5.18

a. $z = \dfrac{25.9 - 28}{5.6/\sqrt{50}} = -2.65$; Because the observed value of $\overline{y}$ lies more than 1.645 (α = 0.05) standard deviations below the hypothesized mean of 28, we reject H_0 and conclude that there is significant evidence that the mean is less than 28.

b. $\beta(27) = P\left(z \le 1.645 - \dfrac{|28-27|}{5.6/\sqrt{50}} \right) = P(z \le 0.38) = 0.6489$

c. No, a Type II error can only be committed if we fail to reject H_0.

5.26 $n = \dfrac{(80)^2(1.645+1.96)^2}{(525-550)^2} = 133.08 \Rightarrow n = 134$

5.27 $z = \dfrac{542-525}{76/\sqrt{100}} = 2.24 > 1.645 = z_{0.05} \Rightarrow$ Reject H_0

There is sufficient evidence to conclude that the mean has been increased above 525.

5.35 $H_0: \mu = 1.6$ vs $H_a: \mu \ne 1.6$

$n = 36, \overline{y} = 2.2, s = 0.57, \alpha = 0.05$

p-value = $2P\left(z \ge \dfrac{|2.2-1.6|}{0.57/\sqrt{36}} \right) = 2P(z \ge 6.32) < 0.0001 < 0.05 = \alpha$

Yes, there is significant evidence that the mean time delay differs from 1.6 seconds.

5.43

a. $4.95 \pm 2.365\dfrac{0.45}{\sqrt{8}} = 4.95 \pm 0.38 = (4.57, 5.33)$ We are 95% confident that the mean dissolved oxygen level for the population is between 4.57 and 5.33 ppm.

b. There is inconclusive evidence that the mean is less than 5 ppm since the CI contains values both less and greater than 5.

c. $H_0: \mu \ge 5$ vs $H_a: \mu < 5$

p-value = $P\left(t \le \dfrac{4.95-5.0}{0.45/\sqrt{8}} \right) = P(t \le -0.31) \Rightarrow 0.25 <$ p-value < 0.40

(Using a computer program, p-value = 0.3828.) Fail to reject H_0 and conclude the data does not support that the mean is less than 5 ppm.

5.64

a. $\bar{y} = 1.466$

b. 95% CI: $1.466 \pm 2.145 \frac{0.3765}{\sqrt{15}} = 1.466 \pm 0.209 = (1.26, 1.67)$ We are 95% confident that the average mercury content after the accident is between 1.26 and 1.67 mg/m^3.

c. Test $H_0: \mu \le 1.20$ versus $H_a: \mu > 1.20$.

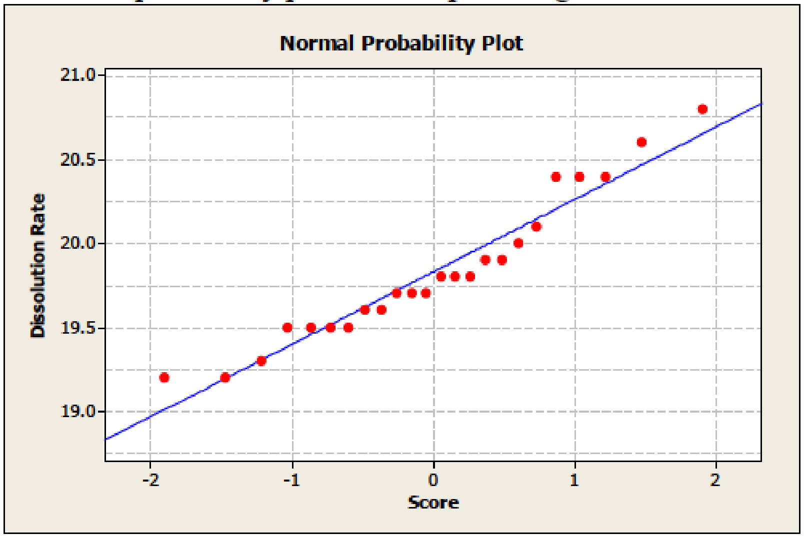
Reject H_0 if $t \ge 1.761$. $t = \frac{1.466 - 1.20}{0.3765/\sqrt{15}} = 2.74 > 1.761$. $\Rightarrow$ Reject H_0. There is sufficient evidence to conclude that the mean mercury concentration has increased.

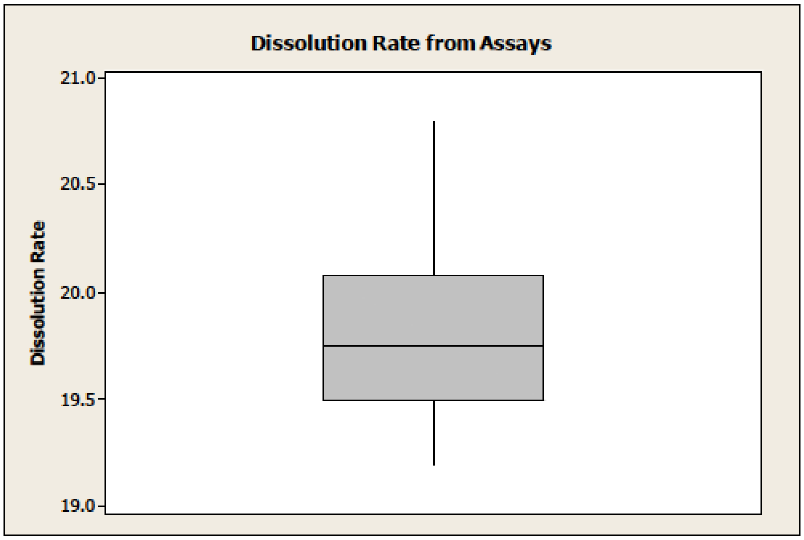
d. Using Table 3, we obtain the following with $d = \frac{|\mu_a - 1.20|}{0.32}$:

μ_a	d	$PWR(\mu_a)$
1.28	0.250	0.235
1.32	0.375	0.396
1.36	0.500	0.578
1.40	0.625	0.744

5.66

a. A normal probability plot and boxplot are given here:





The plots indicate that the data was selected from a population having a distribution that is somewhat skewed to the right, but only slightly, since there are no outliers indicated on the boxplot.

b. $\bar{y} = 19.83$; 99% CI: $19.83 \pm 2.807\frac{0.43}{\sqrt{24}} = 19.83 \pm 0.25 = (19.58, 20.08)$ We are 99% confident that the average dissolution rate is between 19.58 and 20.08 minutes.

c. Test $H_0: \mu \geq 20$ versus $H_a: \mu < 20$.

$n = 24, \bar{y} = 19.83, s = 0.43, \alpha = 0.01$

p-value = $P\left(t \leq \frac{19.83 - 20}{0.43/\sqrt{24}}\right) = P(t \leq -1.94) = 0.0324 > 0.01 = \alpha$

No, there is not sufficient evidence to conclude that the average dissolution rate is less than 20 minutes.

d. From Table 3 with $d = \frac{|19.6 - 20|}{0.43} = 0.93, df = 23, \alpha = 0.01$, we obtain $\beta(19.6) = 0.025$ (actually, this value was obtained from a computer program since this degree of accuracy could not be obtained from Table 3).

5.68 $H_0: \mu \leq 25$ versus $H_a: \mu > 25$

$n = 15, \bar{y} = 28.20, s = 11.44, \alpha = 0.05$

p-value = $P\left(t \geq \frac{28.20 - 25}{11.44/\sqrt{15}}\right) = P(t \geq 1.08) = 0.1492 > 0.05 = \alpha$

No, there is not sufficient evidence to conclude that the average time to fill an order is greater than 25 minutes.