

Halving

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

In[329]:=

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

The 50 BTC coinbase (block reward) in binary

In[330]:=

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

Out[330]//BaseForm=

```
10010101000000010111110010000000002
```

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[331]:=

```

issuancetable = 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, 33}];
Grid[
  Prepend[
    issuancetable
  , {
    Style["Year", FontWeight → Bold]
  , Style["Epoch", FontWeight → Bold]
  , Style[
    Column[{"Block Reward", "(BTC)"}, Alignment → Right], FontWeight → Bold]
  , Style[
    Column[{"Block Reward", "(satoshi)"}, Alignment → Right], FontWeight → Bold]
  , Style["Satoshi (in binary)", FontWeight → Bold]
  , Style[Column[{"210k blocks", "total (BTC)"}, Alignment → Right],
    FontWeight → Bold]
  ]
]
, Frame → All, Alignment → CenterDot, Background → LightYellow
]

```

Out[332]=

Year	Epoch	Block Reward (BTC)	Block Reward (satoshi)	Satoshi (in binary)	210k blocks total (BTC)
2008	1	50.	5 000 000 000	100101010000000101111100100000\0000 ₂	1.05×10^7
2012	2	25.	2 500 000 000	100101010000000101111100100000\000 ₂	5.25×10^6
2016	3	12.5	1 250 000 000	100101010000000101111100100000\00 ₂	2.625×10^6
2020	4	6.25	625 000 000	100101010000000101111100100000 ₂	1.3125×10^6
2024	5	3.125	312 500 000	100101010000000101111100100000 ₂	656250.
2028	6	1.5625	156 250 000	10010101000000010111110010000 ₂	328130.
2032	7	0.78125	78 125 000	1001010100000001011111001000 ₂	164060.
2036	8	0.390625	39 062 500	100101010000000101111100100 ₂	82031.
2040	9	0.1953125	19 531 250	10010101000000010111110010 ₂	41016.
2044	10	0.09765625	9 765 625	1001010100000001011111001 ₂	20508.
2048	11	0.04882812	4 882 812	100101010000000101111100 ₂	10254.
2052	12	0.02441406	2 441 406	10010101000000010111110 ₂	5127.
2056	13	0.01220703	1 220 703	1001010100000001011111 ₂	2563.5
2060	14	0.00610351	610 351	100101010000000101111 ₂	1281.7
2064	15	0.00305175	305 175	10010101000000010111 ₂	640.87
2068	16	0.00152587	152 587	1001010100000001011 ₂	320.43
2072	17	0.00076293	76 293	100101010000000101 ₂	160.22
2076	18	0.00038146	38 146	10010101000000010 ₂	80.107
2080	19	0.00019073	19 073	1001010100000001 ₂	40.053
2084	20	0.00009536	9536	100101010000000 ₂	20.026
2088	21	0.00004768	4768	10010101000000 ₂	10.013
2092	22	0.00002384	2384	1001010100000 ₂	5.0064
2096	23	0.00001192	1192	100101010000 ₂	2.5032
2100	24	0.00000596	596	10010101000 ₂	1.2516
2104	25	0.00000298	298	1001010100 ₂	0.6258
2108	26	0.00000149	149	100101010 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
2140	34	0.	0	0 ₂	0.

In[333]:=

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

Out[333]=

2 099 999 997 690 000

In[334]:=

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

Out[334]//AccountingForm=

```
209999999.9769
```

Let's show just the last 10-rows, for clarity

```
tablebottom = Take[issuancetable, -10];
```

In[336]:=

```
Grid[
  Prepend[
    tablebottom, {
      Style["Year", FontWeight → Bold]
    , Style["Epoch", FontWeight → Bold]
    , Style[
      Column[{"Block Reward", "(BTC)"}, Alignment → Right], FontWeight → Bold]
    , Style[
      Column[{"Block", "Reward", "(sats)"}, Alignment → Right], FontWeight → Bold]
    , Style[
      Column[{"Satoshi", "(in binary)"}, Alignment → Right], FontWeight → Bold]
    , Style[Column[{"210k blocks", "total (BTC)"}, Alignment → Right],
      FontWeight → Bold]
    ]
  ]
, Frame → All, Alignment → CenterDot, Background → LightYellow
]
```

Out[336]=

Year	Epoch	Block Reward (BTC)	Block Reward (sats)	Satoshi (in binary)	210k blocks total (BTC)
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
2140	34	0.	0	0 ₂	0.