Algebra 2 – Warm Up – Mar 12, 2014 Name: ___________________________

1. Bone loss for astronauts may be prevented with an apparatus that rotates to simulate gravity. In the formula $N = \frac{a^{0.5}}{2\pi r^{0.5}}$, N is the rate of rotation in revolutions per second, a is the simulated acceleration in m/s^2, and r is the radius of the apparatus in meters. How fast would an apparatus with the following radii have to rotate to simulate the acceleration of 9.8 m/s^2 that is due to Earth's gravity?

a. r = 1.7 m

b. r = 3.6 m

c. r = 5.2 m

d. Reasoning Would an apparatus with radius 0.8 m need to spin faster or slower than the one in part (a)?

Solving Equations with Radicals

Two Important Properties of Exponents:

1. If $a = b$ then $a^m = b^m$

   Example:

   Given $x = 4$
   then $x^2 = 4^2$

2. Exponents can eliminate radicals

$$\left(\sqrt[m]{b}\right)^m = b$$

3. Examples:

$$\left(\sqrt{6}\right)^2 = 6$$

$$\left(\sqrt[3]{-11}\right)^3 = -11$$

$$\left(\sqrt[4]{7}\right)^4 = 7$$

Steps for Solving Radical Equations:

Step 1. Isolate the radical expression on one side of the equation.

Step 2. Raise both sides of the equation to the power that will eliminate the radical.

Step 3. Solve by known techniques.

Step 4. CHECK the final answer(s). Sometimes this method finds **EXTRANEOUS, or *FALSE*, solutions.** Disregard any answers that do not make the original equation a true statement.

Examples:

1.

$$4+\sqrt[3]{x}=7$$
$$-4 \qquad -4$$
$$\sqrt[3]{x}=3$$
$$\left(\sqrt[3]{x}\right)^3=(3)^3$$
$$x=27$$

Check:

$$4+\sqrt[3]{27}=7$$
$$4+3=7$$
$$7=7 \checkmark$$

2.

$$\sqrt{23-2x}-3=0$$
$$+3 \quad +3$$
$$\sqrt{23-2x}=3$$
$$\left(\sqrt{23-2x}\right)^2=(3)^2$$
$$23-2x=9$$
$$-23 \qquad -23$$
$$-2x=-14$$
$$x=7$$

Check:

$$\sqrt{23-2\cdot 7}-3=0$$
$$\sqrt{23-14}-3=0$$
$$\sqrt{9}-3=0$$
$$3-3=0$$
$$0=0 \checkmark$$

Try These:

1) $\sqrt[3]{x+1}=6$

2) $\sqrt{2x+9}=7$

3) $\sqrt{2x-5}=\sqrt{x}$

4) $2\sqrt[3]{x}=\sqrt[3]{3x-5}$

5) $\sqrt{2x+5}=x+1$

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6-5 Practice

Form G

Solve.

1. $5\sqrt{x}+2=12$

2. $3\sqrt{x}-8=7$

3. $\sqrt{4x}+2=8$

4. $\sqrt{2x-5}=7$

5. $\sqrt{3x-3}-6=0$

6. $\sqrt{5-2x}+5=12$

7. $\sqrt{3x-2}-7=0$

8. $\sqrt{4x+3}+2=5$

9. $\sqrt{33-3x}=3$

10. $\sqrt[3]{2x+1}=3$

11. $\sqrt[3]{13x-1}-4=0$

12. $\sqrt[3]{2x-4}=-2$

Solve.

13. $(x-2)^{\frac{1}{3}}=5$

14. $(2x+1)^{\frac{1}{3}}=-3$

15. $2x^{\frac{3}{4}}=16$

16. $2x^{\frac{1}{3}}-2=0$

17. $x^{\frac{1}{2}}-5=0$

18. $4x^{\frac{3}{2}}-5=103$

19. $(7x-3)^{\frac{1}{2}}=5$

20. $4x^{\frac{1}{2}}-5=27$

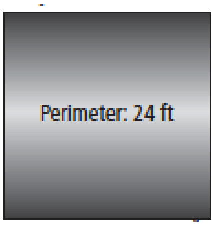
21. $x^{\frac{1}{6}}-2=0$

22. $(2x+1)^{\frac{1}{3}}=1$

23. $(x-2)^{\frac{2}{3}}-4=5$

24. $3x^{\frac{4}{3}}+5=53$

25. The formula $P=4\sqrt{A}$ relates the perimeter P, in units, of a square to its area A, in square units. What is the area of the square window shown below?



26. The formula $A=6V^{\frac{2}{3}}$ relates the surface area A, in square units, of a cube to the volume V, in cubic units. What is the volume of a cube with surface area 486 in.^{2}?

27. A mound of sand at a rock-crushing plant is growing over time. The equation $t=\sqrt[3]{5V-1}$ gives the time, t, in hours, at which the mound has volume V, in cubic meters. When is the volume equal to 549 m^3?

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6-5 Practice (continued)

Form G

28. City officials conclude they should budget *s* million dollars for a new library building if the population increases by *p* thousand people in a ten-year census. The formula $s = 2 + \frac{1}{3}(p+1)^{\frac{2}{5}}$ expresses the relationship between population and library budget for the city. How much can the population increase without the city going over budget if they have $5 million for a new library building?

Solve. Check for extraneous solutions.

29. $\sqrt{x+1} = x-1$

30. $\sqrt{2x+1} = -3$

31. $(x+7)^{\frac{1}{2}} = x-5$

32. $(2x-4)^{\frac{1}{2}} = x-2$

33. $\sqrt{x+2} = x-18$

34. $\sqrt{x} + 6 = x$

35. $(2x+1)^{\frac{1}{2}} = -5$

36. $(x+2)^{\frac{1}{2}} = 10-x$

37. $\sqrt{x+1} = x+1$

38. $\sqrt{9-3x} = 3-x$

39. $\sqrt[3]{2x-4} = -2$

40. $2\sqrt[5]{5x+2} - 1 = 3$

41. $\sqrt{4x+2} = \sqrt{3x+4}$

42. $\sqrt{7x-6} - \sqrt{5x+2} = 0$

43. $2(x-1)^{\frac{1}{2}} = (26+x)^{\frac{1}{2}}$

44. $(x-1)^{\frac{1}{2}} - (2x+1)^{\frac{1}{4}} = 0$

45. $\sqrt{2x} - \sqrt{x+1} = 1$

46. $\sqrt{7x-1} = \sqrt{5x+5}$

47. $(7-x)^{\frac{1}{2}} = (2x+13)^{\frac{1}{2}}$

48. $(x-7)^{\frac{1}{2}} = (x+5)^{\frac{1}{4}}$

49. $\sqrt{x+9} - \sqrt{x} = 1$

50. $\sqrt[3]{8x} - \sqrt[3]{6x-2} = 0$

51. A clothing manufacturer uses the model $a = \sqrt{f+4} - \sqrt{36-f}$ to estimate the amount of fabric to order from a mill. In the formula, *a* is the number of apparel items (in hundreds) and *f* is the number of units of fabric needed. If 400 apparel items will be manufactured, how many units of fabric should be ordered?

52. What are the lengths of the sides of the trapezoid shown at the right if the perimeter of the trapezoid is 17 cm?