

Name: _____

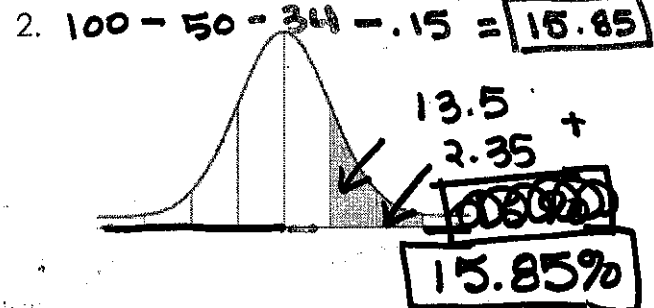
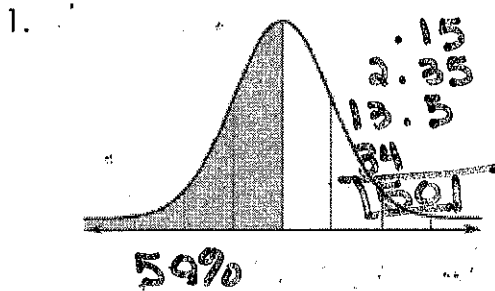
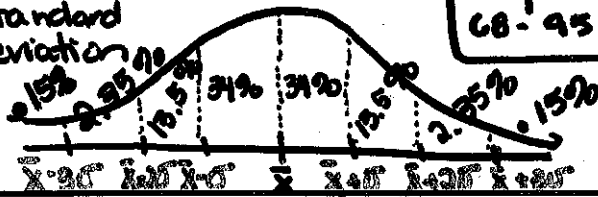
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Normal Curve:

\bar{x} = mean
 σ = standard deviation

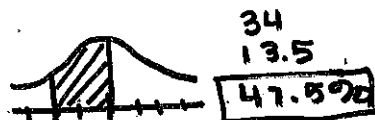
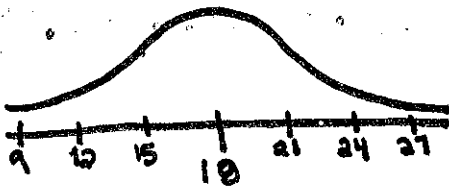
Normal Curve Empirical Rule 68-95-99.7 Rule

- Bell Shaped Curve
- Symmetric About the mean
- The areas are determined by adding or subtracting σ
- Total area = 100% or 1

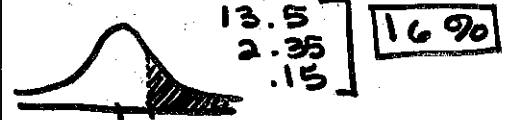


3. A normal distribution has a mean of 18 and a standard deviation of 3. Find the probability that a randomly selected x-value from the given distribution is in the interval.

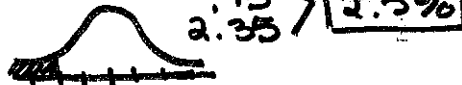
a) Between 12 + 18



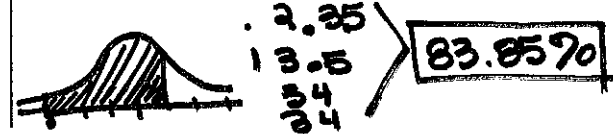
b) at least 21



c) At most 12



d) Between 9 + 21



4. The heights of 3000 women at a particular college are normally distributed with a mean of 65 inches and a standard deviation of 2.5 inches.

a) About what percent of college women have heights below 70 inches?

$50\% + 47.5\% = 97.5\%$

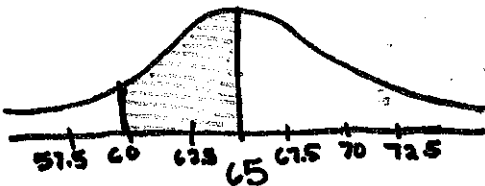


b) About how many college women have heights between 60 inches and 65 inches?

How many?

$n \cdot p$
 # proportion decimal

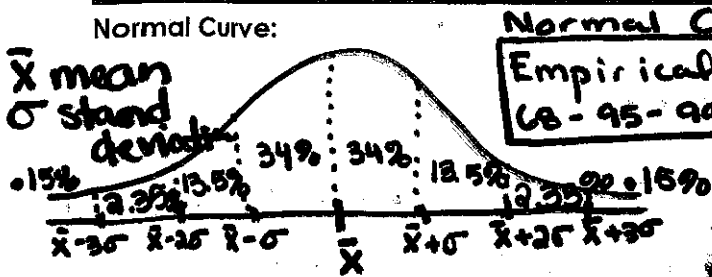
$47.5\% \rightarrow \frac{47.5}{100} \rightarrow .475$
 percent proportion



How many women?
 $3000 \cdot .475 = 1425$
 women

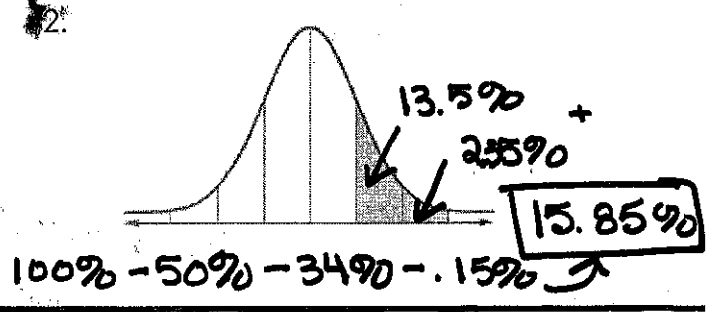
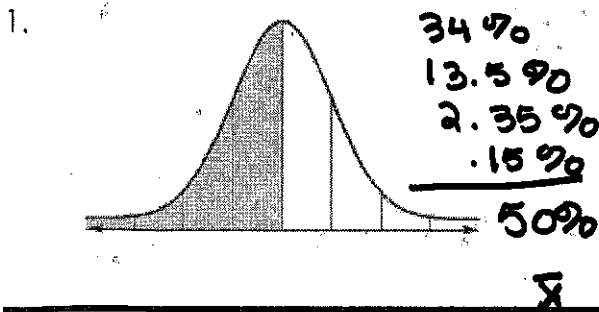
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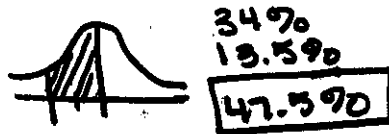
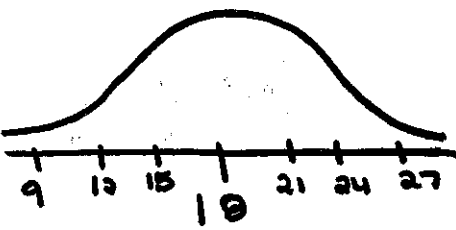
Normal Curve
Empirical Rule
68 - 95 - 99.7 Rule

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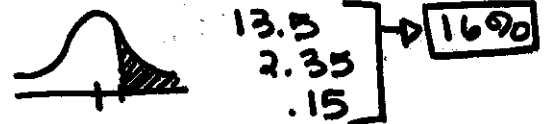


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a) Between 12 + 18



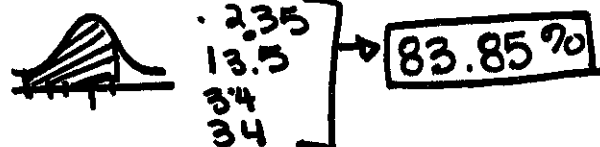
b) at least 21



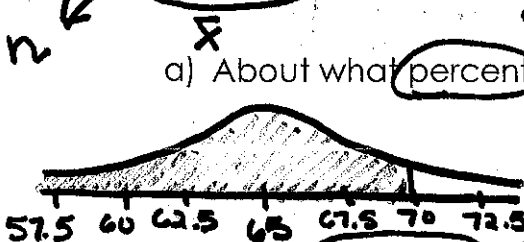
c) At most 12



d) between 9 and 21



4. The heights of 3000 women at a particular college are normally distributed with a mean of 65 inches and a standard deviation of 2.5 inches σ .

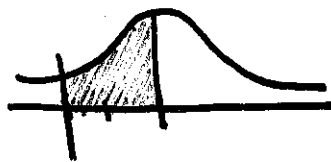


a) About what percent of college women have heights below 70 inches?

97.5%

b) About how many college women have heights between 60 inches and 65 inches?

How many?



47.5% percent $\rightarrow \frac{47.5}{100} \rightarrow .475$ proportion

$n = 3000$
 $p = .475$
 $3000 \times .475 = 1425$ Women

$n \cdot p$
in sample (dec of %)

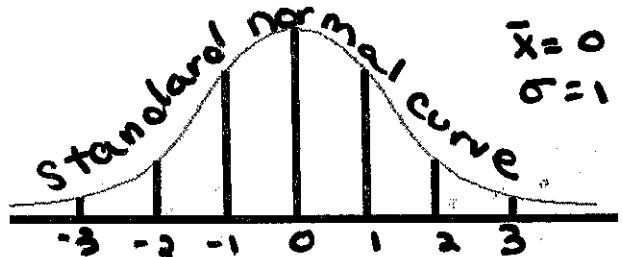
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Z-Score:

The number of Standard deviations the x-value lies above or below the mean.

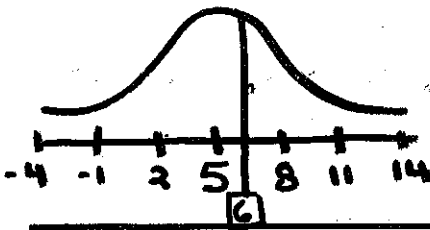
$$Z = \frac{x - \bar{x}}{\sigma}$$



Z-score = $\frac{\text{observation} - \text{mean}}{\text{standard deviation}}$

We can use z-score to compare two different sets of data

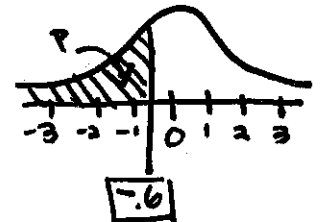
Ex. 1 A normal distribution has a mean of 5 and a standard deviation of 3. Find the z-score. $x = 6$



$$z = \frac{6 - 5}{3} = \frac{1}{3} = .33$$

Ex. 2 A normal distribution has a mean of -10 and a standard deviation of 5. Find the z-score. $x = -13$

$$z = \frac{x - \bar{x}}{\sigma} = \frac{-13 - (-10)}{5} = \frac{-3}{5} = -.6$$



$P = .27425$

Ex. 3 Test scores on the last major test were normally distributed with a mean of 60 and a standard deviation of 9. You made a 54. (Yikes!) x

a. What is the z-score associated with your grade?

$$z = \frac{54 - 60}{9} = \frac{-6}{9} = -.67$$

b. Your very kind teacher decided to curve the grades. She changed the mean to a 70 and the standard deviation to 5 but kept the z-scores the same. What is your new score?

$$\frac{-.67}{1} = \frac{x - 70}{5} \rightarrow -3.35 = x - 70$$

$x = 67$

Margin of Error

Window of accuracy about an observation that depends on the sample size.

$$\text{Margin of Error} = \pm \frac{1}{\sqrt{\text{Sample Size}}}$$

$$\text{ME} = \pm \frac{1}{\sqrt{n}}$$

Always give the ME as a percentage!
Don't forget the "±"!

Find the margin of error given the sample size.

1) $n = 10$

$$\text{ME} = \pm \frac{1}{\sqrt{10}}$$

$$= \pm .316$$

$$\approx \pm \underline{\underline{31.6\%}}$$

Turn into %

2) $n = 600$

$$\text{ME} = \pm \frac{1}{\sqrt{600}}$$

$$= \pm .0408$$

$$= \pm \underline{\underline{4.1\%}}$$

3) $n = 30,000$

$$\text{ME} = \pm \frac{1}{\sqrt{30,000}}$$

$$= \pm .00577$$

$$= \pm \underline{\underline{.58\%}}$$

★ As the sample size increases, the ME decreases.

★ Don't forget the "±"!

Find the sample size given the margin of error.

$$ME = \pm \frac{1}{\sqrt{n}}$$

1) $ME = \pm 30\%$

2) $\pm 3\%$

3) $\pm .02\%$

Change to a decimal
+ plug in.
Solve for n!

1) $\pm 30\%$

$$.3 = \pm \frac{1}{\sqrt{n}}$$

$$\frac{.09}{1} = \frac{1}{n}$$

$$.09n = 1$$

$$n = 11.1\bar{1}$$

about 11 people

square both sides

cross multiply

$$.03 = \pm \frac{1}{\sqrt{n}}$$

$$.0009 = \frac{1}{n}$$

$$.0009n = 1$$

$$n = 1111.\bar{1}$$

About
1,111 people

$$.0002 = \pm \frac{1}{\sqrt{n}}$$

$$.00000004 = \frac{1}{n}$$

$$.00000004n = 1$$

$$n = \frac{1}{.00000004}$$

25,000,000

$$\star ME = \pm \frac{1}{\sqrt{n}} \rightarrow (ME)^2 = \frac{1}{n}$$

$$\rightarrow (ME)^2 \cdot n = 1$$

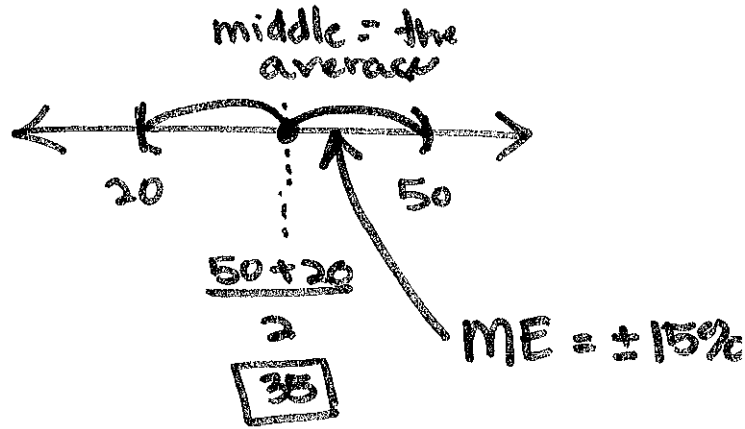
$$\rightarrow n = \frac{1}{(ME)^2}$$

Find the sample size ~~and~~ given the interval w/ the ME.

Ex 20% - 50%

So - middle = 35%

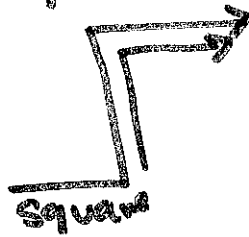
ME = 15%



Now find the sample size:

$$ME = \pm \frac{1}{\sqrt{n}}$$

$$.15 = \pm \frac{1}{\sqrt{n}}$$



$$.0225 = \frac{1}{n}$$

$$n = \frac{1}{.0225}$$

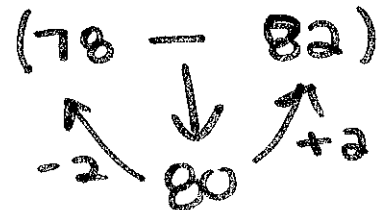
$n \approx 44$ people.

One More

Ex

78% - 82%

ME \rightarrow 2%



$$.02 = \pm \frac{1}{\sqrt{n}}$$

$$.0004 = \frac{1}{n}$$

$$.0004 n = 1$$

$$n = \frac{1}{.0004}$$

$n = 2,500$

Find the ~~non~~ sample size given the margin of error.

1) $ME = \pm 30\%$ 2) $\pm 3\%$ 3) $\pm .02\%$

* Change the % to decimals + plug in *

1) $\pm 30\%$

2) $\pm 3\%$

3) $\pm .02\%$

$$ME = \pm \frac{1}{\sqrt{n}}$$

$$.03 = \pm \frac{1}{\sqrt{n}}$$

$$.0002 = \pm \frac{1}{\sqrt{n}}$$

$$.3 = \pm \frac{1}{\sqrt{n}}$$

$$.0009 = \frac{1}{n}$$

$$.00000004 = \frac{1}{n}$$

$$\frac{.09}{1} = \frac{1}{n}$$

Square both sides

$$.0009 n = 1$$

$$n = \frac{1}{.00000004}$$

$$.09 n = 1$$

$$n = \frac{1}{.0009}$$

$$n = 25,000,000$$

$$n = \frac{1}{.09}$$

$$n \approx 1111$$

$$n \approx 11$$

Always round to nearest whole #.

$$ME = \pm \frac{1}{\sqrt{n}}$$

$$(ME)^2 = \frac{1}{n}$$

$$(ME)^2 \cdot n = 1$$

$$n = \frac{1}{(ME)^2}$$

Name _____

Date _____

Tell the type of sample each situation represents.

You are interested in finding out if students at your school think that fine arts programs are receiving enough funding. You decide to:

- use a written survey that you give to people sitting at your lunch table.

Convenience

- put a table at the entrance to the cafeteria with a sign directing students to complete the survey if they want to and drop it in the box.

Self-selected

- randomly selected students from each of the 4 grades.

Stratified

- ask all the juniors and freshmen.

cluster

- put all names in a hat and draw 1/2 the names out to ask.

random

- Dr. Jones wants to see whether the gender of members in a tribe in the Amazon plays a role in the order in which they are served their meals. Is this an observational study or experiment?

observation

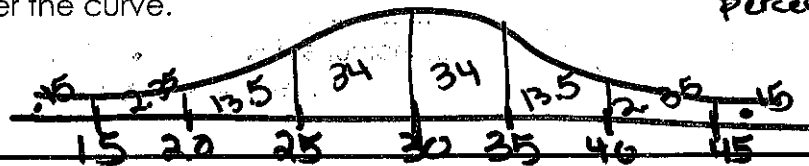
- Dr. Jones also wants to see whether the monkeys in the area grow larger when eating their native diet or when given manufactured monkey pellets. Is this an experiment or observational study? What are the treatment group, control group, and treatment?

monkeys w/pellet - treatment group } pellet
 w/o pellet - control group } treatment

- Draw a normal curve for a normal distribution with a mean of 30 and standard deviation of 5. Label all the areas under the curve.

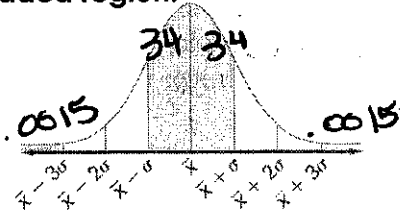
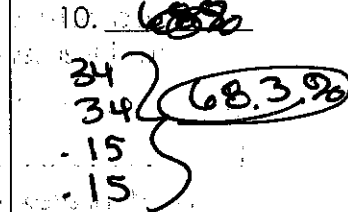
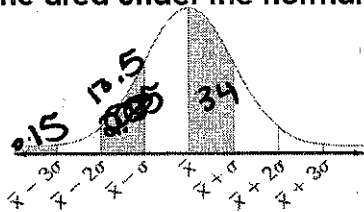
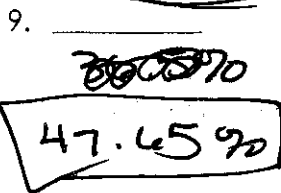
Proportions

.34, .135, .0235
 .0015



Percent	34%
	13.5%
	2.35%
	.15%

Give the percent of the area under the normal curve represented by the shaded region:



- One hundred students out of 1200 at a school were surveyed. Fourteen said they had an after school job. Predict the number of students in the population that would answer similarly.

$n = 100$

omit

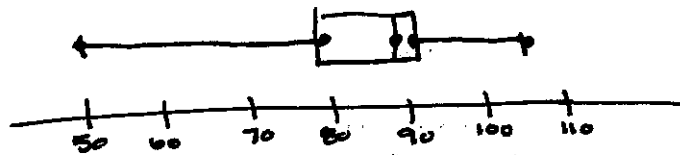
15. The average on the tests in my class and Mrs. Merrill's class were normally distributed on the last advanced algebra test we gave. The average in my class was 86 with a standard deviation of 3. The average on Mrs. Merrill's test was 82 with a standard deviation of 4. If you made an 88 on my test and your friend made 85 on Merrill's test, who had the better score in comparison to the rest of their class?

$$\frac{88 - 86}{3}$$

Your z score = .67 Your friend's z score = .71 Who did better? Your friend

16. Given these test scores for my class. 81 80 90 99 106 50 89 90 78 87

a) Draw a box and whisker graph for this data.



b) Find the IQR 10
 $Q_3 - Q_1$ $90 - 80$

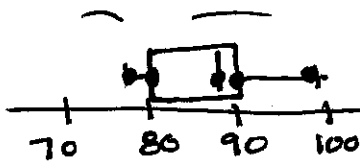
c) Now use $\bar{x} \pm 3\sigma$ to test for outliers. List any outliers.

$Q_1 - 1.5 IQR$	$Q_1 - 3 IQRs$	an <u>extreme outlier</u> .
$Q_3 + 1.5 IQR$	$Q_3 + 3 IQRs$	

$$80 - 1.5(10) = 80 - 15 = 65$$

Extreme? $80 - 3(10) = 80 - 30 = 50$
 $Q_3 + 1.5 IQR = 90 + 15 = 105$

d) If you take the 50 and 106 out of the list, are there any outliers with either calculation?



No outliers

No.
 $IQR = 90 - 80.5 = 9.5$
 $Q_3 + 1.5 IQRs = 90 + 1.5(9.5) = 104.25$

Min = 78
 $Q_1 = 80.5$
 Med = 85
 $Q_3 = 90$
 Max = 99

17)

a) What is the margin of error when you survey 8,674 people?

margin of error. $ME = \pm \frac{1}{\sqrt{n}}$ ← sample size

$$ME = \pm \frac{1}{\sqrt{8674}} = \pm .0107 = \pm 1.1\%$$

b) If you survey 923 people with an 81% "yes" response, what is the range of likely outcomes?

$$ME = \pm \frac{1}{\sqrt{923}} = \pm 3.3\%$$

81% → 77.7% to 84.3%

c) If you have a margin of error of $\pm 3.2\%$, how many people did you survey?

3.2% → .032

$$.032 = \pm \frac{1}{\sqrt{n}} \rightarrow .001024 = \frac{1}{n} \rightarrow n = \frac{1}{.001024} \approx 977$$