

Cambridge International AS & A Level

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Mathematics

9709/52

Paper 5 Probability & Statistics 1

May/June 2020

Question No (2)

- 2 A total of 500 students were asked which one of four colleges they attended and whether they preferred soccer or hockey. The numbers of students in each category are shown in the following table.

	Soccer	Hockey	Total
Amos	54	32	86
Benn	84	72	156
Canton	22	56	78
Devar	120	60	180
Total	280	220	500

- (a) Find the probability that a randomly chosen student is at Canton college and prefers hockey.
- (b) Find the probability that a randomly chosen student is at Devar college given that he prefers soccer.
- (c) One of the students is chosen at random. Determine whether the events 'the student prefers hockey' and 'the student is at Amos college or Benn college' are independent, justifying your answer.

Solution:

(a)

*Student at Canton college prefer hockey are 56.*

*Total number of students = 500*

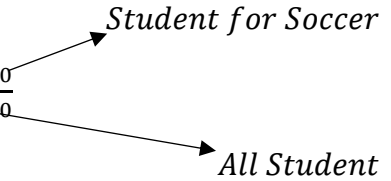
$$P(\text{Student Canton college and prefer hockey}) = \frac{\text{Possible options}}{\text{Total options}}$$

$$= \frac{56}{500} = 0.112 \text{ Ans.}$$

(b)

*It is about the condition probability.*

$$\text{Probability of prefers Soccer} = \frac{280}{500}$$



$$\text{Devar college probability} = \frac{120}{500}$$

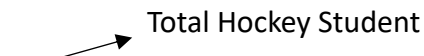
*Now by using conditional probability*

*P(Student at devar college , given that they prefer Soccer)*

$$\begin{aligned}
 &= \frac{\frac{120}{500}}{\frac{280}{500}} \quad \begin{array}{l} \text{--}\rightarrow \\ \text{--}\rightarrow \end{array} \quad \frac{\text{Probabilty in Devar college for Soccer}}{\text{Probability for all soccer student}} \\
 &= \frac{120}{500} \times \frac{500}{280} = \frac{120}{280} \\
 &= \frac{3}{7}
 \end{aligned}$$

(c)

$$\begin{aligned}
 P(\text{Student prefers hockey}) = P(H) &= \frac{220}{500} \\
 &= \frac{11}{25}
 \end{aligned}$$



*Probability formula*

$$P(A \cup B) = P(A) + P(B)$$

$$P(\text{Student is from Amos or Benn college}) = P(A \cup B)$$

(Note: When there is **or** in the condition we use union)

$$= P(A) + P(B)$$

$$P(A \cup B) = P(A) + P(B)$$

$$\begin{aligned}
 P(A \cup B) &= \frac{86}{500} + \frac{156}{500} \\
 &= \frac{242}{500} = \frac{121}{250}
 \end{aligned}$$

Student from Amos College or  
Student from Benn College

$$P(\text{Student prefer hockey and from Amos or Benn College})$$

$$= P(H \cap (A \cup B))$$

$$\begin{aligned}
 &= \frac{32}{500} + \frac{72}{500} \\
 &= \frac{104}{500} = \frac{26}{125}
 \end{aligned}$$

Amos college Hockey student  
Benn College Hockey Student

$$\text{Since } \frac{11}{25} \times \frac{121}{250} \neq \frac{26}{125}$$

$$\therefore P(H) \times P(A \cup B) \neq P(H \cap (A \cup B))$$

**The events are not independent**

