Normal Distribution : Example Using Statistical Tables

Example 1

Table 3 gives the probability that a standardized normal variable, **Z**, selected at random will be **greater than** a certain positive value *a*, i.e. $P[Z \geq a]$, where $a > 0$.
Let Z be a normal standard variable: $\mathbf{Z} \sim \mathbf{N(0,1)}$.

- What is the probability that Z is greater than 1.44?
- What is the probability that Z is less than -1.58?
- What is the probability that Z is greater than -1.25 and less than 1.25?
- What is the probability Z is greater than -1.25?
- What is the probability that Z is greater than 1.75 and less than 2?
- What is the probability that Z is greater than 0 and less than 2?

Figure:

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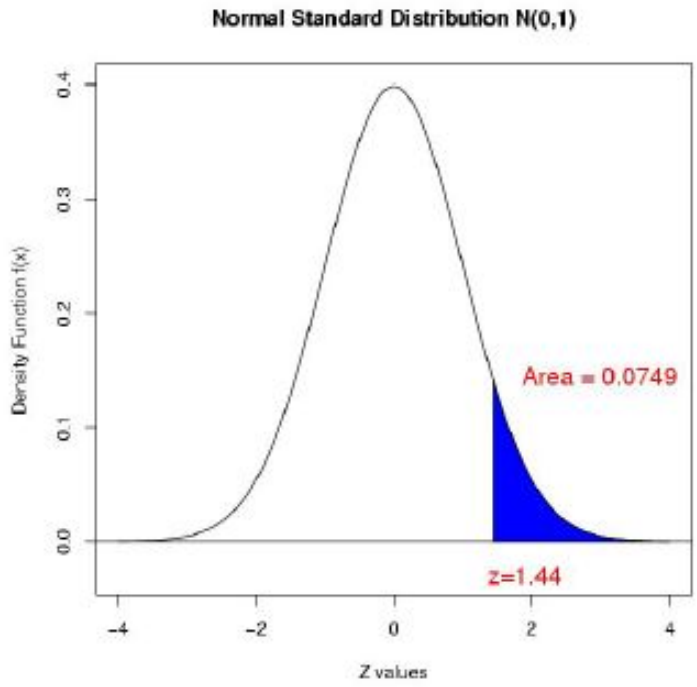
The probability that **Z** takes values greater than 1.44.



P[Z$\geq$1.44]=0.0749 from Table 3.

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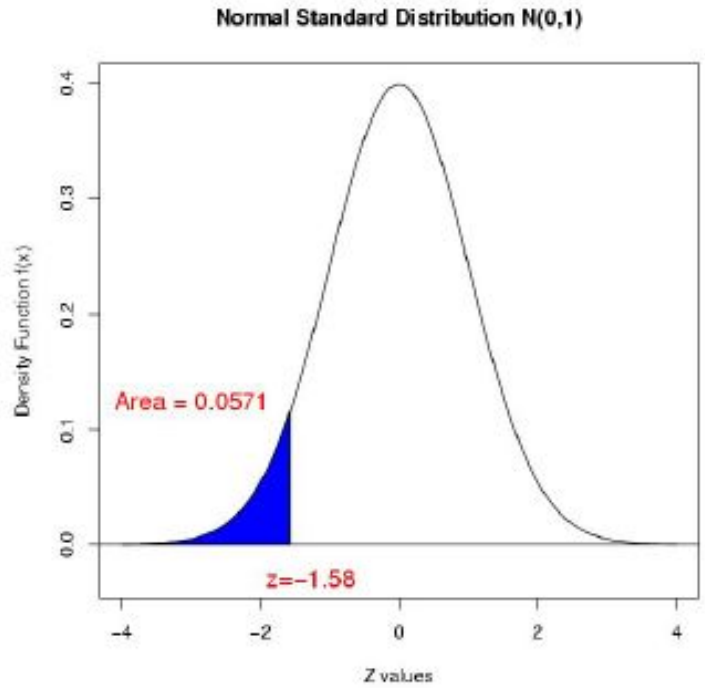
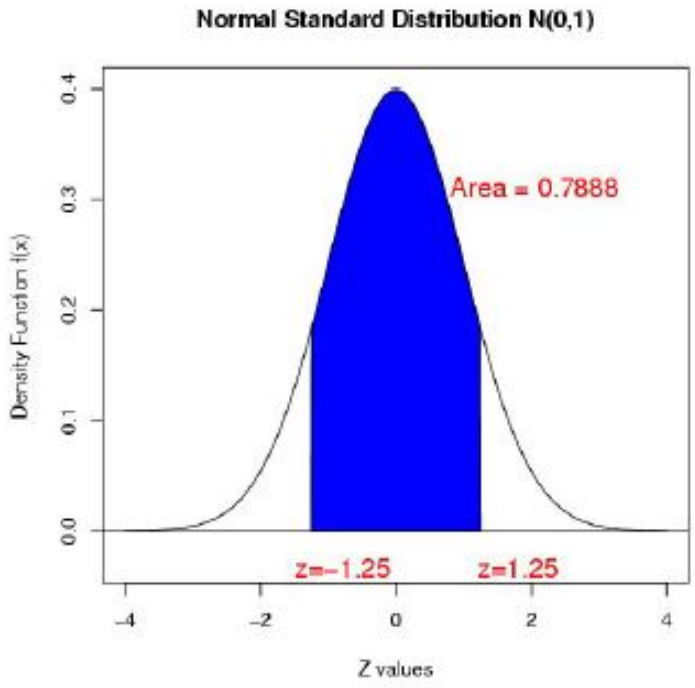
The probability that **Z** takes values less than -1.58.



$P[Z \leq -1.58] = P[Z \geq +1.58] = 0.0571$

Normal Distribution : Example Using Statistical Tables

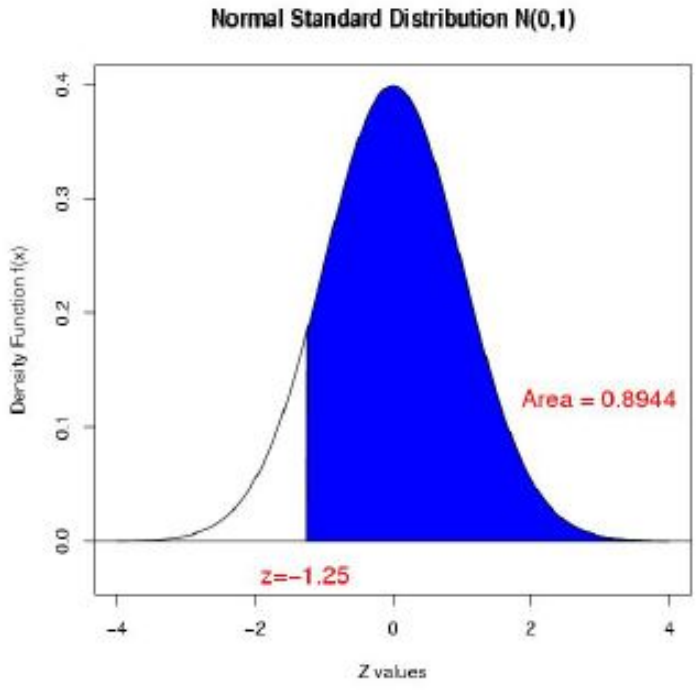
The probability that Z assumes values greater than -1.25 and less than 1.25.



$$P[-1.25 \leq Z \leq 1.25] = 1 - 2 \cdot P[Z \geq +1.25] = 1 - 2 \cdot 0.1056 = 0.7888$$

Normal Distribution : Example Using Statistical Tables

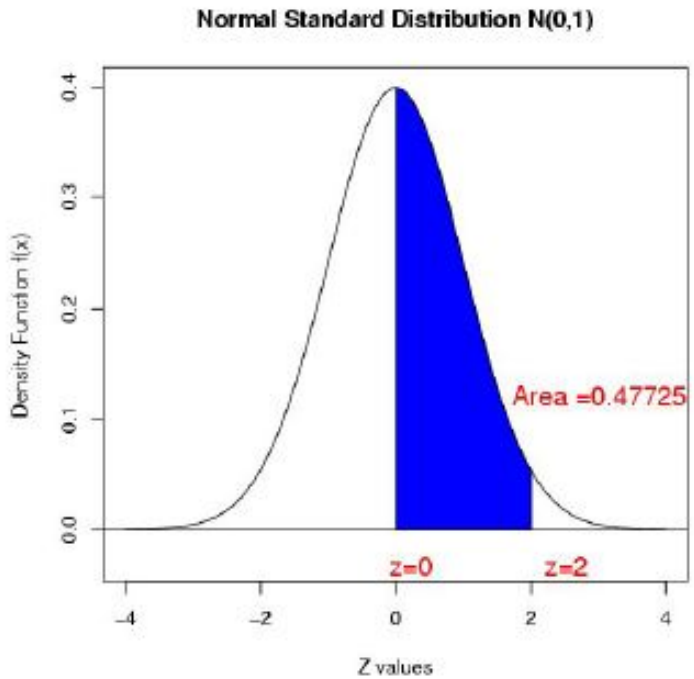
The probability that Z assumes values greater than -1.25 .



$P[Z \geq -1.25]=1- P[Z \leq -1.25]= 1-P[Z \geq +1.25]=1- 0.1056= 0.8944$

Normal Distribution : Example Using Statistical Tables

The probability that Z assumes values greater than 0 and less than 2.



$P[0 \leq Z \leq 2] = P[Z \geq 0] - P[Z \geq 2] = 0.5 - 0.02275 = 0.47725$

Normal Distribution : Example Using Statistical Tables

Example 2

Let X be a normally distributed random variable with mean μ=10 and σ^2=4, i.e. X $\sim$ N(10,4).

- Find the probability that X assumes values greater than 12.
- Find the probability that X assumes values between 6 and 12.

Normal Distribution : Example Using Statistical Tables

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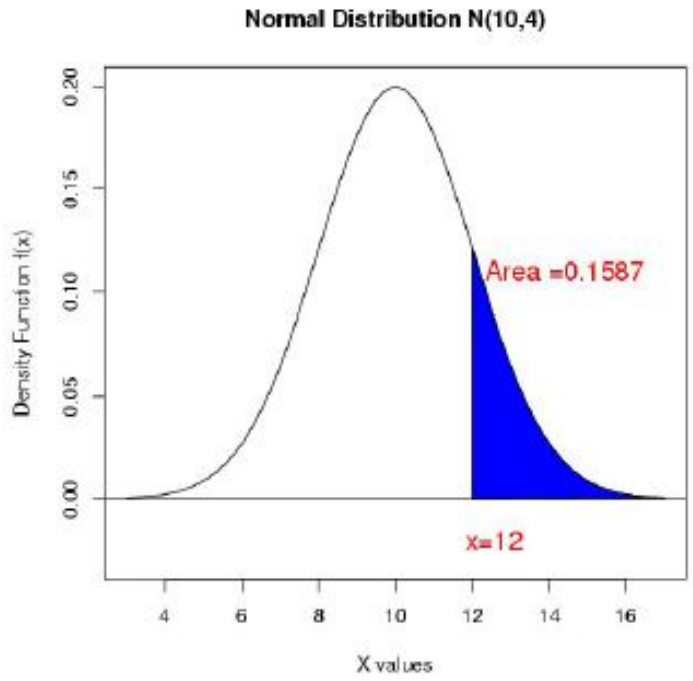
Normal Distribution : Example Using Statistical Tables

The probability that X assumes values greater than 12.



Normal Distribution : Example Using Statistical Tables

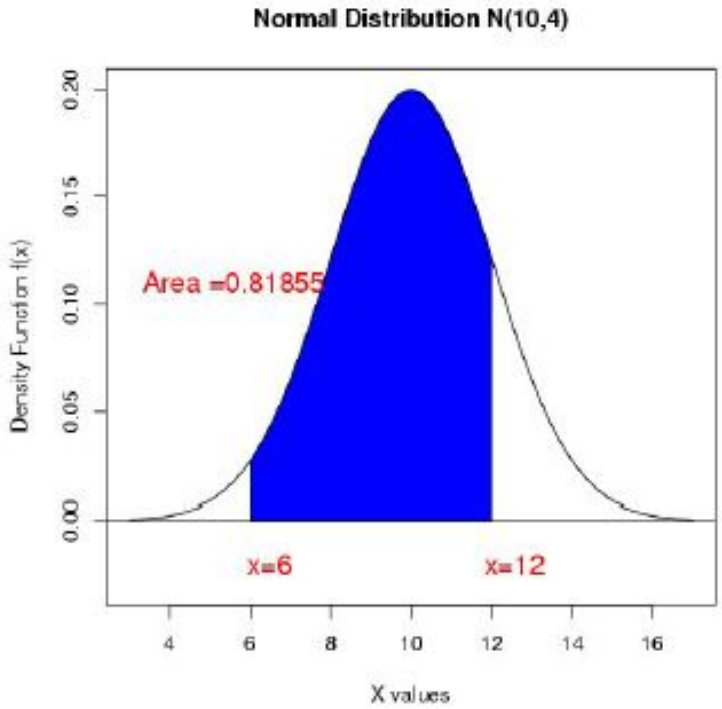
First convert the particular value x=12 from $N(10, 2^2)$ to a z value on $N(0, 1)$ with

$$z = \frac{x - \mu}{\sigma} = \frac{12 - 10}{2} = 1$$

The probability that X is greater than 12 is P[X $\geq$ 12]=
The probability that Z is greater than 1= P[Z $\geq$ 1]=0.1587

Normal Distribution : Example Using Statistical Tables

The probability that X assumes values between 6 and 12.



Normal Distribution : Example Using Statistical Tables

Convert the particular value x=12 to a z value.

$$z = \frac{x - \mu}{\sigma} = \frac{12 - 10}{2} = 1$$

Convert the particular value x=6 to a z value.

$$z = \frac{x - \mu}{\sigma} = \frac{6 - 10}{2} = -2$$

The probability that X assumes values between 6 and 12 is
$P[6 \leq X \leq 12]=$
The probability that Z assumes values between -2 and 1=
$P[-2 \leq Z \leq 1]=1-(0.02275+0.1587)=0.81855$