adamjee maths

A-LEVEL MATHS / EDEXCEL / FREE RESOURCES

Conditional probability

Question paper

6 questions

Exam questions and marking instructions remain credited to their board.

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1. Bag **A** contains 5 red, 4 yellow and 3 green beads.

Bag **B** only contains red and yellow beads.

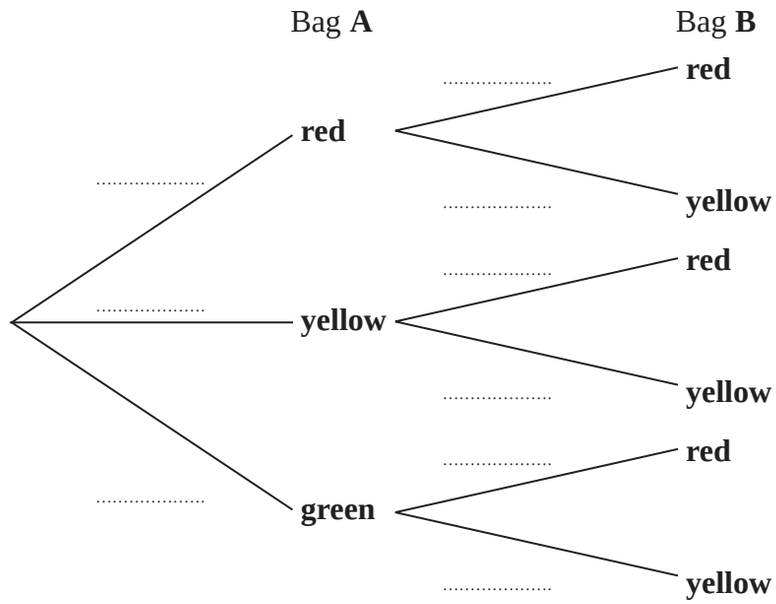
A bead is selected at random from bag **A** and a second bead is selected at random from bag **B**

Given that the probability that both beads selected are yellow is $\frac{3}{16}$

(a) (i) find the probability of selecting a yellow bead from bag **B**

(2)

(ii) Hence complete the tree diagram below by finding the probability on each branch.



(2)

(b) Find the exact probability that at least one of the two beads selected is yellow.

(3)

The event X is that at least one of the beads selected is yellow.

The event W is that a green bead is selected.

(c) Find the exact value of $P(W|X)$

(2)

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Question 1 continued

(Total for Question 1 is 9 marks)

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5. The heights of men in a tennis club are normally distributed with a mean of 183 cm and a standard deviation of 4.9 cm.

A man from the tennis club is selected at random.

(a) Find the probability that the man's height is

(i) more than 186 cm,

(ii) between 175 cm and 185 cm.

(2)

The heights of women in the tennis club are normally distributed with a mean of μ cm and a standard deviation of σ cm.

Given that 40% of the women are shorter than 170 cm and 15% are taller than 175 cm,

(b) find the value of μ and the value of σ
Show your working clearly.

(5)

A man from the tennis club and a woman from the tennis club are selected at random.

(c) Find the probability that both players have heights between 170 cm and 175 cm.

(3)

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Question 5 continued

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Question 5 continued

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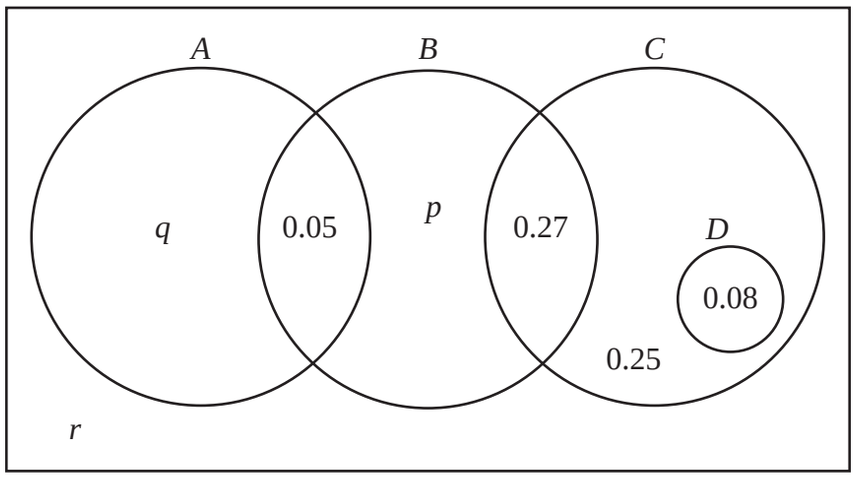
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Question 5 continued

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6. The Venn diagram, where p, q and r are probabilities, shows the events A, B, C and D and associated probabilities.



(a) State any pair of mutually exclusive events from A, B, C and D

(1)

The events B and C are independent.

(b) Find the value of p

(2)

(c) Find the greatest possible value of $\mathrm{P}(A \mid B')$

(3)

Given that $\mathrm{P}(B \mid A') = 0.5$

(d) find the value of q and the value of r

(3)

(e) Find $\mathrm{P}\left(\left[A \cup B\right]' \cap C\right)$

(1)

(f) Use set notation to write an expression for the event with probability p

(1)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 11 marks)

TOTAL FOR STATISTICS IS 50 MARKS

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5. A company has 1825 employees.
The employees are classified as professional, skilled or elementary.

The following table shows

- the number of employees in each classification
- the two areas, *A* or *B*, where the employees live

	A	***B***
Professional	740	380
Skilled	275	90
Elementary	260	80

An employee is chosen at random.

Find the probability that this employee

(a) is skilled,

(1)

(b) lives in area *B* and is not a professional.

(1)

Some classifications of employees are more likely to work from home.

- 65% of professional employees in both area *A* and area *B* work from home
- 40% of skilled employees in both area *A* and area *B* work from home
- 5% of elementary employees in both area *A* and area *B* work from home
- Event *F* is that the employee is a professional
- Event *H* is that the employee works from home
- Event *R* is that the employee is from area *A*

(c) Using this information, complete the Venn diagram on the opposite page.

(4)

(d) Find $P(R' \cap F)$

(1)

(e) Find $P([H \cup R]')$

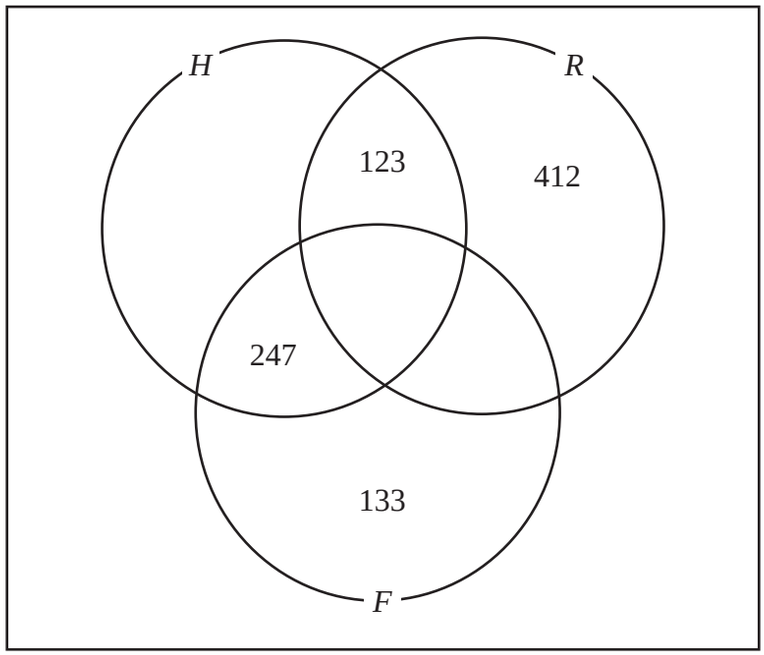
(1)

(f) Find $P(F \mid H)$

(2)

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Question 5 continued



Turn over for a spare diagram if you need to redraw your Venn diagram.

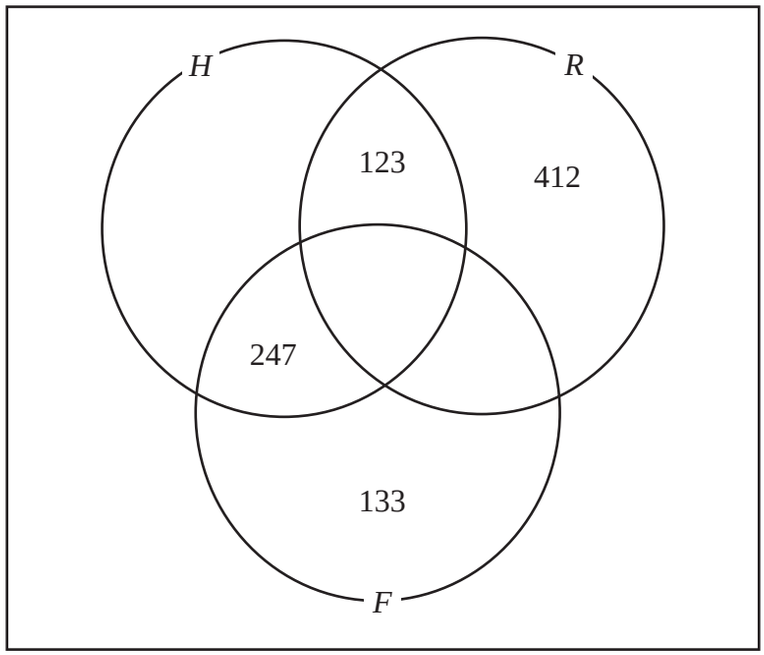
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Question 5 continued

Only use this diagram if you need to redraw your Venn diagram.



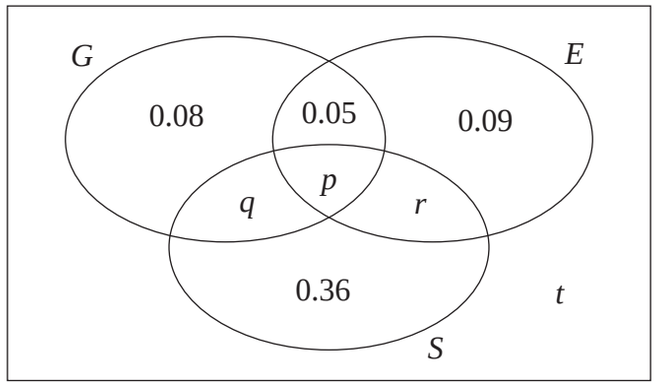
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4. A large college produces three magazines.
One magazine is about green issues, one is about equality and one is about sports.
A student at the college is selected at random and the events G, E and S are defined as follows

G is the event that the student reads the magazine about green issues
E is the event that the student reads the magazine about equality
S is the event that the student reads the magazine about sports

The Venn diagram, where p, q, r and t are probabilities, gives the probability for each subset.



(a) Find the proportion of students in the college who read exactly one of these magazines.

(1)

No students read all three magazines and $P(G) = 0.25$

(b) Find

(i) the value of p

(ii) the value of q

(3)

Given that $P(S \mid E) = \frac{5}{12}$

(c) find

(i) the value of r

(ii) the value of t

(4)

(d) Determine whether or not the events $(S \cap E')$ and G are independent.
Show your working clearly.

(3)

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Question 4 continued.

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Question 4 continued.

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5. The heights of females from a country are normally distributed with

- a mean of 166.5 cm
- a standard deviation of 6.1 cm

Given that 1% of females from this country are shorter than k cm,

(a) find the value of k

(2)

(b) Find the proportion of females from this country with heights between 150 cm and 175 cm

(1)

A female, from this country, is chosen at random from those with heights between 150 cm and 175 cm

(c) Find the probability that her height is more than 160 cm

(4)

The heights of females from a different country are normally distributed with a standard deviation of 7.4 cm

Mia believes that the mean height of females from this country is less than 166.5 cm

Mia takes a random sample of 50 females from this country and finds the mean of her sample is 164.6 cm

(d) Carry out a suitable test to assess Mia's belief.
You should

- state your hypotheses clearly
- use a 5% level of significance

(4)

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