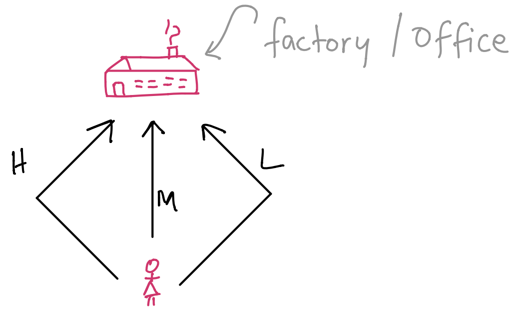
Until now, we have ignored the actual values of the RVs and only looked at their probabilities.

H — 0.6
T — 0.4

But what happens if we do get an H?

Consider an example:



Heavy traffic — 60 minutes
Medium " — 30 minutes
Light " — 10 minutes

Random variable $T \in \{h, m, l\}$

$$P(T=h) = 0.3$$
$$P(T=m) = 0.5$$
$$P(T=l) = 0.2$$

How long does she expect to take to get to the office?

$$\begin{aligned} & 0.3 \times 60 \\ + & 0.5 \times 30 \\ + & 0.2 \times 10 \end{aligned} = 37 \text{ minutes.}$$

1

"Expected value" of T

"weighted avg"

$$E[X] = \sum_x x . P(X=x)$$

Expected value of a discrete RV

all possible values X can take

value

probability of that value

Some properties of Expected values

— $E[cX] = c\,E[X]$

"if you multiply a RV with a number and find EV, it will be the same as finding the EV and then multiplying by that number."

Example above :
if all "times" are multiplied by 2,

EV will become 2×37.

— $E[X+c] = E[X] + c$

So, expectation is "linear".

$$E[X+Y] = E[X] + E[Y]$$

Expected value of continuous RVs

$$E[X] = \int_x x \, f(x) \, dx$$

$f(x) = 3x^3$ $\quad 0 \leq x \leq 1$

$$E[X] = \int_0^1 x \; 3x^3 \; dx \quad = \sim$$