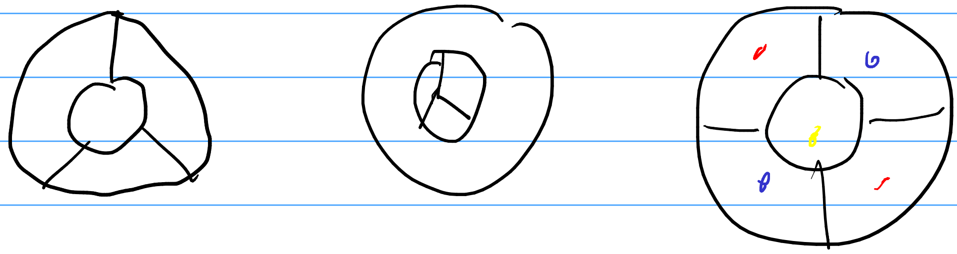
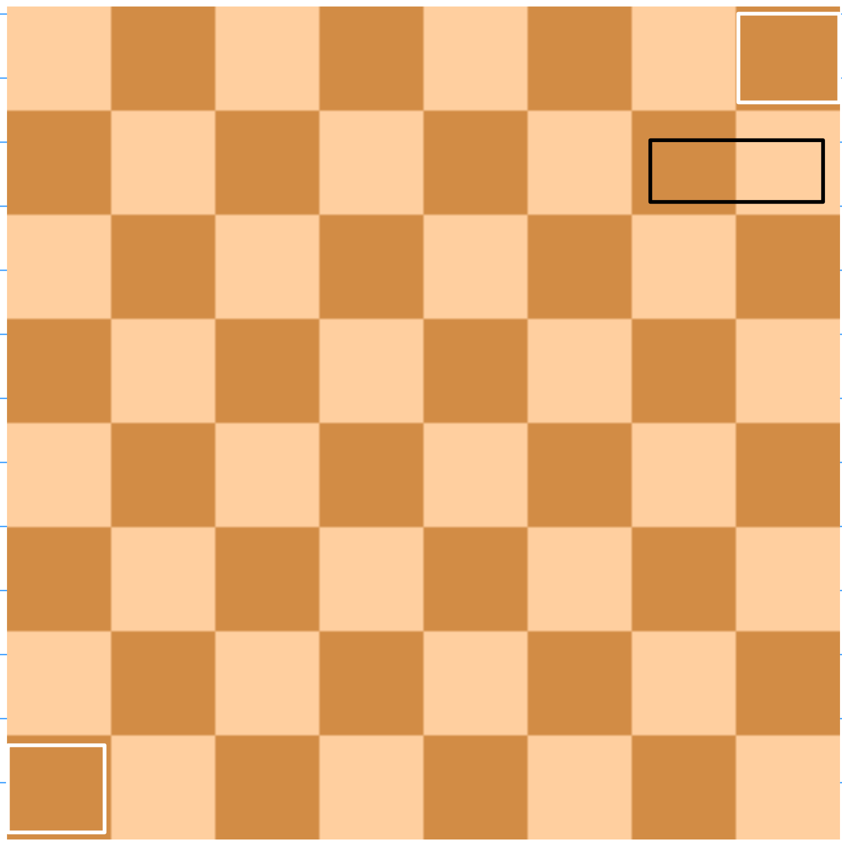
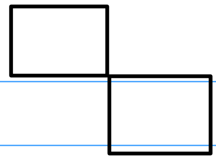
$a \in \mathbb{Z}$ $\quad a^2 + a^4 + a^8 = b^2$, $b \in \mathbb{Z}$

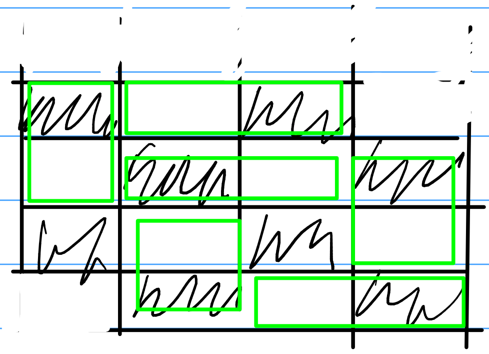
$18 = 11 + 7$

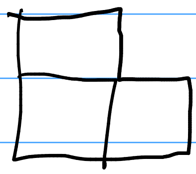
$f: \mathbb{R}^n \to \mathbb{R}$





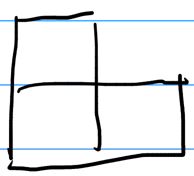


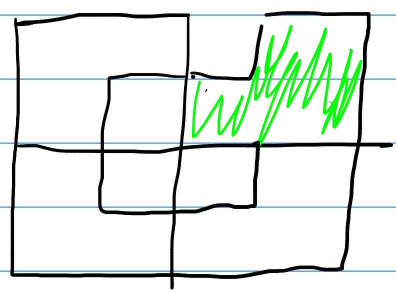


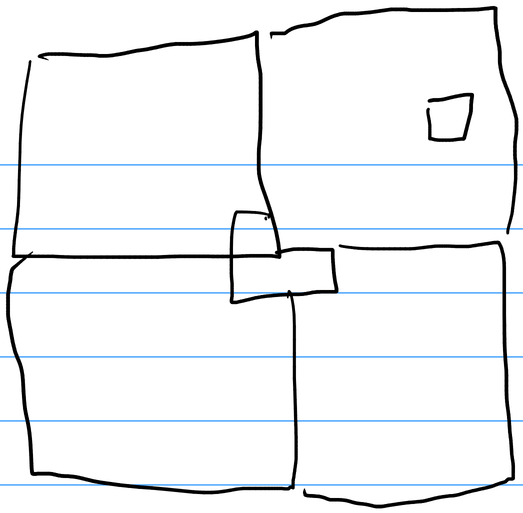


$64 - 1 = 63$

Prove that you can tile any $2^n \times 2^n$ chessboard with 1 square missing using L-shapes $n \geq 1$







$(6, 2)$

$\log_2 X_1 = y_1$

$\log_2 X_2 = y_2$

$2^{y_1} = x_1$

$2^{y_2} = x_2$

$$\frac{x_1 + x_2}{2} = 6$$

$$\frac{y_1 + y_2}{2} = 2$$

$$\frac{2^{y_1} + 2^{y_2}}{2} = 6$$

$y_1 + y_2 = 4$

$y_1 = 4 - y_2$

$$\frac{2^{4-y_2} + 2^{y_2}}{2} = 6$$

$2^{4-y} + 2^{y} = 12$

$16 \cdot 2^{-y} + 2^{y} = 12$

$2^{y} = x_2$

$z = x^2$

$$\frac{16}{z} + z = 12$$

$$16 + z^2 = 12z$$

$$z^2 - 12z + 16 = 0$$

$$\frac{12 \pm \sqrt{144 - 64}}{2}$$

$$\frac{12 \pm \sqrt{80}}{2} \qquad 6 \pm \sqrt{20}$$

$$2\sqrt{20} = 4\sqrt{5}$$

Proof there are an infinite # of primes

$$S = \{ P_0, P_1, P_2, P_3 \ldots P_n \}$$

We want to prove there is a prime not in S

$$Q = P_0 \cdot P_1 \cdot P_2 \cdots \cdot P_n \qquad Q+1$$

$$\prod_{i=0}^{n} P_i$$

$Q+1$ has prime factors
call one of them q

remainder of $\frac{Q+1}{P_i}$ for all $i = 1$,

so none of the P_i is a factor of $Q+1$

so... q is a prime not on the list

$a^b - 1$ is a multiple of $(a-1)$

$a, b \in \mathbb{Z}^+$

$(a-1)(x) = ax - x$

$\sum_{i=0}^{b} a^b$ $\quad c = 1 + a + a^2 + a^3 \dots a^b$

$ac \quad a + a^2 + a^3 \dots a^b + a^{b+1}$

$ac - c = a^{b+1} - 1$

$a^b - 1 \;/\; (a-1)$

$$
\begin{array}{r l}
 & a^3 + a^2 + a + 1 \\
a-1 \,\big) & a^4 + 0 + 0 + 0 - 1 \\
 & -\; a^4 - a^3 \\
 & \quad a^3 - a^2 \\
\hline
 & \quad\quad a^2 + 0
\end{array}
$$

10	9	1
100	99	11
1000	999	111
10000	9999	1111