(c) Since $n = 9 \neq 1$, the algorithm sets $m = \lfloor \frac{9}{2} \rfloor = 4$. Since $x = 10 > a_4 = 4$, the algorithm replaces n by $n - m = 5$ and changes the list to $5, 6, 7, 8, 9$.

Since $n \neq 1$, the algorithm sets $m = \lfloor \frac{5}{2} \rfloor = 2$. Since $x = 10 > a_2 = 6$, the algorithm replaces n with $n - m = 3$ and changes the list to $7, 8, 9$.

Since $n \neq 1$, the algorithm sets $m = \lfloor \frac{3}{2} \rfloor = 1$. Since $x = 10 > a_1 = 7$, the algorithm replaces n with $n - m = 2$ and changes the list to $8, 9$.

Since $n \neq 1$, the algorithm sets $m = \lfloor \frac{2}{2} = 1$. Since $x = 10 > a_1 = 8$, the algorithm replaces n with $n - m = 1$ and changes the list to 9.

Since $n = 1$ and $x = 10 \neq a_1 = 9$, the algorithm outputs "false," sets $n = 0$ and stops.

This search required five comparisons of x with other elements; a linear search would have required nine.

8.

$\mathcal{L}_1$	$\mathcal{L}_2$	$\mathcal{L}_3$
$2, 4, 4, 6, 8$	$1, 5, 7, 9, 10$	
$2, 4, 4, 6, 8$	$5, 7, 9, 10$	1
$4, 4, 6, 8$	$5, 7, 9, 10$	$1, 2$
$4, 6, 8$	$5, 7, 9, 10$	$1, 2, 4$
$6, 8$	$5, 7, 9, 10$	$1, 2, 4, 4$
$6, 8$	$7, 9, 10$	$1, 2, 4, 4, 5$
8	$7, 9, 10$	$1, 2, 4, 4, 5, 6$
8	$9, 10$	$1, 2, 4, 4, 5, 6, 7$
		$1, 2, 4, 4, 5, 6, 7, 8, 9, 10$

The algorithm required seven comparisons.

14. (a) Here's the bubble sort:

$k = 6$:
$\underline{7, 2}, 2, 5, 3, 5, 4$
$\rightarrow 2, \underline{7, 2}, 5, 3, 5, 4$
$\rightarrow 2, 2, \underline{7, 5}, 3, 5, 4$
$\rightarrow 2, 2, 5, \underline{7, 3}, 5, 4$
$\rightarrow 2, 2, 5, 3, \underline{7, 5}, 4$
$\rightarrow 2, 2, 5, 3, \underline{57, 4}$

$k = 5$:
$\underline{2, 2}, 5, 3, 5, 4, 7$
$\rightarrow 2, \underline{2, 5}, 3, 5, 4, 7$
$\rightarrow 2, 2, \underline{5, 3}, 5, 4, 7$
$\rightarrow 2, 2, 3, \underline{5, 5}, 4, 7$
$\rightarrow 2, 2, 3, 5, \underline{5, 4}, 7$

$k = 4$:
$\underline{2, 2}, 3, 5, 4, 5, 7$
$\rightarrow 2, \underline{2, 3}, 5, 4, 5, 7$
$\rightarrow 2, 2, \underline{3, 5}, 4, 5, 7$
$\rightarrow 2, 2, 3, \underline{5, 4}, 5, 7$

$k = 3$:
$\underline{2, 2}, 3, 4, 5, 5, 7$
$\rightarrow 2, \underline{2, 3}, 4, 5, 5, 7$
$\rightarrow 2, 2, \underline{3, 4}, 5, 5, 7$

$k = 2$:
$\underline{2, 2}, 3, 4, 5, 5, 7$
$\rightarrow 2, \underline{2, 3}, 4, 5, 5, 7$

$k = 1$:
$\underline{2, 2}, 3, 4, 5, 5, 7$
$\rightarrow 2, 2, 3, 4, 5, 5, 7$

This required a total of $6 + 5 + 4 + 3 + 2 + 1 = \frac{(6)(7)}{2} = 21$ comparisons.

(b) Here's the merge sort.

Step 2: $7;\ 2;\ 2;\ 5;\ 3;\ 5;\ 4;$

Step 3: $2, 7;\ 2, 5;\ 3, 5;\ 4$

Step 3: $2, 2, 5, 7;\ 3, 4, 5$

Step 3: $2, 2, 3, 4, 5, 5, 7$

Merging two lists of length 1 to one of length 2 requires $1+1-1 = 1$ comparison. Thus, the initial merging of seven lists of length 1 to three of length 2 and one of length 1 required $1 + 1 + 1 = 3$ comparisons. The merging of three lists of length 2 and one of length 1 to one list of length 4 and another of length 3 required $(2 + 2 - 1) + (2 + 1 - 1) = 5$ comparisons. The final merging required $4 + 3 - 1 = 6$ comparisons. The total is $3 + 5 + 6 = 14$ comparisons.