AP STAT Section 6.3: Conditional Probability Worksheet Name Key

Use the table to answer these questions.

Age and Marital Status of Women (thousands of women)

	AGE			
	18 to 24	25 to 64	65 and over	Total
Married	3,046	48,116	7,767	58,929
Never Married	9,289	9,252	768	19,309
Widowed	19	2,425	8,636	11,080
Divorced	260	8,916	1,091	10,267
Total	12,614	68,709	18,262	99,585

1. How many women are married and age 18 to 24 years old? 3,046

2. What is the probability that a woman is age 18 to 24 years old and married?

P(18 to 24 and married) = $3046/99585 \approx \boxed{3.1\%}$

3. Use the conditional probability formula (showing your work) to find the probability that a woman is married on the *condition* she was 18 to 24 years old?

P(married | 18 to 24) = $\dfrac{P(\text{married} \cap 18 \text{ to } 24)}{P(18 \text{ to } 24)} = \dfrac{3046/99585}{12614/99585} \approx \boxed{24.2\%}$

4. What is the probability that a woman chosen is 65 year old or older? P(65 or older) = $18262/99585 \approx \boxed{18.34\%}$

5. What is the probability that the woman we choose is married and at least 65 years old?

P(married and ≥ 65) = $7767/99585 \approx 7.8\%$

6. What is the conditional probability that the woman chosen is married given that she is 65 or older?

P(married | ≥ 65) = $\dfrac{P(\text{married} \cap \geq 65)}{P(\geq 65)} = \dfrac{7.8}{18.34} \approx \boxed{42.53\%}$

7. **Verify** that the probabilities you found in #4, #5, #6 satisfy the **general multiplication rule**:

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

where **A** = woman is at least 65 years old and **B** = woman is married.

P(≥ 65 ∩ married) = P(married | ≥ 65) · P(≥ 65)

$.078 = (.4253)(.1834)$

$.078 = .078$

8. Are the events **A** = "married" and **B** = "at least 65 years old" **independent**? Justify using statistics.

$P(A \cap B) \stackrel{?}{=} P(A) \cdot P(B)$

$.078 \stackrel{?}{=} \left(\dfrac{58929}{99585}\right) \cdot .1834$

$.078 \stackrel{?}{=} .1085$ False

There fore these events are Not independent.

8. What is the probability that the woman chosen is a widow? P(widow) = 1108/99585 ≈ $\boxed{11.13\%}$

9. What is the probability that the woman chosen is a widow and at least 65 years old?

P(widow and ≥ 65) = 8636/99585 ≈ $\boxed{8.7\%}$

10. Use the conditional probability formula (showing your work) to find the probability that a woman is a widow, given that she is at least 65 years old?

P(widow | ≥ 65) = $\dfrac{P(\text{widow} \cap \geq 65)}{P(\geq 65)} = \dfrac{8.7}{18.34} \approx \boxed{47.4\%}$

11. Are the events **A** = "widow" and **B** = "at least 65 years old" **independent**? Justify using statistics.

$P(A \cap B) \stackrel{?}{=} P(A) \cdot P(B)$

$.087 \stackrel{?}{=} (.1113)(.1834)$

$.087 \stackrel{?}{=} .0204$ No

Therefore these events are not independent.

12. What is the conditional probability that the woman chosen is a widow, given that she is between 25 and 64 years old?

P(widow | 25 to 64) = $\dfrac{P(\text{widow} \cap 25 \text{ to } 64)}{P(25 \text{ to } 64)} = \dfrac{2425}{68709} \approx \boxed{3.53\%}$

13. What is the conditional probability that the woman chosen is 18 to 24 years old, given that she is married?

P(18 to 24 | married) = $\dfrac{P(18 \text{ to } 24 \cap \text{married})}{P(\text{married})} = \dfrac{.031}{.592} \approx \boxed{5.24\%}$

14. Earlier you found the P(married | age 18 to 24) = 0.241. Complete this sentence:

24.1% is the proportion of women who are married among those women who are age 18 to 24.

15. In #13 you found P(age 18 to 24 | married). Write a sentence in the form given in #14 that describes the meaning of this result.

5.24% is the proportion of women age 18 to 24 among those who are married.