

Busy as a Bee ☺ KEY

Answers are highlighted in red to help work through this activity.

In this activity, we are going to look at the production of just one food crop—almonds. California produces 82 percent of the total almonds in the world. Almond producers depend upon bees to pollinate their almond trees. What would happen if bees were not available and we had to depend on humans to pollinate the trees?

Calculate Some Almond Pollination Numbers from California's Central Valley:

1. There are approximately 810,000 acres of trees with 112 trees on each acre (810,000 acres of trees X 112 trees = 90,720,000 total trees to pollinate in California's Central Valley). To make the numbers a little easier to calculate, we are going to just focus on just one farm. The average farm size in California is 64 acres. How many total almond trees are found in the average farm? Show your work.

$$64 \text{ acres} \times 112 \text{ trees} = 7,168 \text{ total trees to pollinate}$$

2. Without bees to pollinate these trees, your class has been hired to pollinate the almond trees for one farm. Each tree has 28,000 flowers to pollinate, but only about 25 percent (7,000) of the flowers actually produce almonds. We are only going to pollinate 7,000 flowers per tree. How long would it take your class to pollinate all the trees? In order to solve this problem, you will be placed into groups of 4-5 "bees" to get some average pollination times. First we will determine how long it takes each of you to pollinate 50 flowers on a "tree". Within your group, each "bee" (that's you) will touch the flowers on the almond tree outline, in order by number (from 1-50). The other members in your group will time how long it takes you to do this. You will do four separate trials pollinating your tree and then determine your average time to pollinate fifty flowers.

	Trial 1 (secs)	Trial 2 (secs)	Trial 3 (secs)	Trial 4 (secs)	Average Time
"Bee" #1					
"Bee" #2					
"Bee" #3					
"Bee" #4					

3. What is the average of the times of all four of the practice "bees" in your group? Show your work.

$$\text{Averages of Bee \#1 + Bee \#2 + Bee \#3 + Bee \#4} = \underline{\hspace{2cm}} \text{ divided by four}$$

4. What is the average time for all the "bee" groups in your class? Show your work.

$$\text{Averages of Group \#1 + Group \#2 + Group \#3 + Group \#4} = \underline{\hspace{2cm}} \text{ divided by four}$$

Answers highlighted in green are the answers to this problem with an average of 15 seconds for one person to pollinate 50 flowers.

5. We currently know that you need to pollinate 7,000 flowers on a tree and we have the average time it takes one person to pollinate only fifty of those flowers. How long would it take one person to pollinate one tree? For your answer, figure the number of seconds and convert to minutes.

$$7,000 \text{ flowers divided by } 50 = 140$$

$$15 \text{ Seconds} \times 140 \text{ times} = 2100 \text{ seconds average time of one person to pollinate 7000 flowers (one tree)}$$

$$\underline{2100} \text{ seconds divided by } 60 = \underline{35} \text{ minutes for one tree}$$

6. If you work an eight-hour day, how many trees can one person pollinate? Show your work. Let's assume that your class has thirty students. That means your class can pollinate _____ trees per day. Show your work.

$$8 \text{ hours} \times 60 = 480 \text{ minutes of work per day}$$

$$480 \text{ minutes divided by } 35 \text{ minutes per tree} = 13.71 \text{ trees per day per student}$$

$$13.71 \text{ trees per day} \times 30 \text{ students} = 411.30 \text{ trees per day per class}$$

7. Your class can pollinate (answer from #8) **411.30** trees per day. There are 7,168 (answer from #2) trees total per farm to pollinate. Divide that number to determine how long it would take your class to pollinate one farm.

$$7,168 \text{ divided by } 411.30 \text{ trees per day} = 17.42 \text{ number of days for your class to pollinate all the trees.}$$

8. We need to pay your class for their work. Minimum wage is about \$9.00 per hour in California. How much will you paid per day? Show your work. How much for **17.42** days? How much for your whole class?

$$\text{\$9.00 per hour} \times 8 \text{ hours} = \text{\$72.00 per day}$$

$$\text{\$72.00} \times 17.42 \text{ days} = \text{\$1254.24 per student}$$

$$\text{\$1254.24} \times 30 \text{ students} = \text{\$37,627.20 pay for the whole class}$$

9. Compare that cost to that of renting bees to do the work. Usually two hives are placed on each acre at the cost of \$150.00 per hive. A rental colony usually has eight frames with 1,500-2,000 bees per frame. Populations might triple in size depending upon how nutritious the crop is being pollinated. The average farm size is 640 acres. How much would the bees cost?

$$64 \text{ acres} \times 2 \text{ bee hives/per acre} = 128$$

$$128 \times 150.00 = \text{\$19,200 total}$$

10. What kinds of things would impact the cost of hiring your class to do the work? Think of the conditions—pollinating 50 flowers every **15** seconds for 8 hours a day.