1. The Key west Parrot Shop has a monopoly on the sale of parrot souvenir caps in Key West. The demand curve for caps is \( P = 30 - 0.4Q \), where \( P \) is the price of caps and \( Q \) is the number of caps sold per hour. Thus, the marginal revenue for the parrot shop is \( MR = 30 - 0.8Q \). The Parrot Shop is the only employer in town, and faces an hourly supply curve of labor given by \( w = 0.9E + 5 \), where \( w \) is the hourly wage rate and \( E \) is the number of workers hired each hour. The marginal cost associated with hiring \( E \) workers, therefore, is \( MC = 1.8E + 5 \). Each worker produces two caps per hour. How many workers should the Parrot Shop hire each hour to maximize profit? What wage will it pay? How much will it charge for each cap?

Because each worker can produce two caps per hour, \( Q = 2E \), and the marginal product of labor is also 2. Furthermore, a profit-maximizing monopolist chooses \( E^* \) such that \( MRP = MC_E \). Here, \( MRP = MR \cdot MP \), and the marginal cost of employment is not simply the wage rate, but instead \( MC = 1.8E + 5 \) since the firm is also a monopsonist. Thus,

\[
(30 - 0.8Q)(2) = 1.8E + 5 \\
60 - 1.6(2E) = 1.8E + 5 \\
60 - 3.2E = 1.8E + 5 \\
55 = 5E \\
E^* = 11
\]

Therefore, the firm will hire 11 workers, and will pay \( w = 0.9(11) + 5 = $14.90 \) per hour. Finally, \( P = 30 - 0.4Q = 30 - 0.4(22) = $21.20 \) is the cost of each hat.

2. Variables that might explain differences in the number of years of schooling two individuals might acquire include their discount rates and marginal rates of the return to education.

(a) Suppose first that two individuals differ only in their discount rates. Kris has a discount rate of 0.90, and Ben has a discount rate of 0.95. How will their schooling levels compare? Who will earn a higher wage?

Because Ben’s discount rate is higher, we know he discounts the future and values the present more than Kris. As such, he will obtain fewer years of schooling than she will. Because there is a positive relationship between schooling and earnings (upward-sloping wage-schooling locus), if Kris goes to school longer, she will earn a higher wage than will Ben.

(b) Now assume that both Ben and Kris have the same discount rate. However, Ben’s marginal rate of return to schooling is 10%, whereas Kris’s is 8%. What might explain the difference in the rates of return to schooling? What criticism would you have of a study that simply compares the wage differential of two workers such as Ben and Kris? In other words, what bias would this study be capturing? Give examples of ways various studies have tried to correct for this bias.

Ben has a larger marginal rate of return to schooling than does Kris, which suggests that perhaps he is more able than her, holding all else constant. He benefits from one more year of school
more than Kris, so for a given discount rate, he will be more likely to attend school longer. Therefore, Ben’s marginal rate of return to schooling curve is to the right of Kris’s (see chapter 7, slide 14), and his wage-schooling locus is steeper.

If a wage study simply controls for educational attainment and ignores this potential difference in ability, the schooling coefficient will capture the ability premium that Ben enjoys (in addition to the schooling premium). In other words, even if Kris were to obtain the same number of years of school as Ben, she would not be able to earn the same wage, because more able workers benefit more (in terms of higher wages) from an additional year of school. Since schooling and earnings are positively correlated, the coefficient on schooling will be too large, capturing both effects.

Studies that attempt to eliminate the ability bias include:

- identical twin studies, which assume identical twins have the same innate ability, and a wage differential that might exist as a result of different levels of schooling will truly capture the marginal rate of return to schooling,
- the Vietnam draft lottery study, which assumed men in the same draft cohort had the same ability, on average. Men who attended school to avoid being drafted should earn higher wages than their cohort counterparts who were less likely to be drafted, and the wage differential is void of the ability bias, and
- regressions that include measures of ability, such as an IQ measure or AFQT scores.

3. **Suppose one year of schooling costs $10,000 for high-ability workers and $15,000 for low-ability workers. Firms are willing to pay $100,000 (in total for the duration of this problem) to those whom they consider high-ability workers and $40,000 to low-ability workers.**

   (a) **How much schooling will each type of worker acquire? How much will firms pay low-ability workers? High-ability workers?**

   Because workers know they can differentiate themselves according to ability level, high-ability workers will receive the lower bound on the schooling threshold the firm anticipates out of a high-ability individual. Furthermore, the costs of attending school is too high for a low-ability worker, so he will not attend school at all.

   **Low-ability workers will attend** $S_L = 0$ if
   
   $$ w_L > w_H - C_L S $$
   
   $$ S > \frac{w_H - w_L}{C_L} = \frac{100,000 - 40,000}{15,000} = 4 $$

   **High-ability workers will attend** $S_H = 5$ if
   
   $$ w_L < w_H - C_H S $$
   
   $$ S > \frac{w_H - w_L}{C_H} = \frac{100,000 - 40,000}{10,000} = 6 $$

   Therefore, as long as 4-6 years of schooling identifies a high-ability worker, the firm will be able to correctly identify workers according to ability and pay them accordingly.
High ability workers will go to school for $S$ years, which is the lower bound on the schooling range ($S_H$), and low-ability workers will demand $S_L = 0$ years of schooling. High-ability workers will be paid $100,000$, and low-ability workers will be paid $40,000$.

(b) Suppose instead that one additional year of schooling costs $20,000$ regardless of ability, and firms only know that $55\%$ of the population is considered high-ability, and $45\%$ is low-ability. How much schooling will each type of worker acquire? How much will firms pay low-ability workers? High-ability workers?

When a firm only knows the probability that a worker is high (low)-ability, it will be unable to properly identify workers according to ability. Therefore, the firm will treat all workers the same and pay them a weighted average of the two wages. Specifically, $w_A = pw_H + (1 - p)w_L = (0.55)(100,000) + (0.45)(45,000) = 73,000$. Since the firm pays all workers the same amount and workers cannot use schooling to identify their ability, there is no incentive for a high-ability worker to attend school. Therefore, both types of workers will achieve the same level of schooling, which will be $S = 0$ in this case.