

INVERSE PROBLEMS

We use Inverse Normal when we know the probability and we wish to find the value of the normal variable X .

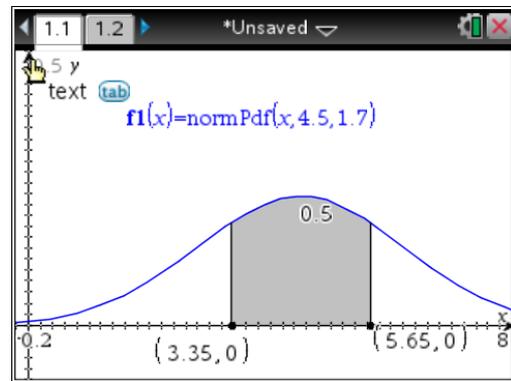
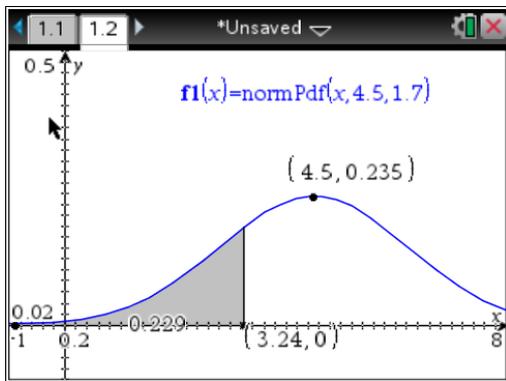
Example 1:

Let $X \sim N(4.5, 1.7^2)$

- Find c such that $P(X < c) = 0.23$
- Find d such that $P(X > d) = 0.4$
- Find k such that $P(-k < X < k) = 0.5$

Expression	Value
$\text{invNorm}(0.23, 4.5, 1.7)$	3.24396
$\text{invNorm}(0.6, 4.5, 1.7)$	4.93069
$\text{invNorm}(0.75, 4.5, 1.7)$	5.64663
$5.6466325740655 - 4.5$	1.14663

Graphing the normal curve:

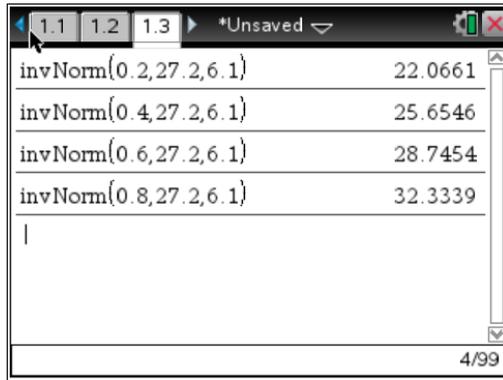


Expression	Value
$\text{invNorm}(0.75, 4.5, 1.7)$	5.64663
$5.6466325740655 - 4.5$	1.14663
$4.5 - 1.1466325740655$	3.35337

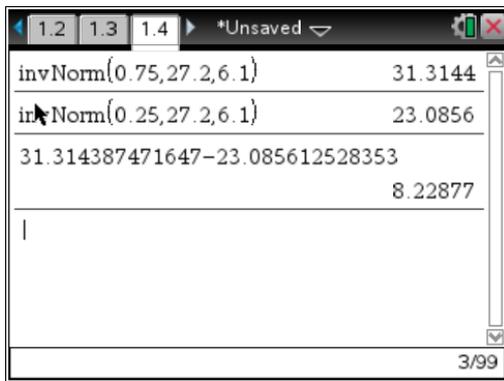
Example 2

The results of a MM CAS course are normally distributed with a mean of 27.2 and a standard deviation of 6.1.

- Find the 20th, 40th, 60th and 80th percentiles.



b) Find the interquartile range.



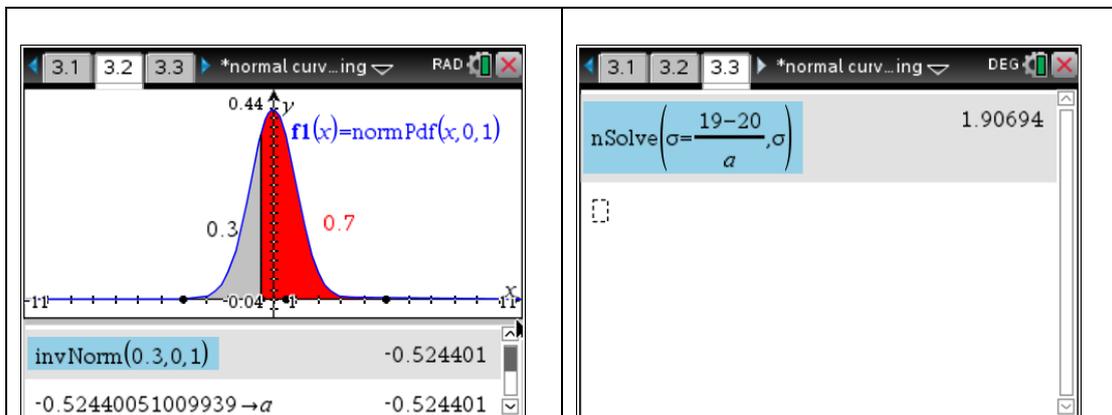
Normal distribution problems unknown mean and/ or standard deviation

Given certain information we can work backwards to find the parameters of the normal distribution. In other words we can find the mean, standard deviation or both. We usually need to use the standard normal distribution $Z \sim N(0,1)$. It will be illustrated through examples.

There is a link between variables X and Z as follows: $Z = \frac{X - \mu}{\sigma}$

Question 1

If $X \sim N(20, \sigma^2)$ and $\Pr(X \geq 19) = 0.7$, find the standard deviation.



Question 2

If $X \sim N(\mu, 16)$ and $\Pr(X \geq 17) = 0.99$, find the mean.

Question 3

If $X \sim N(22, 7^2)$ and $\Pr(c_1 < X < c_2) = 0.8$, find the values of c_1 and c_2 .

Question 4

The speed of cars passing a certain point on a road can be taken to be normally distributed. Measurements show that 95% of the cars are travelling at less than 85 km/h and that 10% are travelling at less than 55 km/h.

- Find the mean speed of the cars passing this point.
- If during one day 1500 cars passed the point on the road, how many were travelling at more than the speed limit which is 70 km/h?

Question 5

The masses of boxes of apples are normally distributed such that 20% of them weigh more than 5 kg and 15% of them weigh more than 5.6 kg. Estimate the mean and standard deviation of the boxes.

Question 6

The lengths of certain items follow a normal distribution with mean μ and standard deviation 6 cm. It is known that 4.78% of the items have length greater than 82 cm. Find the value of the mean μ .

Question 7

Let X be the random variable $X \sim N(100, \sigma^2)$. Given that $P(X < 106) = 0.8849$, find the value of the standard deviation σ .

So what did the standard deviation say to the data set?

You're mean.