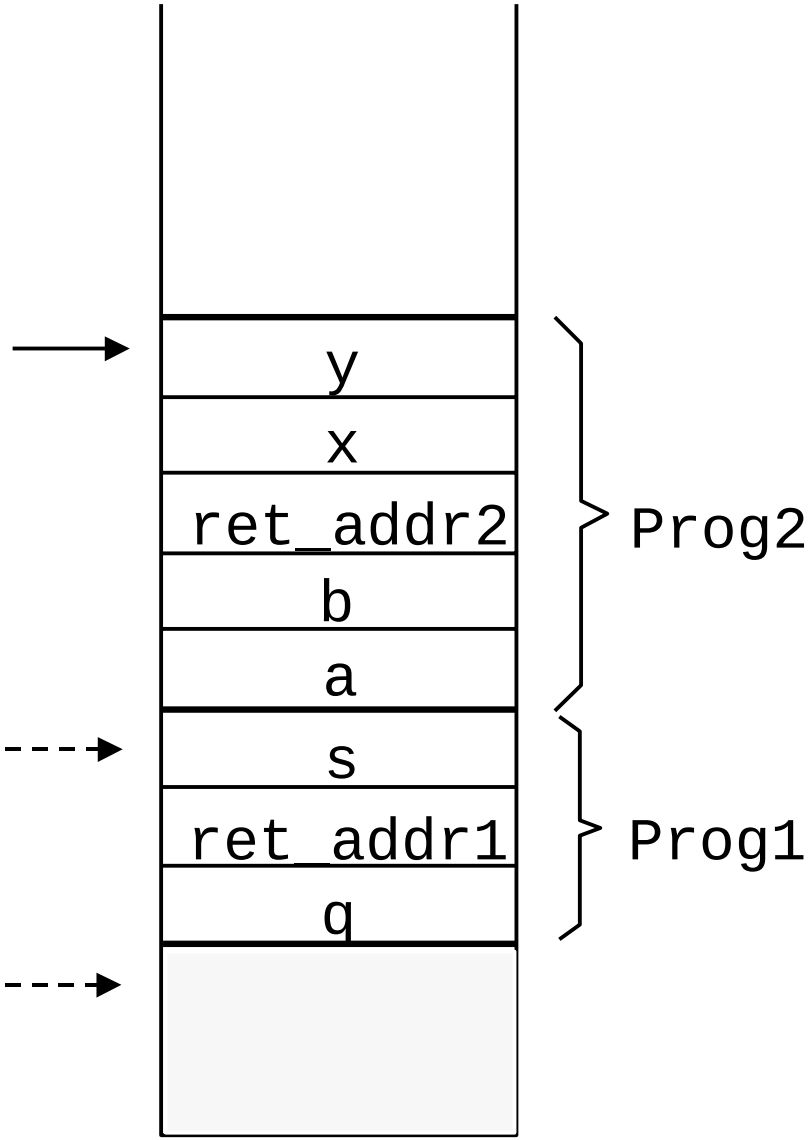
STACK FRAMES

Stack Frames

```
void Prog1( int q )
{
  int   s;

  ...
  Prog2( s, q );
  ...
}

void Prog2( int a, int b )
{
  int   x, y;

  ....

}
```

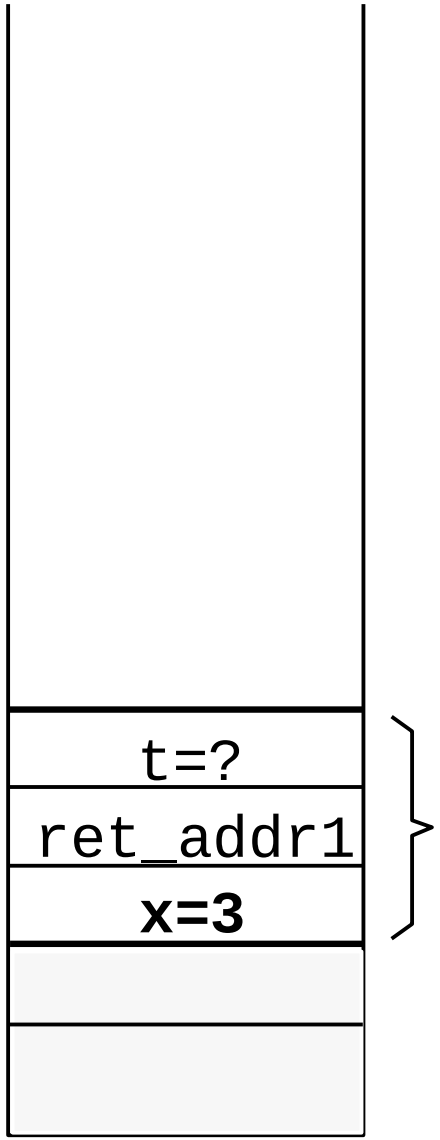


Recursive Programs

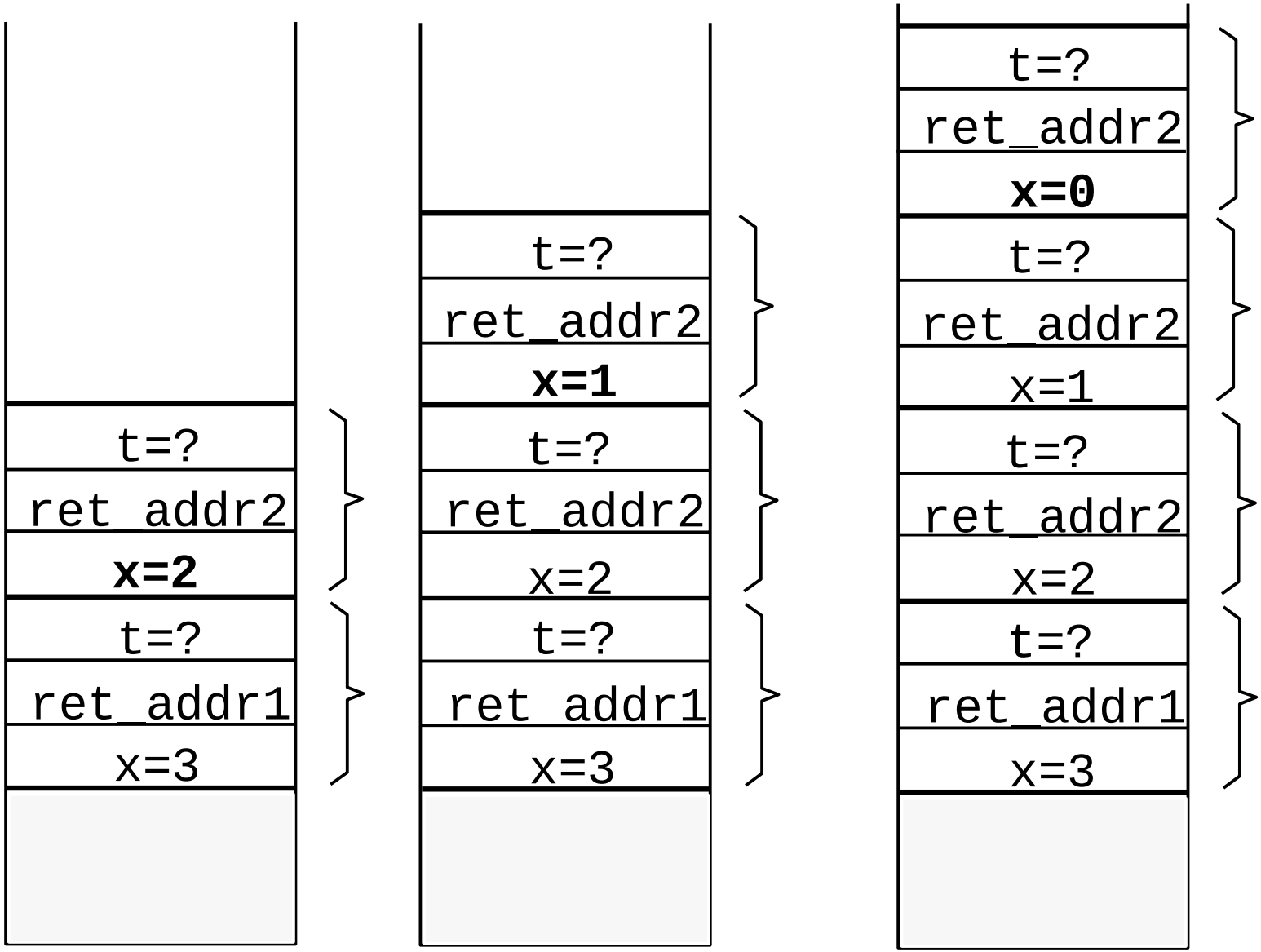
```
  ...
  y = Fac( 3 );
  ...

int  Fac( int  x )
{
  int   t;

  if ( x == 0 )
    return( 1 );
  else {
    t = Fac( x-1 );
    return( x * t );
  }
}
```

ret_addr1

ret_addr2



Recursive Programs



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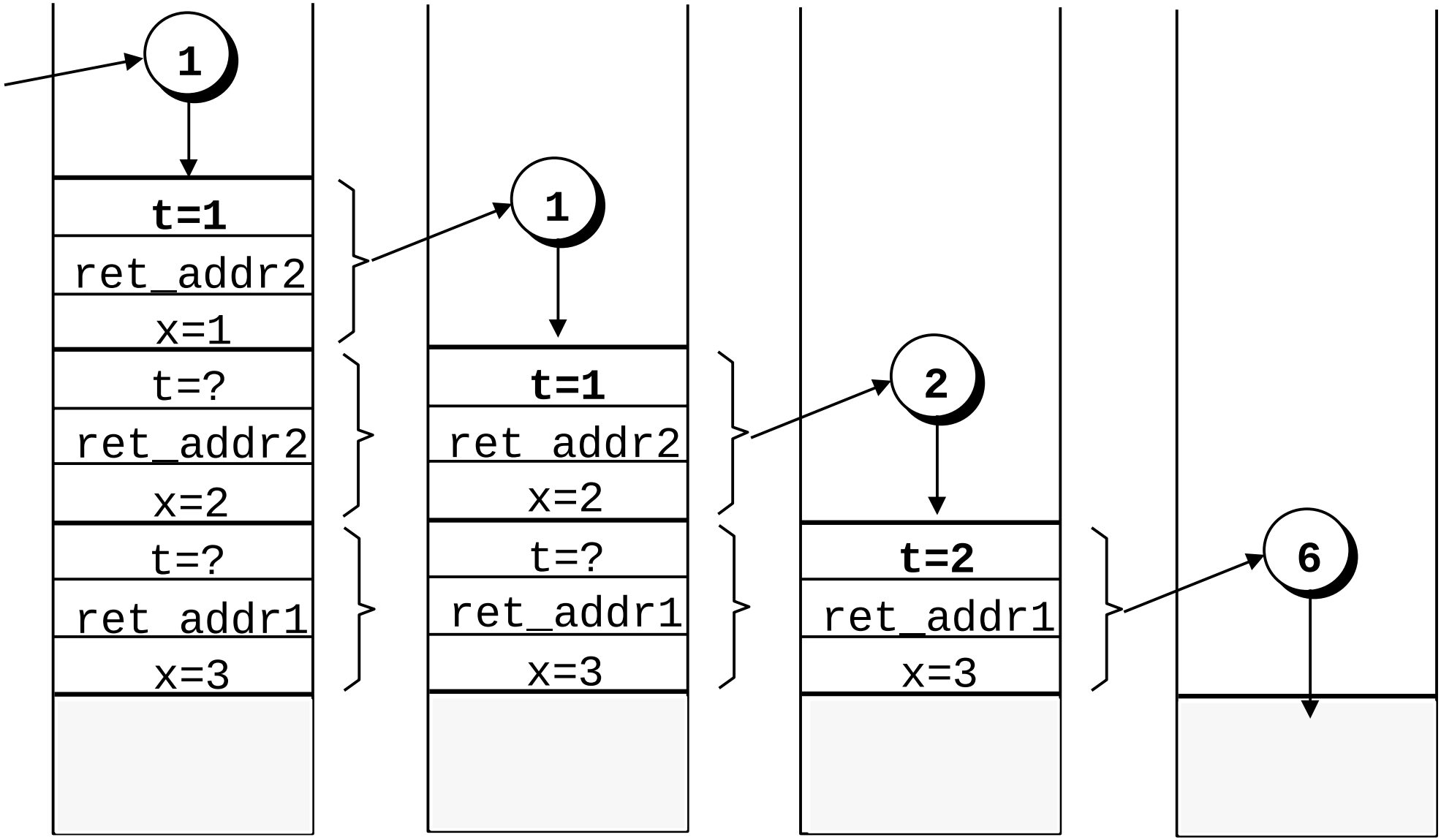
Recursive Programs



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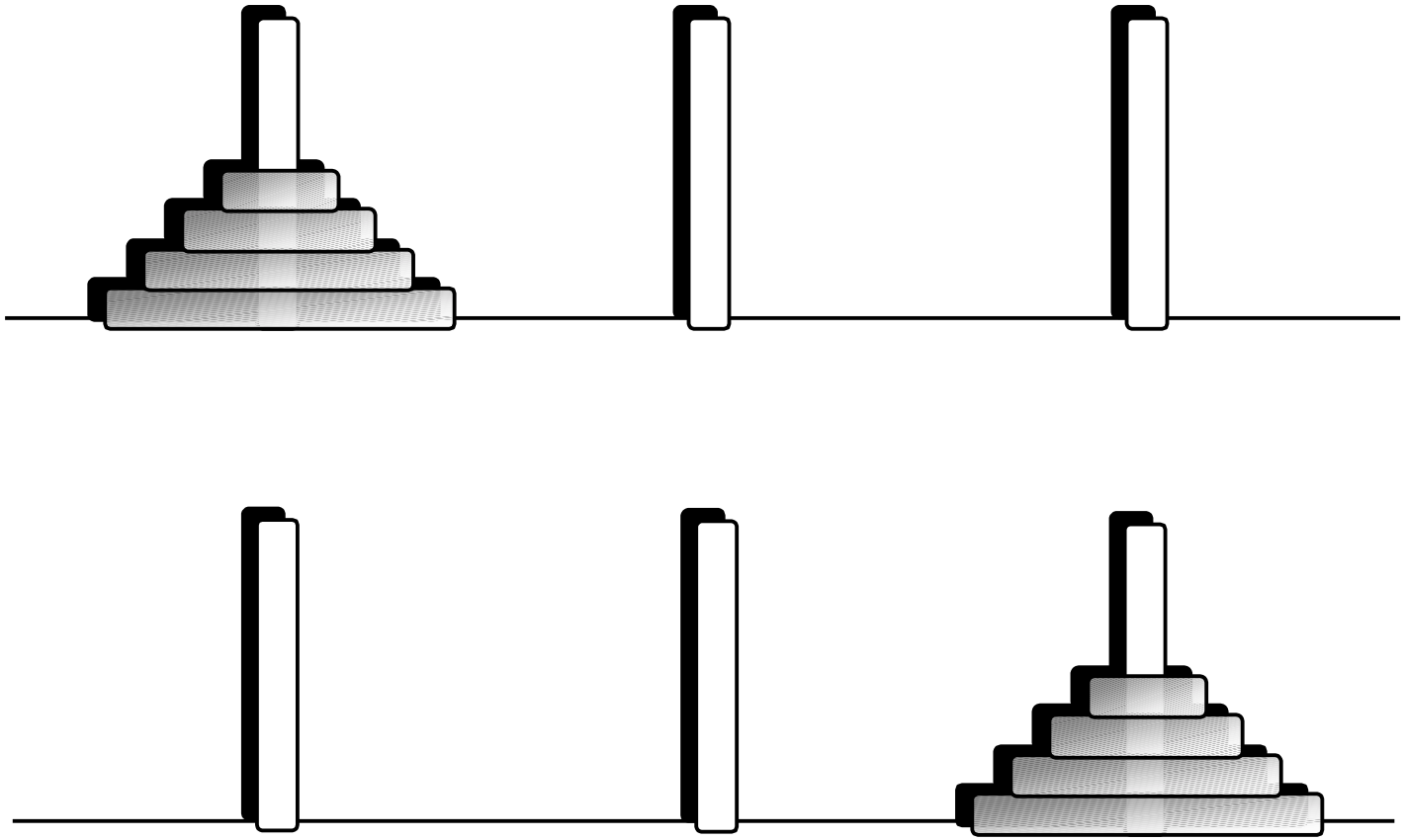
Tower of Hanoi



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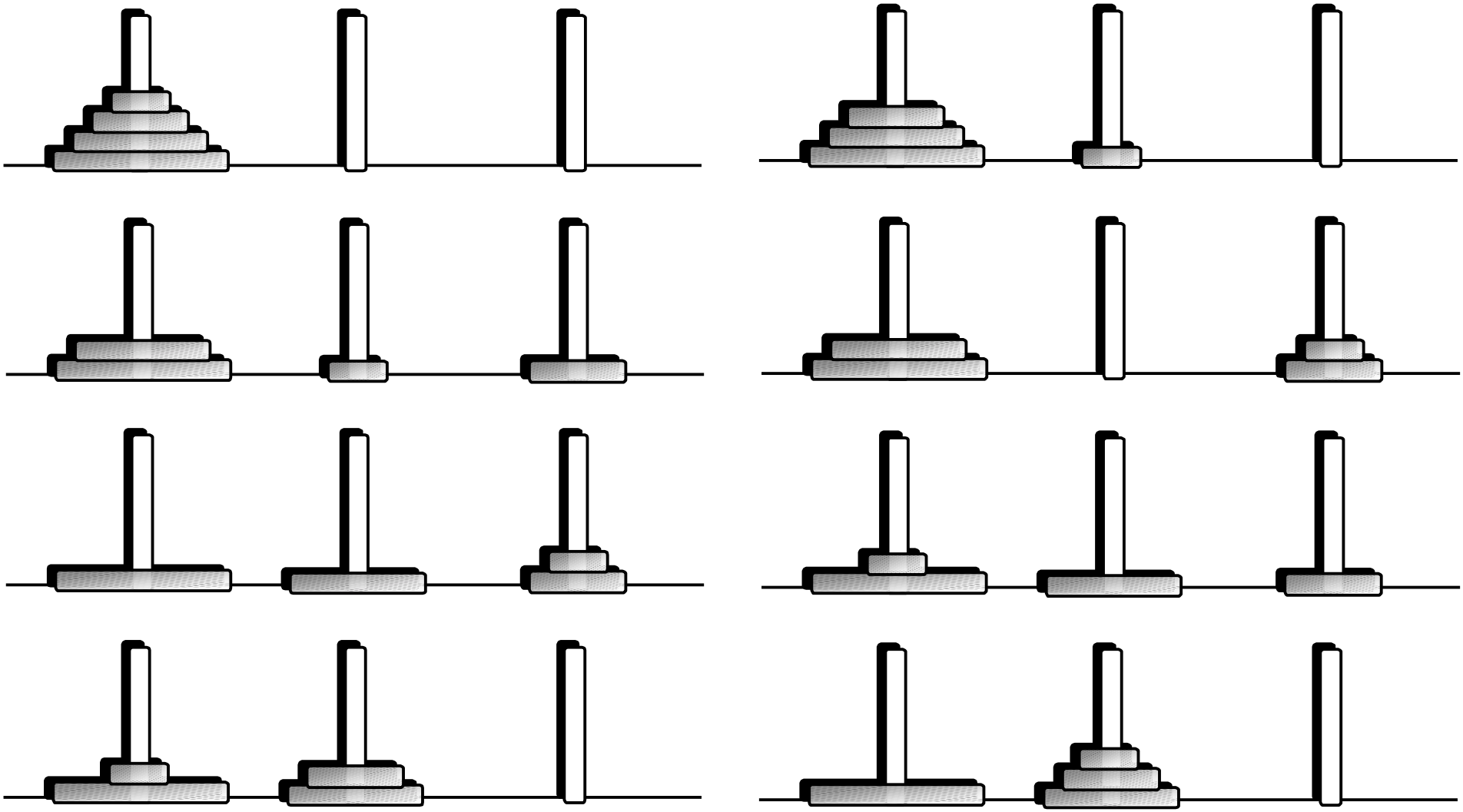
Tower of Hanoi



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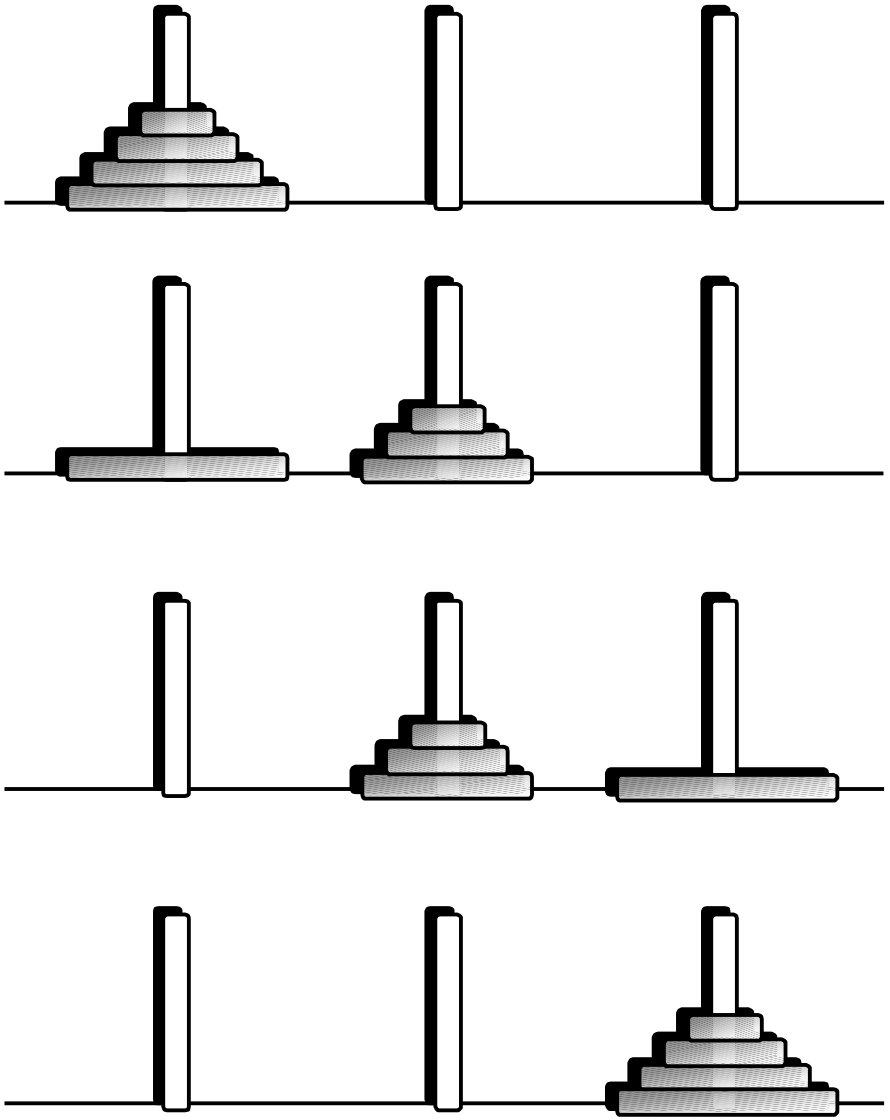
Tower of Hanoi : Divide & Conquer



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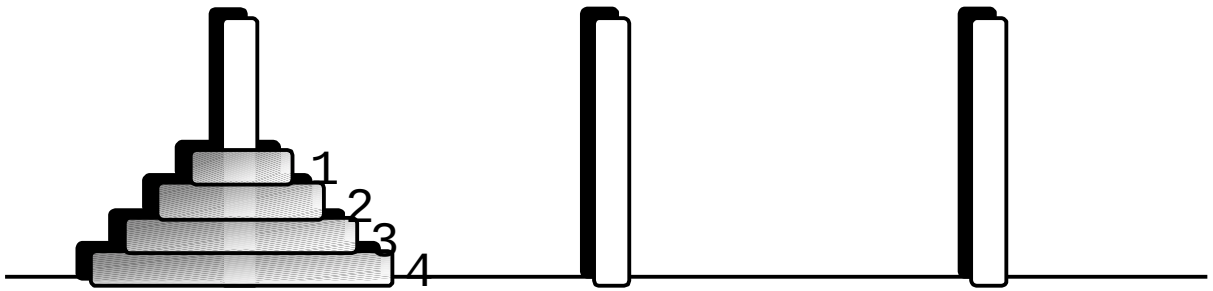
Tower of Hanoi : The Program

```
void  Hanoi( int nDisc
             char cFrom, char cTo, char cTemp )
{
  if ( nDisc == 0 ) return;
  Hanoi( nDisc-1, cFrom, cTemp, cTo );
  printf( "Move disc #%d from %c to %c\n",
          nDisc, cFrom, cTo );
  Hanoi( nDisc-1, cTemp, cTo, cFrom );
}
```



nDisc = 4

Tower of Hanoi

```
0: Hanoi( 4, A, B, C )
   1: Hanoi( 3, A, C, B )
      2: Hanoi( 2, A, B, C )
         3: Hanoi( 1, A, C, B )
            4: Hanoi( 0, A, B, C )
            4: move 1 from A to C
            4: Hanoi( 0, B, C, A )
         3: move 2 from A to B
         3: Hanoi( 1, C, B, A )
            4: Hanoi( 0, C, A, B )
            4: move 1 from C to B
            4: Hanoi( 0, A, B, C )
      2: move 3 from A to C
      2: Hanoi( 2, B, C, A )
         3: Hanoi( 1, B, A, C )
            4: Hanoi( 0, B, C, A )
            4: move 1 from B to A
            4: Hanoi( 0, C, A, B )
         3: move 2 from B to C
         3: Hanoi( 1, A, C, B )
            4: Hanoi( 0, A, B, C )
            4: move 1 from A to C
            4: Hanoi( 0, B, C, A )
```

```
1: move 4 from A to B
1: Hanoi( 3, C, B, A )
   2: Hanoi( 2, C, A, B )
      3: Hanoi( 1, C, B, A )
         4: Hanoi( 0, C, A, B )
         4: move 1 from C to B
         4: Hanoi( 0, A, B, C )
      3: move 2 from C to A
      3: Hanoi( 1, B, A, C )
         4: Hanoi( 0, B, C, A )
         4: move 1 from B to A
         4: Hanoi( 0, C, A, B )
   2: move 3 from C to B
   2: Hanoi( 2, A, B, C )
      3: Hanoi( 1, A, C, B )
         4: Hanoi( 0, A, B, C )
         4: move 1 from A to C
         4: Hanoi( 0, B, C, A )
      3: move 2 from A to B
      3: Hanoi( 1, C, B, A )
         4: Hanoi( 0, C, A, B )
         4: move 1 from C to B
         4: Hanoi( 0, A, B, C )
```

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