STT 200 5:30pm 2-24-10

Note Title 2/24/2010

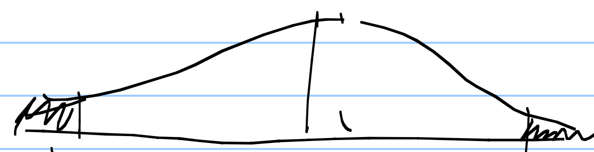
POST FOR TODAY.

#7. HISTORICALLY 20% OF ORDERS ARE RETURNED.

$H_0: p = 0.2$ p = POPULATION FRACTION RETURNED.

ANY CHANGE? $H_A: p \neq 0.2$ TWO-SIDED ALTERNATIVE.

2-SIDED MEANS



SYMMETRICALLY PLACED.

AGGREGATE IS TWICE USUAL ONE-SIDED P-VALUE.

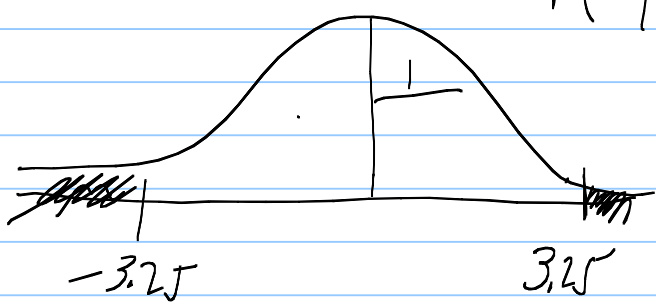
DATA: $n = 100$ #RETURNED = 33.

P-VALUE = P(DATA MORE AGAINST H_0 THAN WE GOT)

$$\cong P\left(|Z| > \frac{33 - 20}{\sqrt{100 \cdot .2 \cdot .8}}\right) \qquad np_0 = 100(.2)$$

TEST BASED ON COUNT X

$p_0 \quad q_0$



$$\frac{13}{10(.4)} = 3.25$$

$$P(|Z| > 3.25) =$$

$$P(Z < -3.25)$$

z	.05
−3.2	$\boxed{0.0006}$

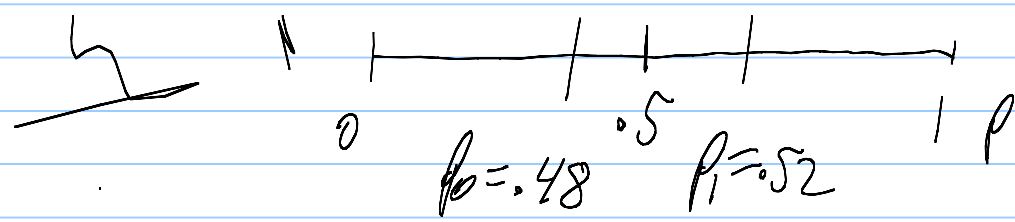
P-VALUE $= 2(0.0006) \approx 0.0012$

INTERPRETATION: LITTLE OVER 1/1000 SAMPLES OF $n=100$ WOULD SHOW THIS OR MORE DEPARTURE (EITHER DIRECTION)

EVEN IF 20% RETURN RATE STILL HOLDS –

#6. SET UP A TEST TO "CALL AN ELECTION."

p = FRACTION WHO VOTED REPUBLICAN (EXIT POLL)



P(DECLARE FOR REPUBLICAN IF $\underset{\text{REP LOST}}{p = .48}$) = 0.01 (SAY) OUR CHOICE

TYPE 1 ERROR PROBABILITY

P(DECLARE FOR DEMOCRAT IF $\underset{\text{REP WON}}{p = .52}$) = 0.01 SAME AS ABOVE.

TYPE 2 ERROR PROBABILITY

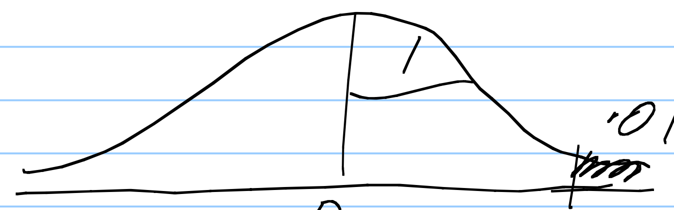
REQUIRED SAMPLE SIZE $n = \left(\frac{\sqrt{p_0 q_0}\,|z_0| + \sqrt{p_1 q_1}\,|z_1|}{p_0 - p_1} \right)^2$

$$n \cong \left(\frac{\sqrt{.48 \cdot .52}\,|2.33| + \sqrt{.52 \cdot .48}\,|-2.33|}{\underbrace{.48}_{p_0} - \underbrace{.52}_{p_1}} \right)^2 = 3387.63$$

ROUND UP 3388

$H_0 < H_A$ TYPE 1

.48   .52



.03

$2.3 \leftarrow \boxed{.9901}$

.99

$z_0 = 2.33$

AS FOR z_1

z_1

$.03_5$

$z_1 = -2.33_5$

$\boxed{.0099}$ -2.3

GO BACK UP + PUT THESE INTO "n"

$$\left(\frac{2.33}{.04}\right)^2 = \left(\frac{233}{4}\right)^2 = (58)^2 \simeq 2525$$

ALSO $C = z_0\sqrt{p_0 q_0}\ \cancel{+\,0.5} + n p_0$

$$= 2.33\sqrt{.48 \cdot .52} + 3387.63\,(.48) \approx \frac{3388}{2}$$

TO KEEP EVERYBODY HAPPY

Bump Up To $n = 3389$

$c = 3388/2 + 1$??

0 1 | 2 3

#5. SAMPLE OF 900 X-RAY ORDERS. $n = 900$

FIND 80 OF THE 900 ORDERED UP ADDITIONAL IMAGES.

SUPPOSE THAT WE'VE BEEN PRESSURED TO REDUCE THE RATE p OF RETURN ORDERS, TO BELOW .12.

$H_A: p < .12$ $\qquad H_0: p = .12$

ONE-SIDED H_A << H_0.

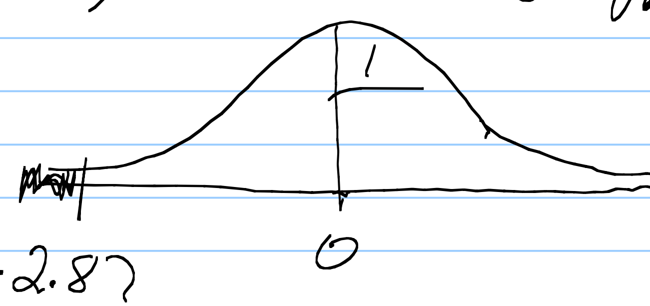
$$P\text{-VALUE} = P(X \le 80 \text{ IF } p = p_0 = .12)$$

WHATEVER RATE APPLIES USING NEW FORM.

MORE EXTREME IN DIRECTION OF H_A.

$$\approx P\left(Z \le \frac{80 - 900(.12)}{\sqrt{900(.12)(.88)}}\right) = P\left(Z < \frac{80-108}{30\sqrt{.12 \cdot .88}}\right)$$

$$= P(Z < -2.87)$$



.07

-2.8 $\boxed{0.0021}$ SO P-VALUE $= 0.0021$

AROUND 2/1000 YOU'D SEE $X \le 80$ (OF 900)

(EVIDECE SUGGESTING H_A MAY BE CORRECT – THAT NEW FORMS REDUCE ADD'L X-RAYS).

EVEN IF THE RATE WITH NEW FORMS REMAINED AT 12%.

PROBABLY I'd GO WITH NEW FORMS.

#4. JOURNAL REQUIRES: P-VALUE < 0.001

IN ORDER TO SUBMIT.

H_0: OUR MED HAS NO EFFECT

H_A: MED HAS DESIRED EFFECT.

DRUG COMPANY WANTS TO OVERWHELMINGLY REJECT H_0.

WANT P-VALUE VERY LOW!

BY TAKING P-VALUE < 0.001 AS A BARRIER TO PUBLICATION THE JOURNAL SCREENS OUT $\frac{999}{1000}$ STUDIES ON WORTHLESS MEDS.