

## AP Physics B Summer Packet

### Page 1: Simplifying Expressions

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

Example: Simplify.  $-(3x + 2y - 8) = -3x - 2y + 8$

Simplify.

1.  $-(x^2 - 2x + 5) =$  \_\_\_\_\_
2.  $-(3x - 4y + 7) =$  \_\_\_\_\_
3.  $-(2a + 3b + 4c) =$  \_\_\_\_\_
4.  $-(-3a + 2b - c) =$  \_\_\_\_\_
5.  $-(3x + 7) + 2 =$  \_\_\_\_\_
6.  $2 - (4x - 8) =$  \_\_\_\_\_
7.  $2y - (3y - 4) =$  \_\_\_\_\_
8.  $-4y - (3x - 7y) =$  \_\_\_\_\_
9.  $5y - (4x + 7y) - 2x =$  \_\_\_\_\_
10.  $3a - (2a + 4b) - 6b =$  \_\_\_\_\_

Example: Simplify.  $2\{3(-2) + 4\} + 5[x - 3] = 2\{3x - 6 + 4\} + 5x - 15$   
 $= 2\{3x - 2 + 5x - 15\}$   
 $= 2\{8x - 17\}$   
 $= 16x - 34$

11.  $3[4x - 7] + 5 =$  \_\_\_\_\_
12.  $8[2 - 3x] - 5 =$  \_\_\_\_\_
13.  $[4x - 3(x - 1) + 6] =$  \_\_\_\_\_
14.  $[6x - 2(3x - 6) + 8] =$  \_\_\_\_\_
15.  $2[3(2x - 1) + 7] =$  \_\_\_\_\_
16.  $-8[2(3x + 4) - 2x] =$  \_\_\_\_\_
17.  $[7(x - 3) + 4] - [6(3x - 2) + x] =$   
\_\_\_\_\_
18.  $[2(3x - 1) + 5] - [7(x + 4) - 8] =$   
\_\_\_\_\_
19.  $3\{[6(x - 4) + 2] - [3x + 2]\} =$   
\_\_\_\_\_
20.  $2\{[3(x - 6) + 1] - 4[3(x - 2) - 3]\} =$   
\_\_\_\_\_

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### Page 2: Adding and Subtracting Polynomials

Directions: All work must be shown for **every** problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

Perform the operations.

- $(12y^2 + 17y - 4) + (9y^2 - 13y + 3) =$
- $(2x^3 + 7x^2 + x) + (2x^2 - 4x - 12) =$
- $(-3m^2 + m) + (4m^2 + 6m) =$
- $(7z^3 + 4z - 1) + (2z^2 - 6z + 2) =$
- $(3a^2 + 2a - 2) - (a^2 - 3a + 7) =$
- $(5x^2 - 2x - 1) - (3x^2 - 5x + 7) =$
- $-(3z^2 + 4z) - (6z^2 - 2) =$
- $(6x^3 - 4x^2 + x - 9) - (3x^2 + 7x + 3) =$
- $(2x^2 + 1) + (x^2 - 2x + 1) =$
- $(-s^2 - 3) - (2s^2 + 10s) =$
- $(5 - 9a^3) + (4a^2 + 6a - 3) =$
- $(3x^2 - x) + 5x^3 + (-4x^3 + x^2 - 8) =$
- $-10(u + v) + 8(u - 1) - 3(u + 6) =$
- $7x - [2(x^2 - z) + 4x^2 - 7z] + 6z^2 =$
- Subtract  $t^4 - 3t^2 + 7$  from  $5t^3 - 9$ .
- Subtract  $y^5 - y^4$  from  $y^2 + 3y^4$ .
- Add  $4(m^2 + 2)$  to  $3m^2 + 7m$ .

## AP Physics B Summer Packet

### Pages 3 - 4: Factoring Polynomials

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

Examples. Factor completely.

a)  $4x^3 + 12x^2 - 8x = 4x(x^2 + 3x - 2)$

b)  $5x^3 - 3x^2 + 20x - 12 = x^2(5x - 3) + 4(5x - 3) = (5x - 3)(x^2 + 4)$

c)  $x^2 + 2x - 35 = (x + 7)(x - 5)$

d)  $3x^2 - 5x - 2 = (3x + 1)(x - 2)$

e)  $x^2 - 18x + 81 = (x - 9)^2$

f)  $4x^2 - 25y^2 = (2x + 5y)(2x - 5y)$

Factor.

1.  $x^2 - 6x - 16 =$  \_\_\_\_\_

2.  $4y^2 + 7y - 2 =$  \_\_\_\_\_

3.  $5a^3 - 25a^2 + 15a =$  \_\_\_\_\_

4.  $9x^2 - 16 =$  \_\_\_\_\_

5.  $x^2 - 64 =$  \_\_\_\_\_

6.  $a^2 + 12a + 27 =$  \_\_\_\_\_

7.  $6x^2 + 12x + 6 =$  \_\_\_\_\_

8.  $x^3 + 2x^2 - 5x - 10 =$  \_\_\_\_\_

9.  $x^2 - 10x + 21 =$  \_\_\_\_\_

10.  $12x^5 - 6x^3 + 3x^2 =$  \_\_\_\_\_

11.  $6y^2 - 54 =$  \_\_\_\_\_

12.  $4y^2 - 17y - 15 =$  \_\_\_\_\_

13.  $6x^2 - 7x + 2 =$  \_\_\_\_\_

14.  $5x^2 - 5 =$  \_\_\_\_\_

15.  $y^5 + 3y^3 + 4y^2 + 12 =$  \_\_\_\_\_

16.  $x^2 - 7x - 18 =$  \_\_\_\_\_

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### Pages 3 - 4: Factoring Polynomials

Directions: All work must be shown for **every** problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

17.  $x^2 - 8x + 16 =$  \_\_\_\_\_ 18.  $a^2 - 9a + 14 =$  \_\_\_\_\_

19.  $49x^2 - 1 =$  \_\_\_\_\_ 20.  $8x^4 - 4x^3 + 12x^2 =$  \_\_\_\_\_

21.  $y^2 + 10y + 25 =$  \_\_\_\_\_ 22.  $3a^2 + 12a - 3 =$  \_\_\_\_\_

23.  $x^4 - 81 =$  \_\_\_\_\_ 24.  $9y^2 - 12y + 4 =$  \_\_\_\_\_

25.  $a^2 + 11a + 30 =$  \_\_\_\_\_ 26.  $8t^2 + 2t - 3 =$  \_\_\_\_\_

27.  $75x^2 - 30x + 3 =$  \_\_\_\_\_ 28.  $3t^2 - 8t - 3 =$  \_\_\_\_\_

29.  $x^2 + 3x + 8x + 24 =$  \_\_\_\_\_ 30.  $y^2 - 22y + 121 =$  \_\_\_\_\_

31.  $x^2 - 2x - 3 =$  \_\_\_\_\_ 32.  $4x^2 - 24x + 36 =$  \_\_\_\_\_

33.  $y^2 - 6y + 5 =$  \_\_\_\_\_ 34.  $25t^2 - 4 =$  \_\_\_\_\_

35.  $14x^3 - 7x^2 + 21x =$  \_\_\_\_\_ 36.  $9x^2 + 42x + 49 =$  \_\_\_\_\_

37.  $9x^2 - 81 =$  \_\_\_\_\_ 38.  $12x^2 + 4x - 5 =$  \_\_\_\_\_

39.  $49a^2 - 28a + 4 =$  \_\_\_\_\_ 40.  $8x^2 - 29x - 12 =$  \_\_\_\_\_

## AP Physics B Summer Packet

### Page 5: Translate Phrases into Math Expressions

Directions: \*All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page. \*OK to show no work on this page.

Translate the following phrases into mathematical expressions.

1. The sum of a number and ten. 1. \_\_\_\_\_
2. Eighteen more than a number. 2. \_\_\_\_\_
3. Five less than a number. 3. \_\_\_\_\_
4. The product of a number and three. 4. \_\_\_\_\_
5. The difference of a number and seven. 5. \_\_\_\_\_
6. The difference of seven and a number. 6. \_\_\_\_\_
7. Two more than a number. 7. \_\_\_\_\_
8. Sixteen less than twice a number. 8. \_\_\_\_\_
9. Five times the sum of a number and four. 9. \_\_\_\_\_
10. Three times the difference of a number and one. 10. \_\_\_\_\_
11. The quotient of a number and six. 11. \_\_\_\_\_
12. Two-thirds of a number. 12. \_\_\_\_\_
13. Eight more than a twice a number. 13. \_\_\_\_\_
14. The difference of a number and eight, divided by ten. 14. \_\_\_\_\_
15. Three more than the sum of a number and four. 15. \_\_\_\_\_
16. Double the difference of a number and seven. 16. \_\_\_\_\_
17. Nine less than the product of a number and two. 17. \_\_\_\_\_
18. The quotient of two and three more than a number. 18. \_\_\_\_\_
19. The product of triple a number and five. 19. \_\_\_\_\_
20. Sixteen less than the sum of three and a number. 20. \_\_\_\_\_

## AP Physics B Summer Packet

### Pages 6 – 7: Solving Equations

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

Solve.

1.  $x + 37 = 98$  \_\_\_\_\_ 2.  $y - 53 = 141$  \_\_\_\_\_ 3.  $59 + a = -123$  \_\_\_\_\_

4.  $-72 + t = -40$  \_\_\_\_\_ 5.  $-55 = x + 32$  \_\_\_\_\_ 6.  $a + \frac{5}{6} = -\frac{1}{2}$  \_\_\_\_\_

7.  $\frac{3}{4} + x = \frac{7}{8}$  \_\_\_\_\_ 8.  $y - 3\frac{1}{2} = -2\frac{2}{3}$  \_\_\_\_\_ 9.  $48x = -192$  \_\_\_\_\_

10.  $-25a = -200$  \_\_\_\_\_ 11.  $-15y = 96$  \_\_\_\_\_ 12.  $-\frac{1}{3}x = 48$  \_\_\_\_\_

13.  $\frac{3}{2}r = -\frac{4}{5}$  \_\_\_\_\_ 14.  $x - 56 = -42$  \_\_\_\_\_ 15.  $15 - y = 33$  \_\_\_\_\_

16.  $51 - x = -133$  \_\_\_\_\_ 17.  $-31t = -93$  \_\_\_\_\_ 18.  $-53 + a = 65$  \_\_\_\_\_

19.  $-\frac{5}{3}b = -\frac{1}{6}$  \_\_\_\_\_ 20.  $58x = -145$  \_\_\_\_\_ 21.  $-89 = -27 - a$  \_\_\_\_\_

22.  $\frac{x}{4} = -45$  \_\_\_\_\_ 23.  $\frac{r}{-3} = \frac{1}{3}$  \_\_\_\_\_ 24.  $\frac{11}{2}y = -3\frac{2}{3}$  \_\_\_\_\_

25.  $t + \frac{5}{8} = -\frac{3}{4}$  \_\_\_\_\_ 26.  $\frac{b}{-5} = 11$  \_\_\_\_\_ 27.  $-\frac{7}{8}t = -\frac{7}{8}$  \_\_\_\_\_

28.  $3x + 5x = 48$  \_\_\_\_\_ 29.  $18x - 12x = -96$  \_\_\_\_\_

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### Pages 6 – 7: Solving Equations

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

30.  $3y - 13y = 50$   
\_\_\_\_\_

31.  $9t - 16t = -49$   
\_\_\_\_\_

32.  $5a - 4 = 26$   
\_\_\_\_\_

33.  $8r + 16 = -48$   
\_\_\_\_\_

34.  $-10x - 41 = 69$   
\_\_\_\_\_

35.  $11b = 45 - 4b$   
\_\_\_\_\_

36.  $9z + \frac{1}{2}z = 38$   
\_\_\_\_\_

37.  $x + 58 = 135$   
\_\_\_\_\_

38.  $62y = -558$   
\_\_\_\_\_

39.  $3a + 4a - 3 = 11$   
\_\_\_\_\_

40.  $6x + 5 - 2x = -19$   
\_\_\_\_\_

41.  $9r + 3r - 5 = 25$   
\_\_\_\_\_

42.  $3x + 2 = 2x - 6$   
\_\_\_\_\_

43.  $5z - 4 = 4z - 3$   
\_\_\_\_\_

44.  $4y + 2y - 7 = 3y + 11$   
\_\_\_\_\_

45.  $3t - 5 = 7t + t - 15$   
\_\_\_\_\_

46.  $6x + 5x - 4 = 2x - 8$   
\_\_\_\_\_

47.  $\frac{1}{2}x + \frac{1}{3}x = \frac{1}{6}x - 5$   
\_\_\_\_\_

48.  $\frac{2}{3}y - \frac{5}{4}y + 8 = -\frac{11}{12}y - 4$  \_\_\_\_\_

49.  $\frac{z}{-5} = -15$  \_\_\_\_\_

50.  $\frac{t}{2} = -33$  \_\_\_\_\_

51.  $\frac{h}{13} = 0$  \_\_\_\_\_

52.  $-2y + 7 = 7$  \_\_\_\_\_

53.  $5x - 4 = 4x - 4$  \_\_\_\_\_

54.  $-3462a = 0$  \_\_\_\_\_

## AP Physics B Summer Packet

### Page 8: Solving Formulas

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

Example: Solve for  $a$ .

$$\begin{aligned} P &= 2a + 3b + 4c \\ P - 3b - 4c &= 2a \\ \frac{P - 3b - 4c}{2} &= a \end{aligned}$$

Solve for the given letter.

1.  $A = p + prt$  for  $r$  \_\_\_\_\_

2.  $A = p + prt$  for  $t$  \_\_\_\_\_

3.  $V = lwh$  for  $l$  \_\_\_\_\_

4.  $V = lwh$  for  $h$  \_\_\_\_\_

5.  $A = \frac{1}{2}d_1d_2$  for  $d_1$  \_\_\_\_\_

6.  $A = \frac{1}{2}d_1d_2$  for  $d_2$  \_\_\_\_\_

7.  $y = mx + b$  for  $m$  \_\_\_\_\_

8.  $y = mx + b$  for  $b$  \_\_\_\_\_

9.  $p = \frac{100a}{t}$  for  $a$  \_\_\_\_\_

10.  $y = \frac{kx}{z}$  for  $x$  \_\_\_\_\_

11.  $A = 2\pi r$  for  $\pi$  \_\_\_\_\_

12.  $V = \pi r^2 h$  for  $h$  \_\_\_\_\_



## AP Physics B Summer Packet

### Page 9: Using the Quadratic Formula

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

Example: Solve  $3x^2 - 5x + 1 = 0$  using the quadratic formula.

$$3x^2 - 5x + 1 = 0$$

$$a = 3 \quad b = -5 \quad c = 1$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(3)(1)}}{2(3)}$$

$$= \frac{5 \pm \sqrt{25 - 12}}{6} = \frac{5 \pm \sqrt{13}}{6}$$

$$\left[ \begin{array}{l} \text{Quadratic formula:} \\ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \end{array} \right]$$

Solve.

1.  $x^2 - 3x = 4$  \_\_\_\_\_

2.  $y^2 - 6y = -8$  \_\_\_\_\_

3.  $x^2 = 10x - 25$  \_\_\_\_\_

4.  $2y^2 - 7y - 15 = 0$  \_\_\_\_\_

5.  $x^2 - 36 = 0$  \_\_\_\_\_

6.  $y^2 - 49 = 0$  \_\_\_\_\_

7.  $x^2 - 3x - 3 = 0$  \_\_\_\_\_

8.  $x^2 - 5x - 7 = 0$  \_\_\_\_\_

9.  $y^2 - 8y + 11 = 0$  \_\_\_\_\_

10.  $y^2 + 7y - 1 = 0$  \_\_\_\_\_

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### Page 10: The Pythagorean Theorem

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

***If  $c$  is the measure of the hypotenuse of a right triangle, find each missing measure. Round answers to the nearest hundredth.***

1.  $a = 3, b = 4, c = \underline{\hspace{2cm}}$

2.  $a = 6, c = 10, b = \underline{\hspace{2cm}}$

3.  $b = 12, c = 13, a = \underline{\hspace{2cm}}$

4.  $a = 6, c = 12, b = \underline{\hspace{2cm}}$

5.  $a = 8, b = 6, c = \underline{\hspace{2cm}}$

6.  $a = 5, c = 13, b = \underline{\hspace{2cm}}$

7.  $b = 0.8, c = 1.0, a = \underline{\hspace{2cm}}$

8.  $a = 11, b = 4, c = \underline{\hspace{2cm}}$

9.  $a = \sqrt{12}, b = 6, c = \underline{\hspace{2cm}}$

10.  $b = 11, c = \sqrt{289}, a = \underline{\hspace{2cm}}$

11.  $a = 19, b = \sqrt{39}, c = \underline{\hspace{2cm}}$

12.  $a = \sqrt{6}, b = \sqrt{19}, c = \underline{\hspace{2cm}}$

***Determine whether the following side measures would form right triangles. Explain why or why not.***

13. 20, 21, 29

14. 15, 30, 34

15. 9,  $\sqrt{40}$ , 11

16. 21, 72, 75

# AP Physics B Summer Packet

## Page 11: Right Triangle Trig

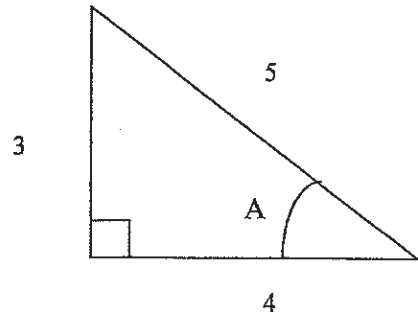
Directions: All work must be shown for **every** problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

1. Answer the following for the triangle to the right:

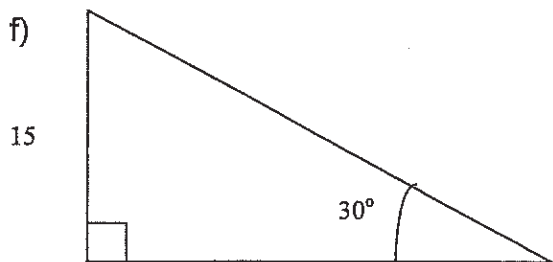
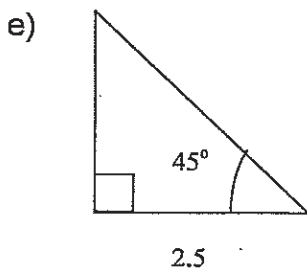
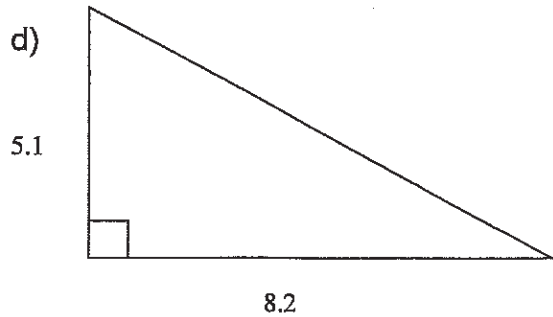
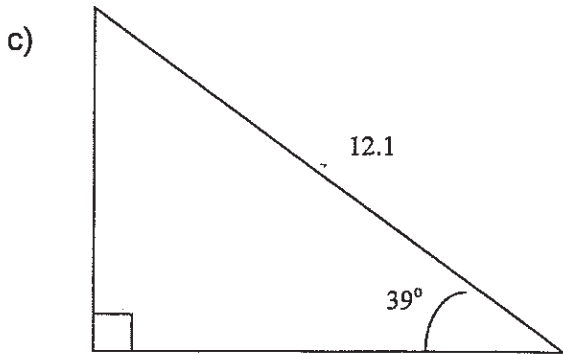
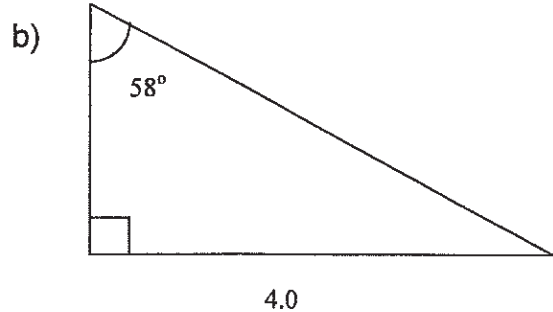
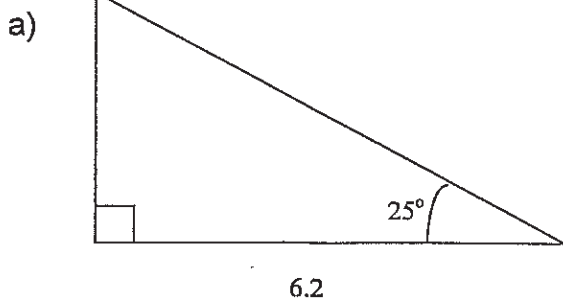
a)  $\cos A =$  \_\_\_\_\_

b)  $\sin A =$  \_\_\_\_\_

c)  $\tan A =$  \_\_\_\_\_



2. Solve for all sides and angles in the following right triangles (*NOT* drawn to scale).



3. Find the value of

a)  $\tan 28^\circ =$  \_\_\_\_\_

b)  $\sin 86^\circ =$  \_\_\_\_\_

c)  $\cos 5^\circ =$  \_\_\_\_\_

4. Find the value of  $\theta$  if

a)  $\tan \theta = 9.5143$

b)  $\sin \theta = .4540$

c)  $\cos \theta = .8192$

## AP Physics B Summer Packet

### Page 12: Motion Problems

Directions: All work must be shown for every problem on a separate page. The final answer should be the only thing written on this page. Staple all work to this page.

*(Note: You must know how to write a correct algebraic equation for each of the problems below. If you do not write a correct algebraic equation for any of the Word Problems given to you on your Test you will not get credit for your problem even if you have the correct answer!)*

**The formula to remember when doing *Motion Problems* is:**

$$R \cdot T = D$$

**Rate • Time = Distance**

*A simple example is:*

**If a person travels at the rate of 45 miles per hour for 2 hours the distance traveled is 60 miles.**

$$45 \text{ mph} \cdot 2 \text{ hrs} = 90 \text{ miles}$$

$$R \cdot T = D$$

1. One car traveling at 30 mph and another car traveling at 40 mph left from the same place at the same time and traveled in opposite directions. How long will it take before the cars are 630 miles apart?
2. Two people started from the same point at the same time and traveled in opposite directions. One traveled at 60 mph and the other at 50 mph. How long will it take before the two people are 440 miles apart?
3. Two jets took off from an airport at the same time using parallel runways. One flew east at 220 mph and the other flew west at 450 mph. How long will it take before the planes are 2010 miles apart?
4. Two trucks started traveling from the same place at 9:00 A.M. One truck traveled north going 45 mph and the other traveled south going 50 mph. What time will it be when the trucks are 380 miles apart?
5. Two trains began their trip from the same station at 8:00 A.M. One train traveled north at the rate of 44 mph and the other traveled south at the rate of 46 mph. What time will it be when the trains are 390 miles apart?
6. An airplane left Miami at the same time another left Santiago, Chile. The two planes flew toward each other at rates of 625 mph and 575 mph. If Miami and Santiago are 4200 miles apart, how long will it take until the planes pass each other?
7. Miami and Orlando are 210 miles apart. A truck traveled from Miami toward Orlando at the rate of 48 mph. Another truck traveled from Orlando toward Miami at the rate of 42 mph. Both trucks started traveling at the same time. How many miles did each travel before they met?
8. At 11 A.M. two trucks start traveling toward each other at average rates of 45 and 53 mph. At the beginning of their trip they were 588 miles apart. What time will it be when they pass each other?
9. Two train stations are 1000 miles apart. Two trains leave each of these stations at the same time and travel toward each other. One of the trains averages 63 mph and the other averages 57 mph. How long will it take until they pass each other?
10. Two planes started at the same time from the same airport and flew in opposite directions. One of the planes flew 70 miles per hour faster than the other. In 5 hours, the planes were 3850 miles apart. Find the rate of each plane.
11. Two buses started from the same depot at the same time and traveled in opposite directions. After traveling 4 hours, they were 480 miles apart. The rate of the fast bus exceeded the rate of the slow bus by 10 mph. Find the rate of each bus.