Quick Questions 15   Hypothesis Testing of Population Proportions

I. Place the number of the appropriate formula or expression next to the item it describes.

A. When using the normal approximation to the binomial distribution,

1. np and n(1 - p) must be __4__

2. n must be __2__

B. A one population test __5__

C. $\bar{p}_w$ = __3__

D. A two population test __1__

1.	$\dfrac{\bar{p}_1 - \bar{p}_2}{\sqrt{\dfrac{\bar{p}w(1-\bar{p}w)}{n_1} + \dfrac{\bar{p}w(1-\bar{p}w)}{n_2}}}$
2.	≥ 30
3.	$\dfrac{x_1 + x_2}{n_1 + n_2}$
4.	≥ 5
5.	$\dfrac{\bar{p} - p}{\sigma_{\bar{p}}}$

II. A national video publication stated long-term tape rentals average 20% of all tape rentals. A 150 customer study at Linda's Video Showcase revealed 24 long-term rentals. Test at the .05 level of significance whether Linda's long-term rentals are less than the national average.

p = .20	x = 24	n = 150	α = .05 → z = ±1.645

$n = 150 \geq 30$

$np = 150(.2) = 30 \geq 5$
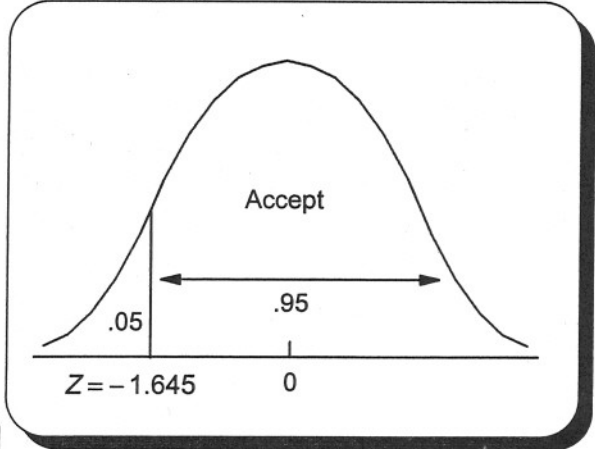
$nq = 150(1 - .2) = 120 \geq 5$

$\bar{p} = \dfrac{x}{n} = \dfrac{24}{150} = .16$

$H_o : P \geq .20$ and $H_1 : P < .20$

$Z = \dfrac{\bar{p} - p}{\sqrt{\dfrac{p(1-p)}{n}}} = \dfrac{.16 - .20}{\sqrt{\dfrac{.20(1-.20)}{150}}} = -1.22$

Accept

.95

.05

$Z = -1.645$ 0

Accept H_o because - 1.22 is not beyond - 1.645. The proportion of customers renting tapes for longer than the minimum period is not less than the number stated in a national publication.

III. Linda Smith found that 70 out of 100 customers rented 2 or more tapes at one store and 44 out of 50 rented 2 or more tapes at a second store. Test at the .05 level of significance whether there is a difference between the proportion of customers at these two stores renting 2 or more tapes.

Given:	X_1 = 70	n_1 = 100	X_2 = 44	n_2 = 50	α = .05/2 = .025 → z = ±1.96

$p_1 = \dfrac{70}{100} = .70$

$p_2 = \dfrac{44}{50} = .88$

$\bar{p}_w = \dfrac{x_1 + x_2}{n_1 + n_2}$

$= \dfrac{70 + 44}{100 + 50}$

$= \dfrac{114}{150}$

$= .76$

$Z = \dfrac{\bar{p}_1 - \bar{p}_2}{\sqrt{\dfrac{\bar{p}w(1-\bar{p}w)}{n_1} + \dfrac{\bar{p}w(1-\bar{p}w)}{n_2}}}$

$= \dfrac{.70 - .88}{\sqrt{\dfrac{.76(1-.76)}{100} + \dfrac{.76(1-.76)}{50}}}$

$= -2.43$

Reject H_o because - 2.43 is beyond - 1.96. The proportion of customers renting two or more tapes differs at these two stores.