Warmup: Convert between decimal, hexadecimal, and binary.

101010₂ in decimal: 42
1111₁₀ in decimal: 31
1₄₁₀ in binary: 1100
73₁₀ in binary: 1001011
100₁₀ in binary: 1100100
1₀₁₀ in decimal: 16
9₈₁₀ in decimal: 49
3F₁₀ in decimal: 63

Question From Tuesday's Lecture

Switches as Transistors

Recall the inverter from lecture:

Made up of three-terminal switches: \( V_{gate} \) \( \overline{ } \) \( \overline{ } \)

- If \( V_{gate} > V_t \), switch is ON, otherwise OFF
- Or, \( V_{gate} < V_t \) for the second device.

So how does the inverter work?

- If \( V_{in} = V_{in} \), the bottom switch is ON and the top switch is OFF. \( V_{out} \) is shorted to GND.
- If \( V_{in} = 0 \), the top switch is ON and the bottom switch is OFF. \( V_{out} \) is shorted to \( V_{dd} \).
We can implement these switches with MOSFETs (transistors). However, we need two types:

**nMOS**

- If $V_{\text{gate}} > V_t$, switch is ON; otherwise OFF.
- "Good at" passing GND; "bad at" passing $V_{\text{dd}}$.
- Use in the pull-down network.

**pMOS**

- If $V_{\text{gate}} < V_t$, switch is ON; otherwise OFF.
- "Good at" passing $V_{\text{dd}}$; "bad at" passing GND.
- Use in the pull-up network.

So, let's re-draw our inverter:

Together, "complementary" networks form CMOS!

- Are $V_{\text{dd}}$ and GND ever shorted together?
- Is the input ever shorted to the output?