

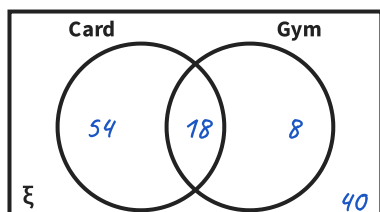
Conditional Probability: Venn Diagrams *extend*

ANSWERS

1



Of 120 people, $\frac{3}{5}$ have a library card and 25% of these also have a gym pass. 40 have neither. Given that a person has a gym pass, find the probability that they have a library card.



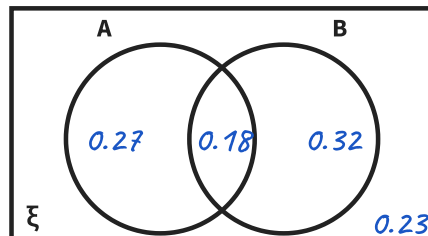
$$\text{gym only: } 120 - 72 - 40 = 8, \text{ so } \frac{18}{26}$$

Answer $\frac{9}{13}$

2



$P(A) = 0.45$, $P(B) = 0.5$ and $P(B | A) = 0.4$. Find $P(A | B')$.



$$P(A \cap B) = 0.45 \times 0.4 = 0.18$$

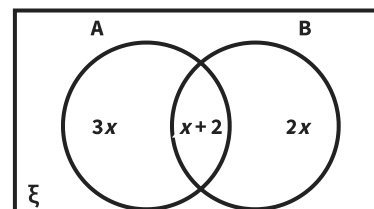
$$P(A \cap B') = 0.27, \text{ so } 0.27 \div 0.5$$

Answer $\frac{27}{50}$

3



There are 60 people in the diagram. $P(A | B) = \frac{2}{5}$. Find the probability that a person is in B given that they are not in A.



$$\frac{x+2}{3x+2} = \frac{2}{5} \text{ gives } x = 6$$

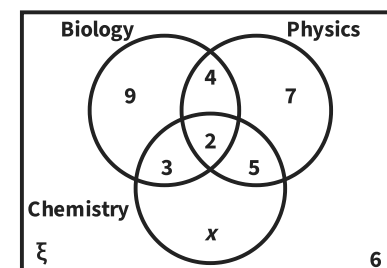
$$\text{outside A: } 12 + 22 = 34, \frac{12}{34}$$

Answer $\frac{6}{17}$

4



The Venn diagram shows the sciences 50 students study. Given that a student studies chemistry, find the probability that they study exactly one other science.



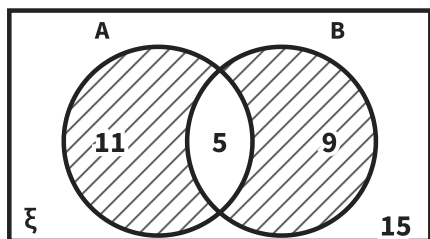
$$x = 14, \text{ then } 8 \text{ out of } 24$$

Answer $\frac{1}{3}$

5



Find $P(A \cup B | (A \cap B)')$ for the people in this Venn diagram.



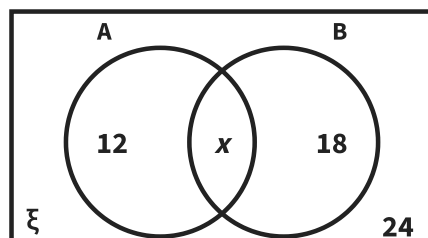
$$35 \text{ not in both, } 20 \text{ of them in } A \cup B$$

Answer $\frac{4}{7}$

6



Events A and B are independent. Find x .



$$P(A | B) = P(A): \frac{x}{18+x} = \frac{12+x}{54+x}$$

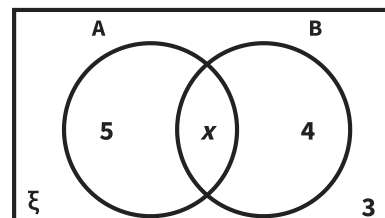
$$54x + x^2 = 216 + 30x + x^2$$

Answer $x = 9$

7



Two different people are chosen at random from those in B. The probability that both are also in A is $\frac{1}{3}$. Find x .



$$\frac{x(x-1)}{(x+4)(x+3)} = \frac{1}{3}$$

$$x^2 - 5x - 6 = 0, (x-6)(x+1) = 0$$

Answer $x = 6$

8



$P(A \cap B)$ is not 0 and $P(A | B) = P(B | A)$. Prove that $P(A) = P(B)$.

$$\frac{P(A \cap B)}{P(B)} = \frac{P(A \cap B)}{P(A)}$$

$$\text{so } P(B) = P(A)$$

Proof $P(A) = P(B)$