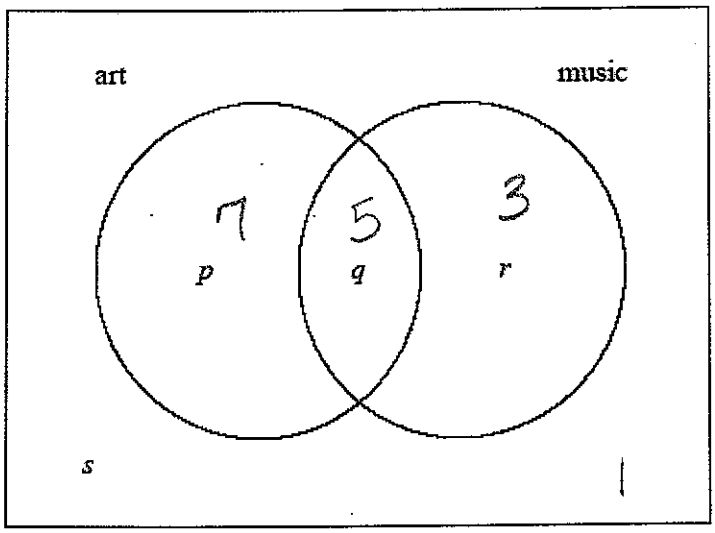
1. In a group of 16 students, 12 take art and 8 take music. One student takes neither art nor music. The Venn diagram below shows the events art and music. The values p, q, r and s represent numbers of students.



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(a) (i) Write down the value of s.
(ii) Find the value of q. 5
(iii) Write down the value of p and of r. 7, 3

(b) Show that taking music and taking art are **not** independent events. $P(m \cap A) \neq 0$

2. The Venn diagram below shows information about 120 students in a school. Of these, 40 study Chinese (C), 35 study Japanese (J), and 30 study Spanish (S).

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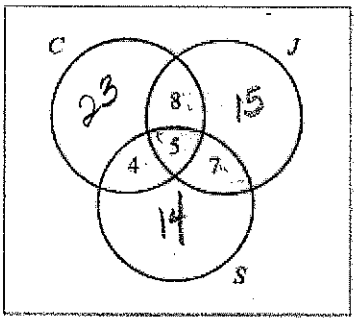
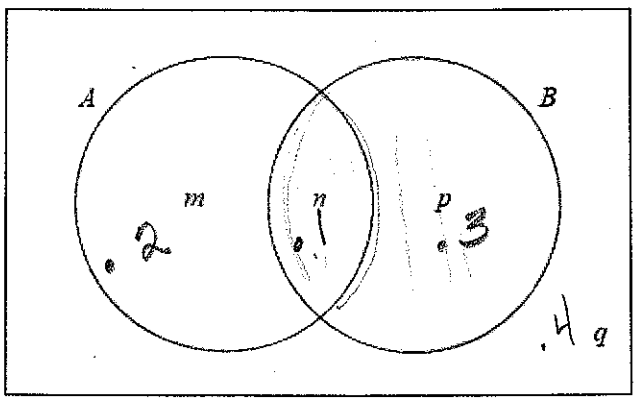


A student is chosen at random from the group. Find the probability that the student

(a) studies exactly two of these languages; 19/120
(b) studies only Japanese; 15/120
(c) does not study any of these languages. 44/120

3. The Venn diagram below shows events A and B where $P(A) = 0.3$, $P(A \cup B) = 0.6$ and

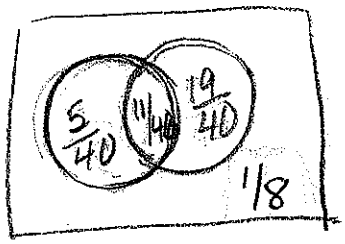


$P(A \cap B) = 0.1$. The values m, n, p and q are probabilities. .2 .3

(a) Write down the value of n. Find the value of m, of p, and of q. .4

(b) Find $P(B')$. .6

4. Consider the events A and B, where $P(A) = \frac{2}{5}$, $P(B') = \frac{1}{4}$ and $P(A \cup B) = \frac{7}{8}$.



(a) Write down $P(B)$.

(b) Find $P(A \cap B)$.

5. Two fair 4-sided dice, one red and one green, are thrown. For each die, the faces are labelled 1, 2, 3, 4. The score for each die is the number which lands face down.

$P(B) = 3/4$
$P(A \cap B) = 11/40$

(a) List the pairs of scores that give a sum of 6.

The probability distribution for the sum of the scores on the two dice is shown below.

Sum	2	3	4	5	6	7	8
Probability	1/16 p	2/16 q	$\frac{3}{16}$	$\frac{4}{16}$	$\frac{3}{16}$	2/16	$\frac{1}{16}$

(b) Find the value of p, of q, and of r.

6. Let A and B be independent events, where $P(A) = 0.6$ and $P(B) = x$.

(a) Write down an expression for $P(A \cap B)$. $.6x$

(b) Given that $P(A \cup B) = 0.8$,

$.8 = .6 + x - .6x$
$.2 = .4x$
$.5 = x$

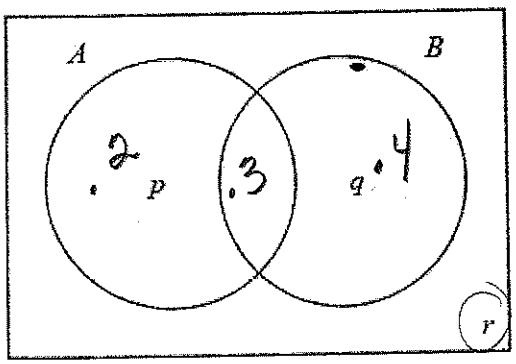
(i) find x; $= .5$

(ii) find $P(A \cap B)$. $= .3$

(c) **Hence**, explain why A and B are **not** mutually exclusive. $P(A \cap B) \neq 0$

7. Consider the events A and B, where $P(A) = 0.5$, $P(B) = 0.7$ and $P(A \cap B) = 0.3$.

The Venn diagram below shows the events A and B, and the probabilities p, q and r.



(a) Write down the value of

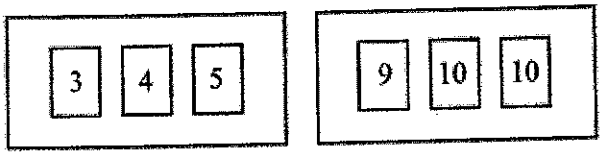
(i) p;

(ii) q;

(iii) r.

(c) Show that the events A and B are **not** independent. $.2 \times .4 \neq .3$

8. Two boxes contain numbered cards as shown below.



Two cards are drawn at random, one from each box.

(a) Copy and complete the table below to show all nine equally likely outcomes.

3, 9	4, 9	5, 9
3, 10	4, 10	5, 10
3, 10	4, 10	5, 10

Let S be the sum of the numbers on the two cards.

(b) Write down all the possible values of S. 12, 13, 14, 15

(c) Find the probability of each value of S. $P(S=12)$ 1/9 $P(S=13) = 2/9$ $P(S=14) = 3/9$ $P(S=15) = 2/9$

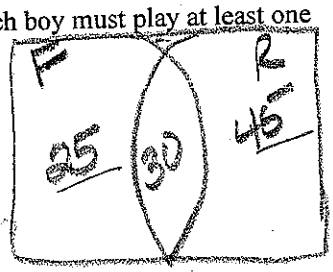
10. There are 20 students in a classroom. Each student plays only one sport. The table below gives their sport and gender.

	Football	Tennis	Hockey
Female	5	3	3
Male	4	2	3

(a) One student is selected at random. Calculate the probability that the student is a male or is a tennis player.

$P(M \cup T) = 12/20$ $9/20 + 5/20 - 2/20 =$

11. In a class of 100 boys, 55 boys play football and 75 boys play rugby. Each boy must play at least one sport from football and rugby.



(a) (i) Find the number of boys who play both sports. 30

(ii) Write down the number of boys who play only rugby. 45

(b) One boy is selected at random.

(i) Find the probability that he plays only one sport. 70/100

Let A be the event that a boy plays football and B be the event that a boy plays rugby.

(c) Explain why A and B are **not** mutually exclusive. $P(F \cap R) \neq 0$

(d) Show that A and B are **not** independent. $\frac{55}{100} \times \frac{75}{100} \neq \frac{30}{100}$