

EB Education Revision Guide



How to work with Required Practicals: Part 4
Combined (AQA Biology Paper 2 2022)



Education
Services Ltd

Assessed Required Practical Activities Paper 1 Foundation & Higher

Required practical 7: measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.

KEY WORDS:

Population: Total number of individuals in a species living in a particular area

Abiotic: Non-living factors e.g. temperature, pH

Biotic: Living factors e.g. predators, disease

Practical 2: Investigating Population Size

What you need to know

To be able to investigate how different factors affect the distribution of species.

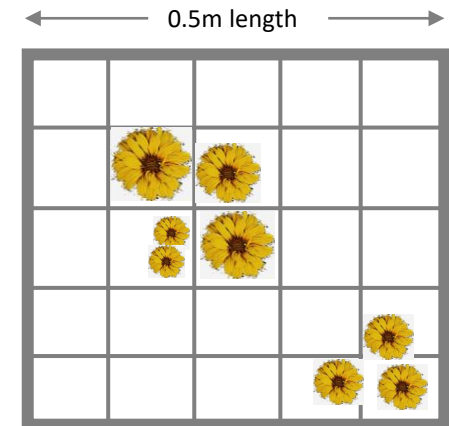
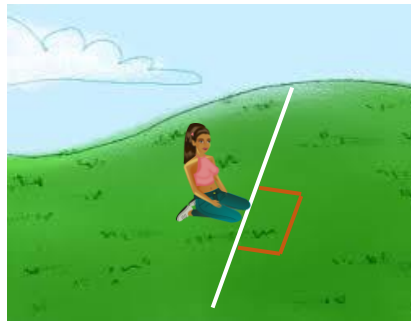
The size of a population of animals or plants in a habitat can be estimated by taking samples of the organisms from the habitat. The larger the sample, the more accurate the estimate of the population size is likely to be. Plants can be sampled more easily than animals because they are unable to move around within the habitat. By sampling, population sizes can be compared between different areas.

- Random sampling – used when you want to know how the organisms are spread out across an area. You would place the quadrats at random coordinates.
- Line transect – used when you want to see how one particular feature (e.g. a river/road/building) affects an area. You take samples in a line (called a transect) and repeat to compare the difference near and far from the feature.

You will need to be able to calculate the mean and work out an estimate of the total number of a particular species which are present:

Estimated population size = (Area of field ÷ area of quadrat) × mean number of specific individual organisms per quadrat

You would use a quadrat (diagram below) and count the number of individuals within it.





Your turn:

1. Josh used quadrats to estimate the population of dandelion plants in a field.

a) Describe how Josh should use the quadrats to estimate the number of dandelion plants in the field.

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b) Josh used 0.25m^2 quadrats. The field measured 30m by 155 m. He found a mean of 0.48 dandelions per quadrat.

Estimate the population of dandelions in the field.

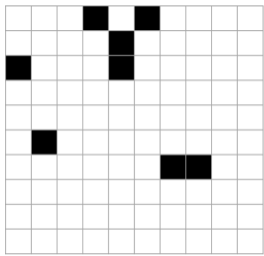
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c) In a corner of the field, there is a lot of grass growing. Suggest why the dandelions may not grow as well in this area.

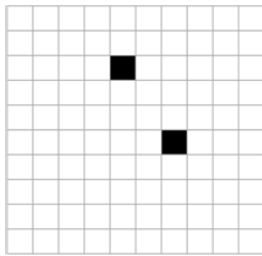
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Your turn

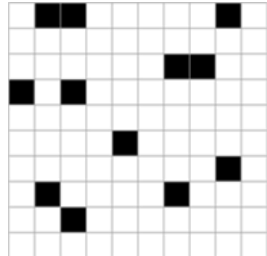
2. Josh and two friends decided to estimate the population size of a plant species in a field, using a quadrat. Below is a diagram of each quadrat.



Josh



Cerys



Lily

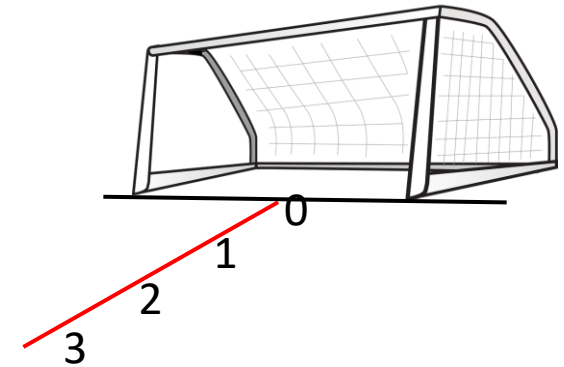
a) Which student would get the most reliable estimate, and why?

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b) Define the term population

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c) They decided to investigate the distribution of grass around the goal in a football pitch. To do this they place a quadrat on the goal line, and then at one metre intervals from the goal line.



They used quadrats which were 10cm x 10cm, containing 100 squares.

The table shows the results they obtained.

Student	% grass cover					
	0m	1m	2m	3m	4m	5m
Josh	10	15	30	41	82	84
Cerys	13	16	38	50	72	94
Lily	23	13	35	56	90	100
Elle	15	17	5	47	86	85
Danny	10	14	45	53	75	90
Average						

i) Calculate the average results.

ii) How could the students investigate how the abundance of seaweed changes from the sea to the top of a beach?

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Answers:

1. Josh used quadrats to estimate the population of dandelion plants in a field.

a) Describe how Josh should use the quadrats to estimate the number of dandelion plants in the field.

Place (a sufficient number of) quadrats randomly in the field.

Count the number of dandelions in each quadrat.

Calculate the mean number of dandelions per quadrat.

Divide the area of the field by the area of the quadrat, then multiply by the mean number of dandelions per quadrat to estimate population

b) Josh used 0.25m² quadrats. The field measured 30m by 155 m. He found a mean of 0.48 dandelions per quadrat.

Estimate the population of dandelions in the field.

$$(30 \times 155) \div 0.25 = 18\,600$$

$$(0.48 \times 18\,600) = 8928$$

c) In a corner of the field, there is a lot of grass growing. Suggest why the dandelions may not grow as well in this area.

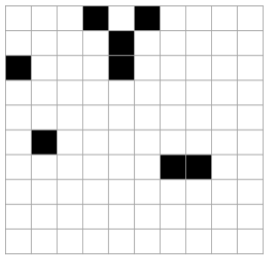
Competition for resources including:

- light, water, space, mineral ions (nutrients/salts/ions)

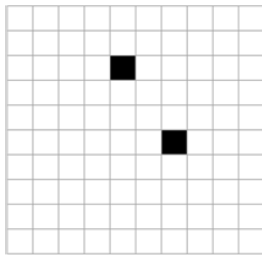
Reference to why growth may be limited:

- less (light) energy for photosynthesis
- less water as a raw material for photosynthesis / support
- less surface area exposed to light
- less sugar / glucose produced in photosynthesis
- less (space) to grow bigger
- less (space) for growth of root system
- less (mineral ions) for growth
- less (mineral ions / sugar) for production of larger molecules

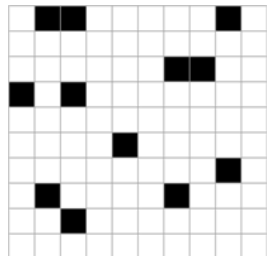
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Josh



Cerys



Lily

a) Which student would get the most reliable estimate, and why?

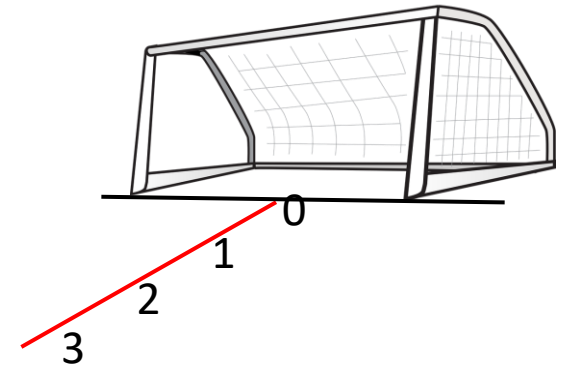
Lily because she has used the most quadrats, and they are randomly spread out.

a) b) Define the term population

The total number of a particular species

Answers

c) They decided to investigate the distribution of grass around the goal in a football pitch. To do this they place a quadrat on the goal line, and then at one metre intervals from the goal line.



They used quadrats which were 10cm x 10cm, containing 100 squares.

The table shows the results they obtained.

Answers

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Danny	10	14	45	53	75	90
Average	14.2	15	37	49.4	81	90.6

ii) How could the students investigate how the abundance of seaweed changes from the sea to the top of a beach?

Place a tape measure from the tide/sea along the shore. This is the transect. Place a quadrat at regular distances, along the line, for example every five metres.

Record the number of pieces of seaweed within each quadrat.

i) Calculate the average results.

Mean calculated by adding up the results for each distance, and dividing by the number of results. For 2m results there is an anomalous result (5). This has not been included when calculating the mean.

For more help and resources, or
to work with us as a tutor, please
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