

Name: _____

Heatherwood Mathletes

Heatherwood Math Olympics 2005-2006: Brown Belt Test 1
December 6, 2006

1. (24 pts) Solve the following linear equations for x :

(a) $4(3 - x) + 3(5x + 2) = 51$

(b) $\frac{2}{x} = 3$

(c) $x - 1 = \frac{x}{4} + 5$

(d) $\frac{1}{x} + \frac{2}{x} = 12$

(e) $\frac{2}{x} + \frac{3(x-1)}{5x} = 2$

(f) $\frac{1}{3x-2} + \frac{8}{6x-4} = \frac{1}{2}$

(g) $ax - by = 3 - 2x$

(h) $a = \frac{1+x}{1-x}$

2. (4 pts) Find the Highest Common Factor (HCF) and Least Common Multiple (LCM) of the following three expressions: $3abc, 21ab^2, 7ab^3c^2$.

3. (5 pts) When 24 is subtracted from $3/8$ of a number, the result is $1/3$ of the number. What's the number?

(a) Letting x be the number, write the algebraic equation for x .

(b) Solve the equation and find the number.

4. (24 pts) Solve the following quadratic equations for x by FACTORING. (Don't use completing the square or the quadratic formula here.)

(a) $x^2 - 2x - 15 = 0$

(b) $x^2 - 9 = 0$

(c) $x^2 + 2x = 0$

(d) $\frac{x^2}{3} = x$

(e) $\frac{4x}{3} = \frac{32}{x}$

(f) $\frac{8}{x-5} = x+2$

5. (10 pts) Solve the following quadratic equations for x by COMPLETING THE SQUARE.

(a) $x^2 + 4x - 6 = 0$

(b) $x^2 - 8x - 5 = 0$

6. (8 pts) Solve the following quadratic equations for x by using the QUADRATIC FORMULA.

(a) $2x^2 - 7x + 6 = 0$

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

7. (5 pts) The length of a rectangle exceeds its width by 3 in, and its area is 10 in^2 .
- (a) Let x be the width of the rectangle. Write a quadratic equation for its area. Draw a diagram labeling the width and length in terms of x .
- (b) Solve the equation to find the rectangle's width and length.
8. (12 pts) Solve each of the following inequalities, and draw the answer on a number line. In each case, state whether the answer is a ray, a line segment, a line, or the null set.
- (a) $3(2x - 1) > 2(x + 1) + 7$.
- (b) $4 - (x - 1) \geq -(5 - 3x)$.
- (c) $2x > 4$ and $3x - 2 \leq 13$.
- (d) $x > 4$ and $\frac{-x}{2} > 10$.