A2.A.25: Quadratics with Irrational Solutions: Solve quadratic equations, using the quadratic formula

1 The solutions of the equation $y^2 - 3y = 9$ are
1) $\frac{3 \pm 3i\sqrt{3}}{2}$
2) $\frac{3 \pm 3i\sqrt{5}}{2}$
3) $\frac{-3 \pm 3\sqrt{5}}{2}$
4) $\frac{3 \pm 3\sqrt{5}}{2}$

2 The roots of the equation $2x^2 + 7x - 3 = 0$ are
1) $-\frac{1}{2}$ and -3
2) $\frac{1}{2}$ and 3
3) $\frac{-7 \pm \sqrt{73}}{4}$
4) $\frac{7 \pm \sqrt{73}}{4}$

3 A cliff diver on a Caribbean island jumps from a height of 105 feet, with an initial upward velocity of 5 feet per second. An equation that models the height, $h(t)$, above the water, in feet, of the diver in time elapsed, t, in seconds, is $h(t) = -16t^2 + 5t + 105$. How many seconds, to the *nearest hundredth*, does it take the diver to fall 45 feet below his starting point?
1) 1.45
2) 1.84
3) 2.10
4) 2.72

4 Solve the equation $6x^2 - 2x - 3 = 0$ and express the answer in simplest radical form.

5 Barb pulled the plug in her bathtub and it started to drain. The amount of water in the bathtub as it drains is represented by the equation $L = -5t^2 - 8t + 120$, where L represents the number of liters of water in the bathtub and t represents the amount of time, in minutes, since the plug was pulled. How many liters of water were in the bathtub when Barb pulled the plug? Show your reasoning. Determine, to the *nearest tenth of a minute*, the amount of time it takes for all the water in the bathtub to drain.

6 A homeowner wants to increase the size of a rectangular deck that now measures 15 feet by 20 feet, but building code laws state that a homeowner cannot have a deck larger than 900 square feet. If the length and the width are to be increased by the same amount, find, to the *nearest tenth,* the maximum number of feet that the length of the deck may be increased in size legally.

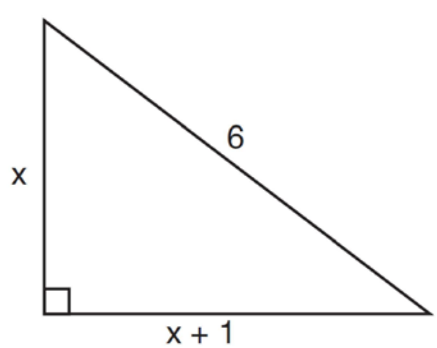
Name: ________________________

7 A homeowner wants to increase the size of a rectangular deck that now measures 14 feet by 22 feet. The building code allows for a deck to have a maximum area of 800 square feet. If the length and width are increased by the same number of feet, find the maximum number of whole feet each dimension can be increased and *not* exceed the building code. [Only an algebraic solution can receive full credit.]

8 Matt's rectangular patio measures 9 feet by 12 feet. He wants to increase the patio's dimensions so its area will be twice the area it is now. He plans to increase both the length and the width by the same amount, x. Find x, to the *nearest hundredth of a foot*.

9 A rectangular patio measuring 6 meters by 8 meters is to be increased in size to an area measuring 150 square meters. If both the width and the length are to be increased by the same amount, what is the number of meters, to the *nearest tenth*, that the dimensions will be increased?

10 As shown in the accompanying diagram, the hypotenuse of the right triangle is 6 meters long. One leg is 1 meter longer than the other. Find the lengths of *both* legs of the triangle, to the *nearest hundredth of a meter.*



A2.A.25: Quadratics with Irrational Solutions: Solve quadratic equations, using the quadratic formula
Answer Section

1 ANS: 4

$$\frac{3 \pm \sqrt{(-3)^2 - 4(1)(-9)}}{2(1)} = \frac{3 \pm \sqrt{45}}{2} = \frac{3 \pm 3\sqrt{5}}{2}$$

REF: 061009a2

2 ANS: 3

$$\frac{-7 \pm \sqrt{7^2 - 4(2)(-3)}}{2(2)} = \frac{-7 \pm \sqrt{73}}{4}$$

REF: 081009a2

3 ANS: 2

$$60 = -16t^2 + 5t + 105 \quad t = \frac{-5 \pm \sqrt{5^2 - 4(-16)(45)}}{2(-16)} \approx \frac{-5 \pm 53.89}{-32} \approx 1.84$$
$$0 = -16t^2 + 5t + 45$$

REF: 061424a2

4 ANS:

$$\frac{2 \pm \sqrt{(-2)^2 - 4(6)(-3)}}{2(6)} = \frac{2 \pm \sqrt{76}}{12} = \frac{2 \pm \sqrt{4}\sqrt{19}}{12} = \frac{2 \pm 2\sqrt{19}}{12} = \frac{1 \pm \sqrt{19}}{6}$$

REF: 011332a2

5 ANS:

120, 4.2. Barb pulled the plug at $t = 0$, so there were 120 liters in the tub.

$$-5t^2 - 8t + 120 = 0$$
$$\frac{-(-8) \pm \sqrt{(-8)^2 - 4(-5)(120)}}{2(-5)} = \frac{8 \pm \sqrt{2464}}{-10} = \frac{8 - \sqrt{2464}}{-10} \approx 4.2$$

REF: 080634b

6 ANS:

12.6.

$$(15 + x)(20 + x) = 900$$
$$x^2 + 35x + 300 = 900$$
$$x^2 + 35x - 600 = 0$$
$$x = \frac{-35 \pm \sqrt{35^2 - 4(1)(-600)}}{2(1)} = \frac{-35 \pm \sqrt{3625}}{2} = \frac{-35 + \sqrt{3625}}{2} \approx 12.6$$

REF: 060128b

7 ANS:

$(x+14)(x+22)=800$ $x=\dfrac{-36\pm\sqrt{(-36)^2-4(1)(-492)}}{2(1)}=\dfrac{-36+\sqrt{3264}}{2}\approx 10.6$ 10 feet increase.

$x^2+36x+308=800$

$x^2+36x-492=0$

REF: 011539a2

8 ANS:

4.27. The patio's current area is 108 (9 x 12). After increasing the dimensions, the area will be 216.

$$(9+x)(12+x)=216$$
$$x^2+21x+108=216$$
$$x^2+21x-108=0$$
$$x=\frac{-21\pm\sqrt{21^2-4(1)(-108)}}{2(1)}=\frac{-21\pm\sqrt{873}}{2}=\frac{-21+\sqrt{873}}{2}\approx 4.27$$

REF: 010729b

9 ANS:

5.3. $(6+x)(8+x)=150$. $x=\dfrac{-14\pm\sqrt{14^2-4(1)(-102)}}{2(1)}=\dfrac{-14\pm\sqrt{604}}{2}$. $\dfrac{-14+\sqrt{604}}{2}\approx 5.3$

$x^2+14x+48=150$

$x^2+14x-102=0$

REF: 080727b

10 ANS:

3.71 and 4.71. $x^2+(x+1)^2=6^2$. $x=\dfrac{-2\pm\sqrt{2^2-4(2)(-35)}}{2(2)}=\dfrac{-2\pm\sqrt{284}}{4}\approx 3.71$

$x^2+x^2+x+x+1=36$

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

REF: 061030b