

In 1979-80 a marine biologist measured the following variables once a day on 300 successive days at Manomet Pt, Massachusetts, where harbour seals *Phoca vitulina* haul out at low tide. Assign a symbol to each variable.

- \_\_\_\_\_ Number of seals hauled out
- \_\_\_\_\_ Wind chill (Watt m<sup>-2</sup>)
- \_\_\_\_\_ Wind speed (knots)
- \_\_\_\_\_ Air temperature (degrees C)
- \_\_\_\_\_ Wave intensity (0 = calm, 1 = slight, 2 = moderate, 3 = heavy)
- \_\_\_\_\_ Disturbance by people (presence/absence)
- \_\_\_\_\_ Disturbance by dogs (presence/ absence)

1. Draw a box and arrow diagram for expressing a preliminary model of the relation of these 7 variables. Use one box for each variable. Arrows should go from explanatory to response variable.

2. Compute the number of potential arrows in your diagram. The formula for number of pairs of n boxes is:

arrows = 2 \* pairs

$$\text{Pairs} = \frac{n!}{(n-2)!} \cdot \frac{1}{2} \quad \text{where } 3! = 3 \cdot 2 \cdot 1$$

arrows = \_\_\_\_\_

3. What is the degree of reduction in your preliminary model, relative to the potential number of arrows? Express this as a ratio, the number of arrows in the diagram, relative to the potential number.

reduction = \_\_\_\_\_

4. How might you further simplify your preliminary model?