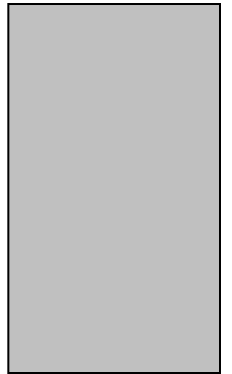


Powers of Two: Trace

Ex. Print powers of 2 that are $\leq 2^N$

- Increment i from 0 to N
- Double v each time

```
int v = 1;
for (int i = 0; i <= N; i++) {
    System.out.println(i + " " + v);
    v = 2 * v;
}
```



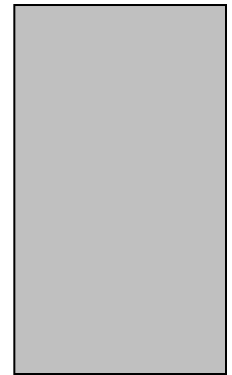
$N = 6$

Powers of Two: Trace

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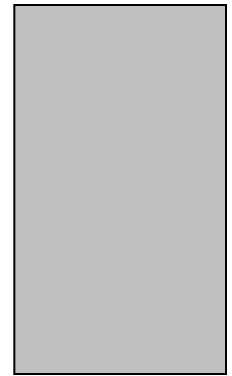
$N = 6$

Powers of Two: Trace

Ex. Print powers of 2 that are $\leq 2^N$

- Increment i from 0 to N
- Double v each time

i	v
0	1



```
int v = 1;
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}
```

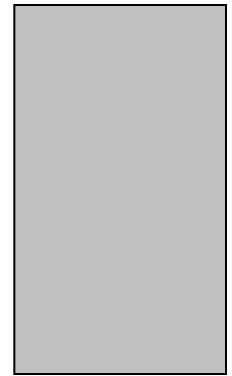
$N = 6$

Powers of Two: Trace

Ex. Print powers of 2 that are $\leq 2^N$

- Increment i from 0 to N
- Double v each time

i	v	$i \leq N$
0	1	true



```
int v = 1;
for (int i = 0; i <= N; i++) {
    System.out.println(i + " " + v);
    v = 2 * v;
}
```

N = 6

Powers of Two: Trace

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    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true

```
0 1
```

$N = 6$

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```
int v = 1;
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    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true
	2	

```
0 1
```

$N = 6$

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0	1	true
1	2	

```
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```

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1	2	true

```
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```

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}
```

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0	1	true
1	2	true

```
0 1
1 2
```

$N = 6$

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    System.out.println(i + " " + v);
    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true
1	2	true
	4	

```
0 1
1 2
```

N = 6

Powers of Two: Trace

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1	2	true
2	4	

0	1
1	2

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2	4	true

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1	2	true
2	4	true

```
0 1
1 2
2 4
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N = 6

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    System.out.println(i + " " + v);
    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
	8	

0	1
1	2
2	4

N = 6

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3	8	

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0	1	true
1	2	true
2	4	true
3	8	true

```
0 1
1 2
2 4
3 8
```

N = 6

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    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
3	8	true
	16	

0	1
1	2
2	4
3	8

$N = 6$

Powers of Two: Trace

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    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
3	8	true
4	16	

```
0 1
1 2
2 4
3 8
```

$N = 6$

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0	1	true
1	2	true
2	4	true
3	8	true
4	16	true

```
0 1
1 2
2 4
3 8
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2	4	true
3	8	true
4	16	true

```
0 1
1 2
2 4
3 8
4 16
```

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}
```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
	32	

```
0 1
1 2
2 4
3 8
4 16
```

$N = 6$

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0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
5	32	

```
0 1
1 2
2 4
3 8
4 16
```

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2	4	true
3	8	true
4	16	true
5	32	true

```
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2 4
3 8
4 16
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5	32	true

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1 2
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5 32
```

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```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
5	32	true
	64	

```
0 1
1 2
2 4
3 8
4 16
5 32
```

$N = 6$

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0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
5	32	true
6	64	

```
0 1
1 2
2 4
3 8
4 16
5 32
```

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4	16	true
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6	64	true

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1	2
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6	64	true

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1	2
2	4
3	8
4	16
5	32
6	64

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    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
5	32	true
6	64	true
	128	

0	1
1	2
2	4
3	8
4	16
5	32
6	64

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    v = 2 * v;
}
```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
5	32	true
6	64	true
7	128	

0	1
1	2
2	4
3	8
4	16
5	32
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```

i	v	$i \leq N$
0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
5	32	true
6	64	true
7	128	false

0	1
1	2
2	4
3	8
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0	1	true
1	2	true
2	4	true
3	8	true
4	16	true
5	32	true
6	64	true
7	128	false

0	1
1	2
2	4
3	8
4	16
5	32
6	64

$N = 6$