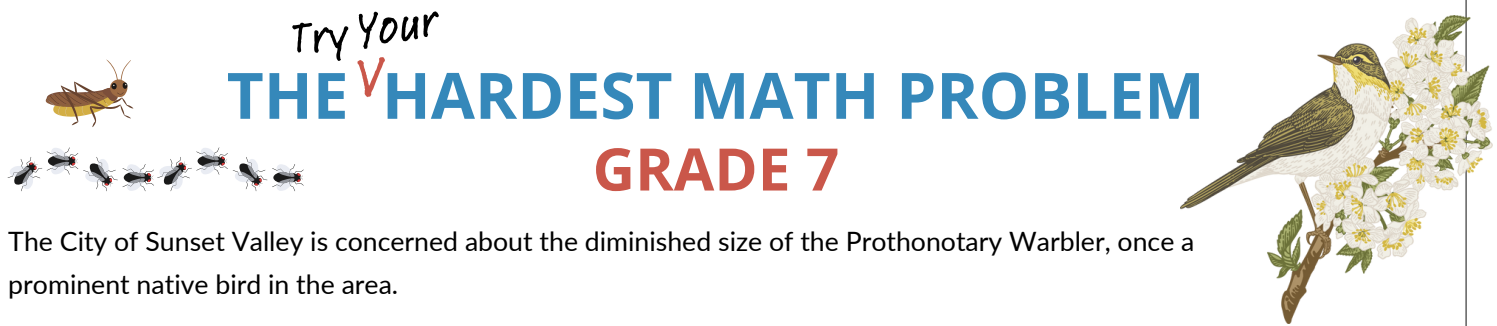
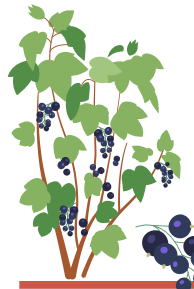


Try Your  
**THE HARDEST MATH PROBLEM**  
**GRADE 7**



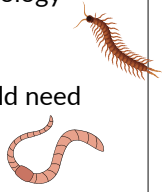
The City of Sunset Valley is concerned about the diminished size of the Prothonotary Warbler, once a prominent native bird in the area.

Rashid, the Sunset Valley Middle School Ecology Club’s student president shared “The warbler population has decreased 40% from 1968 to 2018 and has caused considerable concern.”



“However, a community could create “recovery strategy” for warblers by planting and fostering native plants that will be home and a travel corridor for insects native to the warbler’s diet,” said the Ecology Club’s advisor, Mr. Adebambo.

“Since warblers are insectivorous and won’t eat seeds, a hospitable habitat for the warblers would need plants that will attract insects that the warbler likes to eat,” Cillian added.



**Solve the Problem**


The Regional Animal Conservation Center (RACC) would like to focus on the Prothonotary Warbler in its efforts to help the environment and have designated one acre of land on their property to create a Prothonotary Warbler habitat. The RACC director, Ms. Valitsky, is a volunteer soccer coach at Sunset Valley Middle School and was chatting with some of the Ecology Club students. “I would like to create a sanctuary that will encourage and welcome Prothonotary Warblers, but I don’t know what to plant!” Ms. Valitsky told them.

Cillian and Josephina researched the composition of the existing acre against the guidelines for warbler habitats. “One-fourth of the acre already consists of a flowing water and natural dead wood environment and won’t need to be changed. The guidelines for warbler environments show that fifty-five percent of the acre should be designated for fruit trees and bushes and the remaining twenty percent should be designated for large perennial flowering plants,” Josephina told the club.

“It is recommended that fruit trees or bushes will need a minimum of 400 square feet per tree/bush to grow and mature. Large perennials will need a minimum of 8,281 square centimeters per plant,” Rashid reported after researching the recommended spacing.

“We talked to Mr. Garcia at Bountiful Nature Nursery and since this is a community project, they will sell the RACC the trees/bushes for this project at \$14.49 each,” Mr. Adebambo said. “Large flowering perennials must be purchased in packs of 3, and each pack is \$45.48. Because this is a contribution to a community project, no tax will be charged.”

“That’s wonderful news!” Ms. Valitsky said. “Can you help me figure out the maximum number of each plant to buy that will fit the space given the constraints? I can make the budget request to the RACC board of directors and get started on this project right away. We will round to the hundredth’s place in our work since we are working with money, keeping in mind that we can only purchase whole plants.”



Conversions	
1 acre =	43,560 square feet
1 square centimeter =	0.00108 square feet

**QUESTION: How much will it cost the RACC to purchase fruit trees/bushes and large flowering perennials to fulfill the guidelines for creating the warbler habitat assuming that no partial bushes are allowed and we do not exceed the 1 acre of allotted space?”**



Try Your  
**THE HARDEST MATH PROBLEM**  
**CHALLENGE 1 ANSWER KEY – GRADE 7**

Although each problem has one correct numeric solution, there are multiple pathways students can take to arrive at the answer. Students who answered Challenge 1 correctly are invited to enter Challenge 2!

## Sample Solution

**Solution blueprint:** To find total cost, I must find:

- the square footage allotted for fruit bushes/trees to determine the number of fruit bushes/trees needed given the guidelines for space needed for fruit bushes/trees, and then find the total cost for the fruit bushes/trees needed using the unit cost
- the square footage allotted for large perennials to determine the number of large perennials needed given the guidelines for space needed for each one, and then find the total number of packs of 3 needed before computing the cost for the large perennials
- find the total cost by summing the cost for the fruit bushes/trees and the large perennials

**Step 1: Find the square footage allotted to fruit bushes/trees.** Since 55% of the acre should be allotted for the fruit trees/bushes, we will use the fact that 1 acre is 43,560 square feet:

$$0.55 \times 43,560 \text{ square feet}$$

**23,958 square feet allotted for fruit bushes/trees**

**Step 2: Find the number of fruit bushes/trees in the allotted area given recommended spacing guidelines.**

Since each fruit bush/tree requires 400 square feet of space, in the 23,958 square feet of space in the acre, we can find the number of bushes by:

$$23,958 \text{ square feet} / 400 \text{ square feet per bush}$$

$$= 59.895 \text{ bushes, rounded to } 59.9 \text{ bushes}$$

Since we can't have part of a bush in the space, we would only need **59 bushes**

**Step 3: Find the cost for the fruit bushes/trees.** Since the unit cost for each fruit bush/tree is \$14.49 and there are 59 bushes, the total cost for the fruit trees/bushes is:

$$59 \text{ bushes} \times \$14.49 \text{ per bush}$$

**\$854.91 for the fruit bushes/trees**

**Step 4: Find the square footage allotted to large flowering perennials.** Since 20% of the acre should be allotted for the fruit trees/bushes and 1 acre is 43,560 square feet:

$$0.20 \times 43,560 \text{ square feet}$$

**8,712 square feet allotted for large flowering perennials**



Try Your  
**THE HARDEST MATH PROBLEM**  
**CHALLENGE 1 ANSWER KEY – GRADE 7**

(...sample solution continued...)

**Step 5: Find the number of large flowering perennials in the allotted area given recommended spacing guidelines.** Since each large flowering perennial requires 8,281 square cm, in the 8,712 square feet of space in the acre, we first need to convert the square cm space requirement to square foot for each large flowering perennial:

$$8,281 \text{ sq cm} \times (0.00108 \text{ sq ft} / 1 \text{ sq cm})$$

$$= 8.94348 \text{ sq feet per large flowering perennial}$$

Rounding to 2 decimal places, **8.94 square feet per large flowering perennial**

Now we find the number of large flowering perennial plants in the 8,712 square feet of space

$$8,712 \text{ sq feet} / (8.94 \text{ sq feet} / 1 \text{ bush}) = 974.496644 \text{ bushes}$$

Rounding to 2 decimal places, 974.50

Since we can't have part of a plant in the space, we would need **974 large flowering perennial bushes**

**Step 6: Find the cost for the large perennials**

First, we need to find the number of packs of 3 large perennials are needed since they only come in packs of 3.

$$974 \text{ plants} / 3 \text{ plants per pack} = 324.667$$

Since we can't buy part of a pack, that means that **325 packs are needed.**

For 325 packs, at \$45.48 per pack, the cost for the large perennials would be:

$$325 \text{ packs} \times \$45.48 \text{ per pack}$$

**\$14,781 for the large flowering perennials**

**Step 7: Find the total cost.** With a cost of \$854.91 for the fruit bushes/trees and \$14,781 for the large flowering perennials:

$$\$854.91 + \$14,781 = \mathbf{\$15,635.91 \text{ for all plants}}$$

**Final Answer:** The total cost for the RACC to plant and fill the acre designated for the warbler habitat and not exceed the space is **\$15,635.91.**

