

Bug Watching

I went bug watching after school every day for a week.

On Monday I saw 1 bug.

On Tuesday I saw 2 bugs.

On Wednesday I saw 3 bugs...

On Friday, after I went bug watching I said,
“Wow! It’s a pattern!”

How many bugs did I see that week?

Use pictures, numbers and words to solve this problem.

Investigations Math Alignments for Bug Watching

Kindergarten

Investigations Unit: Collecting, Counting and Measuring

Math Concepts:

- Recognizing number and numeral names
- Connecting numerals to quantities
- Creating & counting sets of objects
- Representing quantities
- Keeping track and recording quantities
- Developing and using language to describe, compare, and order amounts
- Measuring by direct comparison
- Finding totals of two single-digit numbers
- Solving a problem with many possible solutions

Grade 1

Investigations Unit: Building Number Sense

Math Concepts:

- Counting quantities to 20, 40
- Developing strategies for counting/comparing
- Developing strategies for organizing collections
- Using numerals to record how many

Grade 2

Investigations Unit: Coins, Coupons and Combinations

Math Concepts:

- Develop familiarity with 10, work with combinations of 10 and doubles; develop strategies for adding two or more numbers
- Explore patterns, develop fluency in skip counting 2s, 5s, 10s; explore recording large groups; become familiar with coin equivalencies; use money as model for 5s and 10s
- Develop models of add/sub situations; solve problems using add/sub notation
- Become familiar with structure of 100; use 100 chart; use familiar add combinations to find totals; develop add/sub strategies

Bug Watching

Suggested Grade Span

K-2

Task

I went bug watching after school every day for a week.

On Monday I saw 1 bug.

On Tuesday I saw 2 bugs.

On Wednesday I saw 3 bugs...

On Friday, after I went bug watching I said, "Wow! It's a pattern!"

How many bugs did I see that week?

Use pictures, numbers and words to solve this problem.

Alternative Versions of Task

More Accessible Version:

I went bug watching after school every day for a week. On Monday I saw 1 bug. On Tuesday I saw 2 bugs. On Wednesday I saw 3 bugs. If this pattern continues, how many bugs will I see on Thursday, Friday, Saturday and Sunday?

More Challenging Version:

I went bug watching after school every day for a week. On Monday I saw 1 bug. On Tuesday I saw 3 bugs. On Wednesday I saw 5 bugs... On Sunday, after I went bug watching I said, "Wow! It's a pattern!" How many bugs did I see that week? Use pictures, numbers and words to solve this problem.

Context

We spend a lot of time in the primary grades working on patterns. We have the children look for patterns in their everyday world and we frequently hear, "It's a pattern!" We also do daily calendar activities and sometimes have difficulty assessing the calendar concepts outside specific calendar lessons. Teachers in our district have asked for a performance task that assesses patterning. This task was presented to both first and second grades for assessing this concept. The second graders created more sophisticated patterns.

What This Task Accomplishes

This task assesses the child's ability to process information that is not specified in the wording of the task. The child's concept of a school week will be demonstrated, as well as the

sequence of the days of the week. This task also requires the use of patterning to solve the problem. It shows how a child perceives a pattern. Since the pattern is only begun with one, two, three, it shows which children can create more than one pattern (repeating, growing and/or building). In addition, this task shows a child's number sense and computational skills in totaling the number of bugs seen all week.

What Students Will Do

Most students drew the bugs seen and added numbers to compute the total. Others chose to make a chart for the five days of the school week. Some children looked at the calendar to verify the days of the week. The students were encouraged to find more than one solution if possible. Some were able to find two or three ways, and others could not see past their original strategy.

Time Required for Task

Approximately 30 minutes

Interdisciplinary Links

This task works well with a science unit on insects or nature. The object watched for can be changed to fit into any unit (animals, stars, trees, litter, friends, etc.).

Teaching Tips

Set the stage for this activity with the students. Talk about going on a bug watch to look for bugs. Where would you go and what would you do? In this case you are not going to catch the bugs, you are only looking at them. You will write down the number of bugs you see every day after school for a week.

Remind the children that they have to think of the pattern that begins one, two, three. The next numbers in the pattern are not given. Encourage the children to explain how they solved the problem. If the child is able to express him/herself in writing, then the child is to do so independently and the paper stands by itself. If the child is unable to write his/her own thinking, then the teacher (or other "scribe") must elicit the child's thinking or explanation without coaching. I found it necessary to ask some of the children to explain their patterns because some created patterns that were valid, but not apparent to me at first.

Suggested Materials

- Paper
- Pencils
- Class calendar

Possible Solutions

Original Version:

There are several possible solutions depending on the pattern. Here are just a few:

<u>Pattern</u>		<u>Total # of Bugs</u>
1, 2, 3, 5, 8, 13, 21	(growing)	19
1, 2, 3, 4, 5, 6, 7, 8, 9 ...	(growing)	15
1, 2, 3, 1, 2, 1, 2, 3...	(repeating)	9
1, 2, 3, 2, 1, 2, 3, 2, 1, 2, 3		9
1, 2, 3, 2, 2, 3, 3, 2, 3, 4...	(building)	10
1, 2, 3 2, 5, 2, 7, 2, 9, 2...	(building)	13

More Accessible Version Solution:

Thursday: four Friday: five Saturday: six Sunday: seven

More Challenging Version Solution:

Thursday: seven Friday: nine Saturday: 11 Sunday: 13

$$1 + 3 + 5 + 7 + 9 + 11 + 13 = 49$$

Task Specific Assessment Notes

Novice: A Novice will not understand the problem and will not be able to incorporate implied information. There may be; however, some mathematical reasoning and number sense. The Novice may draw bugs for only three days, and will not be able to discern a pattern.

Apprentice: An Apprentice may demonstrate an understanding of the days of the week, some addition skills and some patterning. An Apprentice will not have a strategy that will lead to a full solution, for instance, not understanding that a total of all bugs seen needs to be determined through addition.

Practitioner: A Practitioner will fully understand the problem and arrive at one accurate solution. They are able to explain their strategy, pattern and solution, and communicate the problem well on paper.

Expert: An Expert will be able to solve the problem more than one way, and verify his/her results. More complex reasoning will be demonstrated in the patterns created and the organization of the data. An Expert will make mathematically relevant observations, such as identifying that the difference in the total depends on how the pattern is interpreted.

Novice

Student knows s/he cannot find a workable strategy since understanding is lacking.



I don't eat it.



$$1 + 2 + 3 = 10$$

Diagrams do not assist student in finding a solution.



This student has difficulty adding accurately.

Apprentice

Student's diagrams are accurate for his/her solution.

Student uses some appropriate mathematical language.

$$1 + 2 + 3 = 6 \quad 6 + 3 = 9$$



Student lacks the component of Thursday, and does not seem to have a concept of a pattern.

Practitioner

Student uses correct math language and representations.

I drew all my Bugs Then I Counted.

1
Monday

3
Wednesday

5
Friday

4
Thursday

2
Tuesday

I put Thursday and Friday because it says all week. It adds 1 more egg.

used day

1 + 2 + 3 +
4 + 5 =
15

A correct answer is obtained.

Student explains his/her pattern and reasoning.

Student explain strategy used. Work is clearly documented.

Expert

Student's work is well documented and organized.

1 + 2 + 3 + 4 + 5 = 15

"It's a growing pattern"

1 + 2 + 3 + 1 + 2 = 9

"It's an ABCABC pattern"

1 + 2 + 3 + 2 + 5 = 13

"The odd numbers go up by 2 and the 2's stay the same every other one"

The student uses rich mathematical language.

Student obtains three different solutions and comments on what type of pattern was found.