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

$$
20=5 \mathrm{LK}
$$

Divide by 5
4 = LK
The cost equation is
$\mathrm{C}=1 * \mathrm{~L}+2 * \mathrm{~K}$, because labor is $\$ 1$ per unit and capital is $\$ 2$ per unit

$$
\mathrm{C}=\mathrm{L}+2 \mathrm{~K}
$$

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

$$
\mathrm{L}=4 / \mathrm{K}
$$

Plug that into the cost function

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

To minimize, we take the derivative

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

Set it equal to 0

$$
\begin{gathered}
0=-4 / \mathrm{K}^{\wedge} 2+2 \\
4 / \mathrm{K}^{\wedge} 2=2 \\
\mathrm{~K}^{\wedge} 2=2 \\
\mathrm{~K}=1.41
\end{gathered}
$$

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 $4 / \mathrm{K}$

Now, the cost function is

$$
\begin{gathered}
\mathrm{C}=2 \mathrm{~L}+2 \mathrm{~K} \\
\mathrm{C}=2 * 4 / \mathrm{K}+2 \mathrm{~K} \\
\mathrm{C}=8 / \mathrm{K}+2 \mathrm{~K} \\
\mathrm{dC} / \mathrm{dK}=-8 / \mathrm{K}^{\wedge} 2+2 \\
0=-8 / \mathrm{K}^{\wedge} 2+2 \\
2=8 / \mathrm{K}^{\wedge} 2 \\
\mathrm{~K}=2
\end{gathered}
$$

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
$\mathrm{C}=2.83+2 * 1.41=5.65$
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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