

**20 14** History and Geography are two subjects students may decide to study.

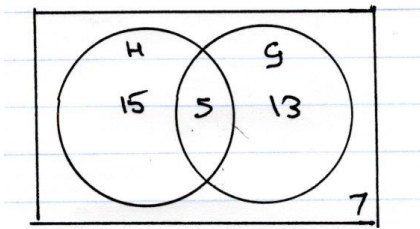
**MA** For a group of 40 students, the following is known.

- 7 students study neither History nor Geography
- 20 students study History
- 18 students study Geography

- (a) A student is chosen at random. By using a Venn diagram, or otherwise, find the probability that the student studies both History and Geography. **2**
- (b) A student is chosen at random. Given that the student studies Geography, what is the probability that the student does NOT study History? **1**
- (c) Two different students are chosen at random, one after the other. What is the probability that the first student studies History and the second student does NOT study History? **2**

(a)

Let  $H$  = History, and  $G$  = Geography.



As  $40 - 7 = 33$ , then 33 students study History, or Geography, or both.

As  $20 + 18 - 33 = 5$ , then 5 students study both. ✓

$$\begin{aligned}
 P(\text{student studies both}) &= P(H \cap G) \\
 &= \frac{5}{40} \\
 &= \frac{1}{8} \quad \checkmark
 \end{aligned}$$

$$(b) P(\text{Not History} | \text{Geography}) = P(\bar{H} | G)$$

$$= \frac{P(\bar{H} \cap G)}{P(G)}$$

$$= \frac{13}{40}$$

$$= \frac{13}{40}$$

$$(c) P(\text{History then not History}) = P(H) \times P(\bar{H} | H)$$

$$= \frac{20}{40} \times \frac{20}{39} \quad \checkmark$$

$$= \frac{10}{39} \quad \checkmark$$

State Mean:

**1.61/2**

**0.49/1**

**1.19/2**

## HSC Marking Feedback

### Question 14 (a)

Students should:

- label Venn diagrams clearly
- read the question carefully
- check that all numbers in the Venn diagram add to the required total
- understand probability may be written as a fraction or percentage.

In better responses, students were able to:

Looking for **Mathematics Advanced** Topic Revision?

Go to our [MathsFit](#) page for downloads @ \$2.95 each



- construct correct, complete, labelled Venn diagrams or 2-way tables
- find that the number of students doing both History and Geography was 5
- ensure that the total number of students added to 40
- answer the question, realising that the answer to a probability question must be a number from 0 to 1.

**Areas for students to improve include:**

- creating Venn diagrams confidently and correctly
- ensuring that their Venn diagram (or equivalent) represents 40 students
- reading questions carefully
- answering the question asked.

**Question 14 (b)****Students should:**

- find the students that studied Geography only
- understand how to use the formula for conditional probability
- recognize that 'given study Geography, does not study history' means  $P(\bar{H}|G)$ .

**In better responses, students were able to:**

- understand the language of conditional probability
- extract the correct information from their Venn diagram, 2-way table or by other means
- use the conditional probability formula correctly.

**Areas for students to improve include:**

- applying conditional probability concepts
- interpreting that the probability required only concerned the 18 students doing Geography and not the whole cohort of 40, ie  $\frac{13}{18}$  not  $\frac{13}{40}$
- using Venn diagrams in preference to algebraic formulae for conditional probability whenever possible.

**Question 14 (c)****Students should:**

- find the probability of multiple events in questions that involve situations without replacement
- understand the multiplication required in two-step probability.

**In better responses, students were able to:**

- interpret the meaning of the question
- use their Venn diagram or a tree diagram and the original information given in the question to find the probabilities needed
- multiply the probabilities, displaying understanding of the language of probability.

**Areas for students to improve include:**

- using tree diagrams to assist with understanding if needed
- learning and applying the language of 'or' and 'and' used in probability
- interpreting questions involved probabilities without replacement
- ensuring their fractional probabilities match the totals in their Venn diagrams.

\* These solutions have been provided by [projectmaths](http://projectmaths.com.au) and are not supplied or endorsed by NESA.

