

Maths 1

Random \rightarrow A function that generates the random number in the given range with equal probability

~~Ques~~ Random6()
generates random number $R/w \ 1 \text{ to } 6$
with equal probability

Random9() $\rightarrow 1 - 9$ with equal probability

random6() $\Rightarrow 1 \rightarrow 6$

$$\begin{array}{ccc} \downarrow & & \text{random6()} + \text{random6()}/2 \\ 6 & 6 & \end{array}$$

$$1/2 \Rightarrow 0$$

$$4/2 \Rightarrow 2$$

$$2/2 \Rightarrow 1$$

$$5/2 \Rightarrow 2$$

$$3/2 \Rightarrow 1$$

$$6/2 \Rightarrow 3$$

`random6() * random6()` \neq

$\Rightarrow ((\text{random6}() * \text{random6}) / .9) + 1$

probability is not same

a <code>Random6()</code>	b <code>Random6()</code>	1	2	3	4	5	6
1	1	7	8	9	10	11	12
2	2	21	22	23	24	25	26
3	3	13	14	15	16	17	18
4	4	31	32	33	34	35	36
5	5	19	20	21	22	23	24
6	6	41	42	43	44	45	46
Every Combination		29	26	27	28	29	30
		51	52	53	54	55	56
$\rightarrow 1/36$		31	32	33	34	35	36
		61	62	63	64	65	66

$$\text{Val} = (a - 1) \times 6 + b$$

$$\begin{cases} \\ \end{cases} 1 \text{ to } 36$$

$$\text{Val} \cdot .9 + 1$$

int Random9()

```
int a = Random6();
int b = Random6();
int val = (a - 1) * 6 + b;
int ans = val % 9 + 1;
return ans
```

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Ques Random5() → 1-5

Random7()

$\text{ans} = \lceil 1 \times 7 + 6 \times \frac{\text{val}}{10} \rceil$

1	1	2	3	4	5
1	1	1	1	1	1
2	1	2	1	2	1
3	2	3	2	3	2
4	3	4	3	4	3
5	4	5	4	5	4
6	5	6	5	6	5
7	6	7	6	7	6
8	7	8	7	8	7
9	8	9	8	9	8
10	9	10	9	10	9
11	10	11	10	11	10
12	11	12	11	12	11
13	12	13	12	13	12
14	13	14	13	14	13
15	14	15	14	15	14
16	15	16	15	16	15
17	16	17	16	17	16
18	17	18	17	18	17
19	18	19	18	19	18
20	19	20	19	20	19
21	20	21	20	21	20
22	21	22	21	22	21
23	22	23	22	23	22
24	23	24	23	24	23
25	24	25	24	25	24

```

int Random7() {
    int a = Random5();
    int b = Random5();
    int val = (a-1)*5 + b;
    if (val > 21) return Random7();
    else return val % 7 + 1;
}

```

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GCD \Rightarrow Greatest Common Divisor

HCF \Rightarrow Highest Common Factor

$$1 \leq \gcd(a, b) \leq \min(a, b)$$

$$(25, 10) \Rightarrow 5$$

$$(27, 20) \Rightarrow 1$$

Brute Force

$$(40, 20) \Rightarrow 20$$

```
for(i = min(a, b); i >= 1; i--) {
```

```
    if(a % i == 0 && b % i == 0) {
```

return i;

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TC $\Rightarrow O(\min(a, b))$

Euclid's algorithm

20, 25

$$\begin{array}{r} 25 \\ \overline{) 20 \quad 0} \\ 0 \\ \hline 20 \quad 25 \end{array}$$

$$\begin{array}{r} 20 \quad 1 \\ \overline{) 25} \\ 20 \\ \hline 5 \quad 20 \\ \overline{) 20} \\ 0 \end{array} \Rightarrow 5$$

$b \% a$

$$\frac{45}{a}, \frac{35}{b}$$

$$\begin{array}{r} 45 \quad 0 \\ \overline{) 35} \\ 0 \end{array} \Rightarrow 5$$

$$\begin{array}{r} 35 \quad 1 \\ \overline{) 45} \\ 35 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 35 \quad 3 \\ \overline{) 10} \\ 30 \\ \hline 5 \quad 10 \\ \overline{) 10} \\ 0 \end{array}$$

int gcd (int a, int b) {

 dividend = a;

 divisor = b;

 rem = dividend % divisor;

 while (rem > 0) {

 dividend = divisor;

 divisor = rem;

 rem = dividend % divisor;

}

 return divisor;

```

int gcd (int a, int b) {
    if (a == 0) return b;
    return gcd (b % a, a);
}

```

$$TC \Rightarrow O(\log_2(\min(a, b)))$$

$$\begin{aligned}
\text{gcd}(a, b, c) &\Rightarrow \text{gcd}(\text{gcd}(a, b), c) \\
&\Rightarrow \text{gcd}(a, \text{gcd}(b, c)) \\
&\Rightarrow \text{gcd}(b, \text{gcd}(a, c))
\end{aligned}$$

$$\begin{aligned}
a, b, c, d &\Rightarrow ((a, b), c, d) \\
&\Rightarrow ((a, b), (c, d)) \\
&\Rightarrow ((a, c), (b, d)) \\
&\Rightarrow ((a, (b, c)), d)
\end{aligned}$$

a, b

$$[a * b = \gcd(a, b) * \text{lcm}(a, b)]$$

$10, 15$

$$\text{lcm}(a, b) \Rightarrow (a * b) / \gcd(a, b);$$

