

Read pgs 587-591 Do Q# 5-8a pg 592

5. Given:

total number of animals captured, marked, and released on the first visit, $M = 18$ bears

total number of animals captured on the second visit, $n = 16$ bears

number of marked animals that were recaptured on the second visit, $m = 5$ bears

Required: total population size, N

Analysis: $N = M \times n \div m$

Solution: Step1. Estimate the total population size by multiplying the number of marked individuals by the ratio of the number of individuals captured to the number of marked individuals captured.

$$\begin{aligned}\text{Population size, } N &= M \times n \div m \\ &= (18 \text{ bears}) \times (16 \text{ bears}) \div (5 \text{ bears}) \\ N &= 57.6 \text{ bears}\end{aligned}$$

Statement: The population of the bears in the forested area is about 60.

6. (a) Given: number of individuals in quadrants, $N_i = 6, 10, 2, 4, 7$

number of quadrants, $N_q = 5$

area of a quadrant, $A_q = 1.0 \text{ m}^2$

total study area, $A_T = 40.0 \text{ m} \times 40.0 \text{ m}$

Required: dandelion population density, D_P

dandelion population size, N_P

Analysis: $D_P = (\sum N_i) \div ((A_q) \times (N_q))$

Solution: Step1. Estimate the population density by dividing the total number of individuals sampled by the total area of all the sampling quadrants.

$$\begin{aligned}\text{Population density, } D_P &= \text{total number of individuals} \div \text{sampling area} \\ &= (\sum N_i) \div ((A_q) \times (N_q)) \\ &= (6 + 10 + 2 + 4 + 7) \div ((1.0\text{m}^2) \times 5) \\ &= (29) \div (5.0 \text{ m}^2) \\ D_P &= 5.8 \text{ seedlings/m}^2\end{aligned}$$

Step2. Estimate the population size by dividing the total number of individuals sampled by the total study area.

$$\begin{aligned}\text{Population size, } N_P &= (\text{population density}) \times (\text{total size of the study area}) \\ &= D_P \times A_T \\ &= (5.8 \text{ dandelions/m}^2) \times (40.0 \text{ m} \times 40.0 \text{ m}) \\ N_P &= 9280 \text{ seedlings}\end{aligned}$$

Statement: The population of the dandelions has a density of 5.8 seedlings/m² and a total estimated size of 9300 dandelions.

(b) The assumption that the student is making is that the randomly selected areas sampled are representative of the entire site. A good sample should be about 10 % of the total area studied; the sample taken was less than 1 % of the studied area.

7. Answers may vary. Students' answer should be well supported. Sample answers:

(a) The mark-recapture technique would be easier to implement because if scientists used quadrat sampling, the area would have to be measured and organized into quadrats. The prairie dogs are not stationary and they are burrowers so the biologist would be spending a great deal of time observing, possibly using video. It would be difficult for scientists to know if they counted animals twice without some kind of marking.

(b) The quadrat sampling technique would be more effective because using mark-recapture techniques it would be difficult to ensure that all assumptions were adequately met (because of the burrowing issues).

8. (a) Answers may vary. Sample answer: Some challenges researchers may experience include that caribou are large and fast so counting will be difficult. Their habitat is rugged and mountainous. Aerial counting or satellite images would likely be easiest although mark-recapture is a possibility.