

## The Standard Normal Distribution (Exercises)

### ? Exercise 7

A bottle of water contains 12.05 fluid ounces with a standard deviation of 0.01 ounces. Define the random variable  $X$  in words.  $X =$  \_\_\_\_\_.

**Answer**

ounces of water in a bottle

### ? Exercise 8

A normal distribution has a mean of 61 and a standard deviation of 15. What is the median?

### ? Exercise 9

$$X \sim N(1, 2)$$

$$\sigma = \underline{\hspace{1cm}}$$

**Answer**

2

### ? Exercise 10

A company manufactures rubber balls. The mean diameter of a ball is 12 cm with a standard deviation of 0.2 cm. Define the random variable  $X$  in words.  $X =$  \_\_\_\_\_.

### ? Exercise 11

$$X \sim N(-4, 1)$$

What is the median?

**Answer**

-4

### ? Exercise 12

$$X \sim N(3, 5)$$

$$\sigma = \underline{\hspace{1cm}}$$

### ? Exercise 13

$$X \sim N(-2, 1)$$

$$\mu = \underline{\hspace{1cm}}$$

**Answer**

-2

### ? Exercise 14

What does a  $z$ -score measure?

### ? Exercise 15

What does standardizing a normal distribution do to the mean?

**Answer**

The mean becomes zero.

### ? Exercise 16

Is  $X \sim N(0, 1)$  a standardized normal distribution? Why or why not?

### ? Exercise 17

What is the  $z$ -score of  $x = 12$ , if it is two standard deviations to the right of the mean?

**Answer**

$z = 2$

### ? Exercise 18

What is the  $z$ -score of  $x = 9$ , if it is 1.5 standard deviations to the left of the mean?

### ? Exercise 19

What is the  $z$ -score of  $x = -2$ , if it is 2.78 standard deviations to the right of the mean?

**Answer**

$z = 2.78$

### ? Exercise 20

What is the  $z$ -score of  $x = 7$ , if it is 0.133 standard deviations to the left of the mean?

### ? Exercise 21

Suppose  $X \sim N(2, 6)$ . What value of  $x$  has a  $z$ -score of three?

**Answer**

$x = 20$

### ? Exercise 22

Suppose  $X \sim N(8, 1)$ . What value of  $x$  has a  $z$ -score of  $-2.25$ ?

### ? Exercise 23

Suppose  $X \sim N(9, 5)$ . What value of  $x$  has a  $z$ -score of  $-0.5$ ?

**Answer**

$x = 6.5$

### ? Exercise 24

Suppose  $X \sim N(2, 3)$ . What value of  $x$  has a  $z$ -score of  $-0.67$ ?

### ? Exercise 25

Suppose  $X \sim N(4, 2)$ . What value of  $x$  is 1.5 standard deviations to the left of the mean?

**Answer**

$$x = 1$$

### ? Exercise 26

Suppose  $X \sim N(4, 2)$ . What value of  $x$  is two standard deviations to the right of the mean?

### ? Exercise 27

Suppose  $X \sim N(8, 9)$ . What value of  $x$  is 0.67 standard deviations to the left of the mean?

**Answer**

$$x = 1.97$$

### ? Exercise 28

Suppose  $X \sim N(-1, 12)$ . What is the  $z$ -score of  $x = 2$ ?

### ? Exercise 29

Suppose  $X \sim N(12, 6)$ . What is the  $z$ -score of  $x = 2$ ?

**Answer**

$$z = -1.67$$

### ? Exercise 30

Suppose  $X \sim N(9, 3)$ . What is the  $z$ -score of  $x = 9$ ?

### ? Exercise 31

Suppose a normal distribution has a mean of six and a standard deviation of 1.5. What is the  $z$ -score of  $x = 5.5$ ?

**Answer**

$$z \approx -0.33$$

### ? Exercise 32

In a normal distribution,  $x = 5$  and  $z = -1.25$ . This tells you that  $x = 5$  is \_\_\_\_ standard deviations to the \_\_\_\_ (right or left) of the mean.

### ? Exercise 33

In a normal distribution,  $x = 3$  and  $z = 0.67$ . This tells you that  $x = 3$  is \_\_\_\_ standard deviations to the \_\_\_\_ (right or left) of the mean.

**Answer**

0.67, right

#### ? Exercise 34

In a normal distribution,  $x = -2$  and  $z = 6$ . This tells you that  $z = -2$  is \_\_\_\_ standard deviations to the \_\_\_\_ (right or left) of the mean.

#### ? Exercise 35

In a normal distribution,  $x = -5$  and  $z = -3.14$ . This tells you that  $x = -5$  is \_\_\_\_ standard deviations to the \_\_\_\_ (right or left) of the mean.

**Answer**

3.14, left

#### ? Exercise 36

In a normal distribution,  $x = 6$  and  $z = -1.7$ . This tells you that  $x = 6$  is \_\_\_\_ standard deviations to the \_\_\_\_ (right or left) of the mean.

#### ? Exercise 37

About what percent of  $x$  values from a normal distribution lie within one standard deviation (left and right) of the mean of that distribution?

**Answer**

about 68%

#### ? Exercise 38

About what percent of the  $x$  values from a normal distribution lie within two standard deviations (left and right) of the mean of that distribution?

#### ? Exercise 39

About what percent of  $x$  values lie between the second and third standard deviations (both sides)?

**Answer**

about 4%

#### ? Exercise 40

Suppose  $X \sim N(15, 3)$ . Between what  $x$  values does 68.27% of the data lie? The range of  $x$  values is centered at the mean of the distribution (i.e., 15).

#### ? Exercise 41

Suppose  $X \sim N(-3, 1)$ . Between what  $x$  values does 95.45% of the data lie? The range of  $x$  values is centered at the mean of the distribution (i.e., -3).

**Answer**

between -5 and -1

**? Exercise 42**

Suppose  $X \sim N(-3, 1)$ . Between what  $x$  values does 34.14% of the data lie?

**? Exercise 43**

About what percent of  $x$  values lie between the mean and three standard deviations?

**Answer**

about 50%

**? Exercise 44**

About what percent of  $x$  values lie between the mean and one standard deviation?

**? Exercise 45**

About what percent of  $x$  values lie between the first and second standard deviations from the mean (both sides)?

**Answer**

about 27%

**? Exercise 46**

About what percent of  $x$  values lie between the first and third standard deviations(both sides)?

Use the following information to answer the next two exercises: The life of Sunshine CD players is normally distributed with mean of 4.1 years and a standard deviation of 1.3 years. A CD player is guaranteed for three years. We are interested in the length of time a CD player lasts.

**? Exercise 47**

Define the random variable  $X$  in words.  $X =$  \_\_\_\_\_.

**Answer**

The lifetime of a Sunshine CD player measured in years.

**? Exercise 48**

$X \sim$  \_\_\_\_ (\_\_\_\_, \_\_\_\_)

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