

Name: \_\_\_\_\_

Heatherwood Mathletes

Heatherwood Math Olympics 2004-2005: Test 3 for Blue/Red Belts

April 7, 2005

**A. Algebra: Solve each equation for  $x$  (3 points each)**

$$4x - 8 = 16$$

$$7x + 9 = 11x - 7$$

$$\frac{3}{4}x - 2 = 4$$

$$7(x - 4) = 3(x + 4)$$

$$\frac{1}{3}(3x + 6) = \frac{1}{2}(4x - 4)$$

$$4(x + 2) + \frac{1}{2}(2x + 4) = 25$$

**B. Algebra Word Problems: Write each as an equation, then solve (4 points each)**

**B.1.** When a number is multiplied by 8, it gives the same result as when 45 is added to three times the number.

B.1a. Write the algebraic equation for this problem.

B.1b. Now solve it for the number.

**B.2.** Find three consecutive odd numbers such that 3 times the smallest added to two times the largest is equal to 63.

B.2a. Write the algebraic equation for this problem.

B.3b. Now solve it for the three numbers.

**B.3 Simultaneous equation word problem.** A number is larger than another by 10 and their sum is 58.

B.3a. Write the two algebraic equations for this problem.

B.3b. Now solve them for the two numbers.

**B.4 Geometry word problem.** A rectangle has sides of length 4 in and 2 in. What is the length of the sides of an equilateral triangle whose perimeter is the same as the rectangle?

B.4a. Write this as an algebraic equation, where the length of a side of the triangle is  $x$ .

B.4b. Now solve this equation for  $x$ .

**B.5 Geometry word problem.** A right triangle has sides of length 3 in, 4 in, and 5 in. A rectangle has the same area as the triangle, and one of its sides has a length of  $\frac{1}{2}$  in. What is the length of the other side of the rectangle?

B.5a. Write this as an algebraic equation, where the length of the unknown side of the rectangle is  $x$ .

B.5b. Now solve this equation for  $x$ .

**C. Speed (4 points each)**

Fill in the missing information in the following table.

Distance	Time	Speed
200 km	5 h	
	4 h	20 km/h
225 km		50 km/h

**D. Graphing**

**D.1** Consider the horizontal line with a y-intercept of 1. (2 points each)

D.1a What is the equation for this line?

D.1b What's its slope?

**D.2** Write down the y-intercepts of the following equations. (2 points each)

$$y = x + 3$$

$$y = 2x - \frac{1}{2}$$

$$4x + y = -3$$

$$-2x - 3y = 6$$

**D.3** Write down the slopes of the following equations. (2 points each)

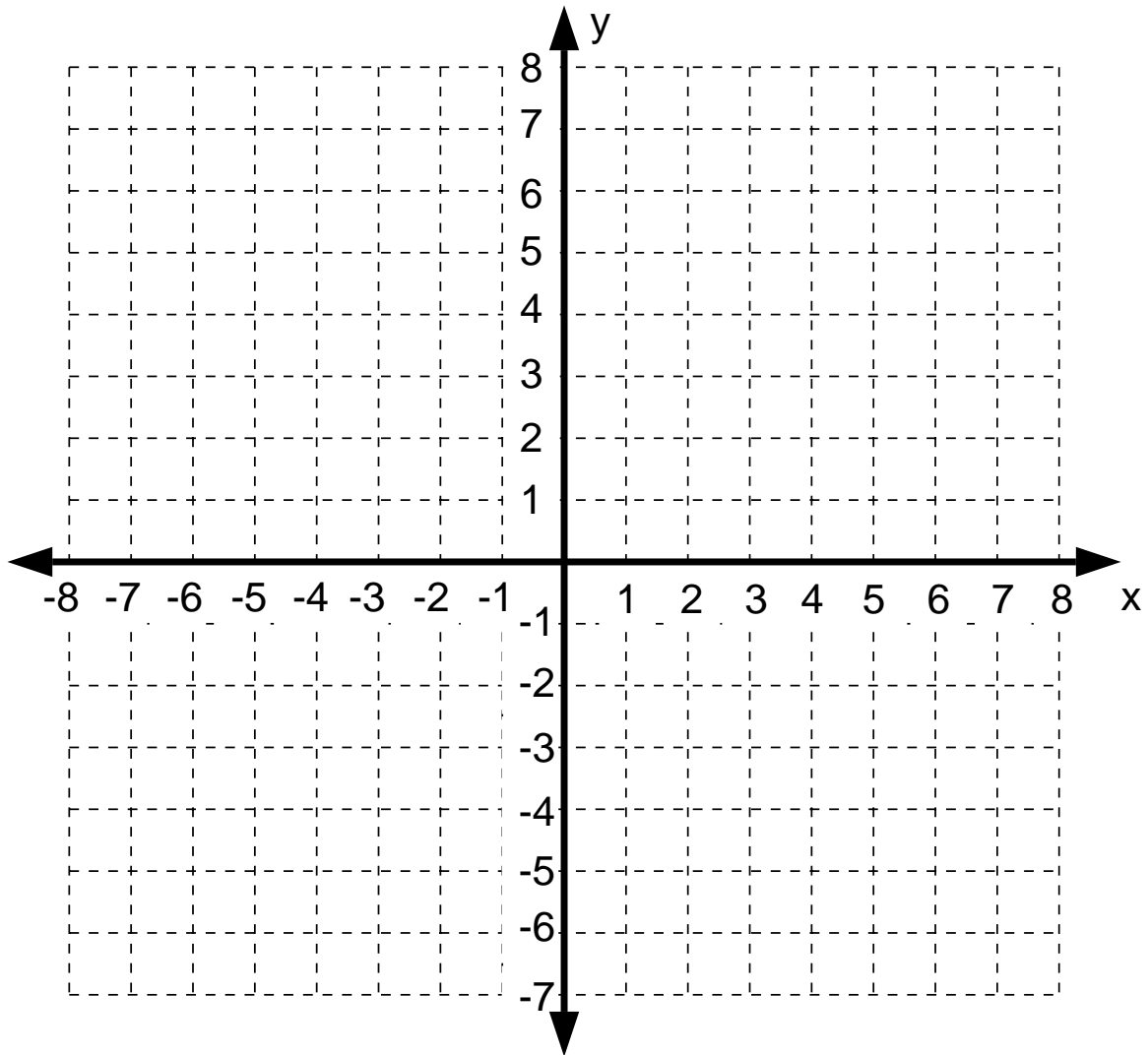
$$y = x + 3$$

$$y = 2x - \frac{1}{2}$$

$$4x + y = -3$$

$$-2x - 3y = 6$$

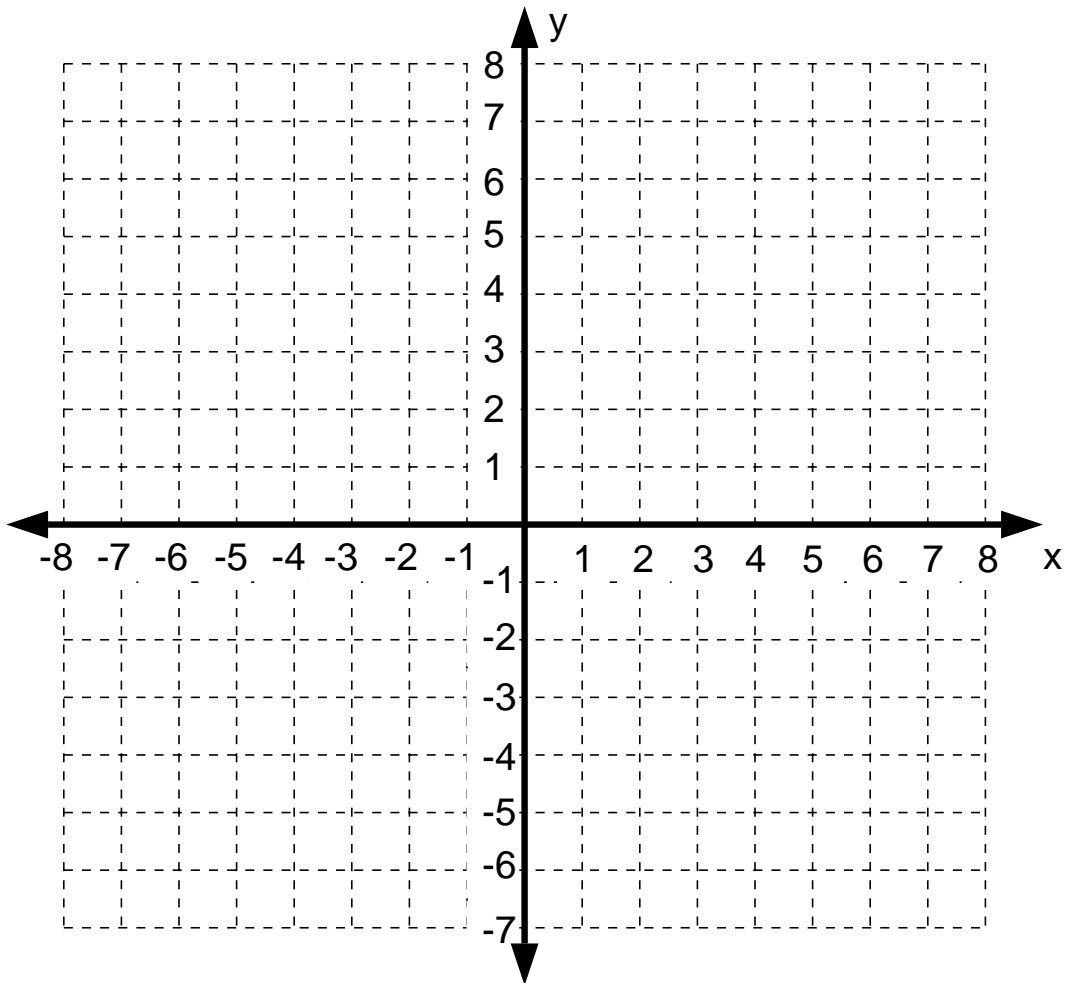
D.4 Consider the equation  $y = x - 1$ . Graph the equation on the following graph. (4 points)



**D.5** Solve the following simultaneous equations algebraically first, and then graphically on the following graph. (6 points)

$$y = x + 1$$

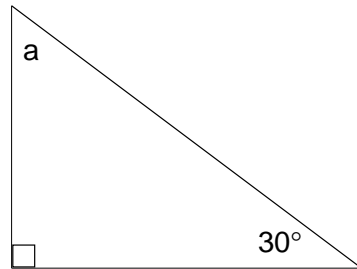
$$y = -x + 1$$



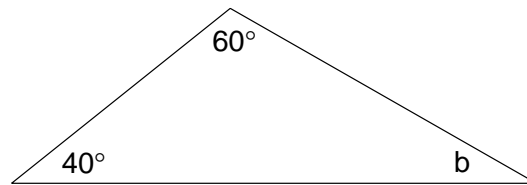
## E. Geometry

E.1 Find the indicated angles in the following triangles. (3 points each)

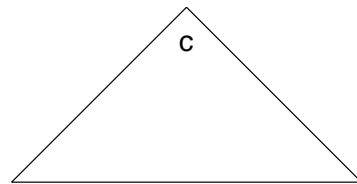
(a) This is a right triangle. Find angle a.



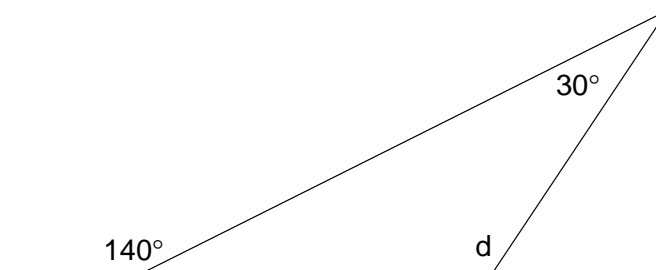
(b) This is a scalene triangle. Find angle b.



(c) This is an equilateral triangle. Find angle c.

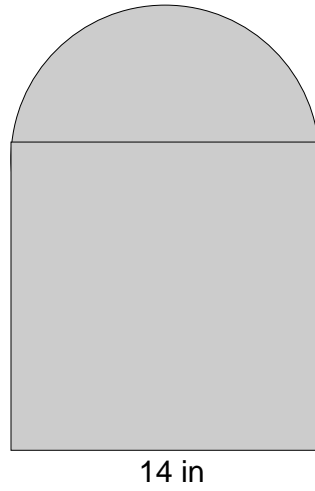


(d) This is a scalene triangle Find angle d.



E.2 Find the shaded area in each figure. (4 points each)

(a) Find the area of the figure composed of a square with sides of 14 in, with a semi-circle sitting so it fits perfectly on top. Let  $\pi = 22/7$ .



(b) Find the area of the following icecream cone. Let  $\pi = 3.14$ .

