Just in Time Quick Check

Standard of Learning A2.EI.5

Strand: Equations and Inequalities

Standard of Learning A2.EI.5

The student will represent, solve, and interpret the solution to an equation containing a radical expression.

Students will demonstrate the following Knowledge and Skills:

a) Solve an equation containing no more than one radical expression algebraically and graphically.
b) Verify possible solution(s) to radical equations algebraically, graphically, and with technology, to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
c) Justify why a possible solution to an equation with a square root might be extraneous.

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Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: A.EO.2

Just in Time Quick Check A2.EI.5

1. Find the solution for the equation: $2\sqrt{7-3x}\ +2=0$

2. The braking distance, *d,* of a car (in feet) can be approximated by $d=\sqrt{6v}$ where *v* is the speed of the car in miles per hour (mph). Find the speed of the car if the braking distance is 18 ft.

3. The time, *t,* in seconds for a swinging pendulum to complete one full cycle is given by the function $t=0.2\sqrt{l}$, where l is the length of the pendulum in centimeters (cm).
    a) How long is a full cycle if the pendulum is 10 cm long?

    b) How long is a full cycle if the pendulum is 20 cm long?

4. Solve the following equation. Justify which solutions, if any, are extraneous.

$$\sqrt{x+4}\ +2=x$$

A2.EI.5 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. Find the solution for the equation: $2\sqrt{7-3x}\ +2=0$

   A common error students make when solving radical equations is squaring both sides of the equation without first checking whether the resulting equation is reasonable. In the given equation, isolating the radical leads to $\sqrt{7-3x}=-1$, which has no solution because a square root cannot be negative. Students who square both sides of the equation will obtain a value for x that appears valid algebraically but is extraneous. Teachers can help students understand this concept by emphasizing that squaring both sides of an equation is not a reversible operation and may lead to solutions that were not present in the original equation. It may be helpful to demonstrate how a false statement like -5 = 5 can be manipulated into a true statement by squaring both sides of the equation, which illustrates why verification is necessary. It may also be helpful for teachers to use a simpler problem such as $\sqrt{x}=-4$ to reinforce the idea that some equations involving square roots have no solution before any algebraic manipulation occurs. Additionally, students could verify solutions graphically by graphing the left and right side of the equations separately to look for a point of intersection. When $y=2\sqrt{7-3x}+2$ and $y=0$ are graphed, they do not intersect, which indicates there is no solution.

2. The braking distance, *d,* of a car (in feet) can be approximated by $d=\sqrt{6v}$ where *v* is the speed of the car in miles per hour (mph). Find the speed of the car if the braking distance is 18 ft.

   A common error students make when solving this equation is squaring only part of the equation. For example, students may write $18=\sqrt{6v}$ and then simplify to $18=6v$, instead of squaring both sides to get $18^2=6v$. Another common error involves misapplying inverse operations, such as dividing by 6 before removing the square root, leading to statements like $\sqrt{v}=3$. Students may also make arithmetic errors after squaring, such as calculating 18^2 as 36 instead of 324, which results in an incorrect value for v. Teachers can support students by explicitly modeling the correct sequence of steps: first isolate the radical and then squaring both sides of the equation. Teachers can also emphasize verifying solutions by substituting the value back into the original equation to confirm that $\sqrt{6(54)}=18$.

3. The time, *t,* in seconds for a swinging pendulum to complete one full cycle is given by the function $t=0.2\sqrt{l}$, where l is the length of the pendulum in centimeters (cm).

   a) How long is a full cycle if the pendulum is 10 cm long?

   b) How long is a full cycle if the pendulum is 20 cm long?

   A common error occurs when students apply the square root to the entire expression on the right side of the equation, rather than only to the variable inside the radical. For example, students *may write $t = \sqrt{0.2 \cdot 10}$, instead of the correct equation $t = 0.2\sqrt{10}$. This error may indicate that students are confused about which parts of the formula are affected by the square root.*

Another common error occurs when students square the length, writing an equation such as $t = 0.2(10^2)$, instead of taking the square root. This may indicate that students are associating square roots with exponents without recognizing that the equation requires determining the square root of the length. Teachers can support students by modeling the structure of the equation and emphasizing that the square root applies only to the variable. It may be helpful to compare the correct form of the equation, $t = 0.2(\sqrt{10})$, with the incorrect form(s) of the equation, $t = \sqrt{0.2 \cdot 10}$ or $t = 0.2\sqrt{10^2}$, and discuss why the equations are not equivalent. This will help students develop a stronger understanding of radicals.

4. Solve the following equation. Justify which solutions, if any, are extraneous.

$$\sqrt{x+4} + 2 = x$$

In this example, students should understand that they must isolate the radical, resulting in $\sqrt{x+4} = x - 2$. A common error students make is to assume that squaring both sides of the equation automatically produces valid solutions. Students may square both sides to obtain $x + 4 = (x-2)^2$, then solve the resulting quadratic and accept all solutions without checking whether they satisfy the original equation. Failing to verify solutions may lead students to accept values such as $x = 0$, even though substituting $x = 0$ into the original equation results in $\sqrt{0+4} + 2 = 4$, which does not equal 0. This reveals that $x = 0$ is an extraneous solution introduced by squaring. Having students explain why $x = 5$ is a valid solution but $x = 0$ is not a valid solution will help students deepen their understanding of radicals and extraneous solutions.