Section 6.4

1.

(a) The equilibrium price is \$30 per unit, and the equilibrium quantity is 6000.

(b) The region representing the consumer surplus is the shaded triangle in Figure 6.8 with area $\frac{1}{2} \cdot 6000 \cdot 70 = 210{,}000$. The consumer surplus is \$210,000.

The area representing the producer surplus, shaded in Figure 6.9, is about 7 grid squares, each of area 10,000. The producer surplus is about \$70,000.

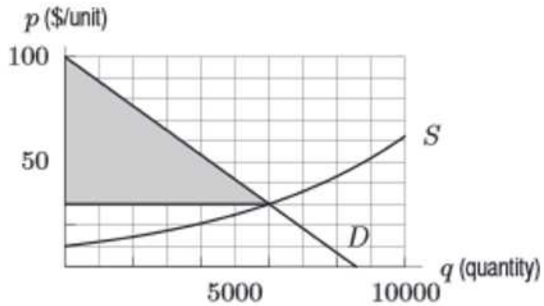

Figure 6.8

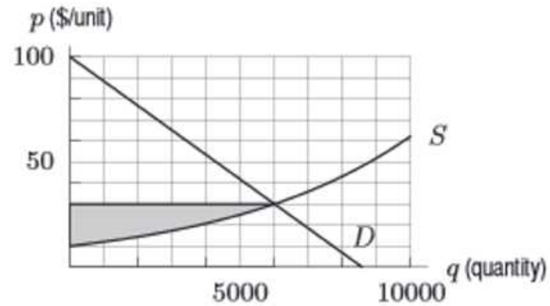

Figure 6.9

3. When $q = 5$, the price is $p = 100 - 3 \cdot 5^2 = 25$. From Figure 6.18 on page 283 of the text, with $q^+ = 5$,

$$\text{Consumer Surplus } = \int_0^5 (100 - 3q^2)\, dq - 5 \cdot 25$$

Using a calculator or computer to evaluate the integral we get

$$\text{Consumer Surplus } = 250.$$

5. When $q = 10$, the price is $p = 100 - 4 \cdot 10 = 60$. From Figure 6. 29on page 309 of the text, with $q^+ = 10$,

$$\text{Consumer surplus} = \int_0^{10} (100 - 4q)\, dq - 60 \cdot 10$$

Using a calculator or computer to evaluate the integral we get

$$\text{Consumer surplus} = 200.$$

7. Solving the equation 100-2p=3p-50, we find the equilibrium price p*=\$30. The eqilibrium quantity is q*=40 units.

(a) The consumer's surplus is the area under the demand curve and above the line p=30 which is the area of the triangle of base 40 and height 20. That is, 400.

(b) The producer's surplus is the area above the supply curve and below the line p=30 which is the area of the triangle of base 40 and height (30-50/3). That is, 800/3.

11.

(a) The consumer surplus is the area the between demand curve and the price \$40—roughly 9 squares. See Figure 6.19. Since each square represents (\$25/unit)·(10 units), the total area is

$$9 \cdot \$250 = \$2250.$$

At a price of \$40, about 90 units are sold. The producer surplus is the area under \$40, above the supply curve, and to the left of $q = 90$. See Figure 6.19. The area is 10.5 squares or

$$10.5 \cdot \$250 = \$2625.$$

The total gains from the trade is

$$\text{Total gain} = \text{Consumer surplus} + \text{Producer surplus} = \$4875.$$

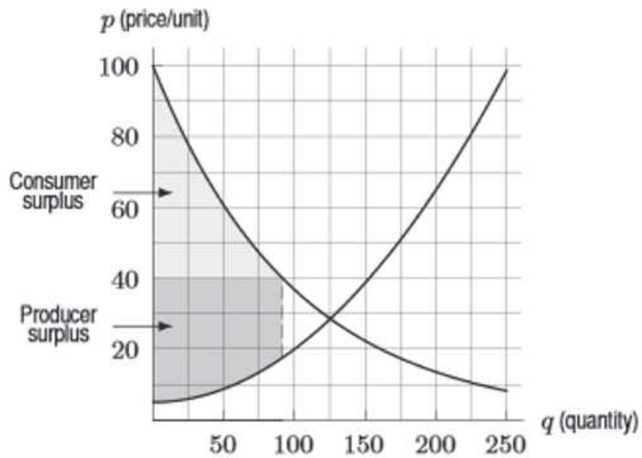

Figure 6.19

(b) The consumer surplus is less with the price control.
The producer surplus is greater with the price control.
The total gains from trade are less with the price control.

14.

(a) In Table 6.1, the quantity q increases as the price p decreases, while in Table 6.2, q increases as p increases. Therefore, the demand data is in Table 6.1 and the supply data is in Table 6.2.

(b) It appears that the equilibrium price is $p^* = 25$ dollars per unit and the equilibrium quantity is $q^* = 400$ units sold at this price.

(c) To estimate the consumer surplus, we use the demand data in Table 6.1. We use a Riemann sum using the price from the demand data minus the equilibrium price of 25.

$$\text{Left sum} = (60-25)\cdot 100 + (50-25)\cdot 100 + (41-25)\cdot 100 + (32-25)\cdot 100 = 8300.$$

$$\text{Right sum} = (50-25)\cdot 100 + (41-25)\cdot 100 + (32-25)\cdot 100 + (25-25)\cdot 100 = 4800.$$

We average the two to estimate that

$$\text{Consumer surplus} \approx \frac{8300+4800}{2} = 6550.$$

To estimate the producer surplus, we use the supply data in Table 6.2. We use a Riemann sum using the equilibrium price of 25 minus the price from the supply data.

$$\text{Left sum} = (25-10)\cdot 100 + (25-14)\cdot 100 + (25-18)\cdot 100 + (25-22)\cdot 100 = 3600.$$

$$\text{Right sum} = (25-14)\cdot 100 + (25-18)\cdot 100 + (25-22)\cdot 100 + (25-25)\cdot 100 = 2100.$$

We average the two to estimate that

$$\text{Producer surplus} \approx \frac{3600+2100}{2} = 2850.$$

18.

(a) p^*q^* = the total amount paid for q^* of the good at equilibrium. See Figure 6.31.
(b) $\int_0^{q^*} D(q)\,dq$ = the maximum consumers would be willing to pay if they had to pay the highest price acceptable to them for each additional unit of the good. See Figure 6.32.

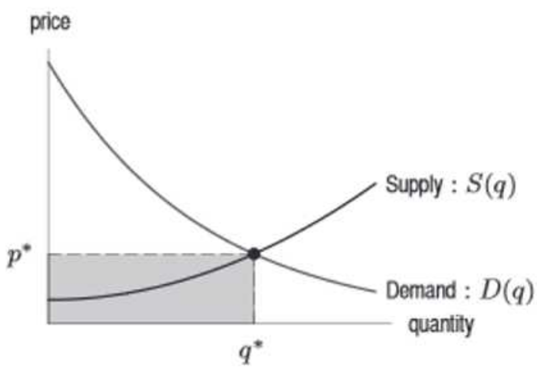

Figure 6.31

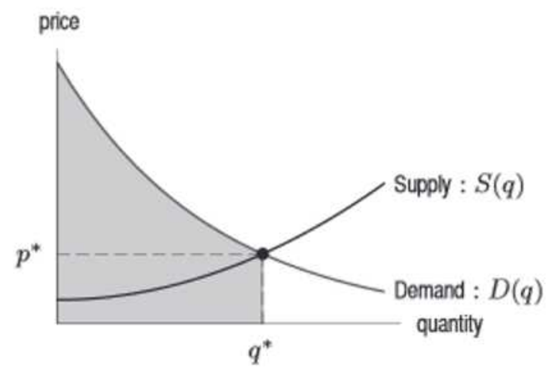

Figure 6.32

(c) $\int_0^{q^*} S(q)\,dq$ = the minimum suppliers would be willing to accept if they were paid the minimum price acceptable to them for each additional unit of the good. See Figure 6.33.

(d) $\int_0^{q^*} D(q)\,dq - p^*q^* =$ consumer surplus. See Figure 6.34.

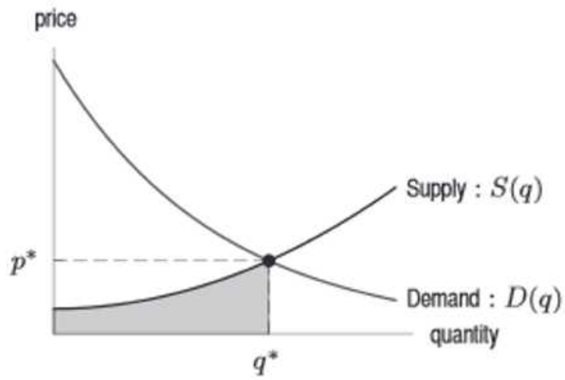

Figure 6.33

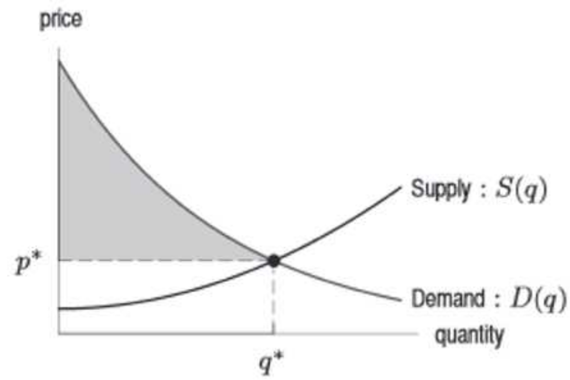

Figure 6.34

(e) $p^*q^* - \int_0^{q^*} S(q)\,dq =$ producer surplus. See Figure 6.35.

(f) $\int_0^{q^*} (D(q) - S(q))\,dq =$ producer surplus and consumer surplus. See Figure 6.36.

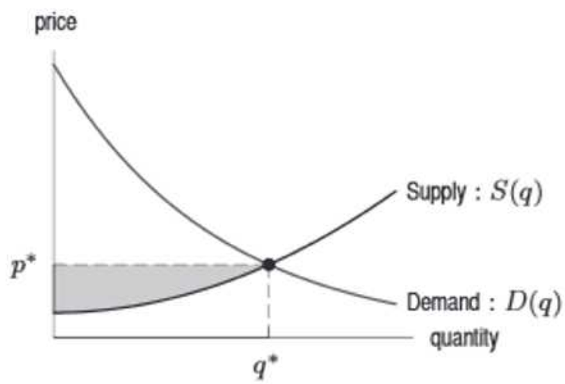

Figure 6.35

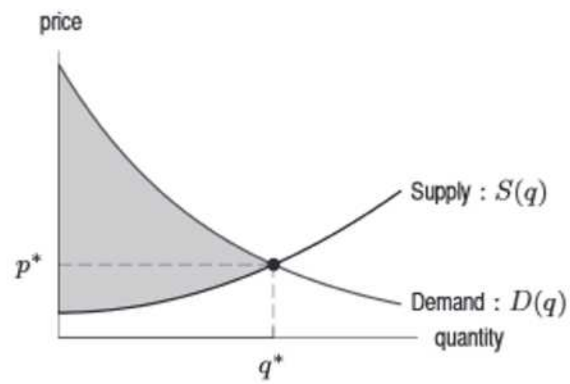

Figure 6.36