



## M4-07: Properties of Distributions in Python: CDF and PPF

Part of the "Simulation and Distributions" Learning Badge

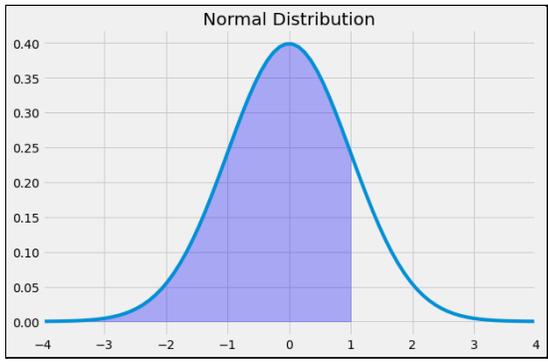
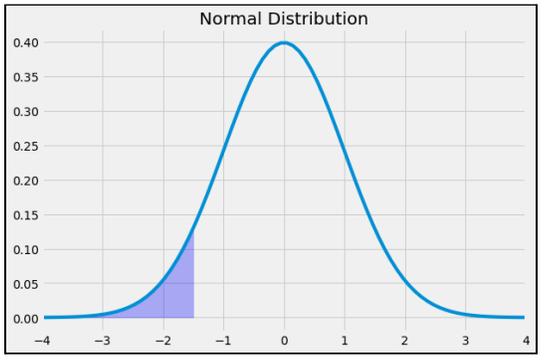
Video Walkthrough: <https://discovery.cs.illinois.edu/m4-07/>

### Distributions in Python

The scipy library provides access to many different distributions in Python, including the normal distribution. Accessing the distribution requires importing a library:

<b>Python:</b>	<code>from scipy.stats import norm</code>
<b>Description:</b>	

**Puzzle #1:** Find the area to the left of various Z-scores on a normal curve:

<b>(a):</b>	<b>Area to the left of: <math>Z = 1</math></b>	<b># Python Code:</b>  <b># Result:</b>	 <p>A normal distribution curve centered at 0. The x-axis ranges from -4 to 4, and the y-axis ranges from 0.00 to 0.40. The area under the curve to the left of Z=1 is shaded in light blue.</p>
<b>(b):</b>	<b>Area to the left of: <math>Z = -1.5</math></b>	<b># Python Code:</b>  <b># Result:</b>	 <p>A normal distribution curve centered at 0. The x-axis ranges from -4 to 4, and the y-axis ranges from 0.00 to 0.40. The area under the curve to the left of Z=-1.5 is shaded in light blue.</p>
<b>(c):</b>	<b>Area to the left of: <math>Z = 0</math></b>	<b># Python Code:</b>  <b># Result:</b>	What sharing do we expect for $Z=0$ ?

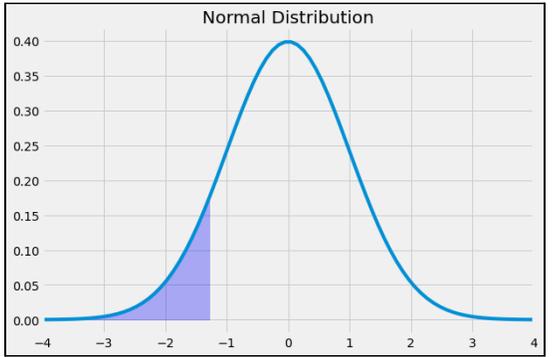
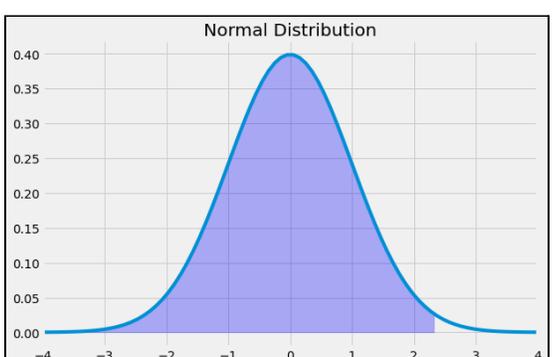


## M4-07: Properties of Distributions in Python: CDF and PPF

Part of the "Simulation and Distributions" Learning Badge

Video Walkthrough: <https://discovery.cs.illinois.edu/m4-07/>

**Puzzle #2:** Find the Z-score for a given a specific shared area to the left:

(a):	<b>Shaded Left Area: 10%</b>	<b># Python Code:</b>  <b># Result:</b>	 <p>Normal Distribution</p> <p>The plot shows a normal distribution curve with the x-axis ranging from -4 to 4 and the y-axis from 0.00 to 0.40. A vertical line is drawn at approximately Z = -1.28, and the area under the curve to the left of this line is shaded in light blue, representing 10% of the total area.</p>
(b):	<b>Shaded Left Area: 99%</b>	<b># Python Code:</b>  <b># Result:</b>	 <p>Normal Distribution</p> <p>The plot shows a normal distribution curve with the x-axis ranging from -4 to 4 and the y-axis from 0.00 to 0.40. A vertical line is drawn at approximately Z = 2.33, and the area under the curve to the left of this line is shaded in light blue, representing 99% of the total area.</p>
(c):	<b>Shaded Left Area: 150%</b>	<b># Python Code:</b>  <b># Result:</b>	Why do we receive the result?

**Puzzle #3:** What percentage area is shared between  $Z=1$  and  $Z=2$ ?

**Puzzle #4:** What percentage area is to the **right** of  $Z=0.107$ ?