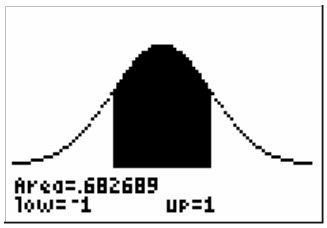
STATISTICS NOTES ON NORMAL DISTRIBUTION

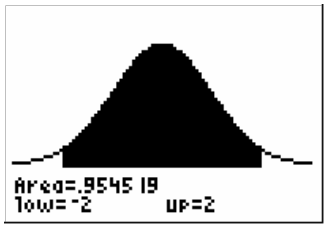
Frequency distribution of many natural phenomena approaches a normal curve.

Normal: Bell-shaped
Symmetrical
Continuous
Never touches x-axis
Area under curve = 1
Mean = median = mode
Mean = 0
Standard deviation = 1

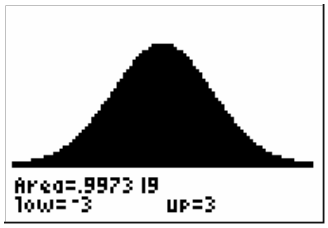
The area under the curve between $\bar{x} \pm \sigma$ is about 68%



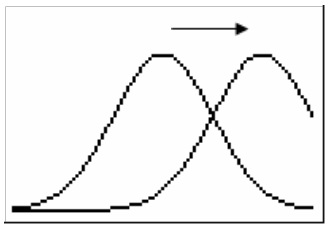
The area under the curve between $\bar{x} \pm 2\sigma$ is about 95%



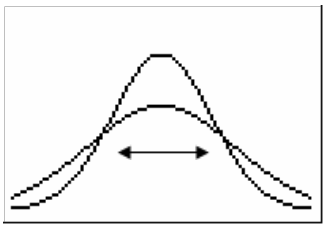
The area under the curve between $\bar{x} \pm 3\sigma$ is about 99.7%



Changing the mean will shift the graph to the left or right



Changing the standard deviation will make the graph wider or narrower.



z-scores: $z = \frac{x - \mu}{\sigma}$

where μ = the mean and σ = the standard deviation

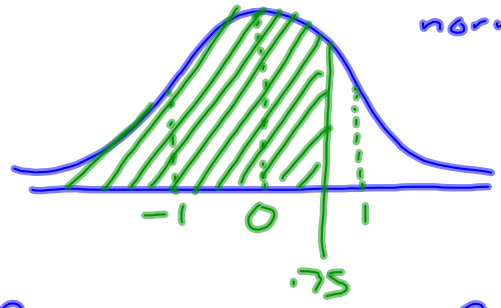
Ex 1 The average weight of Oregon football players is 225 lbs. with a standard deviation of 40 lbs.

Find the *z*-score for a weight of 200 lbs. $\frac{200 - 225}{40}$

$-.625$

Find the *z*-score for a weight of 290 lbs. 1.625

Ex 2 Find the area under the normal curve left of $z = .75$



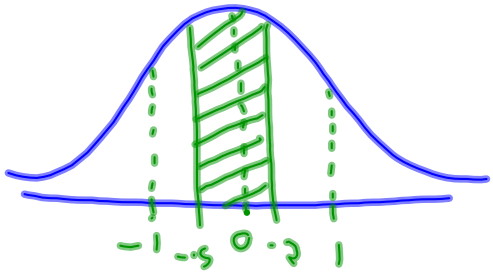
normalcdf(-E99, .75, 0, 1)

-∞ ↑ left bound; .75 ↑ right bound; 0 ↑ mean; 1 ↑ std. dev.

≈ .77

If we're looking for an area or percentage, use normalcdf

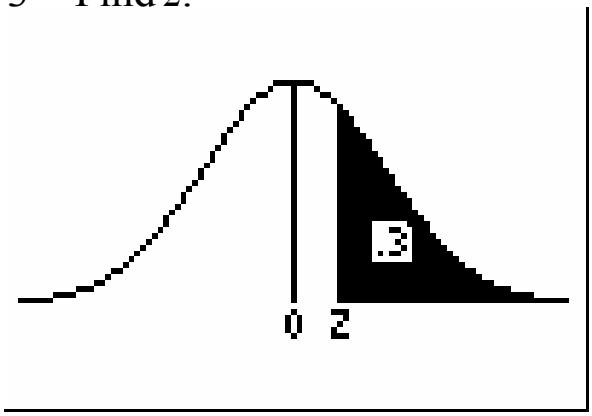
Find the area under the normal curve between $z = -.5$ and $z = .2$



normalcdf(-.5, .2, 0, 1)

≈ .27

Ex 3 Find z:



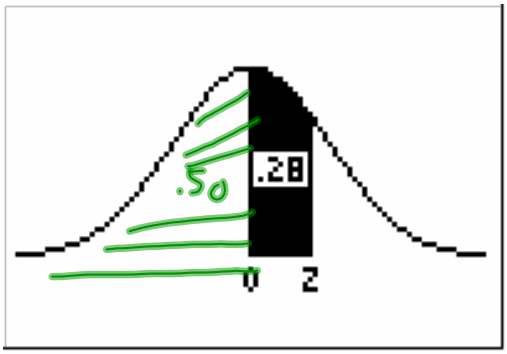
If we know the percent or area under the curve, use

invNorm(%, mean, σ)

% to the left of z

invNorm(.7, 0, 1)

≈ .52

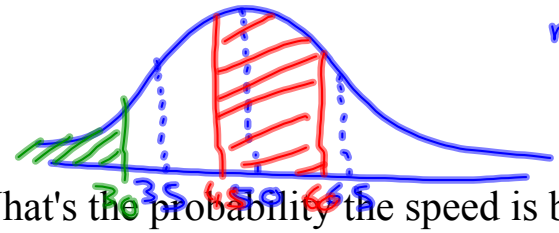


invNorm(.78, 0, 1)

≈ .77

Ex 4 A train's speed is normally distributed with a mean of 50 mph and a standard deviation of 15 mph.

What's the probability the speed is below 30 mph?



normalcdf(0,30,50,15)

≈ .09

What's the probability the speed is between 45 and 60 mph?

normalcdf(45,60,50,15) ≈ .37

The fastest 10% of the time, how fast is the train going?

invNorm(.9,50,15) ≈ 69 mph.

Homework

p.93

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due Monday, October 14