Assignment 1

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Download all python codes from

```
https://github.com/Dishank422/AI1103-Probability
    -and-random-variables/blob/main/
    Assignment_2/codes
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and latex-tikz codes from

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https://github.com/Dishank422/AI1103-Probability
    -and-random-variables/blob/main/
    Assignment_2/main.tex
```

1 Problem

(Gate 11)The probability that a given positive number lying between 1 and 100 (both inclusive) is NOT divisible by 2, 3 or 5 is......

2 Solution

Let $X \in \{1, 2, ..., 100\}$ be the random variable representing the outcome for random selection of a number in $\{1, ..., 100\}$.
Since X has a uniform distribution, the probability mass function (pmf) is represented as

$$\Pr(X = n) = \begin{cases} \frac{1}{100} & 1 \le n \le 100 \\ 0 & otherwise \end{cases} \tag{2.0.1}$$

Let A represent the event that the number is divisible by 2. Let B represent the event that the number is divisible by 3. Let C represent the event that the number is divisible by 5.
We need to find the probability that the number is not divisible by 2, 3 or 5. Thus we need to find $1 - \Pr(A + B + C)$
We know

$$\begin{aligned}\Pr(A + B + C) = \Pr(A) + \Pr(B) + \Pr(C) \\ - \Pr(AB) - \Pr(BC) \\ - \Pr(AC) + \Pr(ABC)\end{aligned} \tag{2.0.2}$$

Event	Interpretation	Probability
A	n is divisible by 2	$\frac{50}{100}$
B	n is divisible by 3	$\frac{33}{100}$
C	n is divisible by 5	$\frac{20}{100}$
AB	n is divisible by 6	$\frac{16}{100}$
BC	n is divisible by 15	$\frac{6}{100}$
AC	n is divisible by 10	$\frac{10}{100}$
ABC	n is divisible by 30	$\frac{3}{100}$

Substituting in (2.0.2), we get

$$\begin{aligned}\Pr(A + B + C) = \frac{50}{100} + \frac{33}{100} + \frac{20}{100} \\ - \frac{16}{100} - \frac{6}{100} - \frac{10}{100} + \frac{3}{100}\end{aligned} \tag{2.0.3}$$

Thus,

$$\Pr(A + B + C) = \frac{74}{100} \tag{2.0.4}$$

Thus required probability =

$$1 - \Pr(A + B + C) = \frac{26}{100} \tag{2.0.5}$$