a) We know that the output is 20, so the equation is then

$$20 = 5LK$$

Divide by 5 4 = LK The cost equation is

C = 1*L + 2*K, because labor is \$1 per unit and capital is \$2 per unit

$$C = L + 2K$$

We want to minimize this function. First, we will solve the output equation for L

$$L = 4/K$$

Plug that into the cost function

$$C = 4/K + 2K$$

To minimize, we take the derivative

$$dC/dK = -4/K^{2} + 2$$

Set it equal to 0

$$0 = -4/K^{2} + 2$$

4/K^2 = 2
K^2 = 2
K = 1.41

Now, since L = 4/K, L = 4/1.41 = 2.83

At K = 1.41 units and L = 2.83 units, you have minimized costs, and still have achieved 20 units of output.

So the company should hire in order to maximize profits.

b) We have the same function for L, which was 4/K

Now, the cost function is

$$C = 2L + 2K$$

$$C = 2*4/K + 2K$$

$$C = 8/K + 2K$$

$$dC/dK = -8/K^{2} + 2$$

$$0 = -8/K^{2} + 2$$

$$2 = 8/K^{2}$$

$$K = 2$$

Since L = 4/K, L = 4/2 = 2

The scale effect is when average cost decreases when you make more units of a good, because the additional labor and capital is more efficient and the cost of each units decreases.

In part a, the cost is

C = 2.83 + 2*1.41 = 5.65

In part b, the cost is

C = 4 + 2*2 = 8

The cost per unit ins a is 5.65/20 =\$0.28

The cost per unit in b is 8/40 = \$0.20

That is, the cost of units decreases with increasing production.

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