Plato and the Nerd

The Creative Partnership of Humans and Technology

By Edward Ashford Lee

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```
solid pyramid
facet normal 0 0 0
    outer loop
        vertex 0 0 0
        vertex 1 0 0
        vertex 0.5 0 0.866
    endloop
endfacet
facet normal 0 0 0
    outer loop
        vertex 1 0 0
        vertex 0.5 0.901 0.433
        vertex 0.5 0 0.866
    endloop
endfacet
facet normal 0 0 0
    outer loop
        vertex 0 0 0
        vertex 0.5 0.901 0.433
        vertex 1 0 0
    endloop
endfacet
facet normal 0 0 0
    outer loop
        vertex 0 0 0
        vertex 0.5 0 0.866
        vertex 0.5 0.901 0.433
    endloop
endfacet
```

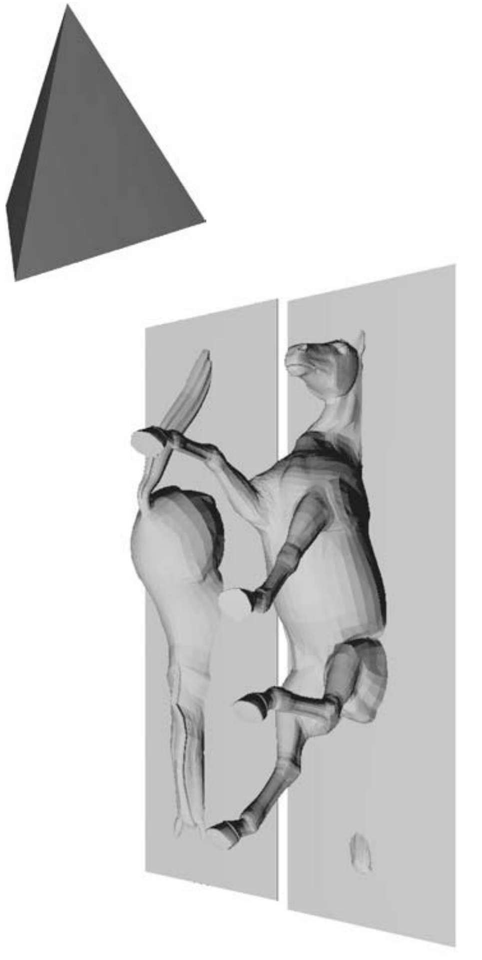

Figure 2.5

Three-dimensional shape specified in STL.

$$v(t) = L\frac{di(t)}{dt}$$

Formula 1

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Figure 3.3

Layers of paradigms.

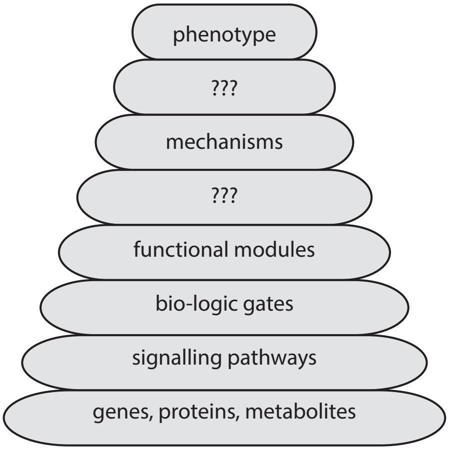


Figure 3.4

Layers of abstraction proposed by Fisher et al. (2011) for synthetic biology.

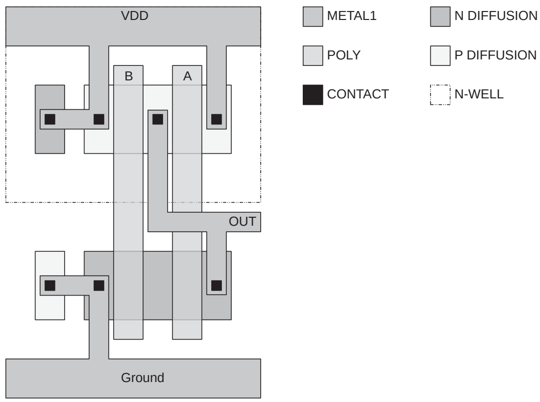


Figure 4.1

Mask design for a four-transistor CMOS NAND gate.

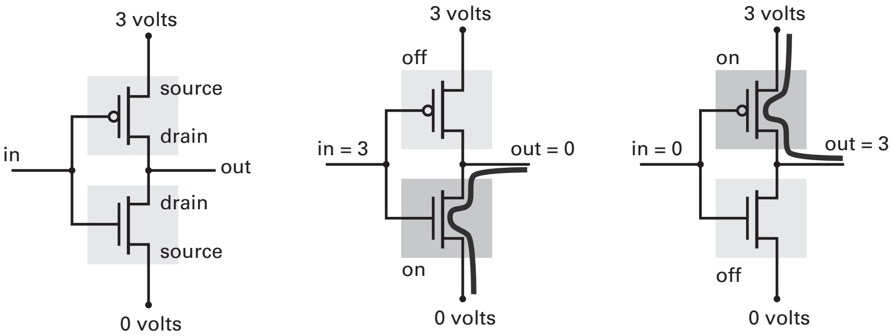


Figure 4.3

Circuit diagram for an inverter logic gate (left). When the input voltage is high (3 volts), the lower transistor is on (center). When the input voltage is low (0 volts), the upper transistor is on (right).

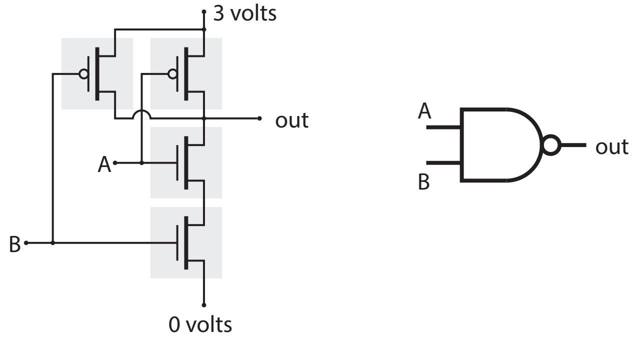


Figure 4.4

Circuit diagram for a NAND logic gate and its logic symbol. When both inputs *A* and *B* are high, the output is low. Otherwise, the output is high.

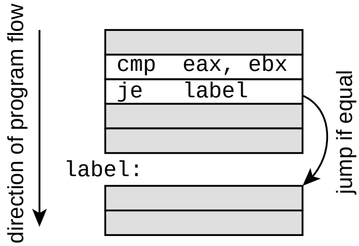


Figure 5.2

Small fragment of x86 assembly code.

$$x[\triangle\!\!\!\mid\;\; x \leftarrow 5?10]$$

Formula 2

7. application	network services used directly by applications
6. presentation	interpretation of bit patterns as text, images, numbers, etc.
5. session	multiple back-and-forth data exchanges treated as a unit
4. transport	reliable transmission of data segments
3. network	routing of packets of bits in a multi-node network
2. data link	delivery of a frame of bits between two nodes
1. physical	streams of bits over wires or radio

Figure 6.3

The OSI model for communication between computers.

HH HT HH HH HH TH HH HH HH HH

Coin Toss

HH	HT	HH	HH	HH	TH	HH	HH	HH	HH
11	10	11	11	11	01	11	11	11	11

Binary Coin Toss

HH	0
TH	10
HT	110
TT	111

Binary Pairs

HH	HT	HH	HH	HH	TH	HH	HH	HH	HH
0	110	0	0	0	10	0	0	0	0

Binary Coin Toss Code

$$-0.9\log_2(0.9) - 0.1\log_2(0.1) \approx 0.47 \text{ bits}$$

Equation 1

$$H(X) = -\int_{\Omega} f(x)\log_2(f(x))dx$$

Formula 3

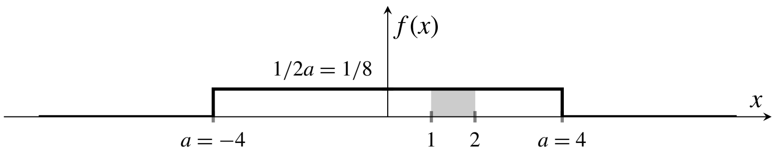


Figure 7.1

Probability density function for a uniform continuous random experiment.

$$H(X) = -\log_2(1/2a) = \log_2(2a) = 3$$

Equation 2

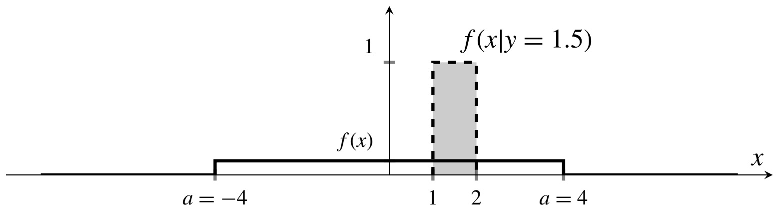


Figure 7.2
Conditional probability density function (dashed line) given a measurement $y = 1.5$.

```
if (F_n(BB) == 1) {
    return 0
} else {
    loop forever
}
```

Pseudocode

$$\begin{array}{ccccc} 0 & 1 & 2 & 3 & \cdots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \cdots \\ -1 & 0 & 1 & 2 & \cdots \end{array}$$

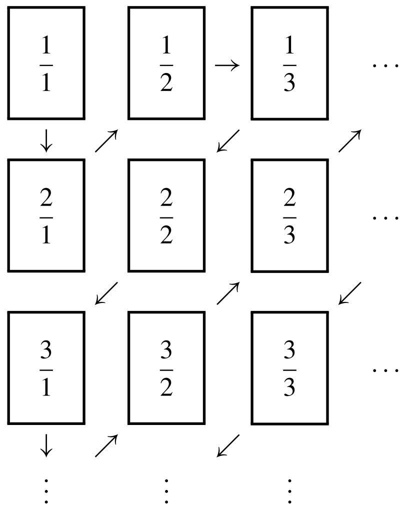
Infinite Set 1

$$
\begin{array}{cccccccc}
\mathbb{N}: & 0 & 1 & 2 & 3 & 4 & 5 & \cdots \\
 & \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & \cdots \\
\mathbb{Z}: & 0 & -1 & 1 & -2 & 2 & -3 & \cdots
\end{array}
$$

Infinite Set 2

$\frac{1}{1}$	$\frac{1}{2}$	$\frac{1}{3}$	$\cdots$
$\frac{2}{1}$	$\frac{2}{2}$	$\frac{2}{3}$	$\cdots$
$\frac{3}{1}$	$\frac{3}{2}$	$\frac{3}{3}$	$\cdots$
$\vdots$	$\vdots$	$\vdots$	

Rational Number Table



Rational Number Table with Arrows

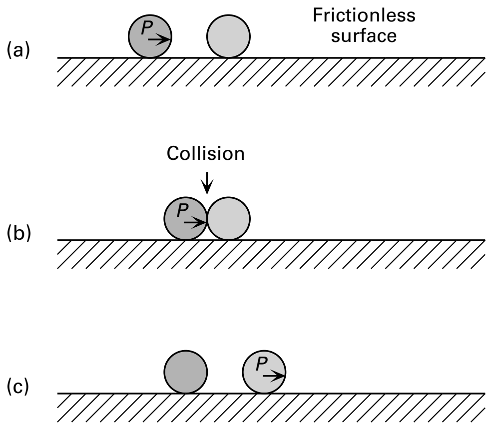


Figure 10.6

Collision of ideal billiard balls on a frictionless surface.

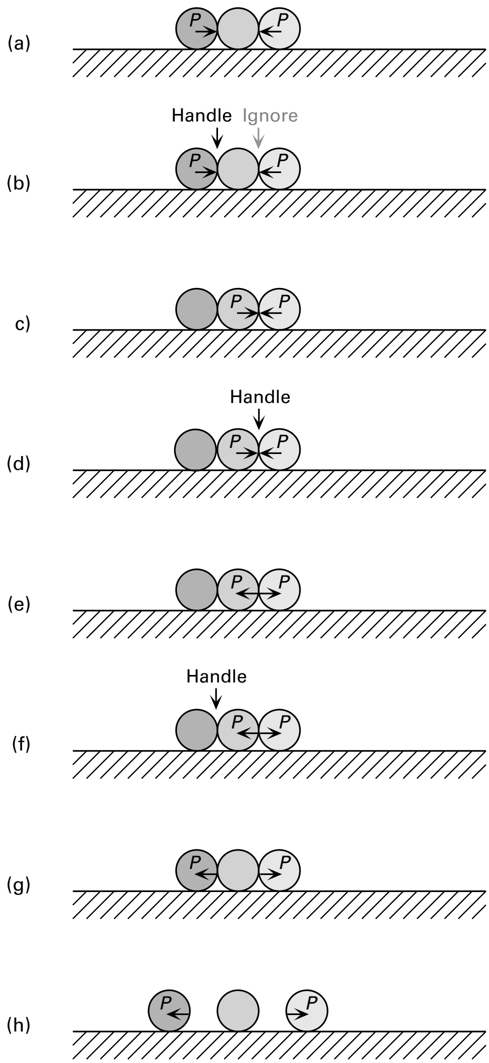


Figure 10.7

One of two orderings for handling collisions among three balls.

$$p(U|H) = \frac{p(H|U)p(U)}{p(H)}$$

Equation 3

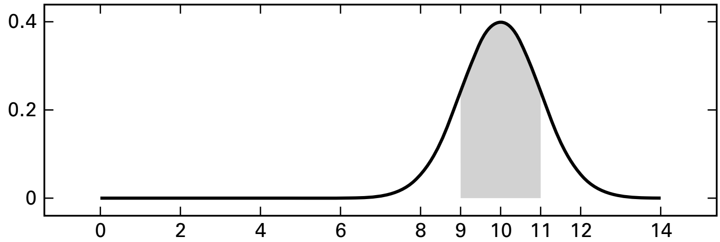


Figure 11.1
Probability density function for the dart distance experiment.