LESSON MAKER PRO

Radical Routes

Solve, graph, and interpret square root and cube root models.

HIGH SCHOOL · MA.912.AR.7.3

MA.912.AR.7.3 "Solve and graph mathematical and real-world problems that are modeled with square root or cube root functions. Interpret key features and determine constraints in terms of the context."

NAME _____ DATE _____

KEY FEATURES OF RADICAL GRAPHS

For y = a sqrt(x - h) + k, the graph begins at (h, k), and the expression inside the square root must be 0 or greater. For y = a cuberoot(x - h) + k, the center point is (h, k), and cube roots allow all real x-values before a context adds limits.

WORKED EXAMPLE

Solve sqrt(x + 13) = 17.

1. Square both sides: x + 13 = 289.
2. Subtract 13: x = 276.
3. Check: sqrt(276 + 13) = sqrt(289) = 17.

Answer: x = 276

PRACTICE 6 problems

1 Solve sqrt(x + 5) = 6.

ANSWER _____

2 Solve cuberoot(x - 8) = -2.

ANSWER _____

3 For y = sqrt(x - 1) + 3, state the domain and range.

ANSWER _____

4 For y = -sqrt(x + 2) + 5, state the starting point and range.

ANSWER _____

5 Give three points you could use to graph y = cuberoot(x - 10) + 4 when x = 2, 10, and 18.

ANSWER _____

6 For y = sqrt(16 - x) - 2, state the domain and range.

ANSWER _____

APPLY IT Show your work

1 A gaming tournament gives a bonus level modeled by B(p) = sqrt(p - 12) + 6, where p is the number of points earned. Find B(48). State the graph's starting point and the meaningful constraint on p.

WORK SPACE

ANSWER _____

2 A music app displays an effect position modeled by v(t) = cuberoot(t - 27) - 5, where t is the number of seconds after a song begins. Find v(35). State the domain and range in this context.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A square root graph has the form y = a sqrt(x + 6) + 2 and passes through (3, 5). Find a, write the equation, and explain in one or two sentences why the graph has no points with x < -6.

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ANSWER KEY # Radical Routes

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve sqrt(x + 5) = 6.	**x = 31**
2	Solve cuberoot(x - 8) = -2.	**x = 0**
3	For y = sqrt(x - 1) + 3, state the domain and range.	**Domain: x >= 1; Range: y >= 3**
4	For y = -sqrt(x + 2) + 5, state the starting point and range.	**Starting point: (-2, 5); Range: y <= 5**
5	Give three points you could use to graph y = cuberoot(x - 10) + 4 when x = 2, 10, and 18.	**(2, 2), (10, 4), (18, 6)**
6	For y = sqrt(16 - x) - 2, state the domain and range.	**Domain: x <= 16; Range: y >= -2**

PART 2 · APPLY IT

1. **B(48) = 12. The starting point is (12, 6). In context, p is a whole number and p >= 12.** Substitute 48 for p: sqrt(48 - 12) + 6 = sqrt(36) + 6 = 12. The square root requires p - 12 >= 0.
2. **v(35) = -3. Domain: t >= 0; Range: v >= -8.** Substitute 35 for t: cuberoot(35 - 27) - 5 = cuberoot(8) - 5 = -3. Since time cannot be negative, the least output occurs at t = 0, where v = -8.

CHALLENGE

Since sqrt(3 + 6) = 3, 5 = 3a + 2, so a = 1. The equation is y = sqrt(x + 6) + 2, with domain x >= -6 and range y >= 2 because x + 6 cannot be negative.

Accept equivalent inequality wording, such as x is at least 1. For graph-point answers, accept correctly ordered coordinate pairs and equivalent descriptions of endpoints, domains, and ranges.