## Doubling operation:

With multiples of 3 included:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| number represented: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| before doubling: | A | B | C | D | E | F | G | H | I | J | K |  |  |  |  |  |  |  |  |  |  |
| after doubling: | A |  | B |  | C |  | D |  | E |  | F |  | G |  | H |  | I |  | J |  | K |

With multiples of 3 omitted:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| number represented: | 1 | 2 | 4 | 5 | 7 | 8 | 10 | 11 | 13 | 14 | 16 | 17 | 19 | 20 |  |  |  |  |  |  |  |
| before doubling: | B | C | E | F | H | I | K |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| after doubling: |  | B | C |  |  | E | F |  |  | H | I |  |  | K |  |  |  |  |  |  |  |

## Shift operation:

With multiples of 3 included:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| number represented: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| before shift: | A | B | C | D | E | F | G | H | I | J | K |  |  |  |  |  |  |  |  |  |  |
| after shift: |  |  |  | A | B | C | D | E | F | G | H | I | J | K |  |  |  |  |  |  |  |

With multiples of 3 omitted:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| number represented: | 1 | 2 | 4 | 5 | 7 | 8 | 10 | 11 | 13 | 14 | 16 | 17 | 19 | 20 |  |  |  |  |  |  |  |
| before shift: | B | C | E | F | H | I | K |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| after shift: |  |  | B | C | E | F | H | I | K |  |  |  |  |  |  |  |  |  |  |  |  |