

Chapter 11 / Example 18

Normal probabilities

In these examples you will see how normal probabilities can be found graphically and by using the Normal CD function.

The time taken for a student to complete a language test follows a normal distribution with a mean of 25 minutes and a standard deviation of 3 minutes. They take a test each week (35 weeks in the school year). Estimate the number of tests during the year which are

- a** longer than 30 minutes **b** less than 23 minutes **c** between 18 and 25 minutes.

Press **MENU** 2 **STAT** to display the List Editor screen.

Press **F5** DIST **F1** NORM **F2** Ncd

Select Data **F2** Var

Enter 30 as the value of Lower, 9×10^{99} as the value of Upper, σ as 3 and μ as 25.

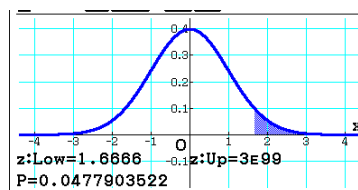
Use **▼** to navigate down to Execute.

Normal C.D
Data : Variable
Lower : 10
Upper : 40
 σ : 3
 μ : 25
Save Res: None
[None] LIST

Press **F6** DRAW.

The GDC shows the area defined under the standard normal curve and its value. Note that the x-values have been converted to z-values.

$$P(X > 30) = 0.0478$$



Press **EXIT** and **F1** CALC

$$P(X > 30) = 0.0478$$

Normal C.D
p = 0.04779035
z: Low = 1.666666667
z: Up = 3×10^9

Since there are 35 weeks in the school year, multiply the probability by 35.

Press **MENU** 1 **RUN-MAT** to display the Run-Matrix screen for arithmetical calculations.

Press **VAR** **F3** STAT **F6** RESULT **F3** DIST **F1** p

Type **X** 35 and press **EXE**

$$0.0478 \times 35 = 1.67$$

The student could expect 2 tests longer than 30 minutes in the school year. (Rounding off to the nearest whole number).

p×35
1.67266233
p | xInv | x1InvN | x2InvN

Chapter 11 / Example 18

Normal probabilities

Press **MENU** 2 **STAT** to display the List Editor screen.

Press **F5** DIST **F1** NORM **F2** Ncd

Select Data **F2** Var

Enter -9×10^{99} as the value of Lower, 23 as the value of Upper, σ as 3 and μ as 25.

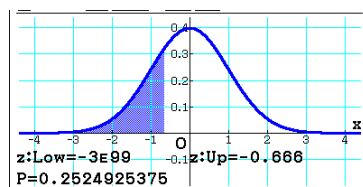
Use **▼** to navigate down to Execute.

Normal C.D
Data : Variable
Lower : -9×10^{99}
Upper : 23
 σ : 3
 μ : 25
Save Res: None

Press **F6** DRAW.

The GDC shows the area defined under the standard normal curve and its value. Note that the x-values have been converted to z-values.

$$P(X < 23) = 0.252$$



Press **EXIT** and **F1** CALC

$$P(X < 23) = 0.252$$

Normal C.D
p = 0.25249253
z: Low = -3×10^{99}
z: Up = -0.6666666

Since there are 35 weeks in the school year, multiply the probability by 35.

Press **MENU** 1 **RUN-MAT** to display the Run-Matrix screen for arithmetical calculations.

Navigate back to $p \times 35$ and press **EXE**

$$0.252 \times 35 = 8.84$$

The student could expect 9 tests shorter than 23 minutes in the school year. (Rounding off to the nearest whole number).

$p \times 35$ 8.837238814
[]
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Press **MENU** 2 **STAT** to display the List Editor screen.

Press **F5** DIST **F1** NORM **F2** Ncd

Select Data **F2** Var

Enter 18 as the value of Lower, 25 as the value of Upper, σ as 3 and μ as 25.

Use **▼** to navigate down to Execute.

Normal C.D
Data : Variable
Lower : 18
Upper : 25
 σ : 3
 μ : 25
Save Res: None
[None] LIST

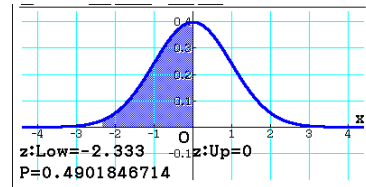
Chapter 11 / Example 18

Normal probabilities

Press **F6** DRAW.

The GDC shows the area defined under the standard normal curve and its value. Note that the x-values have been converted to z-values.

$$P(18 < X < 25) = 0.490$$



Press **EXIT** and **F1** CALC

$$P(18 < X < 25) = 0.490$$

Normal C.D
p = 0.49018467
z:Low = -2.3333333
z:Up = 0

Since there are 35 weeks in the school year, multiply the probability by 35.

Press **MENU** 1 **RUN-MAT** to display the Run-Matrix screen for arithmetical calculations.

Navigate back to $p \times 35$ and press **EXE**

$$0.490 \times 35 = 17.2$$

The student could expect 17 tests between 18 and 25 minutes in the school year. (Rounding off to the nearest whole number).

$p \times 35$ 17.1564635
□
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