Two-Way Frequency Tables

Notes Section P.4

Two-way frequency tables help to organize data.

	iPod	NO iPod	Total
Smart Phone	20	18	38
NO Smart Phone	8	4	12
Total	28	22	50

∩ = Intersection = and

∪ = union = or

Determine the information from the two-way frequency table.

	Sports	Video	Dance	Total
Boys	13	16	1	30
Girls	10	5	15	30
Total	23	21	16	60

1. How many students in the class? 60
2. How many girls like to dance? 15
3. How many students like to play sports? 23
4. How many girls don't like to play video games? 25

Complete the two-way frequency table that represents the given information.

5. 15 and 30-year-old males were asked which of the following actors they liked the best as Batman and the following results were found.

	Adam West	George Clooney	Christian Bale	Total
15 yr	0	4	23	27
30 yr	1	8	15	24
Total	1	12	38	51

6. $P(Adam\ West) =$ $\frac{1}{51}$
7. $P(15\ yr\ old) =$ $\frac{27}{51}$
8. $P(Christian\ Bale) =$ $38/51$
9. $P(30\ yr\ old \cap George\ Clooney) =$ $\frac{8}{51}$
10. $P(15\ yr\ old \cap NOT\ Christian\ Bale) =$ $\frac{4}{51}$

Complete the table from the given information.

11. 23 Juniors and 31 Seniors were asked about which class they like better between AP World History and AP Calculus. 41 students picked AP Calculus and 11 juniors picked AP World History.

	AP World	AP Calc	Total
Juniors	11	12	23
Seniors	2	29	31
Total	13	41	54

"And" is the intersection of a column and row.

	iPod	NO iPod	Total
Smart Phone	20	18	38
NO Smart Phone	8	4	12
Total	28	22	50

1. $P(Smart\ Phone \cap iPod) = \frac{20}{50}$
2. $P(No\ Smart\ Phone \cap No\ iPod) = \frac{4}{50}$
3. $P(No\ Smart\ Phone \cap iPod) = \frac{8}{50}$

"Or" is the sum of a row and column minus the intersection.

	iPod	NO iPod	Total
Smart Phone	20	18	38
NO Smart Phone	8	4	12
Total	28	22	50

4. $P(Smart\ Phone \cup iPod) = P(SP) + P(iP) - P(SP \cap iP)$
$= \frac{38}{50} + \frac{28}{50} - \frac{20}{50}$
$= \frac{46}{50}$
5. $P(No\ Smart\ Phone \cup No\ iPod) = \frac{12 + 22 - 4}{50}$
$= \frac{30}{50}$

Conditional Probabilities in Two Way Frequency Tables

Given that something occurs, restricts the sample space to a row or column.

	iPod	NO iPod	Total
Smart Phone	20	18	38
NO Smart Phone	8	4	12
Total	28	22	50

6. $P(Smart\ Phone|iPod) = \frac{20}{28}$
7. $P(No\ Smart\ Phone|iPod) = \frac{8}{28}$
8. $P(iPod|No\ Smart\ Phone) = \frac{8}{12}$
9. $P(No\ iPod|No\ Smart\ Phone) = \frac{4}{12}$

Determining Independence in Two-Way Tables

Remember there are two tests for independence that we know of:

TEST #1 – If $P(A \cap B) = P(A) \bullet P(B)$

TEST #2 – If $P(A|B) = P(A)$

	iPod	NO iPod	Total
Smart Phone	20	18	38
NO Smart Phone	8	4	12
Total	28	22	50

10. Determine Independence

TEST #1 – If $P(i \cap SP) = P(i) \bullet P(SP)$, then INDY

$\frac{20}{50} \neq \frac{28}{50} \cdot \frac{38}{50}$ Dependant

$.40 \neq \frac{1064}{2500}$

$.40 \neq .43$

TEST #2 – If $P(i|SP) = P(i)$, then INDY

$\frac{20}{38} \neq \frac{28}{50}$

$.52 \neq .56$

Two Way Relative Frequency Tables

Two Way Frequency Table

	Red	Green	Blue	Yellow	Total
Male	12	7	9	0	28
Female	8	8	3	3	22
Total	20	15	12	3	50

Two Way Relative Frequency Table

	Red	Green	Blue	Yellow	Total
Male	.24	.14	.18	0	.56
Female	.16	.16	.06	.06	.44
Total	.40	.30	.24	.06	1

$P(Male) = .56$ $P(Female) = .44$

$P(Red) = .40$ $P(Yellow) = .06$

$P(Male \cap Red) = .24$ $P(Male \cup Red) = .72$

$.56 + .40 - .24$