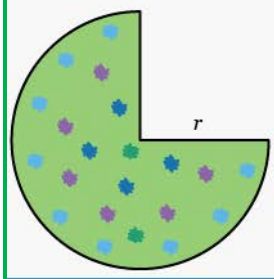
NWEA Assessment Item Illustrating 7.G.B.4

Domain: Geometry
7.G.B: Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
Calculator Availability: Yes

Use the information to answer the question.

A gardener is designing a flower bed in the shape of $\frac{3}{4}$ of a circle, as shown. The gardener has 100.0 meters of fencing available to put around the flower bed, including the straight sides.



What is the largest possible radius, r, to the nearest tenth of a meter for the flower bed? Enter the answer in the box.

[ ] meters

Alignment: 7.G.B.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

This item requires students to understand both the meaning of circumference and the relationship between circumference and radius in order to find the maximum allowable radius given a constraint. Depending on which value of pi is used for calculations, students may calculate the maximum radius as 14.89 meters and then round up to 14.9, or may decide to round down to 14.8 because 100.0 meters of fencing could be insufficient. To account for this attention to precision, this item is keyed for both 14.8 meters and 14.9 meters.

Coherence: In grade 3, students began developing concepts of area and perimeter as attributes of plane figures.[3.MD.C/D] Students learned that the measurement of rectangular regions is a multiplicative relationship of the number of square units in a row and the number rows.[3.MD.C] In grade 4, students found the area of rectangles using a formula.[4.MD.A.3] In grade 5, students developed the concept of volume, and related it to multiplication and addition in order to solve problems involving volume of rectangular prisms.[5.MD.C.5] In grade 6, students tied together the work of decomposing figures and using additive properties to solve problems involving areas of polygons.[6.G.A.1] In grade 7, students connect the meaning of area and perimeter to a familiar shape with a curved boundary.[7.G.B.4] This work extends to grade 8, where students will find the volume of figures with circular bases,[8.G.C.9] and in high school where students will extend their knowledge to solve more complex design problems[HSG-MG.A.3] and problems involving arc lengths and sectors.[HSG-C.B.5]

Rigor: This item attends to conceptual understanding, procedural skill, and application. Students use conceptual understanding as they interpret the context and decide to use the circumference formula in the solution of the problem. The 3/4-circle elevates the conceptual complexity as it requires reasoning about how to calculate the circumference versus the simple procedure of substituting values into the

circumference formula to calculate the radius. The mathematics is not directly indicated in the real-world scenario. Once a path forward is determined, students use the grade-level procedure of working with the circumference formula to find the correct answer.

Answer Key: There are multiple equivalent correct responses. One sample correct response is shown.

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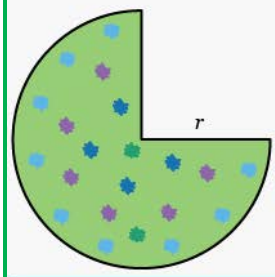

What is the largest possible radius, r, to the nearest tenth of a meter for the flower bed? Enter the answer in the box.

14.9 meters

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