1 Solutions to diagnostic review problems

1a. Since there are six sides on a die and all are assumed equally likely, the probability of any single number, such as '3', is equal to 1/6.

1b. There are three odd numbers out of the six numbers on the die; therefore the probability of rolling an odd number is 3/6=1/2.

1c. There are two even numbers that are less than 5, namely 2 and 4. Thus the probability of rolling an even number less than 5 is 2/6=1/3.

11a. in the text: $\mu = 190, \sigma^2 = 100$, and $n = 25$. Since the standard deviation of the sample mean $\overline{W}, s.e.(\overline{W}) = \sqrt{\sigma^2/n}$,we have $Z = \sqrt{n}(\overline{W} - \mu)/\sigma = \sqrt{25}(180 - 190)/10 = -10/2 = -5$. Thus $P(\overline{W} < 180) = P(Z < -5)$. Since the Z distribution is symmetric, $P(Z < -5) = P(Z > 5)$.

13. The 99% confidence interval for weight loss is given by $\overline{X} \pm t(1 - \alpha/2, n - 1)\ s/\sqrt{n}$. Here $\overline{X} = 30, s = 11, n = 32$,and $\alpha = .01$. From Table A-2 on page 715 we find that $t_{.995,31} \approx t_{.995,30} = 2.75$. Thus our confidence interval is given by $30 \pm (2.75)(11/\sqrt{32})$ which yields 30 ± 5.35 for a final confidence interval of $(24.65, 35.35)$.

15. Note that for the data of problem 14, $n_1 = 15$, and $n_2 = 19$, so that $df = n_1 + n_2 - 2 = 32$. Looking at the t table on page 715, we can use the $df = 30$ which is just below our value of 32. We see that for $df = 30$, the observed value of $t = 2.55$ is in between the values of 2.457 and 2.75, which correspond to the 99^{th} and 99.5^{th} percentiles of the t distribution. Since our observed t value exceeds 2.457, our P value is less than .01. Therefore we will reject the null hypothesis H_0 at α values of either .05 or .01. Note that we can read the P value directly off the table because we are conducting a one-tailed test. If we were conducting a two-tailed test, we would double our value to conclude that $P < .02$.

19. The answers are as listed in the book: Type I, correct decision, correct decision, and Type II error, because of the definitions of Type I and Type II errors.

20. Since our observed t value of -2.75 falls in the critical region of $|T| \geq 2.5$ we should reject H_0, which is answer a. None of the other statements are true.

23. The answers are as listed in the back of the book: $1 - \alpha, \alpha, \beta, 1 - \beta$.

24. Assuming that α is set at the industry-wide standard of .05, our decision is to not reject H_0. Note that it is preferable to 'fail to reject H_0' instead of 'accepting H_0' as the latter statement is essentially implying that the test has high power.

25. Again using the standard value of $\alpha = .05$, we would reject H_0.