Math 373 Hw 17 and 18 Recommended problems, don't turn this in.

Hw 335: 9.2abc, 9.4′abcd, 9.8, 9.10′. Rec 335: 9.1, 9.7, 9.9, 9.11.

Page 335.

9.1 Find the appropriate acceptance and rejection regions for the large-sample test statistic z in each case.

(a) right-tailed test with $\alpha = .01$.

(b) two-tailed test at the 5% significance level.

(c) left-tailed test at the 1% significance level.

(d) two-tailed test with $\alpha = .01$.

9.7 A random sample of 100 observations from a quantitative population produced a sample mean of 26.8 and a sample standard deviation of 6.5.
(a) Use the p-value approach to determine whether the population mean is different from 28.
(b) Use the acceptance region approach

9.9 A supermarket packages meat in trays which are supposed to hold exactly 1 lb. of meat. A random sample of 35 packages has an average of 1.01 lb. and a std. dev. of .18 lb.

(a) If you want to make sure that the average amount of meat is indeed 1 lb. what hypotheses would you test?
H_0:

H_a:

(b) Find the p-value for the test and use it to perform the test in part (a).

9.11 A drug manufacturer claims that the mean potency of one of its antibiotics is 80%. A random sample of $n =$ 100 capsules are tested and found to have a mean of $\overline{x} =$ 79.7% with a std. dev. of $s = .8\%$. Do the data present sufficient evidence to refute the manufacturer's claim at the 5% significance level?

(a) State the null hypothesis.

(b) State the alternative hypothesis.

(c) Should you accept or reject the null hypothesis.

Answers Page 335.

9.1 (a) right-tailed test with $\alpha = .01$. Null region for p-values: $p \in [.01, 1]$.
Acceptance: $z \in (-\infty, 2.33]$. Rejection: $z \in (2.33, \infty)$
(b) two-tailed test at the 5% significance level.
Acceptance: $z \in [-1.96, 1.96]$
Rejection: $z \in (-\infty, -1.96) \cup (1.96, \infty)$
(c) left-tailed test at the 1% significance level.
Acceptance: $z \in [-2.33, \infty)$ Rejection: $z \in (-\infty, -2.33)$
(d) two-tailed test with $\alpha = .01$
Acceptance: $z \in [-2.58, 2.58]$
Rejection: $z \in (-\infty, -2.58) \cup (2.58, \infty)$

9.7 SE $= 6.5/\sqrt{100} = .65$, $z_{\alpha/2} = 1.96$.
$z = (28 - 26.8)/(6.5/\sqrt{100}) = 1.846$
H_0: $\mu = 28$ H_a: $\mu \neq 28$ Null region: $\mu = [28]$.

(a) p-value $= P(\overline{x} < 26.8) + P(\overline{x} > 29.2) =$
$2P(\overline{x} > 29.2) = 2P(\frac{\overline{x}-\mu}{\sigma} > \frac{29.2-28}{.65}) =$
$2(z > 1.846) = 2(.5 - P(0 < z < 1.846) = 2(.5 - .4678)$
$= .0644$
Accept H_0. The p-value is not $< .05$.
The p-value = the probability of H_0. We reject H_0 iff it is extremely unlikely iff the p-value is $< .05$.

(b) Null region: [28].
Acceptance region $= \mu_0 \pm \text{SE} z_{\alpha/2}$
$= [28 \pm (.65)(1.96)] = [26.73, 29.27]$
Accept H_0 since $\overline{x} = 26.8 \in [26.73, 29.27] =$ acceptance.

9.9 (a) You must make sure that the average amount of meat is at least 1 lb. what hypotheses would you test?
H_0: $\mu = 1$ H_a: $\mu \neq 1$
(b) Find the p-value for the test and use it to perform the test in part (a).
z-score $= (1 - 1.01)/(.18/\sqrt{35}) = -.328$
p-value = using z instead of $\overline{x}$.
$P(z < -.328) + P(z > .328) = 2(1 - .6293) = .7414$
Accept H_0; the p-value is not $< .05$

9.11 (a) State the null hypothesis. H_0: $\mu = 80\%$
(b) State the alternative hypothesis. H_a: $\mu \neq 80\%$
(c) Should you accept or reject the null hypothesis.
SE $= \frac{.8}{\sqrt{100}} = .08$ $z_{\alpha/2} = 1.96$
Null region: [80]
Acceptance region for H_0 =
$\mu \pm (1.96)\text{SE} = 80 \pm (1.96)(.08) = [79.8432, 80.1568]$
$79.7 \notin$ acceptance interval for H_0; $\therefore$ reject H_0.
p-value ≈ 0