(Section 5-3) Name:

Solve the following **QUADRATIC EQUATIONS** using the **SQUARE ROOT METHOD**:

1. $w^2 - 16 = 0$

$+16 \quad +16$

$\sqrt{w^2} = \sqrt{16}$

$w = \pm 4$

2. $2y^2 - 48 = 0$

$+48 \quad +48$

$\frac{2y^2}{2} = \frac{48}{2}$

$\sqrt{y^2} = \sqrt{24}$

$y = \pm\sqrt{24}$

$y = \pm 2\sqrt{6}$

$\sqrt{24}$, $4 \cdot 6$, $2 \cdot 2 \cdot 3$

3. $\frac{4m^2}{4} = \frac{-196}{4}$

$\sqrt{m^2} = \sqrt{-49}$

$M = \pm 7i$

4. $\sqrt{(b-2)^2} = \sqrt{36}$

$b - 2 = \pm 6$

$b - 2 = 6$ OR $b - 2 = -6$

$+2 \quad +2 \qquad +2 \quad +2$

$b = 8$ OR $b = -4$

5. $3(x+1)^2 + 2 = 14$

$-2 \quad -2$

$\frac{3(x+1)^2}{3} = \frac{12}{3}$

$\sqrt{(x+1)^2} = \sqrt{4}$

$x + 1 = 2$ OR $x + 1 = -2$

$-1 \quad -1 \qquad -1 \quad -1$

$x = 1$ OR $x = -3$

6. $4\left(\frac{1}{2}a + 1\right)^2 - 5 = 31$

$+5 \quad +5$

$\frac{4\left(\frac{1}{2}a+1\right)^2}{4} = \frac{36}{4}$

$\sqrt{\left(\frac{1}{2}a+1\right)^2} = \sqrt{9}$

$\frac{1}{2}a + 1 = 3$ OR $\frac{1}{2}a + 1 = -3$

$-1 \quad -1 \qquad -1 \quad -1$

$2 \cdot \frac{1}{2}a = 2 \cdot 2$ $\quad a = 4$

$2 \cdot \frac{1}{2}a = -4 \cdot 2$ OR $a = -8$

Solve the following **QUADRATIC EQUATIONS** by **FACTORING & ZERO PRODUCT PROPERTY**:

1. $w^2 - 2w = -24$

$+24 \quad +24$

$w^2 - 2w + 24 = 0$

$(w-6)(w+4) = 0$

$w - 6 = 0$ $\quad w + 4 = 0$

$+6 \quad +6 \qquad -4 \quad -4$

$w = 6$ OR $w = -4$

2. $t^2 = 8t + 20$

$-8t \quad -8t \quad -20$

-20

$t^2 - 8t - 20 = 0$

$(t-10)(t+2) = 0$

$t - 10 = 0$ $\quad t + 2 = 0$

$+10 \quad +10 \qquad -2 \quad -2$

$t = 10$ OR $t = -2$

3. $r^2 + 5 = 6r$

$-6r \quad -6r$

$r^2 - 6r + 5 = 0$

$(r-5)(r-1) = 0$

$r - 5 = 0$ $\quad r - 1 = 0$

$+5 \quad +5 \qquad +1 \quad +1$

$r = 5$ OR $r = 1$

4. $x^2 + 2x - 20 = 7x + 4$

$-7x \quad -4 \quad -7x \quad -4$

$x^2 - 5x - 24 = 0$

$(x-8)(x+3) = 0$

$x - 8 = 0$ $\quad x + 3 = 0$

$+8 \quad +8 \qquad -3 \quad -3$

$x = 8$ OR $x = -3$

5. $(x+2)(x-4) = 4 + 2x$

$x^2 - 4x + 2x - 8 = 4 + 2x$

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

$x^2 - 4x - 12 = 0$

$(x-6)(x+2) = 0$

$x - 6 = 0$ $\quad x + 2 = 0$

$+6 \quad +6 \qquad -2 \quad -2$

$x = 6$ OR $x = -2$

6. $2x^2 - 5 = 3x^2 + 11 - 10x$

$-2x^2 \quad +5 \quad -2x^2 \quad +5$

$0 = x^2 - 10x + 16$

$0 = (x-8)(x-2)$

$x - 8 = 0$ $\quad x - 2 = 0$

$+8 \quad +8 \qquad +2 \quad +2$

$x = 8$ OR $x = 2$

(Continued) Solve the following **QUADRATIC EQUATIONS** by **FACTORING & ZERO PRODUCT PROPERTY**:

7. $2x^2 + 7x - 15 = 0$

$2x - 3$ $\quad$ $2x + 10$

$(2x-3)(x+5) = 0$

$2x - 3 = 0$ $\quad$ $x + 5 = 0$

$+3\ +3$ $\quad$ $-5\ -5$

$\frac{2x}{2} = \frac{3}{2}$ $\quad$ $x = -5$

$x = 3/2$ OR -5

-30: $1,-30$; $-1,30$; $2,-15$; $-2,15$; $3,-10$; $-3,10$

8. $4p^2 - 10 = 3p$

$-3p \quad -3p$

$4p^2 - 3p - 10 = 0$

$4p + 5$ $\quad$ $4p - 8$

$(4p+5)(p-2) = 0$

$4p + 5 = 0$ $\quad$ $p - 2 = 0$

$-5\ -5$ $\quad$ $+2\ +2$

$\frac{4p}{4} = \frac{-5}{4}$ $\quad$ $p = 2$

$p = -\frac{5}{4}$ OR 2

-40: $1,-40$; $-1,40$; $2,-20$; $-2,20$; $4,-10$; $-4,10$; $5,-8$; $-5,8$

9. $3x^2 + 2x - 12 = 3x^2 + 6x$

$-3x^2 \quad -3x^2$

$2x - 12 = 6x$

$-2x \quad -2x$

$\frac{-12}{4} = \frac{4x}{4}$

$-3 = x$

10. $x^3 - 12x^2 + 32x = 0$

$x(x^2 - 12x + 32) = 0$

$x(x-8)(x-4) = 0$

$x = 0$ $\quad$ $x - 8 = 0$ $\quad$ $x - 4 = 0$

$+8\ +8$ $\quad$ $+4\ +4$

$x = 0$ OR $x = 8$ OR $x = 4$

11. $x^2 - 4 = 0$

$(x+2)(x-2) = 0$

$x + 2 = 0$ $\quad$ $x - 2 = 0$

$-2\ -2$ $\quad$ $+2\ +2$

$x = -2$ OR $x = 2$

12. $2a^2 + 5a + 8 = 0$ $\quad$ 17

$2a + 1$ $\quad$ $2a + 16$

$(2a+1)(a+8) = 0$

$2a + 1 = 0$ $\quad$ $a + 8 = 0$

$-1\ -1$ $\quad$ $-8\ -8$

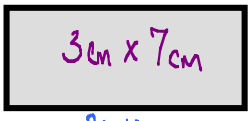
$\frac{2a}{2} = \frac{-1}{2}$ $\quad$ $a = -8$

$a = -1/2$ OR -8

16: $1,16$; $-1,-16$; $2,8$; $-2,-8$; $4,4$; $-4,-4$

Solve the applications that of **QUADRATIC EQUATIONS**:

1. The length of a rectangle is 1 cm more than twice its width. If the area of the rectangle is 21cm^2 then what are the dimensions?



$A = l \cdot w$

$21 = (2x+1)(x)$

$21 = 2x^2 + x$

$-21 \quad -21$

$0 = 2x^2 + x - 21$

$2x - 6$ $\quad$ $2x + 7$

$0 = (x-3)(2x+7)$

$x - 3 = 0$ $\quad$ $2x + 7 = 0$

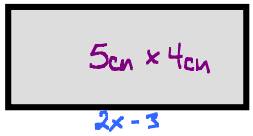
$+3\ +3$ $\quad$ $-7\ -7$

$x = 3$ $\quad$ $\frac{2x}{2} = \frac{-7}{2}$

$x = 3$ $\quad$ $x = -3.5$ EXTRANEOUS

-42: $1,-42$; $-1,42$; $2,-21$; $-2,21$; $3,-14$; $-3,14$; $6,-7$; $-6,7$

2. The length of a rectangle is 3 cm less than twice its width. If the area of the rectangle is 20cm^2 then what are the dimensions?



$A = l \cdot w$

$20 = (2x-3)x$

$20 = 2x^2 - 3x$

$-20 \quad -20$

$0 = 2x^2 - 3x - 20$

$2x + 5$ $\quad$ $2x - 8$

$0 = (2x+5)(x-4)$

$2x + 5 = 0$ $\quad$ $x - 4 = 0$

$-5\ -5$ $\quad$ $+4\ +4$

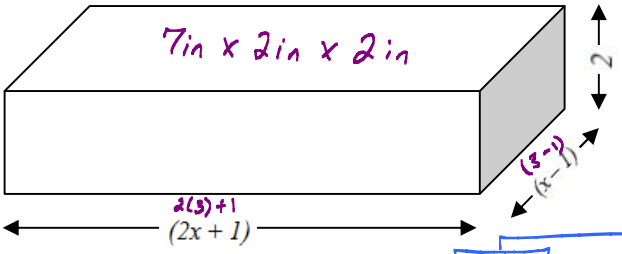
$\frac{2x}{2} = \frac{-5}{2}$ $\quad$ $x = 4$

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

EXTRANEOUS

-40: $1,-40$; $-1,40$; $2,-20$; $-2,20$; $4,-10$; $-4,10$; $5,-8$; $-5,8$

3. The volume of the prism is 28 cubic inches. What is the length of each side?



$V = l \cdot w \cdot h$

$28 = (2x+1)(x-1)(2)$

$28 = (2x^2 - 2x + 1x - 1)(2)$

$28 = 4x^2 - 4x + 2x - 2$

$28 = 4x^2 - 2x - 2$

$-28 \quad -28$

$0 = 4x^2 - 2x - 30$

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

$0 = 2(2x+5)(x-3)$

$2x + 5 = 0$ $\quad$ $x - 3 = 0$

$-5\ -5$ $\quad$ $+3\ +3$

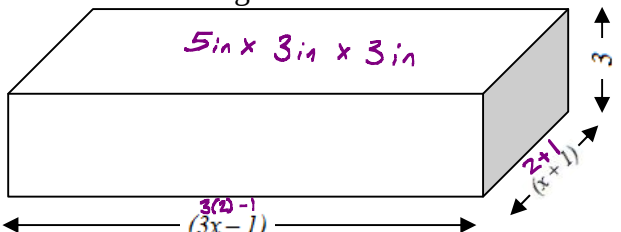
$\frac{2x}{2} = \frac{-5}{2}$ $\quad$ $x = 3$

$x = -5/2$

EXTRANEOUS

-30: $1,-30$; $-1,30$; $2,-15$; $-2,15$; $3,-10$; $-3,10$; $5,-6$; $-5,6$

4. The volume of the prism is 45 cubic inches. What is the length of each side?



$V = l \cdot w \cdot h$

$45 = (3x-1)(x+1)(3)$

$45 = (3x^2 + 3x - 1x - 1)(3)$

$45 = 9x^2 + 9x - 3x - 3$

$-45 \quad -45$

$0 = 9x^2 + 6x - 48$

$0 = 3(3x^2 + 2x - 16)$

$0 = 3(3x^2 + 2x - 16)$

$3x - 6$ $\quad$ $3x + 8$

$0 = 3(x-2)(3x+8)$

$x - 2 = 0$ $\quad$ $3x + 8 = 0$

$+2\ +2$ $\quad$ $-8\ -8$

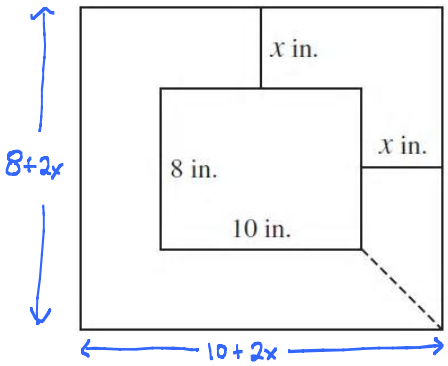
$x = 2$ $\quad$ $\frac{3x}{3} = \frac{-8}{3}$

$x = -8/3$

EXTRANEOUS

-48: $1,-48$; $-1,48$; $2,-24$; $-2,24$; $3,-16$; $-3,16$; $4,-12$; $-4,12$; $6,-8$; $-6,8$

5. A picture frame is shown at the right. If the entire area of the frame and the picture totals 120 square inches find the width of the frame.



$A = l\,w$

$120 = (8+2x)(10+2x)$

$120 = 80 + 16x + 20x + 4x^2$

$120 = 4x^2 + 36x + 80$

$-120 \quad -120$

$0 = 4x^2 + 36x - 40$

$0 = 4(x^2 + 9x - 10)$

$0 = 4(x+10)(x-1)$

$x+10=0 \quad x-1=0$

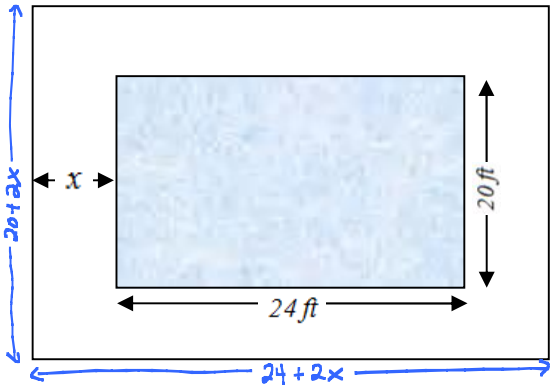
$-10 \quad -10 \quad +1 \quad +1$

$x = -10 \quad x = 1$

EXTRANEOUS

$x = 1$ INCH

6. A below ground swimming pool is to be constructed in the park. The pool is in the shape of a rectangle with the dimensions of 20' by 24'. A uniform width sidewalk is to be made around the pool. If the contractor says that he has enough concrete to create 300 ft^2 of sidewalk. What is the maximum width of the sidewalk around the pool?



AREA OF SIDE WALK = AREA OF OUTER RECTANGLE − AREA OF INNER RECTANGLE

$300 = (24+2x)(20+2x) - (24)(20)$

$300 = 480 + 48x + 40x + 4x^2 - 480$

$300 = 4x^2 + 88x$

$0 = 4x^2 + 88x - 300$

$0 = 4(x^2 + 22x - 75)$

$0 = 4(x+25)(x-3)$

$x+25=0 \quad x-3=0$

$-25 \quad -25 \quad +3 \quad +3$

$x = -25 \quad x = 3$

EXTRANEOUS

$x = 3$ ft

7. The product of two consecutive positive integers is 132. Write an equation to model the situation and find the two integers.

1ST INTEGER = x

2ND INTEGER = $x+1$

$(x)\cdot(x+1) = 132$

$x^2 + x = 132$

$-132 \quad -132$

$x^2 + x - 132 = 0$

$(x+12)(x-11) = 0$

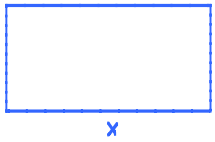
$x = -12 \quad x = 11$

EXTRANEOUS

1ST INTEGER = 11

2ND INTEGER = 12

8. The perimeter of a rectangle is 42 cm and the area is 80 cm^2. Write an equation to model the situation and find the dimensions of the rectangle.



$P = 2x + 2y$

$42 = 2x + 2y$

$-2x \quad -2x$

$\frac{42-2x}{2} = \frac{2y}{2}$

$21 - x = y$

$A = x \cdot y$

$80 = x \cdot (21-x)$

$80 = 21x - x^2$

$-21x \quad -21x \quad +x^2$

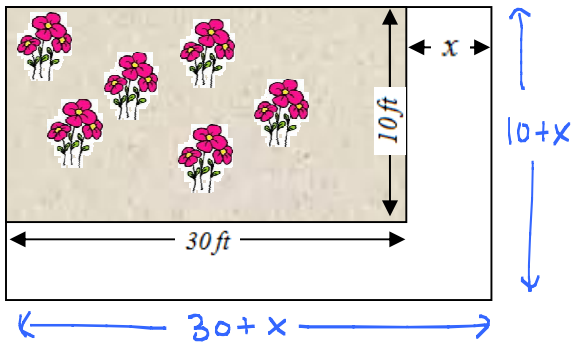
$x^2 - 21x + 80 = 0$

$(x-5)(x-16) = 0$

$x = 5$ OR $x = 16$

5 cm x 16 cm

9. A park is putting in a sidewalk of uniform width to go around two sides of a rectangular garden that is 10 feet by 30 feet. The contractor has enough concrete for 176 ft^2. What is the maximum width of such a sidewalk?



SIDEWALK AREA = AREA OF OUTER RECTANGLE − AREA OF INNER RECTANGLE

$176 = (30+x)(10+x) - (30)(10)$

$176 = 300 + 30x + 10x + x^2 - 300$

$176 = x^2 + 40x - 176$

-176

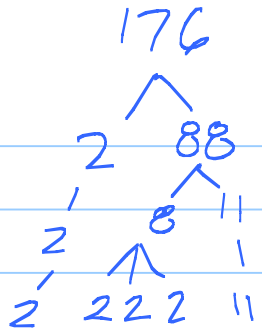
$0 = x^2 + 40x - 176$

$0 = (x+44)(x-4)$

$x = -44 \quad x = 4$

EXTRANEOUS

4 ft



88
2
176