FORM 4
CHAPTER 9

Self Test 1

1 $S = \{(J, J), (J, E), (J, L), (J, A), (J, S), (E, J), (E, E), (E, L), (E, A), (E, S), (L, J), (L, E), (L, L), (L, A), (L, S), (A, J), (A, E), (A, L), (A, A), (A, S), (S, J), (S, E), (S, L), (S, A), (S, S)\}$

2 $S = \{(R, R), (R, G), (G, R), (G, G)\}$

3 $S = \{(B, 3), (B, 5), (B, 7), (A, 3), (A, 5), (A, 7), (J, 3), (J, 5), (J, 7), (U, 3), (U, 5), (U, 7)\}$

4 $S = \{(SS), (SYS), (SYY), (YSS), (YSY), (YY)\}$

Self Test 2

1 (a) Independent event (b) Independent event
(c) Dependent event (d) Dependent event

2 (a) Let A = event of getting even numbers on both dice.

	1	2	3	4	5	6
1						
2		✓		✓		✓
3						
4		✓		✓		✓
5						
6		✓		✓		✓

$A = \{(2, 2), (2, 4), (2, 6), (4, 2), (4, 4), (4, 6), (6, 2), (6, 4), (6, 6)\}$

(b) (i) Listing method

$n(S) = 6 \times 6$
$= 36$

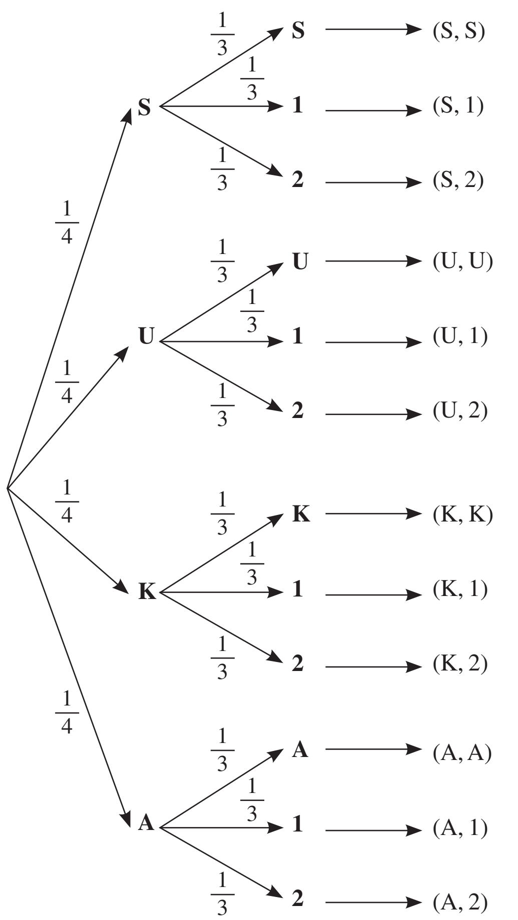
$P(A) = \frac{n(A)}{n(S)}$
$= \frac{9}{36}$
$= \frac{1}{4}$

(ii) Multiplication rule method

P(Even number and Even number)
$= \frac{3}{6} \times \frac{3}{6}$
$= \frac{1}{4}$

Answers in (i) and (ii) are the same, therefore proven that both methods produce the same answer.

3 (a) **Set A** **Set B** **Outcome**



(b) (i) Listing method

$n(S) = 4 \times 3$
$= 12$

n(Both elements chosen are consonants)
$= n\{(S, S), (K, K)\}$
$= 2$

P(Both elements chosen are consonants) $= \frac{2}{12}$
$= \frac{1}{6}$

(ii) Multiplication method

P(Both elements chosen are consonants) $= \frac{2}{4} \times \frac{1}{3}$
$= \frac{1}{6}$

Answers in (i) and (ii) are the same, therefore proven that both methods produce the same answer.

4 (a) $n(S) = 6 \times 4$
$= 24$

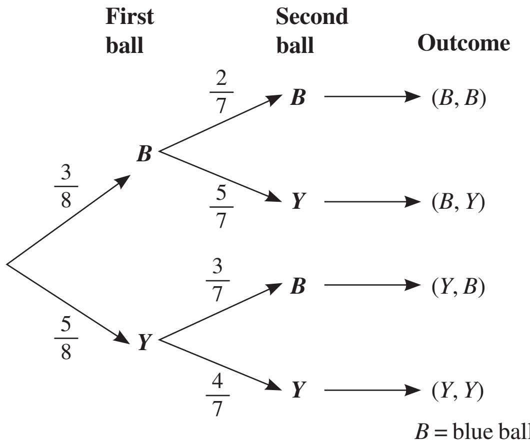
$S = \{(1, A), (1, B), (1, C), (1, D), (2, A), (2, B), (2, C), (2, D), (3, A), (3, B), (3, C), (3, D), (4, A), (4, B), (4, C), (4, D), (5, A), (5, B), (5, C), (5, D), (6, A), (6, B), (6, C), (6, D)\}$

(b) (i) P(a prime number and a consonant) $= \frac{9}{24}$
$= \frac{3}{8}$

(ii) $P(\text{getting letter "A" on the spinning wheel}) = \frac{6}{24}$

$= \frac{1}{4}$

5 (a)



B = blue ball
Y = yellow ball

(b) (i) $P(BB) \text{ or } P(YY) = \left(\frac{3}{8} \times \frac{2}{7}\right) + \left(\frac{5}{8} \times \frac{4}{7}\right)$

$= \frac{13}{28}$

(ii) $P(\text{both balls of different colours}) = 1 - \frac{13}{28}$

$= \frac{15}{28}$

6 (a) $n(S) = 3 + 18 + 14$

$= 35$

$P(\text{bus and bus}) = \frac{14}{35} \times \frac{13}{34}$

$= \frac{13}{85}$

(b) $n(S) = 3 + 5$

$= 8$

(i) $P(\text{RR}) \text{ or } P(\text{SS}) = \left(\frac{3}{8} \times \frac{2}{7}\right) + \left(\frac{5}{8} \times \frac{4}{7}\right)$

$= \frac{13}{28}$

(ii) $P(\text{RS}) \text{ or } P(\text{RS}) = \left(\frac{3}{8} \times \frac{5}{7}\right) + \left(\frac{5}{8} \times \frac{3}{7}\right)$

$= \frac{15}{28}$

Self Test 3

1 $A = \{12, 14, 16, 18, 20, 22, 24, 26, 28, 30\}$
$B = \{12, 16, 20, 24, 28\}$
$C = \{13, 22\}$

(a) A and $B = \{12, 16, 20, 24, 28\}$. Therefore, A and B are non-mutually exclusive events.

(b) A and $C = \{22\}$. Therefore, A and C are non-mutually exclusive events.

(c) B and $C = \{\ \}$ or ϕ. Therefore, B and C are mutually exclusive events.

2 (a) $P(M \cap J) = \frac{7}{12} \times \frac{5}{8}$

$= \frac{35}{96}$

$P(M \text{ only}) = \frac{7}{12} - \frac{35}{96}$

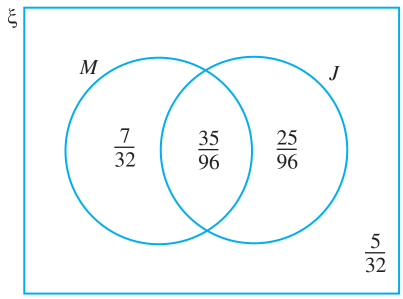
$= \frac{7}{32}$

$P(J \text{ only}) = \frac{5}{8} - \frac{35}{96}$

$= \frac{25}{96}$

$P(M' \cap J') = 1 - \frac{7}{12} - \frac{25}{96}$

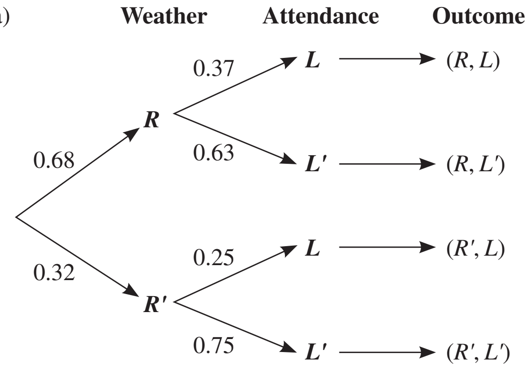
$= \frac{5}{32}$



M = Event of Ming Hao is chosen
J = Event of Jerry is chosen

(b) $P(M \cup J) = \frac{7}{12} + \frac{25}{96} = \frac{27}{32}$

3 (a)



R = Event of rainy day
R' = Event of non-rainy day
L = Event of late to school
L' = Event of not late to school

(b) $P(\text{Siva late to school}) = P(R, L) + P(R', L)$

$= (0.68 \times 0.37) + (0.32 \times 0.25)$

$= 0.2516 + 0.08$

$= 0.3316$

Self Test 4

1 Number of times "2" will appear on both dice

$= \frac{4}{25} \times 500$

$= 80$ times

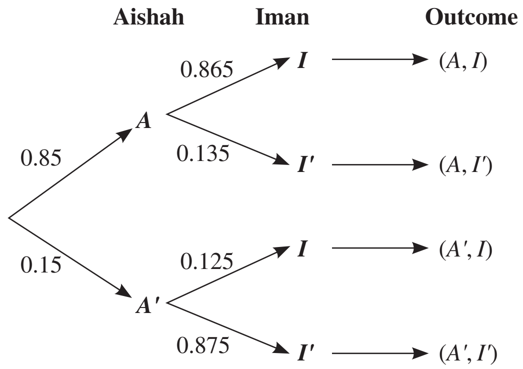
2 $P(YY) \text{ or } P(BB) \text{ or } P(WW)$

$= \left(\frac{13}{35} \times \frac{10}{32}\right) + \left(\frac{8}{35} \times \frac{16}{32}\right) + \left(\frac{14}{35} \times \frac{8}{32}\right)$

$= \frac{13}{112} + \frac{4}{35} + \frac{1}{10}$

$= \frac{37}{112}$

3



A = Event of Aishah joining the school's field trip A' = Event of Aishah not joining the school's field trip I = Event of Iman joining the school's field trip I' = Event of Iman not joining the school's field trip

$$P(A, I') + P(A', I) = (0.85 \times 0.135) + (0.15 \times 0.125)$$
$$= 0.1335$$

SPM PRACTICE

Paper 1

1 C $n(S) = 5 \times 3$
$= 15$

2 B $P(RY) + P(YR) = \left(\frac{3}{5} \times \frac{2}{4}\right) + \left(\frac{2}{5} \times \frac{3}{4}\right)$
$= \frac{3}{5}$

3 A

4 B

5 D $P(X \cap Y) = P(X) \times P(Y)$
$0.21 = 0.3 \times P(Y)$
$P(Y) = \frac{0.21}{0.3}$
$= 0.7$

6 D $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$A = \{3, 6, 9, 12\}$
$B = \{1, 3, 5, 7, 9, 11\}$
$A \cup B = \{1, 3, 5, 6, 7, 9, 11, 12\}$
$P(A \text{ or } B) = \frac{n(A \cup B)}{n(S)}$
$= \frac{8}{12}$
$= \frac{2}{3}$

7 B $P(Y \cup R) = \frac{n(Y \cup R)}{n(S)}$
$= \frac{12}{20}$
$= \frac{3}{5}$

8 C $n(D \cap L) = 5$
$n(S) = n(D) + n(L) - n(D \cap L)$
$= 25 + 18 - 5$
$= 38$
$P(D \cap L) = \frac{n(D \cap L)}{n(S)}$
$= \frac{5}{38}$

9 A

	1	2	3	4	5	6
1		✓	✓		✓	
2	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓
4		✓	✓		✓	
5	✓	✓	✓	✓	✓	✓
6		✓	✓		✓	

P(At least a prime number)
$= \frac{27}{36}$ or $1 - P$(both are not prime numbers)
$= \frac{3}{4}$ or $1 - \frac{9}{36}$
$= \frac{3}{4}$

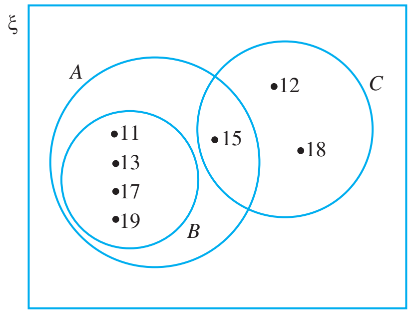
Number of times $= \frac{3}{4} \times 300$
$= 225$

10 D $P(A' \text{ and } M') = (1 - 0.9) \times (1 \times 0.76)$
$= 0.024$

Paper 2

Section A

1 (a) $S = \{x : x \text{ is an integer}, 10 < x < 20\}$
$A = \{11, 13, 15, 17, 19\}$
$B = \{11, 13, 17, 19\}$
$C = \{12, 15, 18\}$



(b) The combined events that are non-mutually exclusive: Events A and B, Events A and C

(c) The combined events that are mutually exclusive: Events B and C

2 (a) $n(S) = 6 \times 5$
$= 30$

(b) $S = \{(S, A), (S, M), (S, B), (S, U), (S, T), (A, S), (A, M), (A, B), (A, U), (A, T), (M, S), (M, A), (M, B), (M, U), (M, T), (B, S), (B, A), (B, M), (B, U), (B, T), (U, S), (U, A), (U, M), (U, B), (U, T), (T, S), (T, A), (T, M), (T, B), (T, U)\}$

(i) $X = \{$The first card is a vowel$\}$
$= \{(A, S), (A, M), (A, B), (A, U), (A, T), (U, S), (U, A), (U, M), (U, B), (U, T)\}$
$P(X) = \frac{10}{30}$
$= \frac{1}{3}$

(ii) $Y = \{$Both cards are consonants$\}$
$= \{(S, M), (S, B), (S, T), (M, S), (M, B), (M, T), (B, S), (B, M), (B, T), (T, S), (T, M), (T, B)\}$
$P(Y) = \frac{12}{30}$
$= \frac{2}{5}$

3 $P(M) = \frac{5}{7}$ $P(M') = \frac{2}{7}$

$P(F) = \frac{5}{8}$ $P(F') = \frac{3}{8}$

M = Event of Adeline pass in Mathematics M' = Event of Adeline fail in Mathematicss F = Event of Adeline pass in Physics F' = Event of Adeline fail in Physics

(a) $P(M \cap F) = P(M) \times P(F)$
$= \frac{5}{7} \times \frac{5}{8}$
$= \frac{25}{56}$

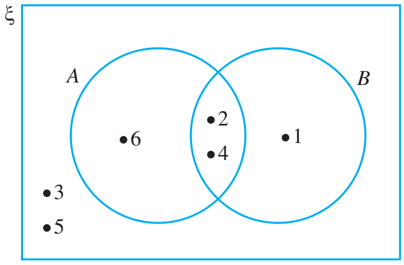
(b) $P(M \cap F')$ or $P(M' \cap F)$ $= \left(\frac{5}{7} \times \frac{3}{8}\right) + \left(\frac{2}{7} \times \frac{5}{8}\right)$

$= \frac{15}{56} + \frac{10}{56}$

$= \frac{25}{56}$

4 $A = \{2, 4, 6\}$, $B = \{1, 2, 4\}$

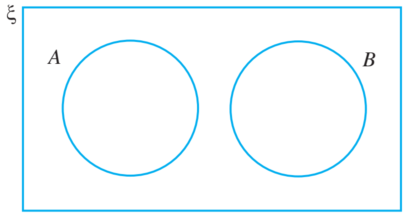
Non-mutually exclusive events.



$A \cap B \neq \phi$

Therefore, A and B are non-mutually exclusive.

5 (a)



(b) Maximum value of $P(B) = 1 - 0.4$

$= 0.6$

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

$0.92 = P(A) + 0.45$

$P(A) = 0.47$

Section B

6 (a) P (male student or motorcycle) $= \frac{1}{2}$

$\frac{350 + 300 + x + 80}{1\,530 + x} = \frac{1}{2}$

$2(730 + x) = 1\,530 + x$

$1\,460 + 2x = 1\,530 + x$

$x = 1\,530 - 1\,460$

$= 70$

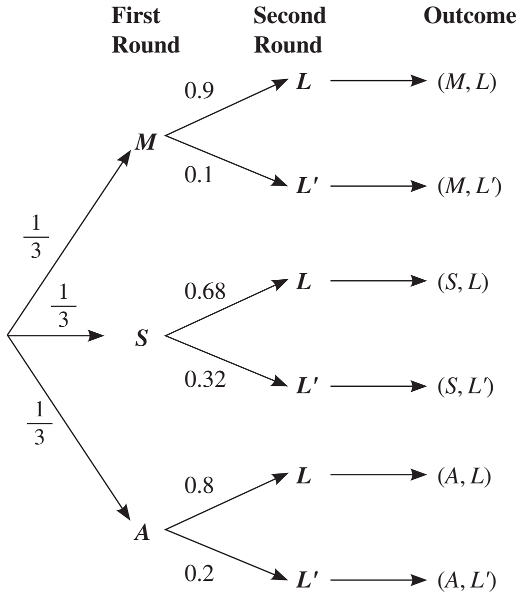
(b) (i) $\frac{380 + 420}{1\,600} = \frac{1}{2}$

(ii) $\frac{350}{1\,600} = \frac{7}{32}$

(iii) $\frac{70 + 420}{1\,600} = \frac{49}{160}$

(iv) $\frac{720}{1\,600} = \frac{9}{20}$

7 (a)



M = Event of choosing Mathematics
S = Event of choosing Science
A = Event of choosing General knowledge
L = Event of qualifying to second round
L' = Event of not qualifying to second round

$S = \{(M, L), (M, L'), (S, L), (S, L'), (A, L), (A, L')\}$

(b) $P(M, L') + P(S, L') + P(A, L')$

$= \left(\frac{1}{3} \times 0.1\right) + \left(\frac{1}{3} \times 0.32\right) + \left(\frac{1}{3} \times 0.2\right)$

$= \frac{31}{150}$ or 0.2067

(c) $P(M, L) + P(S, L) + P(A, L)$

$= \left(\frac{1}{3} \times 0.9\right) + \left(\frac{1}{3} \times 0.68\right) + \left(\frac{1}{3} \times 0.8\right)$

$= \frac{119}{150}$ or 0.7933