Q1 Probability Practice : Part A

		Yes	No	
30%	RC	0.5	0.5	1
70%	TC	ϕ	$1-\phi$	1
		0.65	0.35	1

$$\underbrace{0.3(50\%)}_{RC} + \underbrace{0.7(\phi)}_{TC} = \underbrace{0.65}_{\text{overall}}$$

$$\phi = \frac{0.65 - 0.15}{0.7}$$

$$\phi = \frac{0.50}{0.7} \approx 71.4\%$$

Part B

$$P(+\text{ve test} \mid \text{disease}) = 0.993 \Leftarrow a$$

$$P(-\text{ve test} \mid (\text{disease})^c) = 0.9999 \Leftarrow b$$

	Disease	No Disease
+ve	a	
-ve		b

$$P(\text{disease}) = 0.0025\% \Leftarrow c$$

$$P(\text{Disease} \mid +\text{ve test}) = \frac{P(+\text{test} \mid \text{disease}) \times P(\text{dis})}{P(+\text{test})}$$

$$= \frac{P(+\text{test} \mid \text{dis}) \times P(\text{dis})}{P(+\text{test} \mid \text{dis}) \times P(\text{dis}) + P(+\text{test} \mid \text{no dis}) \times P(\text{no dis})}$$

$$= \frac{a \times c}{a \times c + (1-b) \times (1-c)} = 0.1989$$