p = 1 - probability that no two messages have identical
  = $1 - (1 - 1/2^d) * \ldots * (1 - 199/2^d) < \frac{1}{2}$

```
>>> for d in range(1, 28):
...     product = 1
...     for i in range(1, 200):
...             product *= (2**d-i)/2**d
...     if 1-product<0.5:
...             print(d)
...             break
...
15
```

d = 15