There were two versions of the exam.

Version A - In problem 1, Vera starts from a point 120 feet due north of the water main.

1. (a) $x = 10t, y = 120 - 2t$ (b) Solve the equation $(12t)^2 = (10t)^2 + (120 - 2t)^2$ for $t$. The one positive solution is 13.899748 seconds.

2. (a) Let $M(t)$ be the amount of money Helga makes if she works $t$ hours. Then

\[
M(t) = \begin{cases} 
10t & \text{if } 0 \leq t \leq 8, \\
80 + 15(t - 8) & \text{if } 8 \leq t \leq 12, \\
140 + 20(t - 12) & \text{if } t > 12.
\end{cases}
\]

(b) 11.4285 hours.

3. 8.19288 km

4. The maximum possible area is 625 cm².

Version B - In problem 1, Vera starts from a point 100 feet due south of the water main.

1. (a) $x = 15t, y = -100 + 2t$ (b) Solve the equation $(14t)^2 = (15t)^2 + (-100 + 2t)^2$ for $t$. Since this equation has no real solutions, Vera’s feet never get wet.

2. (a) Ket $M(t)$ be the amount of money Helga makes if she works $t$ hours. Then

\[
M(t) = \begin{cases} 
9t & \text{if } 0 \leq t \leq 8, \\
72 + 13.5(t - 8) & \text{if } 8 \leq t \leq 12, \\
126 + 18(t - 12) & \text{if } t > 12.
\end{cases}
\]

(b) 10.2857 hours

3. 8.94427 km

4. The maximum possible area is 6400 cm².