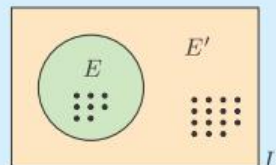


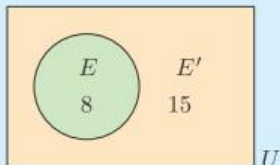
Example 20

Self Tutor

The Venn diagram alongside represents the set U of all children in a class. Each dot represents a student. The event E shows all those students with blue eyes. Determine the probability that a randomly selected child:



- a has blue eyes
- b does not have blue eyes.



$$n(U) = 23, \quad n(E) = 8$$

a $P(\text{blue eyes}) = \frac{n(E)}{n(U)} = \frac{8}{23}$

b $P(\text{not blue eyes}) = \frac{n(E')}{n(U)} = \frac{15}{23}$

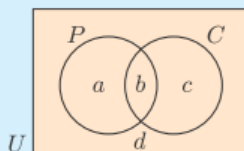
or $P(\text{not blue}) = 1 - P(\text{blue eyes}) = 1 - \frac{8}{23} = \frac{15}{23}$

Example 21

Self Tutor

In a class of 30 students, 19 study Physics, 17 study Chemistry, and 15 study both of these subjects. Display this information on a Venn diagram and hence determine the probability that a randomly selected class member studies:

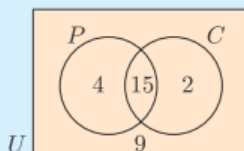
- a both subjects
- b at least one of the subjects
- c Physics but not Chemistry
- d exactly one of the subjects
- e neither subject



Let P represent the event of 'studying Physics' and C represent the event of 'studying Chemistry'.

$$\begin{aligned} \text{Now} \quad a + b &= 19 && \{\text{as 19 study Physics}\} \\ b + c &= 17 && \{\text{as 17 study Chemistry}\} \\ b &= 15 && \{\text{as 15 study both}\} \\ a + b + c + d &= 30 && \{\text{as there are 30 in the class}\} \end{aligned}$$

$$\therefore b = 15, \quad a = 4, \quad c = 2, \quad d = 9.$$



- a $P(\text{studies both}) = \frac{15}{30}$ or $\frac{1}{2}$
- b $P(\text{studies at least one subject}) = \frac{4+15+2}{30} = \frac{7}{10}$
- c $P(P \text{ but not } C) = \frac{4}{30} = \frac{2}{15}$
- d $P(\text{studies exactly one}) = \frac{4+2}{30} = \frac{1}{5}$
- e $P(\text{studies neither}) = \frac{9}{30} = \frac{3}{10}$