24-1 (b) \[ H_0: \mu_{E-A} = 0 \]
\[ H_1: \mu_{E-A} > 0 \]
\[ \alpha = 0.05 \text{ (one-sided)} \]

Step 2 \[ n = 12, \quad \bar{d} = 0.25 \text{ grams}, \quad s_d = 0.4777 \text{ grams}, \quad t_{11} = +1.813 \]

Step 3
Since \( t_{11} = 1.813 \) and \( t_{11; 0.05} = 1.796 \), we have sufficient evidence to reject \( H_0 \). We conclude that the mean weekly nicotine intake for smokers is smaller three weeks after participation in the seminars (0.025 < \( p \)-value < 0.05).

(c) Five-number summary:

\[-0.50, -0.15, +0.25, +0.65, +1.00\]

Since there are no outliers, and the box plot does not look skewed, the \( t \) statistic could be considered appropriate.

(d) Since \( H_0 \) is rejected, the Type I error is possible, which is concluding that \( \mu_{B-A} > 0 \) when actually \( \mu_{B-A} = 0 \).
(e) $H_0$ would not have been rejected with $\alpha = 0.01$ but would have been rejected with $\alpha = 0.10$.

24-3 (b)  

**Step 1**  
$H_0$: $\mu_M - \mu_F = 0$  
$H_1$: $\mu_M - \mu_F \neq 0$  
$\alpha = 0.05$ (two-sided)

**Step 2**  
$n_M = 15$, $x_M = 16.4$ hours, $s_M = 6.390$ hours,  
$n_F = 15$, $x_F = 18.0$ hours, $s_F = 6.358$ hours,  
$t_{28} = -0.687$

**Step 3**  
- do not reject $H_0$  
- $0.20 < p$-value

**Step 4**  
Since $t_{28} = -0.687$ and $t_{28; 0.025} = 2.048$, we do not have sufficient evidence to reject $H_0$. We conclude that there is no difference between male and female voters in the mean time spent listening to the radio weekly in the state ($0.20 < p$-value).
(c) five-number summary for males: 4, 12, 15, 20, 30
five-number summary for females: 10, 13, 15, 25, 27

Since there are no outliers, and neither distribution looks skewed, the $t$ statistic could be considered appropriate.

(d) Since $H_0$ is not rejected, the Type II error is possible, which is concluding that $\mu_M - \mu_F = 0$ when actually $\mu_M - \mu_F \neq 0$.

(e) $H_0$ would not have been rejected with $\alpha = 0.01$ and with $\alpha = 0.10$. 

\[\text{Weekly Radio Hours}\]

\[
\begin{array}{c|c|c|c|c|c}
\text{Males} & \text{Females} \\
\hline
0 & 10 & 20 & 30 \\
\hline
\end{array}
\]
Step 1

**H₀**: \( \mu_B - \mu_M = 0 \)

**H₁**: \( \mu_B - \mu_M > 0 \)

\( \alpha = 0.10 \) (one-sided)

Step 2

\( n_B = 13 \), \( \bar{x}_B = 23.162 \) thousand dollars, \( s_B = 4.899 \) thousand dollars,

\( n_M = 9 \), \( \bar{x}_M = 19.209 \) thousand dollars, \( s_M = 4.359 \) thousand dollars,

\( t_{19} = +1.987 \)

Step 3

Reject \( H_0 \)

0.025 < \( p \)-value < 0.05

Step 4

Since \( t_{19} = 1.987 \) and \( t_{19; 0.10} = 1.328 \), we have sufficient evidence to reject \( H_0 \). We conclude that the mean yearly income per household is higher in Basin City than in Middletown (0.025 < \( p \)-value < 0.05).

(c) The presence of one or more outliers in the data would suggest that the \( t \) statistic may not be appropriate.

(d) Since \( H_0 \) is rejected, the Type I error is possible, which is concluding that \( \mu_B - \mu_M > 0 \) when actually \( \mu_B - \mu_M = 0 \).

(e) \( H_0 \) would not have been rejected with \( \alpha = 0.01 \) but would have been rejected with \( \alpha = 0.05 \).
24-7 (a) To calculate the $t$ statistic, we must also know the sample standard deviations $s_A$ and $s_B$ along with the sample sizes $n_A$ and $n_B$, none of which is given.

(b) Even though we cannot calculate the $t$ statistic, since the sample standard deviations $s_A$ and $s_B$ along with the sample sizes $n_A$ and $n_B$ are not given, we see that the $t$ statistic must be positive; however, the hypothesis test is one-sided with a rejection region which must consist only of negative $t$ values, implying that the $t$ statistic cannot possibly be in the rejection region.