10.5 Pip and Pep Predict Populations

Pep is eating a big slice of pizza (with sausage, pepperoni, mushrooms, green pepper, onions, anchovies, Canadian bacon, pineapples, black olives, and green olives) and concentrating intently on something when Pip walks up.

Pip: Hey, Pep! What are you doing? You seem to be working awfully diligently at something!

Pep: *[looking up]* Huh?? What?? Oh…hi, Pip. Did you say something?

Pip: Wow, you really are focused. I just asked what you were up to.

Pep: Oh…I'm just working on this extra credit problem that _____ (teacher's name) gave us. You know…finding the number of times the letter "b" shows up in our textbook.

Pip: I'm planning on trying that one too…I just haven't started on it yet. Hey, maybe we could work on it together!

Pep: *[looking cheerful]* Hey, that's a great idea! I'm up to page 78—only 1036 pages to go. But if you start on page 557, we'll each cover half the book and we should be done by…

Pip: Wait, wait, wait!!! *[shocked]* You're counting every letter "b" in the whole text book??!! Pep… _____ (teacher's name) wasn't suggesting that you count every letter!!!

Pep: *[uncertain]* …well…then how are we supposed to do it? He didn't say NOT to count each letter. It's not like there's an index or a website or anything that tells you that information…is there?

Pip: Of course not, Pep! But there are easier ways to do this. Your slice of pizza there should have given you a clue to this problem!

Pep: …uh…my…my pizza????? Uh, Pip…I think you've been working too hard. Why don't you go relax for awhile and then we can work on this extra credit assignment?

Pip: No, I'm not suggesting that your pizza talks to you…unless you think it does, Pep. I'm thinking about the lab that we did recently in biology class.

Pep: Lab? What lab?

Pip: The pizza lab…remember?

Pep: *[excited]* I remember eating pizza in biology class!! That was great! There was a lab with that?

Pip: Yes, Pep, there was. We were studying quadrats. You know…..a method for estimating the size of a population.….that uses proportions.

Pep: Sorry…I don't remember that part. So how does it work?

Pip: If you have a large study site—and a large population—*[emphasizing]* you obviously can't count every one.

Pep: *[rolls eyes]* Obviously.

Pip: So you take numerous small samples of the habitat and determine the density of the species.

Pep: Density?! What's that?

Pip: Density is simply the number of individuals of the species that you would expect to find per unit area.

Pep: So…if we're measuring our quadrats in meters squared (m^2), then it would be the number of wombats, for example, that you would find in one square meter of habitat?

Pip: Wombats?! *[shakes head]* Yes… if you were studying wombats, then it would be the average number of wombats per square meter of habitat.

Pep: I would suspect that wombats probably hang out in groups. So you'd have a high population density of wombats in some areas but no wombats in other areas. Most species are probably like that—how do quadrats work if populations are so clumpy?

Pip: Excellent question, Pep! To account for the clumpiness of most populations, you take many quadrats from random areas in your habitat. So…now do you know how to calculate the number of b's in the textbook?

Pep: I think I do! But first, how do we pick random pages in the text? It seems to me that just opening to pages would still favor the middle of the book or certain portions of the book.

Pip: Right you are, Pep! We can use the random number function in our spread sheet software to select random numbers between 1 and 1114 then count the # of times the letter b occurs on each page.

Pg #	# of b's		Pg 3	# of b's		Pg #	# of b's
345	18		724	22		971	25
338	38		88	7		893	16
400	15		481	39		472	36
416	7		388	14		509	23

Pip and Pep do this and come up with the table shown above:

Pep: OK…so we have 12 samples from the book. The average number of b's per page is (18+38+15+7+22+7+39+14+25+16+36+23)/12…which equals _____.

Pip: Then we need to take that average number and multiply it by the number of pages in the book—1114. That gives us a total number of _____! Wow, that's a lot of b's!!!

Pep: AND…it's a few more extra credit points for us!!! Woohoo!!!!! I just love biology!

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