

Mathematics Winter School worksheet

PROBABILITY- MEMO



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA



Supported by:

Out of the Ordinary®



QUESTION 1

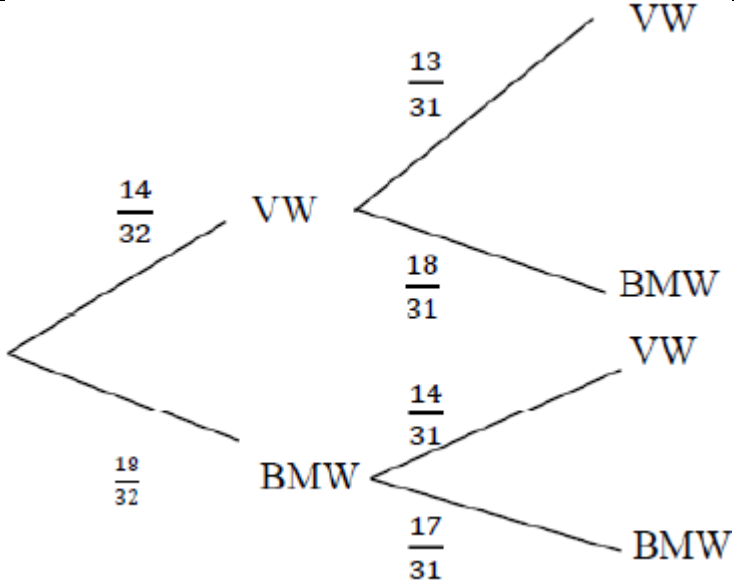
1.1		✓ ✓ ✓
1.2	$(0,65 \times 0,4) + (0,3 \times 0,2) + (0,05 \times 0,5)$ $0,345$	✓✓ answer

QUESTION 2

2.1	$a = 30, \quad b = 396, c = 400 \text{ and } d = 700$	✓✓
2.2	$P(G \text{ and } N) = P(G) \times P(N)$ $\frac{30}{700} = \frac{34}{700} \times \frac{300}{700}$ <p>\therefore the events of being girl and preferring nuclear are</p>	✓ $\frac{30}{700}$ ✓ $\frac{34}{700}$ ✓ $\frac{300}{700}$ ✓ conclusion
2.3	$\frac{400}{700} \times 25\,000$	✓✓✓✓
2.4	These are results are reliable as it is based on the sampled population.	✓ Yes ✓ justification

QUESTION 3

3.1.1	$P(A \text{ or } B) = \frac{3}{8} + \frac{1}{4} = \frac{5}{8}$	✓ answer
3.1.2	$P(A \text{ and } B) = \frac{3}{8} \times \frac{1}{4} = \frac{3}{32}$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $= \frac{3}{8} + \frac{1}{4} - \frac{3}{32}$ $= \frac{17}{32}$	✓ $\frac{3}{32}$ ✓ rule ✓ answer

3.2.1	 $P(\text{both}) = \frac{18}{32} \times \frac{17}{31} = \frac{153}{496} = 0,31$	✓✓ Tree diagram ✓ $\frac{18}{32} \times \frac{17}{31}$
3.2.2	$P(\text{BMW} \dots \text{VW}) = \frac{18}{32} \times \frac{14}{31} = \frac{63}{248} = 0,25$	✓ $\frac{18}{32} \times \frac{14}{31}$ ✓ answer
3.3.1	$n(E) = 7 \times 13! \times 6$ $n(S) = 15!$ $P(E) = \frac{n(E)}{n(S)} = \frac{7 \times 13! \times 6}{15!} = \frac{1}{5}$	✓ $7 \times 13! \times 6$ ✓ $15!$ ✓ answer
3.3.2	$n(E) = 8! \times 7!$ $n(S) = 15!$ $P(E) = \frac{n(E)}{n(S)} = \frac{8! \times 7!}{15!} = \frac{1}{6435}$	✓ $8! \times 7!$ ✓ $\frac{8! \times 7!}{15!}$ ✓ $\frac{1}{6435}$

QUESTION 4

4.1.1	$20^4 \times 9^4 = 1\,049\,760\,000$	✓ 20^4 ✓ 9^4 ✓ answer
4.1.2	$\frac{20^4 \times 4!}{20^4 \times 9^4} = \frac{8}{2187}$	✓ $4!$ ✓ answer
4.2	$3^5 = 243$	✓✓ answer

QUESTION 5

5.1.1	<p style="text-align: right;">$n(S)=60$</p>	
5.1.2	58	✓ answer
5.1.3	$\frac{12}{60} = \frac{1}{5}$	✓ answer
5.1.4	$P(A) \times P(B) = \frac{30}{60} \times \frac{40}{60}$ $= \frac{1}{3}$ $\neq P(A \cap B)$ <p>\therefore events A and B are not independent.</p>	✓ ✓ ✓ conclusion
5.2.1	$8! = 40\,320$	✓✓ answer
5.2.2	$2! \times 4! \times 4! = 1\,152$	✓✓ answer

QUESTION 6

6.1.1	$P(\text{not } E \text{ or } M) = \frac{21 + 27}{150}$ $\frac{8}{25} = 0,32$	✓ $\frac{21+27}{150}$ ✓ 0,32
6.1.2	$P(E) = \frac{23 + 4 + 15 + 8}{150} = \frac{50}{150} = 0,3333$ $P(M) = \frac{4 + 15 + 11 + 41}{150} = \frac{71}{150} = 0,473333$ $P(E \text{ and } M) = \frac{4 + 15}{150} = 0,126666$ $P(E) \times P(M) = \frac{50}{150} \times \frac{71}{150} = 0,1577$ $P(E) \times P(M) \neq P(E \text{ and } M)$ <p>\therefore not independent</p>	✓ both $P(E)$ and $P(M)$ ✓ 0,126666 ✓ 0,1577 ✓ conclusion
6.2	$P(\text{first attempt}) = \frac{1}{10^4}$	✓ 1 ✓✓ 10^4
6.3.1	$6! = 720$	✓✓ answer
6.3.2	$1 \times 4! \times 1 = 24$	✓✓ answer
6.3.3	$3! \times 3! = 36$	✓✓ answer

QUESTION 7

7.1.1		✓✓ diagram
7.1.2	$P(A \text{ and } B) = P(A) \times P(B)$ $\therefore 0,2 = (x + 0,2)(0,5)$ $\therefore 0,2 = 0,5x + 0,1$ $\therefore x = 0,2$ $\therefore y = 1 - 0,2 - 0,2 - 0,3$ $\therefore y = 0,3$	✓ rule ✓ equation ✓ x-value ✓ y-value
7.2.1	$4 \times 3 \text{ ways} = 12 \text{ ways}$	✓✓ answer
7.2.2	$12 - (3 \times 2) = 6$	✓✓ answer
7.3.1	$9! = 362\,880$	✓ answer
7.3.2	$5! \times 3! = 720$	✓✓ answer

QUESTION 8

8.1	$P(X \text{ and } Y \text{ together}) = \frac{2!5!}{6!} = \frac{1}{3}$ $P(X \text{ and } Y \text{ not together}) = 1 - \frac{1}{3}$ $= \frac{2}{3}$	✓ $\frac{2!5!}{6!}$ ✓ $\frac{1}{3}$ ✓ answer
8.2.1	$9 \times 10 \times 10 \times 10 = 9000$	✓ Product ✓ answer
8.2.2	$9 \times 9 \times 8 \times 7$ $= 4\,536$	✓ 9×9 ✓ 8×7 ✓ answer
8.2.3	$9 \times 8 \times 7 \times 1 = 504$	✓ Product ✓ answer

QUESTION 9

9.1	$6! = 720$	✓ $6!$ ✓ 720												
9.2	$\frac{6!}{2! \times 3!} = 60$	✓ $2!3!$ ✓ 60												
9.3	Option 1 <table border="1" style="margin-left: 20px;"> <tr> <td>D</td><td></td><td></td><td></td><td></td><td>D</td> </tr> </table> $\frac{4!}{3!} = 4$ Option 2 <table border="1" style="margin-left: 20px;"> <tr> <td>E</td><td></td><td></td><td></td><td></td><td>E</td> </tr> </table> $\frac{4!}{2!} = 12$	D					D	E					E	✓ $4!$ ✓ $3!$ ✓ $2!$ ✓ 16
D					D									
E					E									

	$= 4 + 12 = 16$	
9.4	$= \frac{4!}{3!} + \frac{4!}{2!}$ $= \frac{6!}{2! \times 3!}$ $= \frac{16}{60}$ $= \frac{4}{15}$	$\checkmark \frac{16}{60}$ \checkmark answer

QUESTION 10

10.1.1	$3 \times 4 \times 2 = 24 \text{ ways}$	\checkmark Product \checkmark answer
10.1.2	$2 \times 4 \times 2 = 16 \text{ ways}$	\checkmark Product \checkmark answer
10.2.1	$P(\text{club}) = \frac{130}{520} = \frac{1}{4}$	$\checkmark \checkmark$ answer
10.2.2	$P(\text{an ace}) = \frac{4}{520} = \frac{1}{13}$	$\checkmark \checkmark$ answer
10.2.3	$P(\text{either an ace or a club}) = \frac{130}{520} + \frac{4}{520} = \frac{67}{260}$	$\checkmark \checkmark$ answer