Halving

The original block reward is **50 BTC** or **5 billion Satoshi.**

In[679]:=

```
coinbase = 50 * 100 000 000;
```

The 50 BTC coinbase (block reward) in binary

In[680]:=

```
BaseForm[coinbase, 2]
```

Out[680]//BaseForm=

$$100101010000001011111001000000000_2$$

Halving happens every 4 years, **every 210,000 blocks**.

So how does the coinbase get to zero if it's cut in half, forever?

Answer: the coinbase is **cut in "half"** by **dropping its last bit**, until there are no more bits (it's zero).

In[791]:=

```
Grid[
 Prepend[
  Table[
   year = 2008 + (4 * x);
   halving = x + 1;
   sat = BitShiftRight[coinbase, x];
   btc = sat / 100 000 000;
   {
    year,
    halving,
    AccountingForm[btc // N, 8],
    sat,
    BaseForm[sat, 2],
    NumberForm[btc * 210 000 , 5] // N
   },
   {x, 0, 32}], {
   "Year"
   , "Epoch"
   , Column[{"Block Reward", "(BTC)"}, Alignment → Right]
   , Column[{"Block Reward", "(satoshi)"}, Alignment → Right]
   , "Satoshi (in binary)"
   , Column[{"210k blocks", "total (BTC)"}, Alignment → Right]
  }
 ]
 , Frame → All, Alignment → CenterDot, Background → LightYellow
]
```

Out[791]=

Year	Epoch	Block Reward (BTC)	Block Reward (satoshi)	Satoshi (in binary)	210k blocks total (BTC)
2008	1	50.	5 000 000 000	$100101010000001011111001000000_2$	1.05×10^7
2012	2	25.	2 500 000 000	$10010101000000101111100100000_2$	5.25×10^6
2016	3	12.5	1 250 000 000	$1001010100000010111110010000_2$	2.625×10^6
2020	4	6.25	625 000 000	$100101010000001011111001000000_2$	1.3125×10^6
2024	5	3.125	312 500 000	$10010101000000101111100100000_2$	656250.
2028	6	1.5625	156 250 000	$1001010100000010111111001000_2$	328130.
2032	7	0.78125	78 125 000	$100101010000001011111001000_2$	164060.
2036	8	0.390625	39 062 500	$10010101000000101111100100_2$	82031.
2040	9	0.1953125	19 531 250	$1001010100000010111110010_2$	41016.
2044	10	0.09765625	9 765 625	$100101010000001011111001_2$	20508.
2048	11	0.04882812	4 882 812	$10010101000000101111100_2$	10254.
2052	12	0.02441406	2 441 406	1001010100000010111110_2	5127.
2056	13	0.01220703	1 220 703	100101010000001011111_2	2563.5
2060	14	0.00610351	610 351	10010101000000101111_2	1281.7
2064	15	0.00305175	305 175	1001010100000010111_2	640.87
2068	16	0.00152587	152 587	100101010000001011_2	320.43
2072	17	0.00076293	76 293	10010101000000101_2	160.22
2076	18	0.00038146	38 146	1001010100000010_2	80.107
2080	19	0.00019073	19 073	100101010000001_2	40.053
2084	20	0.00009536	9536	10010101000000_2	20.026
2088	21	0.00004768	4768	1001010100000_2	10.013
2092	22	0.00002384	2384	100101010000_2	5.0064
2096	23	0.00001192	1192	10010101000_2	2.5032
2100	24	0.00000596	596	1001010100_2	1.2516
2104	25	0.00000298	298	100101010_2	0.6258
2108	26	0.00000149	149	10010101_2	0.3129
2112	27	0.00000074	74	1001010_2	0.1554
2116	28	0.00000037	37	100101_2	0.0777
2120	29	0.00000018	18	10010_2	0.0378
2124	30	0.00000009	9	1001_2	0.0189
2128	31	0.00000004	4	100_2	0.0084
2132	32	0.00000002	2	10_2	0.0042
2136	33	0.00000001	1	1_2	0.0021

In[792]:=

```
totalSats = Total[
  Table[
   210 000 * BitShiftRight[coinbase, x]
   , {x, 0, 32}
  ]
 ]
```

Out[792]=

2 099 999 997 690 000

In[793]:=

```
totalBitcoin = AccountingForm[totalSats / 100 000 000 // N, 20]
```

Out[793]//AccountingForm=

```
20999999.9769
```