

1.6.15 Let $x + y = 55$ and $xy = 684$. $y = 55 - x$, therefore $x(55 - x) = 684$. Expanding and simplifying the equation gives $x^2 - 55x + 684 = 0$. Factoring gives $(x - 19)(x - 36) = 0$. If $x = 19$, then $y = 36$. If $x = 36$, then $y = 19$. It follows that the desired numbers are 19 and 36.

1.6.55 Before the replacement, there are $0.6 \times 3.6 = 2.16$ L of antifreeze. We need $0.5 \times 3.6 = 1.8$ L of antifreeze in the radiator, hence we need to get rid of $2.16 - 1.8 = 0.36$ L of antifreeze. For every x L of the original mixture you drain, you get rid of $0.6x$ L of antifreeze. Set $0.6x = 0.36$. Solving the equation gives $x = 0.6$ L.

1.6.65 Let t be the time in hours that Wendy spent on the train. Then $\frac{11}{2} - t$ is the time in hours that Wendy spent on the bus. We construct a table:

	Rate	Time	Distance
By train	40	t	$40t$
By bus	60	$\frac{11}{2} - t$	$60(\frac{11}{2} - t)$

The total distance traveled is the sum of the distances traveled by bus and by train, so $300 = 40t + 60(\frac{11}{2} - t) \iff 300 = 40t + 330 - 60t \iff -30 = -20t \iff t = \frac{-30}{-20} = 1.5$ hours. So the time spent on the train is $5.5 - 1.5 = 4$ hours.

1.7.40 $x^2 + 2x > 3 \iff x^2 + 2x - 3 > 0 \iff (x + 3)(x - 1) > 0$. The expression on the left of the inequality changes sign when $x = -3$ and $x = 1$. Thus we must check the intervals in the following table.

Interval	$(-\infty, -3)$	$(-3, 1)$	$(1, \infty)$
Sign of $x + 3$	-	+	+
Sign of $x - 1$	-	-	+
Sign of $(x + 3)(x - 1)$	+	-	+

From the table, the solution set is $\{x|x < -3 \text{ or } 1 < x\}$. Interval: $(-\infty, -3) \cup (1, \infty)$.

1.7.54

$$\frac{x}{x+1} > 3x \iff \frac{x}{x+1} - 3x > 0 \iff \frac{x}{x+1} - \frac{3x(x+1)}{x+1} > 0 \iff \frac{-2x - 3x^2}{x+1} > 0 \iff \frac{-x(2+3x)}{x+1} > 0.$$

The expression on the left of the inequality changes sign when $x = 0$, $x = -\frac{2}{3}$, and $x = -1$. Thus we must check the intervals in the following table.

Interval	$(-\infty, -1)$	$(-1, -\frac{2}{3})$	$(-\frac{2}{3}, 0)$	$(0, \infty)$
Sign of $-x$	+	+	+	-
Sign of $2 + 3x$	-	-	+	+
Sign of $x + 1$	-	+	+	+
Sign of $\frac{-x(2+3x)}{x+1}$	+	-	+	-

From the table, the solution set is $\{x|x < -1 \text{ or } -\frac{2}{3} < x < 0\}$. Interval: $(-\infty, -1) \cup (-\frac{2}{3}, 0)$.

1.7.64 $|3x| < 15 \iff -15 < 3x < 15 \iff -5 < x < 5$. Interval: $(-5, 5)$.