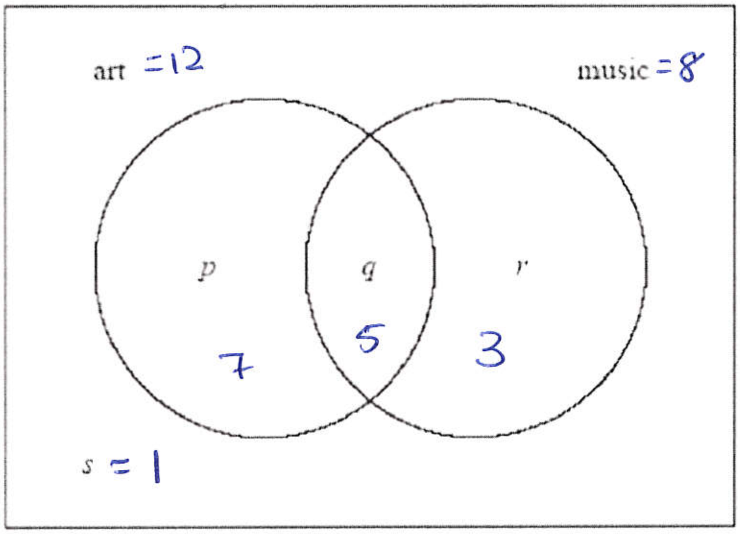
Take-Home

IB Math SL 2 – Probability Test NAME KEY

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.



$U=16$

(a) (i) Write down the value of s. $=1$

(ii) Find the value of q. $=5$

$A+m-q=A\cup m$

$12+8-q=15$

$20-q=15$

$q=5$

(iii) Write down the value of p and of r.

$p=7$

$r=3$

(5)

(b) (i) A student is selected at random. Given that the student takes music, write down the probability the student takes art. $\frac{5}{8}$

(ii) **Hence**, show that taking music and taking art are **not** independent events.

test for independence $P(m)\times P(A) \neq P(A\cap m)$

$\frac{8}{16}\times\frac{12}{16} \neq \frac{5}{16}$

$\frac{96}{256} \neq \frac{5}{16}$

$.375 \neq .3125$

(c) Two students are selected at random, one after the other. Find the probability that the first student takes **only** music and the second student takes **only** art.

(4)

(Total 13 marks)

$P(\text{music only})\times P(\text{art only})$

$=\frac{3}{16}\times\frac{7}{15}$

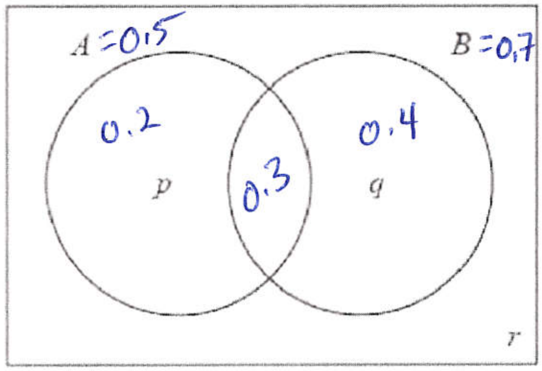
$=\frac{21}{240}=\frac{7}{48}$

In Class

IB Math SL 2 – Probability Test NAME KEY

2.) 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.



$r = 1.0 - (0.2 + 0.3 + 0.4)$

$r = 1.0 - (0.9)$

$r = 0.1$

(a) Write down the value of

(i) p; $= 0.2$

(ii) q; $= 0.4$

(iii) r. $= 0.1$

(3)

(b) Find the value of $P(A \mid B)$.

(2)

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

$$= \frac{0.3}{0.7}$$

$$= \frac{3}{7} \approx .429_{(3sf)}$$

(c) Hence, or otherwise, show that the events A and B are **not** independent.

(1)

(Total 6 marks)

$$P(A|B) = \frac{3}{7} \neq 0.5 = P(A)$$

so A and B are <u>not</u> independent

or $P(A) \times P(B) = (0.5)(0.7)$

$= 0.35$

$\neq 0.3$

$= P(A \cap B)$

so A and B are not independent

In Class

IB Math SL 2 – Probability Test

NAME KEY

3.) 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.

(i) Calculate the probability that the student is a male or is a tennis player.

$P(m \cup T) = P(m) + P(T) - P(m \cap T)$

$= \frac{9}{20} + \frac{5}{20} - \frac{2}{20} = \frac{12}{20}$ or $.6$ or $\frac{3}{5}$

(ii) Given that the student selected is female, calculate the probability that the student does not play football.

(4)

$P(\sim Foot \mid Female) = \dfrac{P(\sim Foot \cap Female)}{P(Female)}$

$= \dfrac{6}{11}$

(b) Two students are selected at random. Calculate the probability that neither student plays football.

without replacement:

$\frac{11}{20} \times \frac{10}{19} = \frac{110}{180}$ or $\frac{11}{18}$

(3)

(Total 7 marks)

4.) Two standard six-sided dice are tossed. A diagram representing the sample space is shown below.

Score on second die

Score on first die	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Let X be the sum of the scores on the two dice.

(a) Find

(i) $P(X = 6)$; $= \frac{5}{36}$

(ii) $P(X > 6)$; $= \frac{21}{36} = \frac{7}{12}$

(iii) $P(X = 7 \mid X > 5)$. $= \dfrac{P(x = 7 \cap x > 5)}{P(x > 5)} = \dfrac{6}{26} = \dfrac{3}{13}$

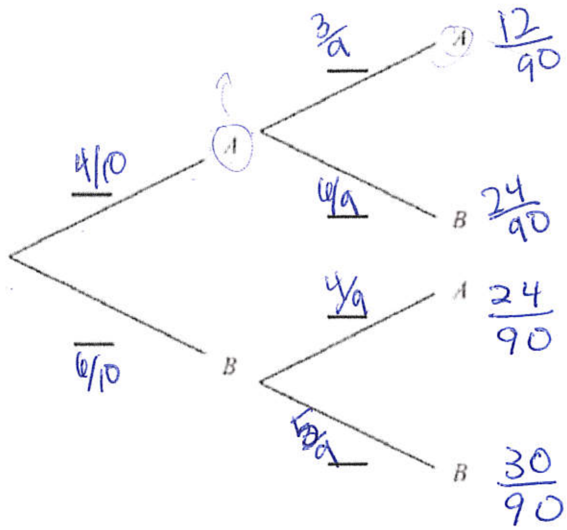
(6)

In Class IB Math SL 2 – Probability Test

NAME KEY

5 A bag contains four apples (A) and six bananas (B). A fruit is taken from the bag and eaten. Then a second fruit is taken and eaten.

(a) Complete the tree diagram below by writing probabilities in the spaces provided.



(3)

(b) Find the probability that one of each type of fruit was eaten. (3)

$P(A \text{ then } B) + P(B \text{ then } A)$

$\frac{24}{90} + \frac{24}{90} = \frac{48}{90} = \frac{24}{45}$

6 Two unbiased 6-sided dice are rolled, a red one and a black one. Let E and F be the events

E : the same number appears on both dice;

F : the sum of the numbers is 10.

Find

(a) $P(E)$: $\frac{6}{36} = \frac{1}{6}$

(b) $P(F)$: $\frac{3}{36} = \frac{1}{12}$

(c) $P(E \cup F)$.

$P(E \cup F) = P(E) + P(F) - P(E \cap F)$

$= \frac{6}{36} + \frac{3}{36} - \frac{1}{36}$

$= \frac{8}{36} = \frac{2}{9}$

	1	2	3	4	5	6
1	E					
2		E				
3			E			
4				E		10
5					E 10	
6				10		E

(6)