

Radical Equations

Solve each equation. Remember to check for extraneous solutions. Determine restrictions on variables.

1) $(\sqrt{x})^2 = (10)^2$
 $x = 100$
 check:
 $\sqrt{100} = 10$
 $10 = 10$
 ✓

2) $(10)^2 = \left(\sqrt{\frac{m}{10}}\right)^2$
 $100 = \frac{m}{10}$
 $1000 = m$
 $m = 1000$
 check:
 $10 = \sqrt{\frac{1000}{10}}$
 $10 = \sqrt{100}$
 $10 = 10$
 ✓

3) $(\sqrt{v-4})^2 = (3)^2$
 $v-4 = 9$
 $v = 13$
 check:
 $\sqrt{13-4} = 3$
 $\sqrt{9} = 3$
 $3 = 3$
 ✓

4) $(6)^2 = (\sqrt{v-2})^2$
 $36 = v-2$
 $38 = v$
 check:
 $6 = \sqrt{38-2}$
 $6 = \sqrt{36}$
 $6 = 6$
 ✓

5) $(\sqrt{n})^2 = (9)^2$
 $n = 81$
 check:
 $\sqrt{81} = 9$
 $9 = 9$
 ✓

6) $(5)^2 = (\sqrt{x+3})^2$
 $25 = x+3$
 $22 = x$
 check:
 $5 = \sqrt{22+3}$
 $5 = \sqrt{25}$
 $5 = 5$
 ✓

7) $(2)^2 = (\sqrt{4b})^2$
 $4 = 4b$
 $1 = b$
 $b = 1$
 check:
 $2 = \sqrt{4(1)}$
 $2 = \sqrt{4}$
 $2 = 2$
 ✓

8) $(\sqrt{n+9})^2 = (1)^2$
 $n+9 = 1$
 $n = -8$
 check:
 $\sqrt{-8+9} = 1$
 $\sqrt{1} = 1$
 $1 = 1$
 ✓

* 9) $-8 + \sqrt{5a-5} = -3$
 $\sqrt{5a-5} = 5$
 $5a-5 = 25$
 $5a = 30$
 $a = 6$
 check:
 $-8 + \sqrt{5(6)-5} = -3$
 $-8 + \sqrt{30-5} = -3$
 $-8 + \sqrt{25} = -3$
 $-8 + 5 = -3$
 $-3 = -3$
 ✓

10) $10\sqrt{9x} = 60$
 $\sqrt{9x} = 6$
 $9x = 36$
 $x = 4$
 check:
 $10\sqrt{9(4)} = 60$
 $10\sqrt{36} = 60$
 $10 \cdot 6 = 60$
 $60 = 60$
 ✓

11) $(1)^2 = (\sqrt{x-5})^2$
 $1 = x-5$
 $6 = x$
 $x = 6$
 check:
 $1 = \sqrt{6-5}$
 $1 = \sqrt{1}$
 $1 = 1$
 ✓

12) $\frac{-10\sqrt{v-10}}{-10} = \frac{-60}{-10}$
 $\sqrt{v-10} = 6$
 $v-10 = 36$
 $v = 46$
 check:
 $\frac{-10\sqrt{46-10}}{-10} = \frac{-60}{-10}$
 $\frac{-10\sqrt{36}}{-10} = \frac{-60}{-10}$
 $\frac{-10 \cdot 6}{-10} = \frac{-60}{-10}$
 $\frac{-60}{-10} = \frac{-60}{-10}$
 ✓

* Turn over!

*13) $10 + \sqrt{10m-1} = 13$
 $(\sqrt{10m-1})^2 = 3^2$
 $10m-1 = 9+1$
 $10m = 10$
 $m = 1$

$10m-1 \geq 0$
 $10m \geq 1$
 $m \geq \frac{1}{10}$

check:
 $10 + \sqrt{10(1)} - 1 = 13$
 $10 + \sqrt{9} = 13$
 $10 + 3 = 13$
 $13 = 13$
 \checkmark

14) $\frac{-12}{-6} = \frac{-6\sqrt{b+4}}{-6}$
 $2 = \sqrt{b+4}$
 $4 = b+4-4$
 $0 = b$
 $b = 0$

$b+4 \geq 0$
 $b \geq -4$

check:
 $-12 = -6\sqrt{0+4}$
 $-12 = -6\sqrt{4}$
 $-12 = -6 \cdot 2$
 $-12 = -12$
 \checkmark

*15) $\sqrt{v+3} - 1 = 7+1$
 $(\sqrt{v+3})^2 = (8)^2$
 $v+3 = 64-3$
 $v = 61$

$v+3 \geq 0$
 $v \geq -3$

check:
 $\sqrt{61+3} - 1 = 7$
 $\sqrt{64} - 1 = 7$
 $8 - 1 = 7$
 $7 = 7$
 \checkmark

16) $\frac{90}{9} = \frac{9\sqrt{25v}}{9}$
 $(10)^2 = (\sqrt{25v})^2$
 $\frac{100}{25} = \frac{25v}{25}$
 $4 = v$
 $v = 4$

$v \geq 0$

check:
 $90 = 9\sqrt{25(4)}$
 $90 = 9\sqrt{100}$
 $90 = 9(10)$
 $90 = 90$
 \checkmark

17) $\sqrt{\frac{x}{10}} = \sqrt{3x-58}$
 $(\sqrt{\frac{x}{10}})^2 = (\sqrt{3x-58})^2$
 $(\frac{x}{10})^{x10} = (3x-58)^{x10}$

$\frac{x}{10} \geq 0$ $3x-58 \geq 0$
 $x \geq 0$ $3x \geq 58$
 $x \geq \frac{58}{3}$
 $x \geq 19.\bar{3}$

$x = 30x - 580$
 $-30x \quad -30x$
 $-29x = -580$
 $\frac{-29x}{-29} = \frac{-580}{-29}$
 $x = 20$

check:
 $\sqrt{\frac{20}{10}} = \sqrt{3(20)-58}$
 $\sqrt{2} = \sqrt{60-58}$
 $\sqrt{2} = \sqrt{2}$
 \checkmark

18) $(\sqrt{3n+12})^2 = (\sqrt{n+8})^2$
 $\frac{3n+12}{-n} = \frac{n+8}{-n}$
 $2n = -4$
 $n = -2$

$3n+12 \geq 0$ $n+8 \geq 0$
 $3n \geq -12$ $n \geq -8$
 $n \geq -4$

check:
 $\sqrt{3(-2)+12} = \sqrt{(-2)+8}$
 $\sqrt{-6+12} = \sqrt{6}$
 $\sqrt{6} = \sqrt{6}$
 \checkmark

19) $\sqrt{72-x} = \sqrt{\frac{x}{5}}$
 $(\sqrt{72-x})^2 = (\sqrt{\frac{x}{5}})^2$
 $(72-x)^{x5} = (\frac{x}{5})^{x5}$
 $360-5x = x$
 $+5x \quad +5x$
 $360 = 6x$
 $\frac{360}{6} = \frac{6x}{6}$
 $60 = x$
 $x = 60$

$72-x \geq 0$ $\frac{x}{5} \geq 0$
 $-x \geq -72$ $x \geq 0$
 $x \leq 72$
 $0 \leq x \leq 72$

check:
 $\sqrt{72-60} = \sqrt{\frac{60}{5}}$
 $\sqrt{12} = \sqrt{12}$
 \checkmark

20) $\sqrt{x+3} = \sqrt{1-x}$
 $(\sqrt{x+3})^2 = (\sqrt{1-x})^2$
 $x+3 = 1-x$
 $+x \quad -3 \quad -3 \quad +x$
 $2x = -2$
 $\frac{2x}{2} = \frac{-2}{2}$
 $x = -1$

$x+3 \geq 0$ $1-x \geq 0$
 $x \geq -3$ $-x \geq -1$
 $x \leq 1$
 $-3 \leq x \leq 1$

check:
 $\sqrt{(-1)+3} = \sqrt{1-(-1)}$
 $\sqrt{2} = \sqrt{1+1}$
 $\sqrt{2} = \sqrt{2}$
 \checkmark