The transistor counts double approximately every 24 months.

1.3

1.4

(a)  

(b)  

(c)
1.5

(a) A \rightarrow Y

(b) A \rightarrow B \rightarrow Y

(c) A \rightarrow B \rightarrow Y

(d) A \rightarrow B \rightarrow C \rightarrow Y

1.6

[Diagram of a circuit with inputs A, B, and C, and outputs Y and C']
1.7 The minimum area is 5 tracks by 5 tracks ($40 \lambda \times 40 \lambda = 1600 \lambda^2$).

1.8 The minimum area is 5 tracks by 5 tracks ($40 \lambda \times 40 \lambda = 1600 \lambda^2$).

1.9 The layout is $40 \lambda \times 40 \lambda$ if minimum separation to adjacent metal is considered, exactly as the track count estimated.
1.11

5 tracks wide by 6 tracks tall, or $1920 \lambda^2$.

1.12 This latch is nearly identical save that the inverter and transmission gate feedback has been replaced by a tristate feedback gate.

1.13

\begin{center}
\begin{tikzpicture}
\node (A) at (0,0) [draw, rectangle] {A};
\node (B) at (0,1) [draw, rectangle] {B};
\node (C) at (1,0) [draw, rectangle] {C};
\node (D) at (1,1) [draw, rectangle] {D};
\node (E) at (2,0) [draw, rectangle] {E};
\node (F) at (2,1) [draw, rectangle] {F};
\draw[->] (A) -- (B);
\draw[->] (B) -- (C);
\draw[->] (C) -- (D);
\draw[->] (D) -- (E);
\draw[->] (E) -- (F);
\end{tikzpicture}
\end{center}
1.14

(c) 4 x 6 tracks = 32 \lambda \times 48 \lambda = 1536 \lambda^2.

(e) The layout size matches the stick diagram.

1.15

(c) 5 x 6 tracks = 40 \lambda \times 48 \lambda = 1920 \lambda^2. (with a bit of care)

(d-e) The layout should be similar to the stick diagram.

1.16

(c) 6 tracks wide x 7 tracks high = (48 x 56) = 2688 \lambda^2.
1.17 20 transistors, vs. 10 in 1.16(a).

1.18

(c) The area of this stick diagram is $11 \times 6$ tracks $= 4224 \lambda^2$ if the polysilicon can be bent.

1.19 The lab solutions are available to instructors on the web.

Chapter 2