d. Use the graph to estimate the break-even point. Explain how you determined your answer.

After about one cow the time it takes milking by hand or machine is about the same. (1, 0.45) ← estimate

e. What does the break-even point represent in this problem situation?

The break-even point represents the number of cows it would take to milk by hand or machine that it wouldn't matter if you used a machine or hand, the time would be the same.

f. Verify your answer to part (d) by solving the system algebraically.

we want to know when does Hand = Machine

$H(c) = M(c)$ setup

$0.3 + 0.2c = 0.4 + 0.05c$ substitute
$-0.05c \qquad\qquad -0.05c$

$0.3 + 0.15c = 0.4$
$-0.3 \qquad\qquad -0.3$

solve for c

$0.15c = 0.1$
$\overline{0.15} \qquad \overline{0.15}$

$\boxed{c = 0.\overline{6}}$

g. Does the solution make sense in terms of this problem situation? Explain your reasoning.

You can not milk $0.\overline{6}$ cows, so the solution does not make sense. You can milk 0 or 1 cow, not $0.\overline{6}$.

h. Which method of milking is more efficient? Explain your reasoning.

Milking cows using a machine is more efficient if you are milking 1 or more cows.

i. Is this system of equations consistent or inconsistent? Explain your reasoning.

The system of equations is consistent because the graphs intersect at one place, giving one solution point that is the same for both graphs.

Name ___Key___ Date _____

Prepping for the Robot Challenge
Solving Linear Systems Graphically and Algebraically

1. Wesley owns a dairy farm. In the morning, it takes him 0.3 hour to set up for milking the cows. Once he has set up, it takes Wesley 0.2 hour to milk each cow by hand. He is contemplating purchasing a milking machine in hopes that it will speed up the milking process. The milking machine he is considering will take 0.4 hour to set up each morning and takes 0.05 hour to milk each cow.

   a. Write a system of linear equations that represents the total amount of time Wesley will spend milking the cows using the two different methods.
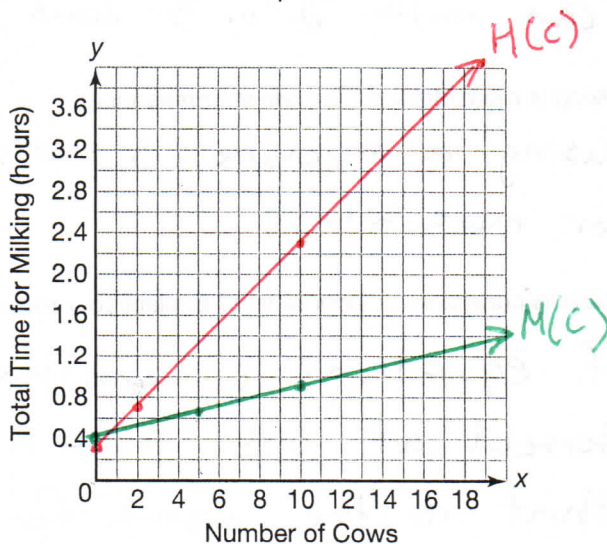
   $H(c) = 0.3 + 0.2c$

   $M(c) = 0.4 + 0.05c$

   b. Compare the equations in the system you wrote in part (a). Explain what they mean in terms of the problem situation.

   Although it takes longer to set up the machine, the machine is much quicker milking each cow.

   c. Graph both equations on the coordinate plane.

   Hand

C	H(c)
0	0.3
2	0.7
10	2.3

   Machine

C	H(c)
0	0.4
5	0.65
10	0.9

   Graph: Total Time for Milking (hours) (y-axis) vs Number of Cows (x-axis). H(c) line in red, M(c) line in green.

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