

Algebra Test - Novice Solutions
1999 MAO National Convention

1. A $1-2x \leq 5x-2$ $-7x \leq -3$ $x \geq 3/7$	11. B $15 \cdot 2^4 \cdot 4^3 \cdot 8^2 \cdot 1 = 2^4 \cdot 2^6 \cdot 2^6 = 2^{16}$
2. A $3x+2(3x-1)=16$ $x=2, y=5; 4-25=-21$	12. D $2 \cdot 4 - 10 + N = 8$ $-2 + N = 8, N = 10$
3. C $3x+7x < 60$ $x < 6$, Since #s are integers, $x=5$ so greatest possible value of smaller is 15	13. E undefined
4. A $5 = 4a+2b+c$ $3 = a+b+c$ $5 = a-b+c$ $a=1, b=-1, c=3$	14. B $x^2+2xy+y^2 = a^2$ $b^2+2xy = a^2$ $b^2+80 = a^2$ $b = \sqrt{a^2-80}$
5. B $b^2(b-3) - 4(b-3)$ $(b-3)(b^2-4)$ $(b-3)(b+2)(b-2)$	15. C $(\frac{1}{P} + \frac{1}{m} = \frac{1}{D})$ PMD $mD + DP = mP$ $PD - PM = -mD$ $P(D-m) = -mD$ $P = \frac{-mD}{D-m}$ or $\frac{DM}{m-D}$
6. E $5+5b-4=4a+5$ $5b+4=4a+5$ $5b-1=4a$ $\frac{5b-1}{4} = a$	16. E $3^1 \cdot 3^k = k \cdot 3^{k+1}$ $3^{k+1} = k \cdot 3^{k+1}, k=1$
7. D $-\frac{8}{3} = \frac{k+3}{-6-3}, k=21$	17. B $\frac{2^{12}}{x^4 y^{30}} \cdot \frac{x^5}{3^8 y^2} = \frac{x^{17}}{y^{38}}, 43$
8. A. T C. F $g(z)=1$ C B. T $1^2 \neq 1$ D. T	18. C $\frac{\sqrt{3} \cdot \sqrt{6}}{2 \sqrt{3}} = \frac{3\sqrt{2}}{2\sqrt{3}}, \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{10}}{10}$
9. A midpt $(-\frac{1}{2}, 1), m = -3/8$ $3x+8y = 13/2, 6x+16y=13$ y intercept $(0, 13/16)$	19. C $2x-3=7$ or $2x-3=-7$ $x=5, -2$ $(\frac{1}{5}) + (\frac{1}{-2})^2 = \frac{1}{25} + \frac{1}{4} = \frac{29}{100}$
10. C Let $a = \frac{1}{x}, b = \frac{1}{y}$ $a-3b = 3/4$ $2a+5b = 2$ $b = \frac{1}{22},$ so $y = 22$ $a = \frac{39}{44},$ so $x = \frac{44}{39}$ $76 \cdot \frac{44}{39} - 2 \cdot 22 = 44$	20. D $f(x) = x^2 - 3x + 5$ $f(x-1) = (x-1)^2 - 3(x-1) + 5$ $= x^2 - 5x + 9$ $x^2 - 3x + 5 - x^2 + 5x - 9$ $2x - 4$
	21. C $\frac{20\sqrt{2} - 21\sqrt{2} + 6\sqrt{2}}{3\sqrt{2} - 3\sqrt{6}} = \frac{5\sqrt{2}}{3\sqrt{2} - 3\sqrt{6}}$ $\frac{5\sqrt{2} \cdot (3\sqrt{2} + 3\sqrt{6})}{(3\sqrt{2} - 3\sqrt{6})(3\sqrt{2} + 3\sqrt{6})} = \frac{30 + 30\sqrt{3}}{18 - 54} = \frac{30 + 30\sqrt{3}}{-36} = \frac{5 + 5\sqrt{3}}{-6}$

22. A $3x-2y=2$ $4x+3y=20$ $x=2, y=4$ $x+y=6$
23. B $12x^2 + 11(x-10)$
24. E $5 = 1-2x$ $-2 = x$
25. C $(-7, 7), (-5, 2) m = -5/2$ $5x+2y = -21$ $g(0) = -21/2$
26. B $f(z)=1, g(1)=-2$
27. B $y=kx, \frac{y}{x}=k$ $\frac{9}{5} = \frac{45}{x}, x=25$
28. D $(2x-1-2x-1)(2x-1+2x+1)$ $(-2)(4x) = -8x$
29. B mean is $\frac{27}{3}$ or 9 add $g = -9$ mult $g = -\frac{1}{9}$
30. C TB (1) $x^2+y^2=34$ $(x+y)^2=64$ $x^2+2xy+y^2=64$ $2xy+34=64$ $2xy=30$ $xy=15$ ② $\frac{2}{3} = \frac{x+2-(2x-1)}{-1-2}$ $x=5$ $3a - \{2a+4b\} - \{-3a+1+2a-b\}$ $3a - \{2a+4b+3a-1-2a+b\}$ $3a - \{3a+5b-1\}$ $3a - 3a - 5b + 1 - 5b + 1$ $-10b + 2$ TB (3) $x+2+x+1=1$ $x=-1$