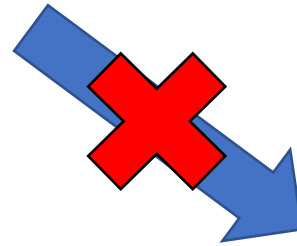


## Titanic – Training Data

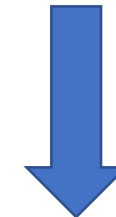
Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891

199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived						342



## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	
4	male	3	Teenager	S	0	2	

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$

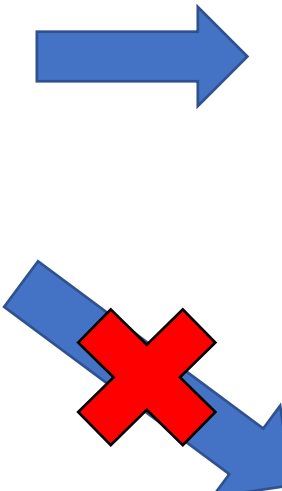
	Not Survived	Survived	
Combination of values: 3	12.4	?	?

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

## Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891  
↓  
199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female			3 4%	6 7%	72 89%	81

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	
4	male	3	Teenager	S	0	2	

2 x 3 x 4 x 3 x 7 x 7 = 3528

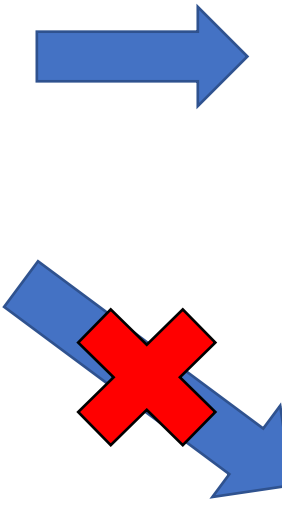
Combination of values: 3	Survived		
	12.4	?	?

$0.15 \cdot 0.15 \cdot 549 = 12.4$

## Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

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↓  
199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female			3 4%	6 7%	72 89%	81
Not Survived & 1st class	3 4%	77 96%				80

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	
4	male	3	Teenager	S	0	2	

2 x 3 x 4 x 3 x 7 x 7 = 3528

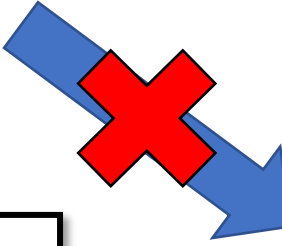
	Survived		
Combination of values: 3	12.4	?	?

$0.15 \cdot 0.15 \cdot 549 = 12.4$

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891  
↓  
199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female			3 4%	6 7%	72 89%	81
Not Survived & 1st class	3 4%	77 96%				80

	Sex	Pclass
1	male	3
2	female	2
3	female	1
4	male	3

2 x 3

Multiplication Rule for independent Events

$$P(A \cap B) = P(A) \times P(B)$$

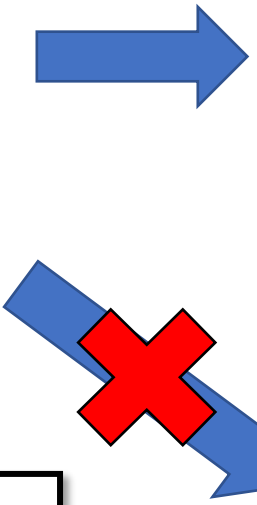
Combination of values:	Survived		
3	12.4	?	?

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891  
↓  
199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female			3 4%	6 7%	72 89%	81
Not Survived & 1st class	3 4%	77 96%				80

	Sex	Pclass
1	male	3
2	female	2
3	female	1
4	male	3

2 x 3

Multiplication Rule for independent Events

$$P(A \cap B) = P(A) \times P(B)$$


---

General Multiplication Rule

$$P(A \cap B) = P(A) \times P(B|A)$$

$$= P(B) \times P(A|B)$$

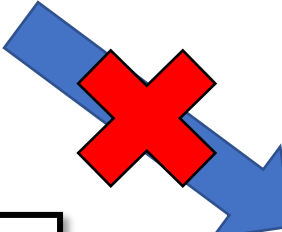
	Survived		
Combination of values: 3	12.4	?	?

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891  
↓  
199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female	3 4%	6 7%	72 89%			81
Not Survived & 1st class	3 4%	77 96%				80

	Sex	Pclass
1	male	3
2	female	2
3	female	1
4	male	3

2 x 3

Multiplication Rule for independent Events

$$P(A \cap B) = P(A) \times P(B)$$


---

General Multiplication Rule

$$P(A \cap B) = P(A) \times P(B|A)$$

$$= P(B) \times P(A|B)$$

Combination of values:	Survived		
3	12.4	?	?

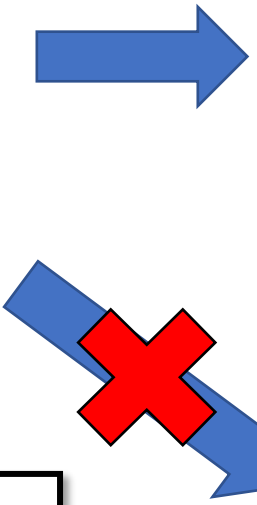
$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$\frac{81}{549} \cdot \frac{3}{81} \cdot 549 = 3$$

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891  
↓  
199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female			3 4%	6 7%	72 89%	81
Not Survived & 1st class	3 4%	77 96%				80

	Sex	Pclass
1	male	3
2	female	2
3	female	1
4	male	3

2 x 3

Multiplication Rule for independent Events

$$P(A \cap B) = P(A) \times P(B)$$


---

General Multiplication Rule

$$P(A \cap B) = P(A) \times P(B|A)$$

$$= P(B) \times P(A|B)$$

Combination of values:	Survived		
3	12.4	?	?

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$\frac{81}{549} \cdot \frac{3}{81} \cdot 549 = 3$$

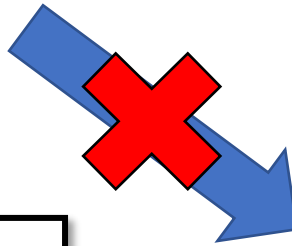
$$\frac{80}{549} \cdot \frac{3}{80} \cdot 549 = 3$$

# Titanic – Training Data

## Look-up Approach:

Combination of values: 3	Survival Status		94
	Not Survived	Survived	
	3 3%	91 97%	

891  
↓  
199



	Sex		Pclass			549
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female			3 4%	6 7%	72 89%	81
Not Survived & 1st class			3 4%	77 96%		80

Combination of values: 3	Survival Status		
	Not Survived	Survived	
	12.4	?	?

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$\frac{81}{549} \cdot \frac{3}{81} \cdot 549 = 3$$

$$\frac{80}{549} \cdot \frac{3}{80} \cdot 549 = 3$$

	Sex	Pclass
1	male	3
2	female	2
3	female	1
4	male	3

2 x 3

## Multiplication Rule for independent Events

$$P(A \cap B) = P(A) \times P(B)$$

## General Multiplication Rule

$$P(A \cap B) = P(A) \times P(B|A)$$

$$= P(B) \times P(A|B)$$

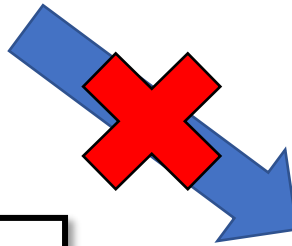


# Titanic – Training Data

## Look-up Approach:

Combination of values: 3	Survival Status		94
	Not Survived	Survived	
	3 3%	91 97%	

891  
↓  
199



	Sex		Pclass			549
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	

	Sex		Pclass			
	female	male	1	2	3	
Not Survived & female			3 4%	6 7%	72 89%	81
Not Survived & 1st class			3 4%	77 96%		80

Combination of values: 3	Survival Status		?	?
	Not Survived	Survived		
	12.4			

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$\frac{81}{549} \cdot \frac{3}{81} \cdot 549 = 3$$

$$\frac{80}{549} \cdot \frac{3}{80} \cdot 549 = 3$$

	Sex	Pclass
1	male	3
2	female	2
3	female	1
4	male	3

2 x 3

## Multiplication Rule for independent Events

$$P(A \cap B) = P(A) \times P(B)$$

## General Multiplication Rule

$$P(A \cap B) = P(A) \times P(B|A) = P(B) \times P(A|B)$$

## Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	445 81%	53 10%	40 7%	2 0.4%	4 0.7%	4 0.7%	1 0.2%	549
Survived	233 68%	65 19%	40 12%	3 0.9%	0 0%	1 0.3%	0 0%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$

	Not Survived	Survived	
Combination of values:	-	-	-



Accuracy: 77%

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891



	Sex		Pclass			
	female	male	1	2	3	
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	ParCh							
	0	1	2	3	4	5	6	
Not Survived	445 81%	53 10%	40 7%	2 0.4%	4 0.7%	4 0.7%	1 0.2%	549
Survived	233 68%	65 19%	40 12%	3 0.9%	0 0%	1 0.3%	0 0%	342

# Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	0

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$

Combination of values: 5	Not Survived	Survived	0.008
	0.008 100%	0 0%	

$$0.15 \cdot 0.15 \cdot 0.62 \cdot 0.78 \cdot 0.18 \cdot 0.007 \cdot 549 = 0.008$$

$$0.68 \cdot 0.40 \cdot 0.62 \cdot 0.64 \cdot 0.33 \cdot 0.00 \cdot 342 = 0.00$$



Accuracy: 77%

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	445 81%	53 10%	40 7%	2 0.4%	4 0.7%	4 0.7%	1 0.2%	549
Survived	233 68%	65 19%	40 12%	3 0.9%	0 0%	1 0.3%	0 0%	342

# Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	0

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$

Combination of values: 5	Not Survived	Survived	0.008
	0.008 100%	0 0%	

$$0.15 \cdot 0.15 \cdot 0.62 \cdot 0.78 \cdot 0.18 \cdot 0.007 \cdot 549 = 0.008$$

$$0.68 \cdot 0.40 \cdot 0.62 \cdot 0.64 \cdot 0.33 \cdot 0.00 \cdot 342 = 0.00$$

Accuracy: 77%

## Titanic – Training Data

### Estimation with only “Sex” and “Pclass”:

Combination of values: 3	Not Survived	Survived	105.4
	12.4 12%	93.0 88%	

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$0.68 \cdot 0.40 \cdot 342 = 93.0$$

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	0

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	445 81%	53 10%	40 7%	2 0.4%	4 0.7%	4 0.7%	1 0.2%	549
Survived	233 68%	65 19%	40 12%	3 0.9%	0 0%	1 0.3%	0 0%	342

Combination of values: 5	Not Survived	Survived	0.008
	0.008 100%	0 0%	

3528

$$0.15 \cdot 0.15 \cdot 0.62 \cdot 0.78 \cdot 0.18 \cdot 0.007 \cdot 549 = 0.008$$

$$0.68 \cdot 0.40 \cdot 0.62 \cdot 0.64 \cdot 0.33 \cdot 0.00 \cdot 342 = 0.00$$



Accuracy: 77%

## Titanic – Training Data

### Estimation with only “Sex” and “Pclass”:

Combination of values: 3	Not Survived	Survived	105.4
	12.4 12%	93.0 88%	

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$0.68 \cdot 0.40 \cdot 342 = 93.0$$

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	1

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	445 81%	53 10%	40 7%	2 0.4%	4 0.7%	4 0.7%	1 0.2%	549
Survived	233 68%	65 19%	40 12%	3 0.9%	0 0%	1 0.3%	0 0%	342

Combination of values: 5	Not Survived	Survived	0.008
	0.008 100%	0 0%	

3528

$$0.15 \cdot 0.15 \cdot 0.62 \cdot 0.78 \cdot 0.18 \cdot 0.007 \cdot 549 = 0.008$$

$$0.68 \cdot 0.40 \cdot 0.62 \cdot 0.64 \cdot 0.33 \cdot 0.00 \cdot 342 = 0.00$$



Accuracy: 77%

## Titanic – Training Data

### Estimation with only “Sex” and “Pclass”:

Combination of values: 3	Not Survived	Survived	105.4
	12.4 12%	93.0 88%	

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$0.68 \cdot 0.40 \cdot 342 = 93.0$$

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	1

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	446 80%	54 10%	41 7%	3 0.5%	5 0.9%	5 0.9%	2 0.4%	556
Survived	234 67%	66 19%	41 12%	4 1%	1 0.3%	2 0.6%	1 0.3%	349

Combination of values: 5	Not Survived	Survived	0.008
	0.008 100%	0 0%	

3528

$$0.15 \cdot 0.15 \cdot 0.62 \cdot 0.78 \cdot 0.18 \cdot 0.007 \cdot 549 = 0.008$$

$$0.68 \cdot 0.40 \cdot 0.62 \cdot 0.64 \cdot 0.33 \cdot 0.00 \cdot 342 = 0.00$$



Accuracy: 77%

## Titanic – Training Data

### Estimation with only “Sex” and “Pclass”:

Combination of values: 3	Not Survived	Survived	105.4
	12.4 12%	93.0 88%	

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$0.68 \cdot 0.40 \cdot 342 = 93.0$$

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	1

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	446 80%	54 10%	41 7%	3 0.5%	5 0.9%	5 0.9%	2 0.4%	556
Survived	234 67%	66 19%	41 12%	4 1%	1 0.3%	2 0.6%	1 0.3%	349

Combination of values: 5	Not Survived	Survived	0.05
	0.01 20%	0.04 80%	

3528

$$0.15 \cdot 0.15 \cdot 0.62 \cdot 0.78 \cdot 0.18 \cdot 0.009 \cdot 549 = 0.01$$

$$0.68 \cdot 0.40 \cdot 0.62 \cdot 0.64 \cdot 0.33 \cdot 0.003 \cdot 342 = 0.04$$



Accuracy: 77%



# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891



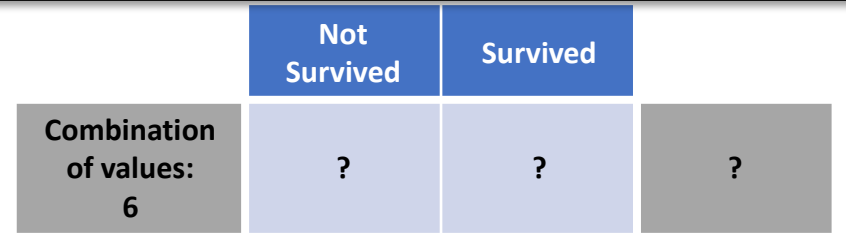
	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	446 80%	54 10%	41 7%	3 0.5%	5 0.9%	5 0.9%	2 0.4%	556
Survived	234 67%	66 19%	41 12%	4 1%	1 0.3%	2 0.6%	1 0.3%	349

# Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	1
6	male	3	Unknown	S	1	9	?

2 x 3 x 4 x 3 x 7 x 7 = 3528



$0.85 \cdot 0.68 \cdot 0.23 \cdot 0.78 \cdot 0.18 \cdot ? \cdot 549 = ?$

$0.32 \cdot 0.35 \cdot 0.15 \cdot 0.64 \cdot 0.32 \cdot ? \cdot 342 = ?$

Accuracy: 77%

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891



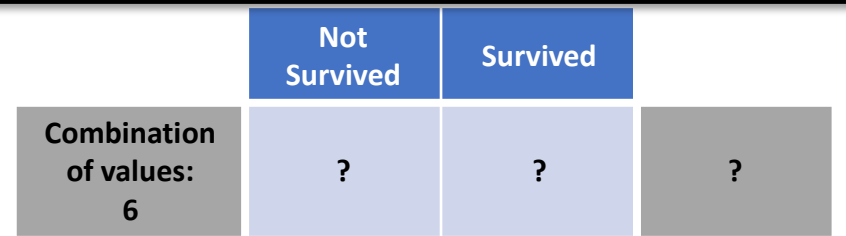
	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	446 80%	54 10%	41 7%	3 0.5%	5 0.9%	5 0.9%	2 0.4%	556
Survived	234 67%	66 19%	41 12%	4 1%	1 0.3%	2 0.6%	1 0.3%	349

# Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	1
6	male	3	Unknown	S	1	9	?

2 x 3 x 4 x 3 x 7 x 7 = 3528



$0.85 \cdot 0.68 \cdot 0.23 \cdot 0.78 \cdot 0.18 \cdot ? \cdot 549 = ?$

$0.32 \cdot 0.35 \cdot 0.15 \cdot 0.64 \cdot 0.32 \cdot ? \cdot 342 = ?$

Accuracy: 77%

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	446 80%	54 10%	41 7%	3 0.5%	5 0.9%	5 0.9%	2 0.4%	556
Survived	234 67%	66 19%	41 12%	4 1%	1 0.3%	2 0.6%	1 0.3%	349

# Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	1
6	male	3	Unknown	S	1	9	0

2 x 3 x 4 x 3 x 7 x 7 = 3528

Combination of values: 6	Not Survived	Survived	11.43
	10.25 90%	1.18 10%	

0.85 · 0.68 · 0.23 · 0.78 · 0.18 · 549 = 10.25

0.32 · 0.35 · 0.15 · 0.64 · 0.32 · 342 = 1.18

Accuracy: 77%

# Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	ParCh							
	0	1	2	3	4	5	6	
Not Survived	446 80%	54 10%	41 7%	3 0.5%	5 0.9%	5 0.9%	2 0.4%	556
Survived	234 67%	66 19%	41 12%	4 1%	1 0.3%	2 0.6%	1 0.3%	349

# Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	0
5	female	1	Adult	S	1	4	1
6	male	3	Unknown	S	1	9	0

2 x 3 x 4 x 3 x 7 x 7 = 3528

Combination of values: 6	Not Survived	Survived	11.43
	10.25 90%	1.18 10%	

$0.85 \cdot 0.68 \cdot 0.23 \cdot 0.78 \cdot 0.18 \cdot 549 = 10.25$

$0.32 \cdot 0.35 \cdot 0.15 \cdot 0.64 \cdot 0.32 \cdot 342 = 1.18$

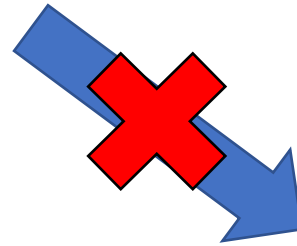
Accuracy: 77%

## Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891

199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	Continuous Feature				
	1	2	3	...	
Not Survived	0 0%	0 0%	0 0%	0 0%	549
Survived	0 0%	0 0%	0 0%	0 0%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$

Combination of values: 3	Not Survived	Survived	105.4
	12.4 12%	93.0 88%	

$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

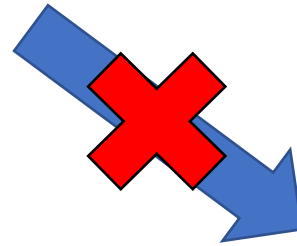
$$0.68 \cdot 0.40 \cdot 342 = 93.0$$

## Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891

199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

	Continuous Feature				
	1	2	3	...	
Not Survived	0 0%	0 0%	0 0%	0 0%	549
Survived	0 0%	0 0%	0 0%	0 0%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$

Combination of values: 3	Not Survived	Survived	0
	0 0%	0 0%	

$$0.15 \cdot 0.15 \cdot 0.00 \cdot 549 = 0$$

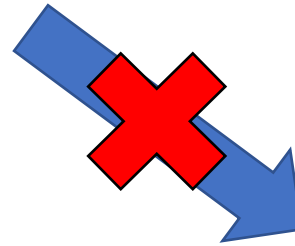
$$0.68 \cdot 0.40 \cdot 0.00 \cdot 342 = 0$$

## Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891

199



	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$

	Sex		Pclass			
	female	male	1	2	3	
Class 1	0 0%	0 0%	0 0%	0 0%	0 0%	0
Class 2	0 0%	0 0%	0 0%	0 0%	0 0%	0
...	0 0%	0 0%	0 0%	0 0%	0 0%	0

Combination of values: 3	12.4 12%	93.0 88%	105.4
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$$0.15 \cdot 0.15 \cdot 549 = 12.4$$

$$0.68 \cdot 0.40 \cdot 342 = 93.0$$

## Titanic – Training Data

Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
male	1	Adult	S	0	0	1
male	3	Child	S	3	1	0
female	2	Teenager	C	1	0	1
female	1	Adult	C	1	0	1
male	3	Unknown	Q	0	0	0

891

199

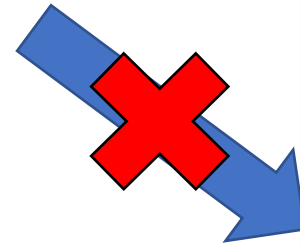


	Sex		Pclass			
	female	male	1	2	3	
Not Survived	81 15%	468 85%	80 15%	97 18%	372 68%	549
Survived	233 68%	109 32%	136 40%	87 25%	119 35%	342

## Titanic – Test Data

	Sex	Pclass	Age_Group	Embarked	SibSp	ParCh	Survived
1	male	3	Unknown	S	0	0	0
2	female	2	Adult	S	0	0	1
3	female	1	Adult	C	1	3	1
4	male	3	Teenager	S	0	2	

$$2 \times 3 \times 4 \times 3 \times 7 \times 7 = 3528$$



	Sex		Pclass			
	female	male	1	2	3	
Class 1	0 0%	0 0%	0 0%	0 0%	0 0%	0
Class 2	0 0%	0 0%	0 0%	0 0%	0 0%	0
...	0 0%	0 0%	0 0%	0 0%	0 0%	0

Combination of values: 3	0 0%	0 0%	0
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$$0.00 \cdot 0.00 \cdot 549 = 0$$

$$0.00 \cdot 0.00 \cdot 342 = 0$$