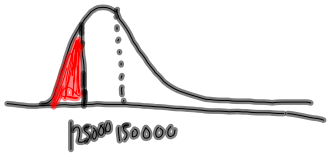
Example

The average price of a house sold in NS in 2007 was $150,000 with a std. dev. of $15,000. Housing prices are right skewed.

a) If you randomly selected one house from those sold in 2007, what is the probability that it sold for less than $125,000?

← right skewed



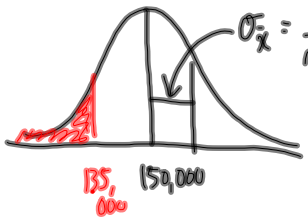
Can we use z-scores?

NO! - the distribution is not normal.

- we can't answer without knowing more info.

b) You randomly select 40 houses from those sold in 2007. What is the probability that the average price of those 40 houses was < $135,000.

Sampling Distribution is normal even though the population was skewed and since we are dealing with a large enough sample size (40)



$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{15,000}{\sqrt{40}} = 2372$

Now we have a normal curve... we can use z-scores.

$z = \frac{135,000 - 150,000}{2372} = -6.32$

look up -6.32 on z-sore chart....

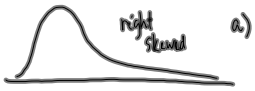
What do you notice?? Way off the chart

∴ the probability is basically ZERO

The probability of selecting 40 houses at random, with an average price of less than $135,000 is ZERO! (impossible ...basically)

Example

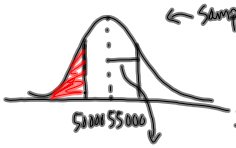
The average Family income in NS is $55,000 with a standard deviation of $12,000. The income is right skewed.



a) If you chose one family in NS at random, what % of families have an income of < $50,000?

* We can't use z-scores since the population is not normally distributed
* We cannot answer the question.

b) You take a SRS (simple random sample) of 30 families and determine the average income to be 50,000. What % of all possible samples will have an $\bar{x}$ of < $50,000?



← Sampling distribution of the sample means is NORMAL!

Find the z-score:

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

$\sigma_{\bar{x}} = \frac{12,000}{\sqrt{30}}$

$\sigma_{\bar{x}} = 2191$

$z = \frac{50000 - 55000}{2191}$

$z = -2.28$

Look up a z-score of -2.28: 0.0113 ↑ 1.13% will be below $50,000

There is a 1.13% probability that a sample of 30 families will have a mean of less than $50,000.

c) What if you take a SRS of 4 families and determine $\bar{x}$ = $60,000? What % of families will have $\bar{x}$ < 60,000

Can't solve..... $n = 4$ so the sample size is not large enough to produce a sampling distribution that is normal. We cannot use z-scores!

Summary

* If the population is normal + selecting only 1 person ⇒ use z-scores
* If the population is normal + selecting a group of people (mean for group) ⇒ use z-scores * $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
* If the population is not normal + selecting one person ⇒ Can't use z-scores.
* If the population is not normal + selecting a group ($n \geq 30$) (mean for group) ⇒ use z-scores $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$