

## Solutions Sheet 1

### 1. Solution

$$P(Y = 0) = P(\text{no impurities}) = .2, P(Y = 1) = P(\text{exactly one impurity}) = .7, P(Y = 2) = .1.$$

$$2. P(SH) = 0.08, P(B) = 0.06, P(B \text{ and } SH) = 0.02$$

Let B = bushing defect, SH = shaft defect.

a.  $P(B) = .06 + .02 = .08$

b.  $P(B \text{ or } SH) = .06 + .08 + .02 = .16$

c.  $P(\text{exactly one defect}) = .06 + .08 = .14$

d.  $P(\text{neither defect}) = 1 - P(B \text{ or } SH) = 1 - .16 = .84$

### 3. Solution:

Let E be the event that at a random spot the depth is higher than 4 feet. So,  $P(E) = .17$ . So, the answer is  $P(\text{not } E) = 1 - P(E) = 1 - .17 = .83$ .

### 4. Solution

a. Since the events are M.E.,  $P(S) = P(E_1) + \dots + P(E_4) = 1$ . So,  $P(E_2) = 1 - .01 - .09 - .81 = .09$ .

b.  $P(\text{at least one hit}) = P(E_1) + P(E_2) + P(E_3) = .19$ .

### 5. Solution

The main component of GIS: Hardware, Software, Data, People, Methods

the different characteristics of spatial data used in GIS: GIS handles SPATIAL information referenced by its location in space, GIS makes connections between activities based on spatial proximity

### 6. Examples of Vector :

A representation of the world using points, lines, and polygons. Vector models are useful for storing data that has discrete boundaries, such as country borders, land parcels, and streets.

and Raster data:

A representation of the world as a surface divided into a regular grid of cells. Raster models are useful for storing data that varies continuously, as in an aerial photograph, a satellite image, a surface of chemical concentrations, or an elevation surface.

vector Data advantages : Data can be represented at its original resolution and form without generalization. Graphic output is usually more aesthetically pleasing (traditional cartographic representation); Since most data, e.g. hard copy maps, is in vector form no data conversion is required. Accurate geographic location of data is maintained.

Disadvantages: The location of each vertex needs to be stored explicitly. This is often processing intensive and usually requires extensive data cleaning. As well, topology is static, and any updating or editing of the vector data requires re-building of the topology.

#### Raster Data

Advantages : The geographic location of each cell is implied by its position in the cell matrix. It is ideally suited for mathematical modeling and quantitative analysis. Discrete data, e.g. forestry stands, is accommodated equally well as continuous data, e.g. elevation data, and facilitates the integrating of the two data types.

Disadvantages: The cell size determines the resolution at which the data is represented.; It is especially difficult to adequately represent linear features depending on the cell resolution. Raster maps inherently reflect only one attribute or characteristic for an area. Since most input data is in vector form, data must undergo vector-to-raster conversion. Most output maps from grid-cell systems do not conform to high-quality cartographic needs.