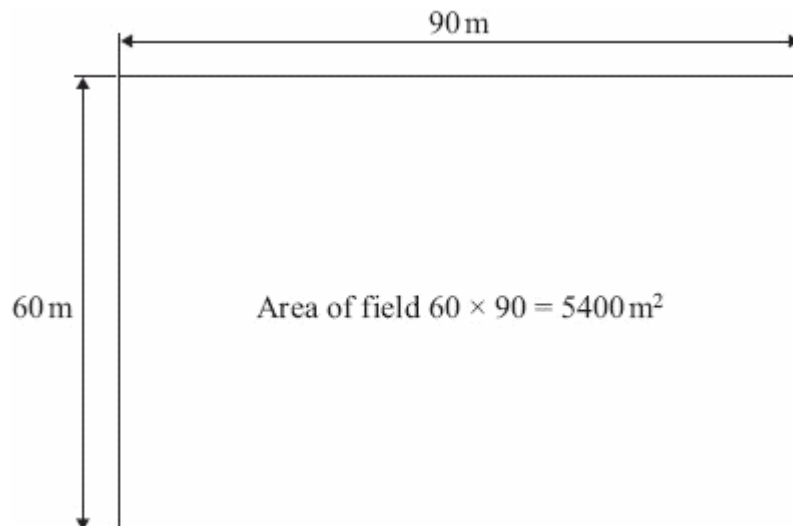## Distribution of organisms

1. A class of students was set the task of estimating the number of dandelions on the school field. To do this, they decided to use sampling squares called quadrats.

Each quadrat had an area of 1 m^2.

The diagram shows the dimensions of the school field.

90 m

60 m   Area of field $60 \times 90 = 5400\,m^2$

(a) They wanted to make their investigation as fair as possible.

Which would be the best way to sample the field?

1 throw all the quadrats near the middle of the field

2 throw the quadrats where there were lots of dandelions to count

3 throw the quadrats randomly around the field

4 make sure all the quadrats had a similar number of dandelions in them

(b) Each student collected data by throwing 10 quadrats.

Which would be the best way to improve the reliability of their estimate?

1 count all the dandelions on the field

2 use the results of the student with the highest estimate

3 work out an estimate using all the data collected by all the students

4 use smaller quadrats

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These are the results for one student, Mary.

Quadrat number	Number of dandelions
1	3
2	3
3	6
4	2
5	1
6	2
7	0
8	3
9	2
10	0

(c)   What was the mean number of dandelions per quadrat counted by Mary?

1   1.7

2   1.8

3   2.0

4   2.2

(d)   Another student, Sharon, calculated a mean of 2.8 dandelions per quadrat from her results.

Estimate the number of dandelions in the whole field by using:

- the mean of 2.8

- information from the diagram on the opposite page

- the equation below.

Estimated number of dandelions on field	=	mean number of dandelions per quadrat	×	number of quadrats that would fit into the field

1   28

2   420

3   15 120

4   54 000

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2. Puffins are birds which live along coastal regions from southern Spain to Iceland. Scientists investigated whether wing length is related to temperature by collecting data on five adult puffins from each of Spain, France, the British Isles and Iceland.

The results are shown in the table.

Country	Latitude in North	Mean daily temperature range in °C	Range of wing length in cm
Spain	36 to 43	10 to 28	13.3 to 14.8
France	42 to 50	3 to 25	14.1 to 15.8
the British Isles	50 to 58	2 to 18	15.2 to 16.8
Iceland	63 to 66	−10 to 10	15.9 to 17.5

(a) In which country was the greatest range of wing length observed

   1 Spain

   2 France

   3 the British Isles

   4 Iceland

(b) What relationship does the data show?

   1 Puffins from more northerly countries have larger bodies.

   2 Puffins which live in colder countries have smaller wings.

   3 There is no relationship between wing length and latitude.

   4 Puffins from more northerly countries have longer wings.

(c) The wing length of a dead adult puffin washed up on the shore was 15.7 cm.

   From which countries could the puffin have come?

   1 Spain and the British Isles

   2 the British Isles and Iceland

   3 France and the British Isles

   4 Spain and France

(d) Which of the following describes a weakness in the design of this investigation?

   1 The wing lengths of puffins from other parts of the world were not measured.

   2 No wing lengths were measured in puffins from latitudes 59° to 62° North.

   3 Only five puffins were measured from each country.

   4 The ranges of wing lengths overlap.

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