LESSON MAKER PRO

Radical Route Maps

Solve, graph, and interpret square root models.

HIGH SCHOOL · MA.912.AR.7.4

MA.912.AR.7.4 "Solve and graph mathematical and real-world problems that are modeled with radical functions. Interpret key features and determine constraints in terms of the context."

NAME _____ DATE _____

SQUARE ROOT FEATURES

For y = a sqrt(x - h) + k, the graph starts at (h, k). The expression inside a square root must be 0 or more, so the domain begins at x = h. If a is positive, the range begins at y = k, and if a is negative, the range goes down from y = k. Check every solution in the original equation after squaring.

WORKED EXAMPLE

Graph y = sqrt(x - 11) + 13 by stating its starting point, domain, and range.

1. Start with y = sqrt(x).
2. The x - 11 shifts the graph right 11 units.
3. The + 13 shifts the graph up 13 units.

Answer: Starting point: (11, 13). Domain: x >= 11. Range: y >= 13.

PRACTICE 6 problems

1 For y = sqrt(x + 4) - 3, state the starting point, domain, and range.

ANSWER _____

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

ANSWER _____

3 Solve: sqrt(x + 1) = 7

ANSWER _____

4 Solve: sqrt(2x - 1) = 3

ANSWER _____

5 List three points on y = sqrt(x + 7) - 4. Use radicands 0, 1, and 4.

ANSWER _____

6 Solve: sqrt(x + 4) = x - 2

ANSWER _____

APPLY IT Show your work

1 On a driver education course, an estimated speed is modeled by v = sqrt(24d), where v is speed in miles per hour and d is skid distance in feet. If the estimated speed is 36 miles per hour, find the skid distance. State the constraints on d and v.

WORK SPACE

ANSWER _____

2 A gaming app models a player's level score with L = sqrt(p - 4) + 3, where p is the number of practice matches. How many practice matches give a level score of 8? State the values of p and L that make sense for the model.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Solve sqrt(x + 5) = x - 1. Explain why the other solution created by squaring is not valid.

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ANSWER KEY

Radical Route Maps

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For y = sqrt(x + 4) - 3, state the starting point, domain, and range.	**Starting point: (-4, -3). Domain: x >= -4. Range: y >= -3.**
2	For y = -sqrt(x - 2) + 5, state the starting point, domain, and range.	**Starting point: (2, 5). Domain: x >= 2. Range: y <= 5.**
3	Solve: sqrt(x + 1) = 7	**x = 48**
4	Solve: sqrt(2x - 1) = 3	**x = 5**
5	List three points on y = sqrt(x + 7) - 4. Use radicands 0, 1, and 4.	**(-7, -4), (-6, -3), and (-3, -2)**
6	Solve: sqrt(x + 4) = x - 2	**x = 5**

PART 2 · APPLY IT

1. **d = 54 feet. The constraints are d >= 0 and v >= 0.** Substitute 36 for v, then square both sides: 36^2 = 24d, so d = 54. A skid distance and an estimated speed cannot be negative.
2. **p = 29 practice matches. Mathematically, p >= 4 and L >= 3. In context, p must be a whole number.** Set 8 = sqrt(p - 4) + 3, so sqrt(p - 4) = 5 and p = 29. The square root requires p - 4 to be 0 or more.

CHALLENGE

x = 4. Squaring gives x = 4 and x = -1, but x = -1 fails the original equation because sqrt(4) = 2 while -1 - 1 = -2.

Accept equivalent domain and range notation, such as [-4, infinity) for x >= -4. For radical equations, accept only solutions that check in the original equation.