A.REI.A.2: Solving Radicals 1

1 The solution set for the equation $\sqrt{56-x}=x$ is
1) $\{-8,7\}$
2) $\{-7,8\}$
3) $\{7\}$
4) $\{\ \}$

2 What is the solution set of $x=\sqrt{3x+40}$?
1) $\{-5,8\}$
2) $\{8\}$
3) $\{-4,10\}$
4) $\{\ \}$

3 The solution set for the equation $\sqrt{3(x+6)}=x$ is
1) $\{6,-3\}$
2) $\{-6,3\}$
3) $\{6\}$
4) $\{-3\}$

4 What is the solution set for x in the equation below?

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

1) $\{1\}$
2) $\{0\}$
3) $\{-1,0\}$
4) $\{0,1\}$

5 The solution set of the equation $x-1=\sqrt{2x+6}$ is
1) $\{5,-1\}$
2) $\{5\}$
3) $\{-1\}$
4) $\{\ \}$

6 The solution set for the equation $x+1=\sqrt{4x+25}$ is
1) $\{\ \}$
2) $\{6\}$
3) $\{6,-4\}$
4) $\{-4\}$

7 The solution set for the equation $b=\sqrt{2b^2-64}$ is
1) $\{-8\}$
2) $\{8\}$
3) $\{\pm 8\}$
4) $\{\ \}$

8 The value(s) of x that satisfy $\sqrt{x^2-4x-5}=2x-10$ are
1) $\{5\}$
2) $\{7\}$
3) $\{5,7\}$
4) $\{3,5,7\}$

9 The solution set for the equation $\sqrt{x+14}-\sqrt{2x+5}=1$ is
1) $\{-6\}$
2) $\{2\}$
3) $\{18\}$
4) $\{2,22\}$

10 Jin solved the equation $\sqrt{4-x}=x+8$ by squaring both sides. What extraneous solution did he find?
1) -5
2) -12
3) 3
4) 4

11 Determine the solution of $\sqrt{3x+7}=x-1$ algebraically.

12 Solve algebraically for all values of x: $\sqrt{4x+1}=11-x$

13 Solve algebraically for all values of x: $\sqrt{x-5}+x=7$

14 Solve algebraically for all values of x: $\sqrt{x-4}+x=6$

15 Solve the equation $\sqrt{49-10x}+5=2x$ algebraically.

16 Solve algebraically for all values of x: $\sqrt{6-2x}+x=2(x+15)-9$

17 Algebraically solve for x: $2x=6+2\sqrt{x-1}$

18 Solve the given equation algebraically for all values of x. $3\sqrt{x}-2x=-5$

19 Solve the equation $\sqrt{2x-7}+x=5$ algebraically, and justify the solution set.

20 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s=\sqrt{t}-2t+6$, where t represents the time from its origin in hours. Algebraically determine the time when $s=0$. How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

21 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t=2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2. The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing. Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

22 The Beaufort Wind Scale was devised by British Rear Admiral Sir Francis Beaufort, in 1805 based upon observations of the effects of the wind. Beaufort numbers, B, are determined by the equation $B=1.69\sqrt{s+4.45}-3.49$, where s is the speed of the wind in mph, and B is rounded to the nearest integer from 0 to 12.

Beaufort Wind Scale	
Beaufort Number	**Force of Wind**
0	Calm
1	Light air
2	Light breeze
3	Gentle breeze
4	Moderate breeze
5	Fresh breeze
6	Steady breeze
7	Moderate gale
8	Fresh gale
9	Strong gale
10	Whole gale
11	Storm
12	Hurricane

Using the table above, classify the force of wind at a speed of 30 mph. Justify your answer. In 1946, the scale was extended to accommodate strong hurricanes. A strong hurricane received a B value of exactly 15. Algebraically determine the value of s, to the *nearest mph*. Any B values that round to 10 receive a Beaufort number of 10. Using technology, find an approximate range of wind speeds, to the *nearest mph*, associated with a Beaufort number of 10.

A.REI.A.2: Solving Radicals 1
Answer Section

1 ANS: 3

$\sqrt{56-x} = x$ -8 is extraneous.

$56 - x = x^2$

$0 = x^2 + x - 56$

$0 = (x+8)(x-7)$

$x = 7$

REF: 061605aii

2 ANS: 2

$x^2 = 3x + 40$. $x = -5$ is an extraneous solution.

$x^2 - 3x - 40 = 0$

$(x-8)(x+5) = 0$

$x = 8, -5$

REF: 012010aii

3 ANS: 3

$\sqrt{3x+18} = x$ -3 is extraneous.

$3x + 18 = x^2$

$x^2 - 3x - 18 = 0$

$(x-6)(x+3) = 0$

$x = 6, -3$

REF: 082315aii

4 ANS: 3

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

$x + 1 = x^2 + 2x + 1$

$0 = x^2 + x$

$0 = x(x+1)$

$x = -1, 0$

REF: 011802aii

5 ANS: 2

$(x-1)^2 = 2x+6$ -1 is extraneous.

$x^2 - 2x + 1 = 2x + 6$

$x^2 - 4x - 5 = 0$

$(x-5)(x+1) = 0$

$x = 5, -1$

REF: 082411aii

6 ANS: 2

$x + 1 = \sqrt{4x+25}$ $-4 + 1 < 0$

$x^2 + 2x + 1 = 4x + 25$

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

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

$x = 6, -4$

REF: 062408aii

7 ANS: 2

$b^2 = 2b^2 - 64$ -8 is extraneous.

$-b^2 = -64$

$b = \pm 8$

REF: 061919aii

8 ANS: 3

$x^2 - 4x - 5 = 4x^2 - 40x + 100$

$3x^2 - 36x + 105 = 0$

$x^2 - 12x + 35 = 0$

$(x-7)(x-5) = 0$

$x = 5, 7$

REF: 081807aii

9 ANS: 2

$\sqrt{x+14} = \sqrt{2x+5} + 1$ $\qquad$ $\sqrt{22+14} - \sqrt{2(22)+5} = 1$

$x + 14 = 2x + 5 + 2\sqrt{2x+5} + 1$ $\qquad$ $6 - 7 \neq 1$

$-x + 8 = 2\sqrt{2x+5}$

$x^2 - 16x + 64 = 8x + 20$

$x^2 - 24x + 44 = 0$

$(x-22)(x-2) = 0$

$x = 2, 22$

REF: 081704aii

10 ANS: 2

$\sqrt{4-x} = x + 8$ $\qquad$ $-12 + 8 = -4$

$4 - x = x^2 + 16x + 64$

$0 = x^2 + 17x + 60$

$x = (x+12)(x-5) + x = -12, 5$

REF: 012521aii

11 ANS:

$3x + 7 = x^2 - 2x + 1$ $\qquad$ -1 is extraneous.

$0 = x^2 - 5x - 6$

$0 = (x-6)(x+1)$

$x = 6, -1$

REF: 062326aii

12 ANS:

$\sqrt{4x+1} = 11 - x$ $\qquad$ 20 is extraneous.

$4x + 1 = 121 - 22x + x^2$

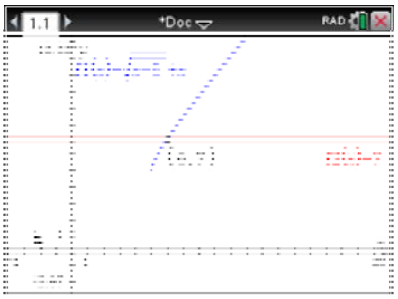
$0 = x^2 - 26x + 120$

$0 = (x-6)(x-20)$

$x = 6, 20$

REF: 082227aii

13 ANS:



$\sqrt{x-5} = -x+7$ $\sqrt{x-5} = -9+7 = -2$ is extraneous.

$$x-5 = x^2 - 14x + 49$$
$$0 = x^2 - 15x + 54$$
$$0 = (x-6)(x-9)$$
$$x = 6, 9$$

REF: spr1508aii

14 ANS:

$\sqrt{x-4} = -x+6$ $\sqrt{x-4} = -8+6 = -2$ is extraneous.

$$x-4 = x^2 - 12x + 36$$
$$0 = x^2 - 13x + 40$$
$$0 = (x-8)(x-5)$$
$$x = 5, 8$$

REF: 061730aii

15 ANS:

$\sqrt{49-10x} = 2x-5$ $-\frac{3}{2}$ is extraneous.

$$49-10x = 4x^2 - 20x + 25$$
$$0 = 4x^2 - 10x - 24$$
$$0 = 2x^2 - 5x - 12$$
$$0 = (2x+3)(x-4)$$
$$x = -\frac{3}{2}, 4$$

REF: 012333aii

16 ANS:

$\sqrt{6-2x}+x=2x+30-9$ $\sqrt{6-2(-29)} \neq -29+21$, so -29 is extraneous.

$\sqrt{6-2x}=x+21$ $\sqrt{64} \neq -8$

$6-2x=x^2+42x+441$

$x^2+44x+435=0$

$(x+29)(x+15)=0$

$x=-29,-15$

REF: 061833aii

17 ANS:

$2x-6=2\sqrt{x-1}$ 2 is extraneous.

$4x^2-24x+36=4(x-1)$

$x^2-6x+9=x-1$

$x^2-7x+10=0$

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

$x=2,5$

REF: 012434aii

18 ANS:

$3\sqrt{x}-2x=-5$ 1 is extraneous.

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

$9x=4x^2-20x+25$

$4x^2-29x+25=0$

$(4x-25)(x-1)=0$

$x=\frac{25}{4},1$

REF: 011936aii

19 ANS:

$\left(\sqrt{2x-7}\right)^2 = (5-x)^2$ $\sqrt{2(4)-7}+4=5$ $\sqrt{2(8)-7}+8=5$

$2x-7 = 25-10x+x^2$ $\sqrt{1}=1$ $\sqrt{9}\neq -3$

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

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

$x = 4, 8$

REF: 081635aii

20 ANS:

$0 = \sqrt{t}-2t+6$ $2\left(\frac{9}{4}\right)-6<0$, so $\frac{9}{4}$ is extraneous.

$2t-6 = \sqrt{t}$

$4t^2-24t+36 = t$

$4t^2-25t+36 = 0$

$(4t-9)(t-4) = 0$

$t = \frac{9}{4}, 4$

$(\sqrt{1}-2(1)+6)-(\sqrt{3}-2(3)+6) = 5-\sqrt{3} \approx 3.268$ 327 mph

REF: 011737aii

21 ANS:

$t = 2\pi\sqrt{\frac{67}{9.81}} \approx 16.4$ $9.6 = 2\pi\sqrt{\frac{L}{9.81}}$

$L \approx 22.9$

REF: 062234aii

22 ANS:

$B = 1.69\sqrt{30 + 4.45} - 3.49 \approx 6$, which is a steady breeze.

$$15 = 1.69\sqrt{s + 4.45} - 3.49$$
$$18.49 = 1.69\sqrt{s + 4.45}$$
$$\frac{18.49}{1.69} = \sqrt{s + 4.45}$$
$$\left(\frac{18.49}{1.69}\right)^2 = s + 4.45$$
$$s = \left(\frac{18.49}{1.69}\right)^2 - 4.45$$
$$s \approx 115$$

$$9.5 = 1.69\sqrt{s + 4.45} - 3.49$$
$$12.99 = 1.69\sqrt{s + 4.45}$$
$$\frac{12.99}{1.69} = \sqrt{s + 4.45}$$
$$\left(\frac{12.99}{1.69}\right)^2 = s + 4.45$$
$$s = \left(\frac{12.99}{1.69}\right)^2 - 4.45$$
$$s \approx 55$$

$$10.49 = 1.69\sqrt{s + 4.45} - 3.49$$ 55-64
$$13.98 = 1.69\sqrt{s + 4.45}$$
$$\frac{13.98}{1.69} = \sqrt{s + 4.45}$$
$$\left(\frac{13.98}{1.69}\right)^2 = s + 4.45$$
$$s = \left(\frac{13.98}{1.69}\right)^2 - 4.45$$
$$s \approx 64$$

REF: 081937aii