A = 0$
$Z_B = -0.5$	$Z_B = 0$	$Z_B = 2$
$Z_C = 1.5$	$Z_C = 1$	$Z_C = 2.5$

Total SD above the mean

A: 1.5
B: 2.5
C: 2

Competitor B deserves the gold medal.
Competitor C had the most remarkable performance (in the long jump).

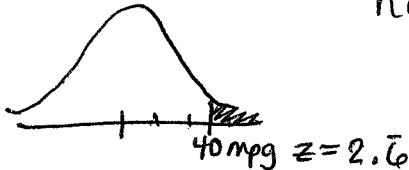
c. What percent of all cars get between 20 and 30 mpg?



$$\text{normalcdf}(-0.6, 1) \approx 0.5889$$

$\approx 59\%$ of all cars get between 20 and 30 mpg

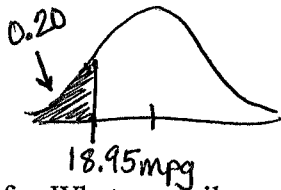
d. What percent of cars get more than 40 mpg?



$$\text{normalcdf}(2.6, 1E99) \approx 0.0038$$

$\approx 0.4\%$ of all cars get more than 40 mpg

e. Describe the fuel efficiency of the worst 20% of all cars.



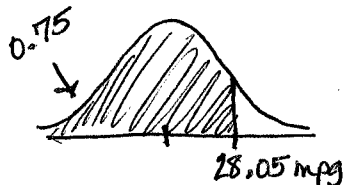
$$\text{invNorm}(0.2) \approx -0.8416 = z$$

$$-0.8416 = \frac{y - 24}{6}$$

$$y = 18.95 \text{ mpg}$$

$\approx 20\%$ of all cars get less than 19 mpg

f. What gas mileage represents the third quartile?



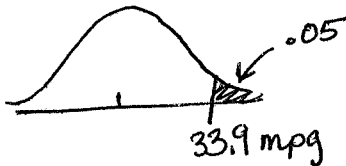
$$\text{invNorm}(0.75) \approx 0.6745 = z$$

$$0.6745 = \frac{y - 24}{6}$$

$$y = 28.047$$

28 mpg represents the third quartile

g. Describe the gas mileage of the most efficient 5% of all cars.



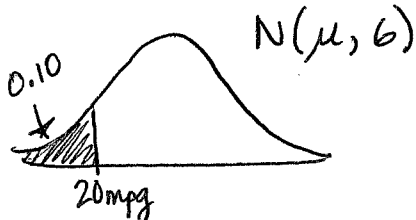
$$\text{invNorm}(0.95) = 1.6449 = z$$

$$1.6449 = \frac{y - 24}{6}$$

$$y = 33.869$$

$\approx 5\%$ of all cars get more than 34 mpg

h. An ecology group is lobbying for a national goal calling for no more than 10% of all cars to be less than 20 mpg. If the standard deviation does not change what average fuel efficiency must be attained?



$$\text{invNorm}(0.10) \approx -1.2816 = z$$

$$-1.2816 = \frac{20 - \mu}{6}$$

$$\mu \approx 27.689 \text{ mpg}$$