Example: (Reading Assignment)

Suppose that a dental clinic has 12 nurses classified as follows:

Nurse	1	2	3	4	5	6	7	8	9	10	11	12
Has children	Yes	No	No	No	No	Yes	No	No	Yes	No	No	No
Works at night	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes

The experiment is to randomly choose one of these nurses. Consider the following events:

$$C = \text{the chosen nurse has children}$$
$$N = \text{the chosen nurse works night shift}$$

a) Find The probabilities of the following events:
1. the chosen nurse has children.
2. the chosen nurse works night shift.
3. the chosen nurse has children and works night shift.
4. the chosen nurse has children and does not work night shift.

b) Find the probability of choosing a nurse who woks at night given that she has children.

c) Are the events C and N independent? Why?

d) Are the events C and N disjoint? Why?

e) Sketch the events C and N with their probabilities using Venn diagram.

Solution: We can classify the nurses as follows:

	N (Night shift)	$\overline{N}$ (No night shift)	total
C (Has Children)	2	1	3
$\overline{C}$ (No Children)	6	3	9
total	8	4	12

a) The experiment has $n(\Omega) = 12$ equally likely outcomes.

P(The chosen nurse has children) = P(C) = $\frac{n(C)}{n(\Omega)} = \frac{3}{12} = 0.25$

P(The chosen nurse works night shift) = P(N) = $\frac{n(N)}{n(\Omega)} = \frac{8}{12} = 0.6667$

P(The chosen nurse has children and works night shift)

$= P(C \cap N) = \frac{n(C \cap N)}{n(\Omega)} = \frac{2}{12} = 0.16667$

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P(The chosen nurse has children and does not work night shift)

$$= P(C \cap \overline{N}) = \frac{n(C \cap \overline{N})}{n(\Omega)} = \frac{1}{12} = 0.0833$$

b) The probability of choosing a nurse who woks at night given that she has children:

$$P(N \mid C) = \frac{P(C \cap N)}{P(C)} = \frac{2/12}{0.25} = 0.6667$$

c) The events C and N are independent because $P(N \mid C) = P(N)$.

d) The events C and N not are disjoint because C∩N≠ϕ.   (Note: n(C∩N)=2)

e) Venn diagram