

**M414 – Chapter 3**  
**Worksheet 4 - Z-Score**

Name \_\_\_\_\_

Date \_\_\_\_\_ Period \_\_\_\_\_

1. The mean speed of vehicles along a stretch of highway is 56 mph with a standard deviation of 4 mph. You measure the speed of three cars traveling along this stretch of highways as 62 mph, 47 mph, and 56 mph. Find the z-score that corresponds to each speed. Determine which car had a relatively faster speed.
2. The monthly utility bills in a city have a mean of \$70 and a standard deviation of \$8. Find the z-scores that correspond to utility bills of \$60, \$71 and \$92. What can you conclude?
3. A certain brand of automobile tire has a mean life span of 35,000 miles and a standard deviation of 2250 miles. If the life spans of three randomly selected tires are 34,000 miles, 37,000 miles, and 31,000 miles. Find the z-scores that correspond with each of these mileages. Would the life spans of any of the tires be considered unusual?
4. A highly selective university will only admit students who place at least 2-zcores above the mean on the ACT that has a mean of 18 and a standard deviation of 6. What is the minimum score that an applicant must obtain to be admitted to the university?
5. The average for the statistics exam was 75 and the standard deviation was 8. Andrey was told by the instructor that he scored 1.5 standard deviations below the mean. What was Andrey's exam score and what can you conclude??

6. On a statistic test the class mean was 63 and the standard deviation was 7 and for the biology test the mean was 23 and has a standard deviation of 3.9.

a. Find the z-score for each score.

b. Determine on which test the student had a better score.

i. A student received a 73 on the statistics test and a 26 on the biology test.

ii. A student gets a 60 on the statistics tests and a 20 on the biology test.

iii. A student gets a 78 on the statistics test and a 29 on the biology test.

iv. A student gets a 63 on the statistics test and a 23 on the biology test.

7. A pharmaceutical company wants to test a new cholesterol drug. The average cholesterol of the target population is 200 mg and they have a standard deviation of 25 mg. The company wished to test a sample of people who fall between 1.5 and 3 z-scores above the mean. Into what range must a candidate's cholesterol level be in order for the candidate to be included in the study?

8. A manufacturer of bolts has a quality control policy that requires it to destroy any bolts that are more than 2 standard deviations from the mean. The quality control engineer knows that the bolts coming off the assembly line have a mean length of 8cm with a standard deviation of 0.05 cm. For what length will a bolt be destroyed?

(1.)  $\bar{X} = 56$  mph  
 $\sigma = 4$  mph

Z SCORES

(62)

$$z = \frac{62 - 56}{4} = 1.5$$

(56)

$$z = 0$$

(47)

$$z = \frac{47 - 56}{4} = -\frac{9}{4}$$

$$z = -2.25$$

(2.)  $\bar{X} = \$70$   
 $\sigma = \$8$

Z SCORES (\$60)

$$z = \frac{60 - 70}{8} = -1.25$$

(71)

$$z = \frac{71 - 70}{8} = 0.125$$

(92)

$$z = \frac{92 - 70}{8} = 2.75$$

(3.)  $\bar{X} = 35,000$  mi  
 $\sigma = 2,250$  mi

Z SCORES

(34000)

$$z = \frac{34000 - 35000}{2250} = -0.44$$

(37000)

$$z = \frac{37000 - 35000}{2250} = 0.88$$

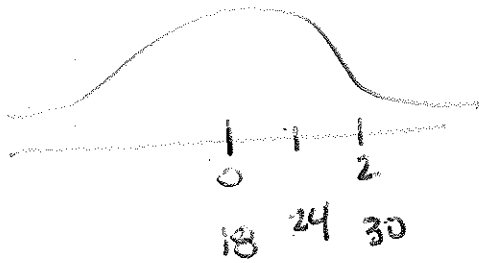
or  
0.89

(31000)

$$z = \frac{31000 - 35000}{2250}$$

$$= -1.78$$

(4.)



$$\bar{x} = 18, \sigma = 6$$

MINIMUM SCORE WOULD BE  
30

$$(5.) \quad z = \frac{\text{Value} - \bar{x}}{\sigma}$$

$$1.5 = \frac{V - 75}{8}$$

$$z = 1.5$$

$$12 = V - 75$$

$$\bar{x} = 75$$

$$87 = V$$

$$\sigma = 8$$

ANDRAY EARNED AN 87

$$(6.) \quad \text{Stat test } \bar{x} = 63 \quad \sigma = 7$$

$$\text{Bio test } \bar{x} = 23 \quad \sigma = 3.9$$

$$i.) \quad 73 \text{ on stats test} \rightarrow z \text{ score} \quad z = \frac{73 - 63}{7}$$

$$z = 1.43$$

$$26 \text{ on Bio test} \rightarrow z \text{ score} \quad z = \frac{26 - 23}{3.9}$$

$$z = 0.77$$

Stat student was higher  
on STANDARDIZED RANGES

ii) 60 on stats test  $\rightarrow$  z score  $z = \frac{60 - 63}{7}$

$$z = -0.43$$

20 on Bio test  $\rightarrow$  z score

$$z = \frac{20 - 23}{3.9}$$

stats student did better  
on STANDARDIZED RANGE

$$z = -0.77$$

iii) 78 on stats  $\rightarrow$  z score

$$z = \frac{78 - 63}{7} = 2.14$$

29 on Bio test  $\rightarrow$  z score

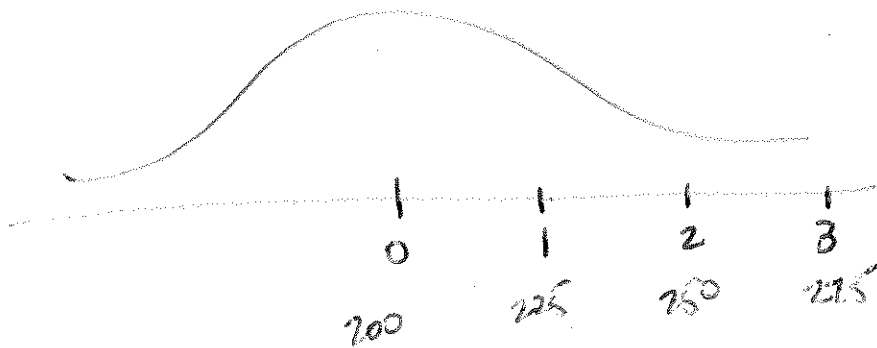
$$z = \frac{29 - 23}{3.9}$$

stats student was  
better on  
STANDARDIZED RANGE

$$z = 1.5$$

(iv) 63 on stats  $\rightarrow$  both z score of 0  
23 on Bio  
they did equally well

(7)  $\bar{X} = 200 \text{ mg}$      $\sigma = 25 \text{ mg}$



Between  $z = 1.5$  and  $z = 3$

$$1.5 = \frac{V - 200}{25}$$

$$37.5 = V - 200$$

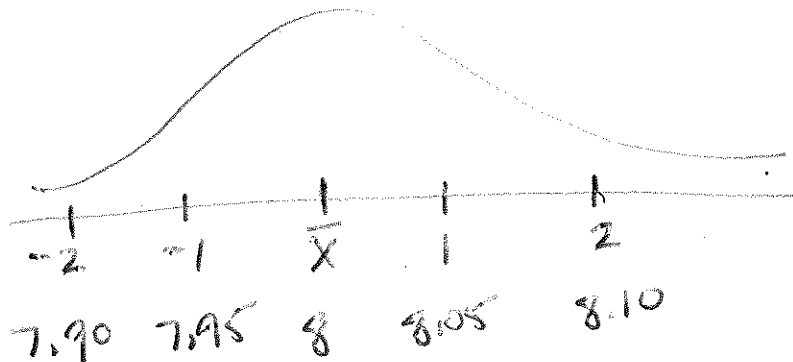
$$V = 237.5$$

↓  
275 mg

Range is

from 237.5 to 275

(8)  $\bar{X} = 8 \text{ cm}$   
 $\sigma = 0.05 \text{ cm}$



Bolts longer than 8.1 cm or shorter than 7.9 cm will be destroyed.