# SEC-1-FA3-GROUP-1-SIGUE,-JP-FA3

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**A binary communication channel carries data as one of two sets of signals denoted by 0 and 1. Owing to noise, a transmitted 0 is sometimes received as a 1, and a transmitted 1 is sometimes received as a 0. For a given channel, it can be assumed that a transmitted 0 is correctly received with probability 0.95, and a transmitted 1 is correctly received with probability 0.75. Also, 70% of all messages are transmitted as a 0. If a signal is sent, determine the probability that:**

*R = Received, T = Transmitted

```
binary_comm <- data.frame(correct = c(0.95, 0.75), error = c(0.05, 0.25),
                          sent = c(0.70, 0.30), row.names = 0:1)
binary_comm
```

```
##   correct error sent
## 0    0.95  0.05  0.7
## 1    0.75  0.25  0.3
```

**a 1 was received**

$P(R = 1) = P(R = 1|T = 0) \cdot P(T = 0) + P(R = 1|T = 1) \cdot P(T = 1)$

```
prob_get1 <- round((0.05 * 0.7 + .75 * 0.3), 4)
cat(prob_get1 * 100, "%", sep = "")
```

```
## 26%
```

**a 1 was transmitted given then a 1 was received**

$P(T = 1|R = 1) = \frac{P(T=1) \cdot P(R=1|T=1)}{P(R=1)}$

```
prob_send1_get1 <- round(((0.3 * 0.75) / prob_get1), 4)
cat(prob_send1_get1 * 100, "%", sep = "")
```

```
## 86.54%
```

**There are three employees working at an IT company: Jane, Amy, and Ava, doing 10%, 30%, and 60% of the programming, respectively. 8% of Jane's work, 5% of Amy's work, and just 1% of Ava's work is in error.**

```
work <- data.frame(runs = c(0.92, 0.95, 0.99), errors = c(0.08, 0.05, 0.01),
                   load = c(0.10, 0.30, 0.60), row.names = c("Jane", "Amy", "Ava"))
work
```

```
##      runs errors load
## Jane 0.92   0.08  0.1
## Amy  0.95   0.05  0.3
## Ava  0.99   0.01  0.6
```

**What is the overall percentage of error?**

$$P(E) = P(E|\text{Jane}) * P(\text{Jane}) + P(E|\text{Amy}) * P(\text{Amy}) + P(E|\text{Ava}) * P(\text{Ava})$$

```
error <- round((0.08 * 0.1 + 0.05 * 0.3 + 0.01 * 0.6), 4)
cat(error * 100, "%", sep = "")
```

```
## 2.9%
```

**If a program is found with an error, who is the most likely person to have written it?**

$$P(E|\text{Employee}) = \frac{P(E|\text{Employee}) \cdot P(\text{Employee})}{P(E)}$$

```
e_jane <- round(((0.08 * 0.1) / error), 4)
e_amy <- round(((0.05 * 0.3) / error), 4)
e_ava <- round(((0.01 * 0.6) / error), 4)

e_likely <- max(c(e_jane, e_amy, e_ava))

cat("Most likely to cause an error is Amy with ", e_amy * 100, "%.\n\n", sep = "")
```

```
## Most likely to cause an error is Amy with 51.72%.
```

```
cat("Jane:", e_jane * 100, "%\n", sep = "")
```

```
## Jane:27.59%
```

```
cat("Amy:", e_amy * 100, "%\n", sep = "")
```

```
## Amy:51.72%
```

```
cat("Ava:", e_ava * 100, "%\n", sep = "")
```

```
## Ava:20.69%
```