Assignment 1

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Download all python codes from

```
https://github.com/Dishank422/AI1103−Probability
    −and−random−variables/blob/main/
    Assignment_1/codes
```

and latex-tikz codes from

```
https://github.com/Dishank422/AI1103−Probability
    −and−random−variables/blob/main/
    Assignment_1/main.tex
```

1 Problem(prob. misc. 6.11)

Given that the events A and B are such that $\Pr(A) = \frac{1}{2}$, $\Pr(A+B) = \frac{3}{5}$ and $\Pr(B) =$ p. Find p if they are

i) mutually exclusive
ii) independent

2 Solution

i) Since the events are mutually exclusive, by definition

$$\Pr(AB) = 0 \tag{2.0.1}$$

$$\implies \Pr(A+B) = \Pr(A) + \Pr(B) \tag{2.0.2}$$

On substituting the values of $\Pr(A)$, $\Pr(B)$ and $\Pr(A+B)$ in (2.0.2), we get

$$\frac{3}{5} = \frac{1}{2} + p \tag{2.0.3}$$

$$\implies p = \frac{1}{10} \tag{2.0.4}$$

ii) Since the events are independent

$$\Pr(AB) = \Pr(A)\Pr(B) \tag{2.0.5}$$

We know

$$\Pr(A+B) = \Pr(A)+\Pr(B)-\Pr(AB) \tag{2.0.6}$$

$$\implies \Pr(A+B) = \Pr(A) + \Pr(B) - \Pr(A)\Pr(B) \tag{2.0.7}$$

On substituting the values of $\Pr(A)$, $\Pr(B)$ and $\Pr(A+B)$ in (2.0.7), we get

$$\frac{3}{5} = \frac{1}{2} + p - \frac{1}{2}p \tag{2.0.8}$$

$$\implies p = \frac{1}{5} \tag{2.0.9}$$