AP Stats $\boxed{12.1, 2, 3, 4, 5, 7, 8}$

$\boxed{12.1}$ a) population: the 175 students in the dorm
p: the proportion who like the food.

b) $\hat{p} = \frac{14}{50} = .28$

$\boxed{12.2}$ a) population: students (2400) at his college
p: the proportion who think tuition is too high

b) $\hat{p} = \frac{38}{50} = .76$

$\boxed{12.3}$ a) population: the 15000 living alumni
p: the proportion who support firing the coach

b) $\hat{p} = \frac{76}{200} = .38$

$\boxed{12.4}$ a) No → the population is not large enough compared to the sample size.

b) Yes → SRS, pop. $> 10 \cdot 50$, $\overset{np}{38} > 10$

$2400 > 500$ $\quad \underset{n(1-p)}{12} > 10$

c) No → $n\hat{p} \to 2673(.002) = 5.346$ less than 10.

$\boxed{12.5}$ a) No → $np_0 = 10(.5) = 5$ less than 10

b) No → $np_0 = 200(.99) = 198$

$n(1-p_0) = 200(.01) = 2$ less than 10

c) Yes → SRS, pop. $(250) > 10 \cdot 20$

$np_0 = 20(.5) = 10$

$n(1-p_0) = 20(.5) = 10$

$\boxed{12.7}$ $n = 17592$

$p_0 = .40$

$x = 7741$

$\hat{p} = \frac{7741}{17592} \approx .44$

$H_0: p = .40$

$H_a: p > .40$

where p is the proportion of college students who engage in binge drinking.

1-prop z test

- SRS (representative sample)
- large sample (normality is not an issue)
- pop. > 175,920 (more than 176000 college students)

$np_0 = 17592(.4) = 7036.8$
$n(1-p_0) = 17592(.6) = 10555.2$ } both greater than 10

$$z = \frac{\frac{7741}{17592} - .4}{\sqrt{\frac{.4(.6)}{17592}}} = 10.84$$

p-value ≈ 0
so
Reject H_0

We have evidence to conclude that more than 40% of college students engage in binge drinking.

$\boxed{12.8}$ $n = 200$

$\hat{p} = 132/200$

a) $$132/200 \pm 1.960\left(\sqrt{\frac{132/200\,(1 - 132/200)}{200}}\right)$$

$$.66 \pm 1.960(.0335)$$

$$.66 \pm .0657$$

$$(.594, .726)$$

We are 95% confident that between 59.4% and 72.6% of first year college students identify being well-off as an important personal goal.

2.8 b) $H_0: p = .73$ Where p is the proportion of first year college students at this university who think being well-off is important.

$H_a: p \neq .73$

1-prop z test

$$z = \frac{.66 - .73}{\sqrt{\frac{.66(.34)}{200}}} = -2.23$$

p-value = .0258 so Reject Ho.

We have good evidence that the proportion of students who think being well off differs from the national value.

c) • SRS

• If there are at least 2000 students pop. ≥ 10 n

• $n\hat{p} = 132$, $n(1-\hat{p}) = 68$ both greater than 10

AP Stats $\boxed{12.10, 11, 16, 18, 19}$

$\boxed{12.10}$ $m = z^* \sqrt{\frac{p^*(1-p^*)}{n}}$

a) $.03 = 1.960 \sqrt{\frac{.44(.56)}{n}}$

$\sqrt{n} = \frac{1.960\sqrt{.44(.56)}}{.03}$

$\sqrt{n} = 32.43$

$n = 1051.7$

$\boxed{1052}$

b) $.03 = 1.960 \sqrt{\frac{.5(.5)}{n}}$

$\sqrt{n} = \frac{1.960(.5)}{.03}$

$\sqrt{n} = 32.67$

$n = 1067.1$ This requires 16 more people.

$\boxed{1068}$

$\boxed{12.11}$ $p = .75$ $\quad .04 = 1.96 \sqrt{\frac{.75(.25)}{n}}$

$\sqrt{n} = \frac{1.96\sqrt{.75(.25)}}{.04}$ $\Rightarrow \sqrt{n} = 21.2$

$\boxed{n \approx 451}$

$\boxed{12.16}$ a) $750/1785 \pm 2.576\left(\sqrt{\frac{750/1785(1-750/1785)}{1785}}\right)$

$.42 \pm .03 \Rightarrow (.39, .45)$

b) Since .50 falls outside the 99% confidence interval, this is strong evidence against $H_0: p = .5$. We conclude that less than half of the population attended church or synagogue.

c) $0.01 = 2.576 \sqrt{\frac{.5(.5)}{n}}$

$\sqrt{n} = \frac{2.576(.5)}{.01}$

$\sqrt{n} = 128.8$

$\boxed{n = 16590}$

Since our p is between .39 and .45 (and so between .3 and .7) using $p^* = .5$ is reasonable.

$H_0: p = .5$ where p is the proportion of people

$\boxed{12.18}$ $H_a: p > .5$ who prefer fresh brewed coffee.

1-prop z-test $z = 1.697$ p-value $= 0.0448$ Reject H_0

We have evidence to conclude that the majority of people prefer fresh-brewed coffee over instant.

b) $(.507, .733)$ 50.7% to 73.3%

c) Random order. Some (selected randomly) should taste the instant first and some should taste the fresh-brewed first.

$\boxed{12.19}$ a) $0.015 = 2.576\left(\sqrt{\frac{.2(.8)}{n}}\right)$

$$\sqrt{n} = \frac{2.576\sqrt{.2(.8)}}{.015}$$

$$\sqrt{n} = 68.69 \qquad \boxed{n = 4719}$$

b) $m = 2.576\sqrt{\frac{.10(.90)}{4719}}$ ← using the # from a

$$\boxed{m = 0.0112}$$

AP Stats $\boxed{12.21, 23, 24}$

		n	x	$\hat{p}$
$\boxed{12.21}$	1. Protestants	267	104	104/267
	2. Catholics	230	75	75/230

a) $\left(\frac{104}{267} - \frac{75}{230}\right) \pm 1.960 \sqrt{\frac{104/267(1-104/267)}{267} + \frac{75/230(1-75/230)}{230}}$

$(0.0634) \pm .084$

$(-0.021, 0.148)$

b) There are certainly more protestants than 2670
and catholics 2300

$n_2p_2 = 75$ $\quad n_1p_1 = 104$
$n_2(1-p_2) = 155$ $\quad n_1(1-p_1) = 78$ } all greater than 5

		n	x
$\boxed{12.23}$	1. Protestants	267	161
	2. Catholics	230	136

2 prop z test

a) $H_0: p_1 = p_2$ where p is the proportion of
$H_a: p_1 \neq p_2$ people who said the government is not doing enough . . .

✓ • 2 SRSs
✓ • pop. > 2670 and 2300
✓ • np 161 | 136
n(1-p) 106 | 94 } all greater than 5

b)
$z = .2650$
p-value $= .79$
Fail to reject H_0

We do not have evidence to conclude that Catholics and Protestants differ on this issue.

		n	X
$\boxed{12.24}$	1. acet.	650	44
	2. ibu.	347	49

P is the proportion of people who experienced adverse symptoms.

2 prop. z test

✓ ◦ Random assignment to groups

✓ • Population > 3470 or 6500

✓ ◦

np	44	49
$n(1-p)$	606	298

> greater than 5

$H_0: p_1 = p_2$

$H_a: p_1 \neq p_2$

$z = -3.80$

$\therefore$ reject Ho $\longrightarrow$ p-value = .0001

We have evidence to conclude that there is a difference in the proportion of people who experience adverse symptoms when taking acetamenophin or ibuprofen.

AP Stats $\boxed{12.25, 26, 28, 29}$

$\boxed{12.25}$ a) $H_0: p_1 = p_2$
$H_a: p_1 < p_2$
where p is the proportion of subjects who developed aids.

	n	X	$\hat{p}$
Group 1 A2T	435	17	17/435 .039
Group2 Placebo	435	38	38/435 .08

2 prop Z test
✓ • Random assignment to treatment groups
✓ • Population > 4350
✓ • np 17 | 38 ; n(1-p) 418 | 397 — all greater than 5

$Z = -2.926$ p-value = .0017 Reject Ho

b) We have evidence to conclude that taking A2T lowers the proportion of subject who contract AIDS. The evidence is strong (p=.0017).

c) Neither the subjects or those who interact with them knew who was taking A2T and who the placebo

$\boxed{12.26}$ a) $H_0: p_1 = p_2$
$H_a: p_1 \neq p_2$

	n	X
Urban	65	52
Rural	55	30

p is the proport. who succeeded

$Z = 2.987$ p-value = .0028
We have strong evidence to conclude that there is a difference between rural and urban students in the proportion of students who succeed in chemical eng. courses.

b) (.117, .392) We are 90% confident that the difference between the proportion of urban and rural

$\boxed{12.28}$

	n	X
male	89	60
female	34	23

p is the proportion of people who succeed in Chemical engineering Class.

$H_0: p_m = p_w$ $z = -.024$

$H_a: p_m \neq p_w$ p-value = .98

We do not have evidence to conclude that there is a difference in the proportion of men and women who succeed in Chemical engineering.

$\boxed{12.29}$

	n	X
1. high tech	91	73
2. non-tech	109	75

p is the proportion of companies who offer stock options.

$H_0: p_1 = p_2$ $z = 1.83$ p-value = .033

$H_a: p_1 > p_2$ Reject H_0

We conclude that there is evidence to support the conclusion that a higher proportion of high-tech companies offer stock options.

b) (−.0053, .2336) We are 95% confident that the difference between the proportions of high-tech and non-tech companies that offer stock options $(p_1 - p_2)$ is −.005 to .234.