LESSON MAKER PRO

Who Shapes the Plot?

Use quadrat data to compare plants in a community.

HIGH SCHOOL · BOT.6

BOT.6 "Students will ask questions, plan, and conduct field investigations on local plant communities. Conduct transects/plot studies to determine species, biodiversity, or health of a plant community..."

NAME _____ DATE _____

MEASURING PLANT IMPORTANCE

Relative density = a species' stems / all stems × 100. Relative dominance = a species' basal area / all basal area × 100, and relative frequency = its occupied-plot count / the sum of all species' occupied-plot counts × 100. Add these three percentages to find the species' importance value (IV).

WORKED EXAMPLE

A team surveys four quadrats. Find the sunflower IV.

COURTYARD QUADRAT SURVEY

Species	Stems	Basal area (cm^2)	Plots present
Sunflower	9	12	3
Clover	6	8	2

1. Totals: 9 + 6 = 15 stems; 12 + 8 = 20 cm^2; 3 + 2 = 5 plot occurrences.
2. Sunflower: 9/15 × 100 = 60% density; 12/20 × 100 = 60% dominance; 3/5 × 100 = 60% frequency.
3. IV = 60 + 60 + 60 = 180.

Answer: Sunflower IV = 180

PRACTICE 6 problems

1 Find the relative density of aster.

MEADOW STEM COUNT

Species	Stems
Aster	11
Milkweed	9

ANSWER _____

2 Find the relative dominance of willow.

STREAMBANK BASAL AREA

Species	Basal area (cm^2)
Willow	15
Alder	25

ANSWER _____

3 A team surveys six quadrats. Find the relative frequency of fern.

FOREST-FLOOR PLOT SURVEY

Species	Plots present
Fern	6
Moss	4

ANSWER _____

4 Find the relative density of plantain.

PATHSIDE STEM COUNT

Species	Stems
Dandelion	6
Plantain	4
Chicory	10

ANSWER _____

5 A team surveys three quadrats. Find the sedge IV.

WETLAND QUADRAT SURVEY

Species	Stems	Basal area (cm^2)	Plots present
Sedge	6	7	1
Iris	4	3	3

ANSWER _____

6 A team surveys four quadrats. Which species has the higher IV, and what is its IV?

POND-EDGE QUADRAT SURVEY

Species	Stems	Basal area (cm^2)	Plots present
Sedge	5	2	1
Reed	5	8	4

ANSWER _____

APPLY IT Show your work

1 Your school is planning a shadier courtyard. A student team surveys six quadrats where young trees are growing. Find the oak IV to help describe its current importance in the plant community.

COURTYARD TREE SURVEY

Species	Stems	Basal area (cm^2)	Plots present
Oak	8	18	2
Maple	12	12	6

ANSWER _____

2 Students are checking a rain garden that absorbs runoff near the gym. They survey five quadrats. Which species has the higher IV, and by how much?

RAIN GARDEN QUADRAT SURVEY

Species	Stems	Basal area (cm^2)	Plots present
Cattail	12	10	3
Rush	8	30	5

ANSWER _____

CHALLENGE One step up

A team surveys four quadrats before planning a native planting. A student claims that the species present in the most quadrats must have the highest IV. Does this survey support the claim? Calculate each species' IV and explain your answer.

NATIVE PLANTING SITE SURVEY

Species	Stems	Basal area (cm^2)	Plots present
Serviceberry	4	12	2
Goldenrod	8	2	4
Switchgrass	8	6	2

WORK SPACE AND ANSWER

Who Shapes the Plot?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the relative density of aster.	**55%**
2	Find the relative dominance of willow.	**37.5%**
3	A team surveys six quadrats. Find the relative frequency of fern.	**60%**
4	Find the relative density of plantain.	**20%**
5	A team surveys three quadrats. Find the sedge IV.	**155**
6	A team surveys four quadrats. Which species has the higher IV, and what is its IV?	**Reed, IV = 210**

PART 2 · APPLY IT

1. **Oak IV = 125** Oak's relative density is 8/20 × 100 = 40%, its relative dominance is 18/30 × 100 = 60%, and its relative frequency is 2/8 × 100 = 25%. Its IV is 40 + 60 + 25 = 125.
2. **Rush has the higher IV by 55.** Cattail's IV is 60 + 25 + 37.5 = 122.5, while rush's IV is 40 + 75 + 62.5 = 177.5. The difference is 177.5 - 122.5 = 55.

CHALLENGE

No. Serviceberry has IV = 20 + 60 + 25 = 105; goldenrod has IV = 40 + 10 + 50 = 100; switchgrass has IV = 40 + 30 + 25 = 95. Goldenrod occurs in the most quadrats, but serviceberry has the highest IV because its greater relative dominance more than offsets its lower relative frequency.

Accept equivalent calculations with or without percent signs in the intermediate steps. For relative frequency, divide by total plot occurrences across species, not by the number of quadrats surveyed.