SOLVE BY TAKING SQUARE ROOTS

CASE I : there is no linear (x^1) term

Ex $x^2 - 11 = 29$

$x^2 = 40$ — ISOLATE x^2

$x = \pm\sqrt{40}$ — TAKE SQUARE ROOT BOTH SIDES

$x = \pm\sqrt{4 \cdot 10}$ — SIMPLIFY RADICAL USING PRODUCT PROPERTY

$x = \pm 2\sqrt{10}$ — INDICATE 2 SOLUTIONS

Ex $3x^2 - 5 = 25$

$3x^2 = 30$ — ISOLATE ~~RADICA~~ x^2

$x^2 = 10$ — take square roots

$x = \pm\sqrt{10}$ — cannot simplify $\sqrt{10}$

Ex $4x^2 - 9 = x^2 + 3$ — combine like terms; separate x^2 and constant on opposite sides of equal sign

$3x^2 - 9 = 3$

$3x^2 = 12$

$x^2 = 4$ — take square roots

$x = \pm 2$ — answers are rational ∴ there is no radical sign remaining

Case 2: Use when there is a binomial²

Ex $(x-7)^2 = 8$ — Binomial is isolated so square root both sides; put ± outside radical

$x - 7 = \pm\sqrt{8}$

$x = 7 \pm \sqrt{8}$ — isolate x; watch positioning of rational term

$x = 7 \pm \sqrt{4 \cdot 2}$

$x = 7 \pm 2\sqrt{2}$ — simplify radical, if possible

Ex $2(2x+3)^2 = 8$ — Isolate binomial (divide by 2)

$(2x+3)^2 = 4$ — square root both sides; indicate 2 solutions

$2x+3 = \pm 2$

Since answers will be Rational, write two distinct equations and solve

$2x+3 = 2$ | $2x+3 = -2$

$2x = -1$ | $2x = -5$

$x = -\frac{1}{2}$ | $x = -\frac{5}{2}$

Name: Period: Date:

Practice Worksheet: Square Root Method

Solve the quadratic equation using the square root method. Show all work.

1 $x^2 - 25 = 25$

$x^2 = 50$

$x = \pm\sqrt{50}$

$x = \pm\sqrt{25 \cdot 2}$

$x = \pm 5\sqrt{2}$

i.e. $x = 5\sqrt{2}$ and $x = -5\sqrt{2}$

2] $20 - x^2 = -29$

$-x^2 = -49$

$x^2 = 49$

$x = 7$ and $x = -7$

3] $2x^2 - 1 = 7$

$2x^2 = 8$

$x^2 = 4$

$x = 2$ and $x = -2$

4] $\frac{x^2}{25} - 6 = -2$

$\frac{x^2}{25} = 4$

$x^2 = 100$

$x = 10$ and $x = -10$

5] $\frac{2}{3}x^2 - 4 = 12$

$\frac{2}{3}x^2 = 16$

$x^2 = 16\left(\frac{3}{2}\right)$

$x^2 = 24$

$x = \pm\sqrt{24}$

$x = \pm\sqrt{4 \cdot 6}$

$x = \pm 2\sqrt{3}$

6] $4(x^2 - 8) = 84$

$(x^2 - 8) = 21$

$x^2 - 8 = 21$

$x^2 = 29$

$x = \pm\sqrt{29}$

7] $4(x - 1)^2 = 8$

$(x-1)^2 = 2$

$x - 1 = \pm\sqrt{2}$

$x = 1 \pm \sqrt{2}$

this means

$x = 1 + \sqrt{2}$ AND $x = 1 - \sqrt{2}$

8] $(x + 2)^2 - 6 = 30$

$(x+2)^2 = 36$

$x + 2 = \pm 6$

$x + 2 = 6$ $\quad$ $x + 2 = -6$

$x = 4$ AND $x = -8$

9] $7(x - 4)^2 - 18 = 10$

$7(x-4)^2 = 28$

$(x-4)^2 = 4$

$x - 4 = \pm 2$

$x - 4 = 2$ $\quad$ $x - 4 = -2$

$x = 6$ AND $x = 2$

10] $\frac{1}{2}(x-4)^2+2=10$

$\frac{1}{2}(x-4)^2=8$

$(x-4)^2=16$

$x-4=\pm 4$

$x-4=4$ $\quad$ $x-4=-4$

$x=8$ AND $x=0$

11] $(4x-5)^2=64$

$4x-5=\pm 8$

$4x-5=8$ AND $4x-5=-8$

$4x=13$ $\quad$ $4x=-3$

$x=\frac{13}{4}$ AND $x=-\frac{3}{4}$

12] $(3x+6)^2-18=0$

$(3x+6)^2=18$

$3x+6=\pm\sqrt{18}$

$3x=-6\pm\sqrt{18}$

$x=\frac{-6\pm\sqrt{18}}{3}$

$x=\frac{-6\pm\sqrt{9\cdot 2}}{3}$

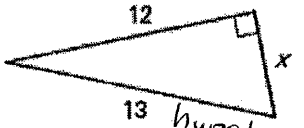
$x=\frac{-6\pm 3\sqrt{2}}{3}$

$x=-2\pm\sqrt{2}$

Remember $a^2+b^2=c^2$

Find the length of the missing side of the right triangle. Show all work.

13]



hypotenuse $=c$

$x^2+12^2=13^2$

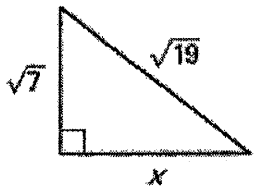
$x^2+144=169$

$x^2=25$

$x=\pm 5$

IN THIS CASE, $x=-5$ MAKES NO SENSE AS YOU CANNOT HAVE NEGATIVE LENGTH. THE ONLY SOLUTION IS $x=5$

14]



$(\sqrt{7})^2+x^2=(\sqrt{19})^2$

$7+x^2=19$

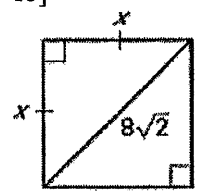
$x^2=12$

$x=\pm\sqrt{12}$

$x=\pm\sqrt{4\cdot 3}$

$x=2\sqrt{3}$ Choose only positive solution

15]



$x^2+x^2=(8\sqrt{2})^2$

$2x^2=(8\sqrt{2})(8\sqrt{2})$

$2x^2=64(2)$

$2x^2=128$

$x^2=64$

$x=8$

From 1970 to 1990, the average cost of a new car, C, can be approximated by the model $C=30.5t^2+4192$ where t is the number of years since 1970.

16] What was the average cost of a car in 1987? Show all work.

$t=17$ (since 1970)

$C=30.5(17)^2+4192$

$C=30.5(289)+4192$

$C=8814.5+4192$

$C\approx \$13,006.50$ was the average cost in 1987

17] During which year was the average cost of a new car $7,242? Show all work.

$7242=30.5t^2+4192$

$3050=30.5t^2$

$100=t^2$

$t=\pm 10$

$t=10$ ∴ the year was 1980

Choose only positive solution since # years cannot be negative