Inverse Normal Distribution calculations – with and without the average given.

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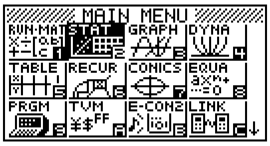
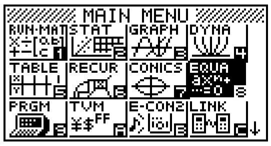
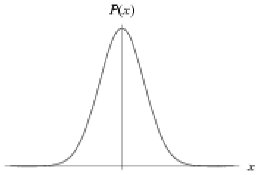
Select the **STAT** icon (or press 2) from the main menu and the **EQUA** icon (or press 8) **OR** by using the arrow keys to highlight the icon and then press **EXE**.





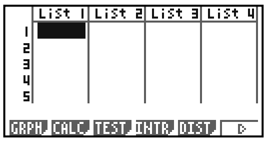
This activity sheet shows how the FX9750GII calculator can be used to calculate inverse normal distribution problems both with and without the average known.

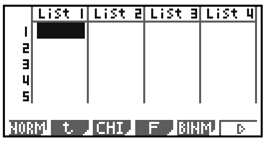
A normal distribution in a variate *X* with mean ‘μ’ and variance ‘σ’ is a statistic distribution with probability function as illustrated here P(x).

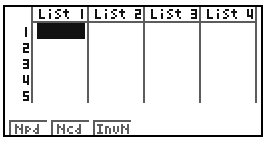


In **STAT** mode:

F5 for **DIST**ribution then **F1** for **NORM**al then **F3** for **Inv**erse**N**ormal





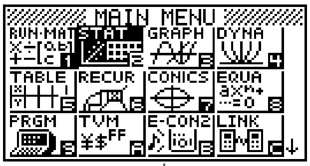


N.B. The Inverse Normal calculates for the left, centre or right tail of the Normal Distribution curve.

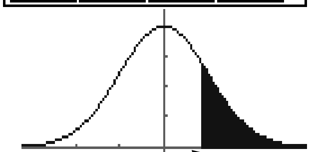
Example 1:

At Tane and Koha’s home the mail is delivered in the afternoon. The delivery times are normally distributed with a mean of 1:20 PM and a standard deviation of 23 minutes. Koha leaves home at the same time each day. If the mail is delivered after this time, Koha considers that the mail is delivered ‘late’. Koha notices that over a period of time she finds that the mail is delivered late 20% of the time.

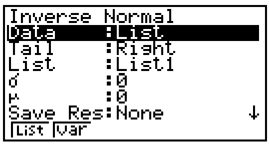
Find the time, to the nearest minute, that Koha leaves the house and hence the late mail delivery time at Tane and Koha’s home.

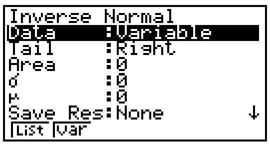


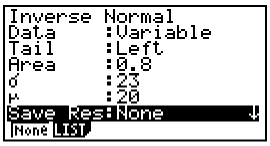
Answer: Select **STAT**, then **[F5]**, then **[F1]**, then **[F3]** for Inverse Normal calculations.
Here use the average, μ = 20 minutes (relates to 1:20 PM) and σ = 23 minutes.
Probability (**Area**) = 0.8 for a left tail calculation of the normal curve (or 0.2 = **Area** for a right tail calculation of the normal curve).

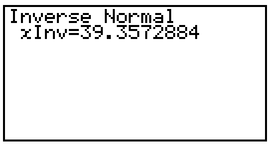


Need to find the time that is here.









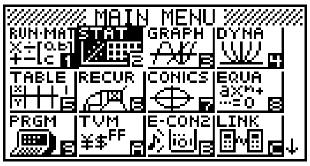
Change from **List** to **Var**iable. Enter the information given, then **EXE**.

Time required is 39.4 minutes i.e.39 minutes and 24 seconds.

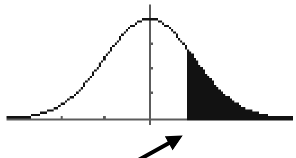
Interpretation: The earliest time that the mail can be considered as being delivered ‘late’ at Tane and Koha’s home is at 1:39 PM (to the nearest minute).

Example 2:
At Derek and Janice's home the mail is delivered in the morning. The delivery times are normally distributed with a standard deviation of 16 minutes. If the mail is delivered after 11:15 AM it is considered that the mail is delivered 'late'. Over a period of time they found that the mail is delivered late 35% of the time.
Find the average time, to the nearest minute, for the delivery times of mail to Derek and Janice's home.

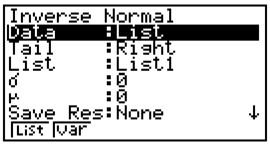
Answer: Select **STAT**, then **[F5]**, then **[F1]**, then **[F3]** for Inverse Normal calculations.
Need to use the Standard Normal Distribution to model this situation as the mean (μ) is not known.

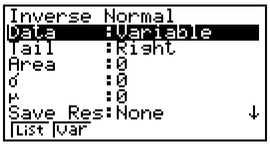


Here use the average μ = 0 minutes and σ = 1 minutes, using the Standard Normal Distribution.
Probability = 0.65 form the left tail of the normal curve.
Probability (**Area**) = 0.65 for a left tail calculation of the normal curve (or 0.35 = **Area** for a right tail calculation of the normal curve).

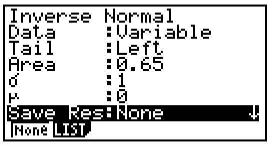


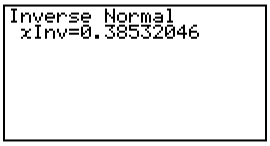
Need to find the time that is here.





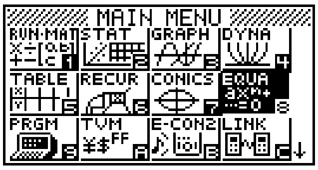
Change from **List** to **Var**iable.



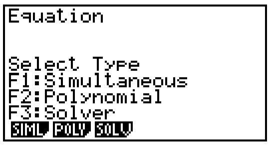


Enter the information given, then **EXE**.

Z = 0.38532 standard deviations from the 'true' average.

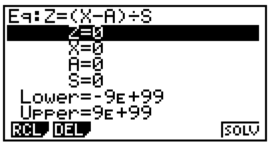


Now enter into **EQUA** icon and the **SOLV**er.

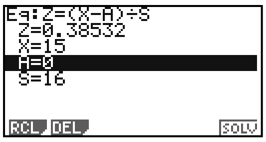


Press **F3** for **SOLV**er.

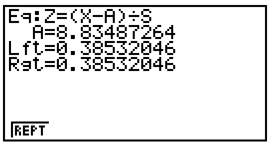
Enter in the Z-score transform equation:
Z = (X – A)/S, where **A** = average and **S** = standard deviation



Enter in what is known, namely:
Z = 0.38532046
X = 15 minutes (11:15 AM)
S = 16 minutes



Now, move the cursor so that it is 'resting' over the unknown variable (A).
What we want to find is the value of A (average (Population mean - μ), then press **F6** or **EXE** to solve.



Average = 8.83487264 minutes i.e.8 minutes and 56 seconds.

Interpretation: The average time for this normally distribution delivery times at Derek and Janice's home is 11:09 AM (nearest minute).