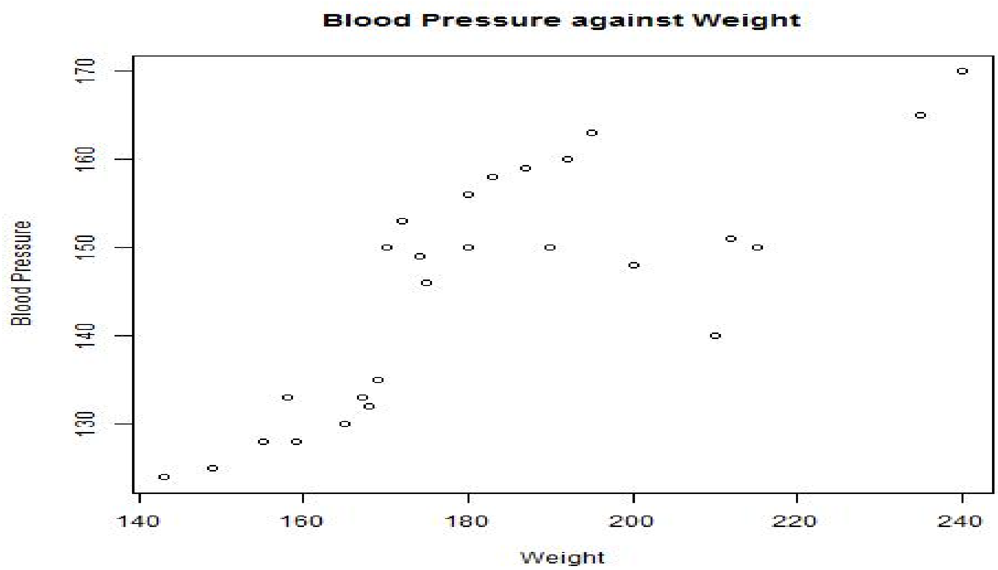
Stat 6021: Guided Question Set 1 Solutions

1. This one is a bit ambiguous, an argument can be made that the relationship is linear or curved. Can be difficult to ascertain especially with a small data set.



2. The R output is shown below.

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Call:
lm(formula = BP ~ weight)

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 69.10437   12.91013   5.353 1.71e-05 ***
weight       0.41942    0.07015   5.979 3.59e-06 ***
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Residual standard error: 8.681 on 24 degrees of freedom
Multiple R-squared:  0.5983,    Adjusted R-squared:  0.5815
F-statistic: 35.74 on 1 and 24 DF,  p-value: 3.591e-06
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The estimated equation is $\hat{BP} = 69.1044 + 0.4194weight$. The estimated slope and intercept are 0.4194 and 69.1044 respectively. The predicted blood pressure increases by 0.4194mmHg for every pound increase in weight, for 25 to 30 year old mals. The predicted blood pressure is 69.1044mmHG for a 25 to 30 year old male who weighs 0 pounds.

3. $\hat{BP} = 69.1044 + 0.4194 \times 200 = 152.9874$mmHg. This person's residual is $148 - 152.9874 = -4.9874$mmHg.

4. The ANOVA output is shown below.

```
Analysis of Variance Table

Response: BP
          Df Sum Sq Mean Sq F value    Pr(>F)
weight     1 2693.6 2693.58  35.744 3.591e-06 ***
Residuals 24 1808.6   75.36
```

5. $R^2 = 0.5983$. This is found using $R^2 = \frac{SS_R}{SS_T} = \frac{2693.6}{2693.6+1808.6}$. 59.83% of the variance in blood pressure can be explained by weight.

6. This is the residual standard error, 8.681.

7. $H_0 : \beta_1 = 0, H_a : \beta_1 \neq 0$.

8.
$$\begin{aligned} F &= \frac{MS_R}{MS_{res}} \\ &= \frac{2693.58}{75.36} \\ &= 35.744. \end{aligned}$$

9. Since the p-value is less than 0.05, we reject the null hypothesis. Our data supports the claim that there is a linear relationship between blood pressure and weight.