Using the TI 83 or 84 To Do Normal Distribution Problems

**Problem:**
A specific IQ test had results which were normally distributed, having mean of 112 points and standard deviation of 16 points.

[1] Sketch his distribution below, including all appropriate labels.

![Distribution of IQ](image)

Notice that we have labels on the x and y axes and main title with the normally shaped bell-curve. Also, I believe Jeff wants us to show the mean value and the 1, 2, and 3 standard deviation values above and below the mean. It doesn't have to be “perfect”, only be neatly done (in pencil).

[b] Which IQ is more unusual, one which is 85 points or one which is 142 points.

We would use the z formula $z = \frac{\bar{x} - \mu}{\sigma}$.

So, $z_1 = (85 - 112)/16 = -1.6875$, and $z_2 = (142 - 112)/16 = 1.875$

So, since $|z_2|$ is greater than $|z_1|$, we reason that having an IQ of 142 is more unusual, because it has a larger absolute value of z value (therefore, farther away from the middle), and having a smaller “tail value” of probability, as shown in the sketch below.
[c] In a certain group, everyone had an IQ of at least 88. Using the 68-95-99.7 approximate rule, what proportion of people fulfill this claim?

88 = 2*12 points below the mean of 112, so 88 is 2 standard deviations below the mean, according to the approximate rule. Therefore, the tail value on the low end is 0.025, meaning that the 88 or above lies in the 0.975 proportion.

[d] Rather than use the approximate rule, find the exact probability calculated above, and compare your answers with part [c]

We can use the TI calculator here, using the function Normalcdf(low, high, mean, std dev) from the calculator buttons 2nd VARS, to get the following screen display.

The “low” and “high” values refer to the low and high values of the shaded area (the area we want the probability of). So, we want the following screen display.

```
normalcdf(88,100
0000,112,16)
```

.9331927713
This says that our computed value is more precisely 0.9332, compared to the 0.9750.

[e] *What proportion of people have IQ’s between 70 and 134 points?*

We would use the TI again and get the following screen display

```
normalcdf(70, 134, 112, 16)
```

0.911017348

based upon the sketch below.

![Graph of normal distribution with IQ values]

[f] *What is the IQR of this distribution?*

We need to compute the 25th and 75th percentile in order to find the IQR.

The 25th percentile has a left tail of 0.25, and the 75th percentile has a left tail of 0.75, so we can use the `invNorm(left tail, mean, std dev)` function of the TI (again pushing the buttons 2nd VARS again to put in the values shown for each percentile value.

![TI screen showing invNorm calculations]

So, \( x_{75} - x_{25} = 122.79 - 101.21 = 21.58 \) points = IQR

Remember that the IQR is *not* from one standard deviation below the mean to one standard deviation above the mean, because this will not contain the middle 50%, but rather the middle 68%