Section 5.4
Interpretations of the Definite Integral

1. Annual coal production in the US (in quadrillion BTU per year) is given in the table below.

Year	1960	1965	1970	1975	1980	1985	1990
Rate	10.82	13.06	14.61	14.99	18.60	19.33	22.46

   (a) Estimate the total amount of coal produced in the US between 1960 and 1990.

   (b) Using the data from the table, draw a plot of the rate of coal production vs. years since 1960. On your plot, shade in the area you computed in part (a). Is your answer to (a) likely to be an over-estimate or an underestimate of the true amount of coal produced during this time period?

   (c) If $r = f(t)$ is the rate of coal production t years since 1960, write an integral to represent the exact 1960 to 1990 coal production.

2. If $f(x)$ is force measured in Newtons and x is distance measured in meters, what are the units of $\int_a^b f(x)dx$?

3. A two-day environmental clean-up started at 9am on the first day of Earth Week. The number of workers fluctuated as shown in the figure below.
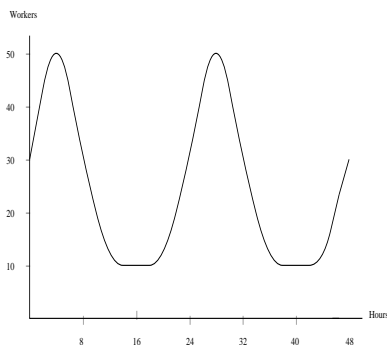
(a) If the workers were paid $10 per hour, how much was the total personnel cost of the clean-up?

(b) If workers were paid $10 per hour from 9am to 5pm and $15 per hour during the rest of the day, what was the total personnel cost of the clean-up?