Name: ________________________________

Sec. 3.4: Solve Equations with Variables on Both Sides

To solve equations that have variables on both sides, we typically:

- Use the distributive property, as necessary
- Move all terms with the variable to one side of the equation (either side)
- Combine like terms, as necessary
- Use inverse operations
- Perform those inverse operations in reverse order from normal order of operations

<u>Examples</u>

Solve the equation.

1. $8x - 5 = 6x + 3$	2. $15 - 2y = 7y - 4(y + 10)$
3. $8 - 2(3q - 4) = 4q - 14$	4. $\frac{3}{4}(16x - 8) = 7x + 14$

Two especially interesting cases can result when solving equations with variables on both sides:

- Identity: an equation that is true for all values of the variable
- No solution: an equation that is never true for any value of the variable

5. Solve: $-2x + 5(x - 1) = 3(x + 1) - 8$

6. Solve: $4y + 9 = 5(y - 2) - y$

7. A small store sold 88 blue shirts and 74 green shirts this month. Over time, the number of blue shirts sold has increased by 4 each month and the number of green shirts sold has decreased by 3 each month. How long do you predict it will it take before the store sells twice as many blue shirts as green shirts?

Month	0	1	2	3	4	5	6	7	8
Blue Shirts	88								
Green Shirts	74								

8. Acme Racquetball Club charges a $30 monthly membership fee plus $6.00 per hour of court use. Take Me to Court Racquetball Club charges a $15 monthly membership fee plus $7.50 per hour of court use. For how many hours of court use in a month would the two clubs be equally expensive? Which would be the better deal for more hours than that?

Sec. 3.4 Practice Problems

Solve the equation. Check your solution.		
1) $10x - 4 = 8x + 14$	2) $m + 4 = 2m - 19$	3) $8t + 2 = 3t - 18$
4) $13 - 2k = 4k + 7$	5) $10 - 5y = -6y - 2$	6) $5\frac{1}{2}z - 11 = 4\frac{3}{8}z + 7$
7) $2(3a + 5) = 4a + 6$	8) $4(-2a - 4) = 4a + 8$	9) $-3y + 4 = 5(2y - 7)$
10) $\frac{1}{2}(-6x - 4) = 10x - 19$	11) $7(r + 7) = 5r + 59$	12) $40 + 14j = 2(-4j - 13)$

Solve the equation, if possible.		
13) $w + 3 = w + 6$	14) $8z = 4(2z + 1)$	15) $12y + 6 = 6(2y + 1)$
16) $\frac{1}{2}(12g + 8) = 2(3g + 2)$	17) $22x + 70 = 17x - 95$	18) $5(1 + 4m) = 2(3 + 10m)$
19) $8w - 8 - 6w = 4w - 7$	20) $-15c + 7c + 1 = 3 - 8c$	21) $3(2t - 8) = 4(2t - 6)$

22) $\frac{3}{2}+\frac{3}{4}a=\frac{1}{4}a-\frac{1}{2}$	23) $3.7b+7=8.1b-19.4$	24) $\frac{1}{8}(5y+64)=\frac{1}{4}(20+2y)$

25) CHALLENGE: Find the value of a for which the equation is an identity.

$$10x-35+3ax=5ax-7a$$

26) A certain golf course charges green fees (the cost to play a round of golf) of $40 for members and $50 for non-members. If the annual membership fee is $300, how many rounds of golf would one need to play in a year to make getting a membership worthwhile financially?

27) Company A charges $30 a day to rent a car, plus $0.08 per mile. Company B charges $25 a day plus $0.10 per mile for the same car. How many miles would a renter need to drive in one day for Company A to be the less expensive choice?

<u>Answers to Sec. 3.4 Practice Problems</u>

1. $x = 9$
2. $m = 23$
3. $t = -4$
4. $k = 1$
5. $y = -12$
6. $z = 16$
7. $a = -2$
8. $a = -2$
9. $y = 3$
10. $\frac{17}{13}$
11. $r = 5$
12. $j = -3$
13. No solution
14. No solution
15. All real numbers; identity
16. All real numbers; identity
17. $x = -33$
18. No solution
19. $w = -\frac{1}{2}$
20. No solution
21. $t = 0$
22. a = -4
23. $b = 6$
24. $y = -24$
25. $a = 5$
26. The membership will pay for itself after 30 rounds of golf. (Playing more than 30 rounds will make being a member cheaper than not being a member.)
27. At 251 miles, Company A becomes less expensive. (The two companies charge the same for 250 miles.)