

THE HARDEST MATH PROBLEM

GRADE 7

There's a new club at Monroe Middle School thanks to three persuasive students—Vishal, Maria, and Jade. When the principal read their proposal for EARTH Club, she smiled and said, "Environmentally Aware and Ready to Help! What a great title! Now what activities do you have planned?"

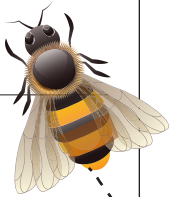
"First, we'll study the declining population of bees," said Vishal.

"Bees are vital to our ecosystem," Maria explained. "Did you know that when they transfer pollen, they start the process of reproduction in about 80 percent of plants? That includes fruits, vegetables, flowers, and seeds."

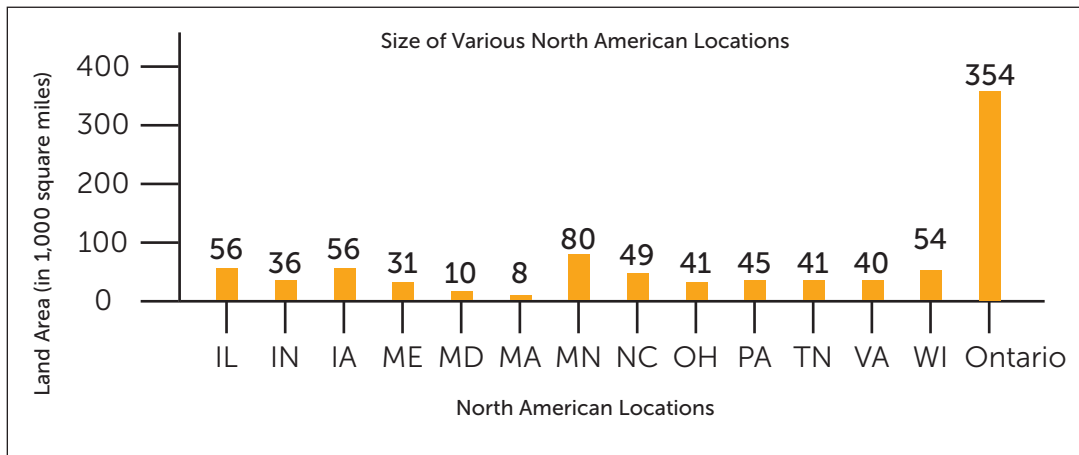
"It also includes around 90 different types of food, like apples and pumpkins," Jade added.

"Wow," said the principal. "The EARTH Club is officially approved!"

Solve the Problem



Maria found out that "bumblebee" isn't just a nickname. The **rusty patched bumble bee** (*Bombus affinis*) exists, but it's now on the endangered species list. Twenty years ago, an estimated 727,731,000 of these bees lived across America and Canada. Today, they are usually found only in the states and the province shown below.



Assume an even distribution of bees per mile across these territories. Suppose today's scientists sample an area of five square miles within each territory, and find, on average, 3 nests with 205 living rusty patched bumble bees per nest.

What is the percent decline, to the nearest whole number, of rusty patched bumble bees from 20 years ago to today?



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CHALLENGE 1 ANSWER KEY — GRADE 7

Although each problem does have a correct numeric solution, there are multiple pathways students can take to arrive at the answer. Teachers, if your students answered Challenge 1 correctly, they are invited to enter Challenge 2! Get the Challenge 2 materials at [scholastic.com/hardestmathcontest](https://www.scholastic.com/hardestmathcontest).

Population Decline Calculation

Step 1: Let's start with what I do know. The population 20 years ago was 727,731,000 bees. To find out how much it has declined, I must find the population today.

Step 2: I know that per every 5 square miles, on average, there were 3 nests and each contained 205 living bees. I multiply 3 by 205 to get the average number of living bees per every 5 square miles.

$$3 \times 205 = 615 \text{ living bees per every 5 square miles}$$

Step 3: I will divide 615 by 5 to get the unit rate.

$$615/5 = 123 \text{ living bees per 1 square mile}$$

Step 4: Next, I need to find the total number of square miles in all the territories. And I must be careful! The title of the graph is Land Area (in 1,000 square miles). That means, for example, the land area in Illinois is not 56 square miles but $56 \times 1,000$, or 56,000 square miles!

$$\begin{aligned} \text{Total Land Area} &= (56 + 36 + 56 + 31 + 10 + 8 + 80 + 49 + 41 + 45 + 41 + 40 + 54 + 354) \times 1,000 \\ &= (901) \times 1,000 \\ &= 901,000 \text{ square miles} \end{aligned}$$

Step 5: The number of bees per square mile multiplied by the total number of square miles will give me the total number of bees.

$$123 \text{ bees per square mile} \times 901,000 \text{ square miles} = 110,823,000 \text{ total bees today}$$

Step 6: To find the percent change in bees from 20 years ago to today, I use the following formula:

$$\begin{aligned} \% \text{ of change} &= \frac{\text{amount of change}}{\text{original value}} \\ \% \text{ of change} &= \frac{(727,731,000 - 110,823,000)}{727,731,000} \\ \% \text{ of change} &= \frac{616,908,000}{727,731,000} = 0.847714334... \end{aligned}$$

Step 7: To change the decimal to a percent, I multiply by 100.

$$0.847714334 \times 100 = 84.7714334\%$$

But, wait! I have to round "to the nearest whole number" (84.77... rounds to 85).

Final Answer: The percent decline of rusty patched honey bees from 20 years ago to today is about **85%**. I could also report this as a change of **-85%**.