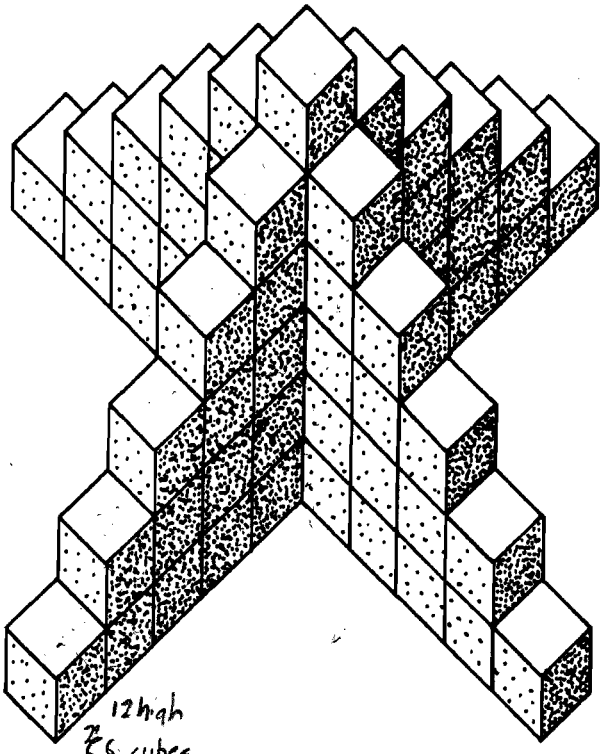
Skeleton Tower

T1



15
× 4
60
+ 6
66

12 high
22 cubes
× 4
264
+ 12

276 cubes

1. How many cubes are needed to build this tower?
   Show your calculations

66 cubes ✓ 2

2. How many cubes are needed to build a tower like this, but 12 cubes high?
   Explain how you figure out your answer.

276 cubes ✓ 1

for this problem only 1 cube is alone on top with a single row of cubes going down center. However 11 rows of cubes aren't attached to middle row. From the 5 rows already shown add another row with 1 extra ✓ up to 11 rows to 66 cubes multiply by 4 to get 264 cubes and add the 12 middle row to get 276 cubes 2 1 ✓

T1

Skeleton Tower (continued)

3. How would you calculate the number of cubes needed for a tower n cubes high?

no of cubes in each wing is $1+2+3+4+\cdots(n-1)$ which is $\frac{n(n-1)}{2}$

There are 4 wings. so the number of cubes is $\frac{4n(n-1)}{2}$

This does not include the number of cubes down the centre 2

so the complete formula for the number of cubes is

$\frac{4n(n-1)}{2} + n = 2n(n-1) + n = 2n^2 - 2n + n$

$= 2n^2 - n$ ✓ 2

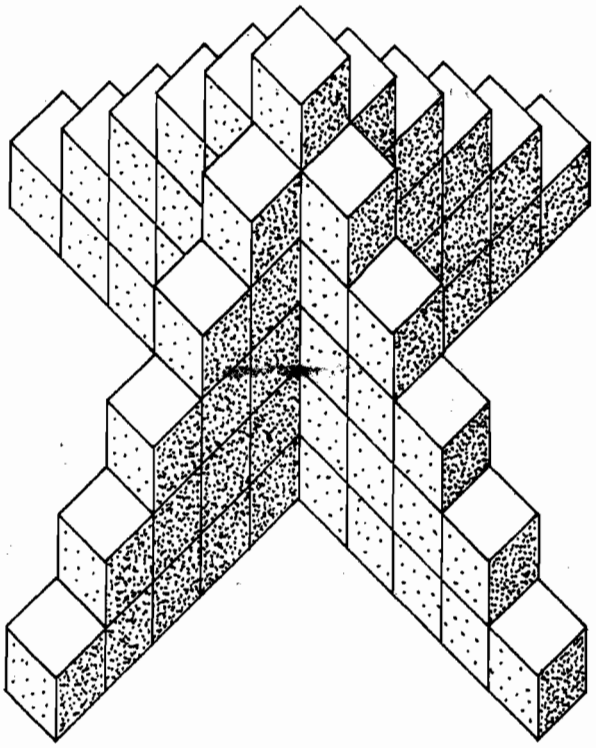
check $n = 5 \quad 2 \cdot 5^2 - 5 = 72 - 6 = 66$ ✓

$n = 12 \quad 2 \cdot 12^2 - 12 = 288 - 12 = 276$ ✓

(10)

Skeleton Tower

T2



1. How many cubes are needed to build this tower?
   Show your calculations

66 ✓ 2

each side w/o center post has height (1+2+3+4+5) = 15

4 sides = 60

+ 6 cubes in center = 66

2. How many cubes are needed to build a tower like this, but 12 cubes high?
   Explain how you figure out your answer.

276 ✓ 1

12 + 4 (1+2+ ··· 11) 12+4((12·5)+6) = 12+4(66) = 12+264 = 276

(I found the formula first) ✓ 2

1

T2

Skeleton Tower (continued)

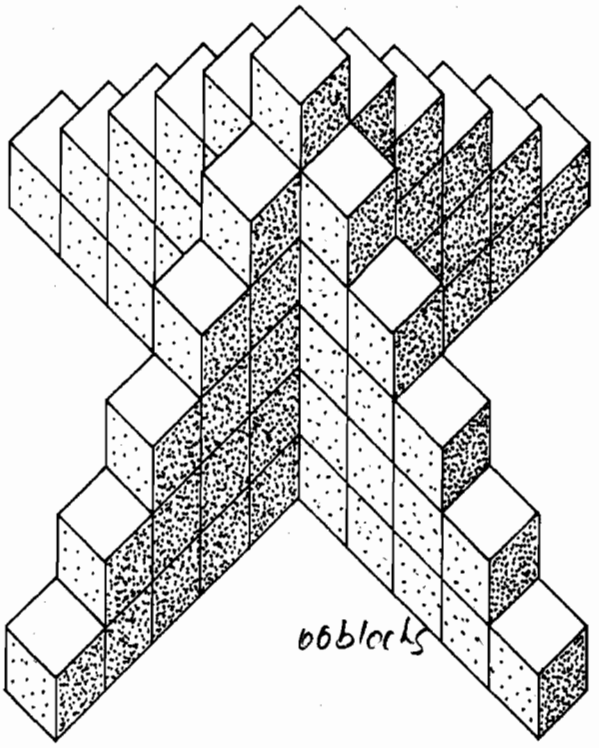
3. How would you calculate the number of cubes needed for a tower *n* cubes high?

n + 4(1+2⋯(n-1)) (1)

4 sides w/o center would always be 1+2+3+4⋯ until the number just before n:(n-1)., the center post is the highest, so the height n of the tower determines 2 how tall the center post is

Skeleton Tower

T3



1. How many cubes are needed to build this tower?
   Show your calculations

66 cubes ✓ 2

15×4+5+1=66

2. How many cubes are needed to build a tower like this, but 12 cubes high?
   Explain how you figure out your answer.

276 cubes ✓ 1

x= height of tower ∧ Formula each wing #of blocks = $\frac{(x-1)x}{2}$

Total blocks 4 wings: $\frac{4(x-1)x}{2} = 2x(x-1)$

center tower blocks: x (1)

Total #of blocks of entire tower = $2x(x-1)+x=$ 1

$2x^2-2x+x=$

$2x^2-x$

$2(12)^2-12$

$288-12=276$

Skeleton Tower (continued)

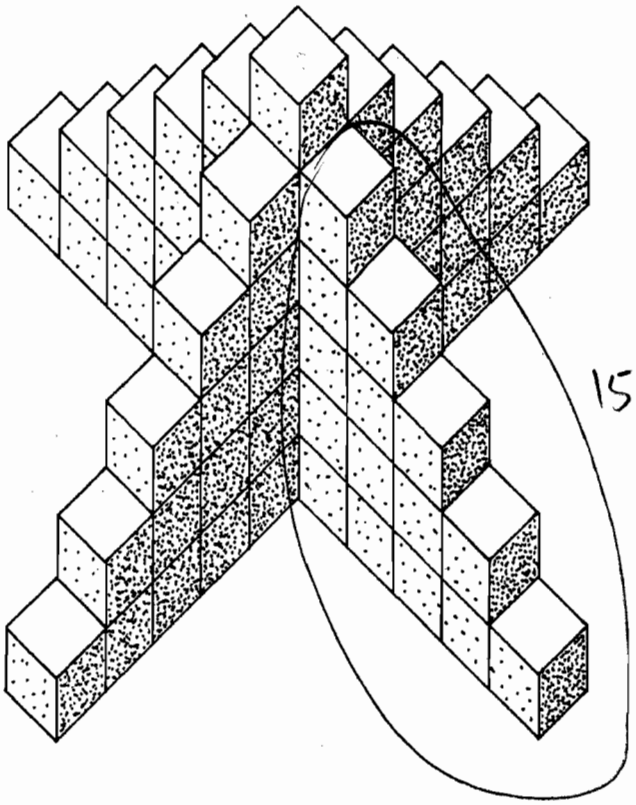
3. How would you calculate the number of cubes needed for a tower n cubes high?

$2 \cdot n^2 - n$ ✓ 2

1 (1)

Skeleton Tower

T4



1+2+3+4+5=15

1 less ✓

1. How many cubes are needed to build this tower?
   Show your calculations

66 cubes ✓ 2

15 × 4 = 60

60 + 6 = 66

2. How many cubes are needed to build a tower like this, but 12 cubes high?
   Explain how you figure out your answer.

276 cubes ✓ 1

1+2+3+4+5+6+7+8+9+10+11=66 ✓

(66)(4)=264 ✓ 1 0

264+12=276 ✓ 1

T4

Skeleton Tower (continued)

3. How would you calculate the number of cubes needed for a tower n cubes high?

$1+2+3+\ldots+(n-1) = \frac{n(n-1)}{2}$ 11.

$4\left(\frac{n(n-1)}{2}\right) + n$

$4\left(\frac{n^2-n}{2}\right) + n$

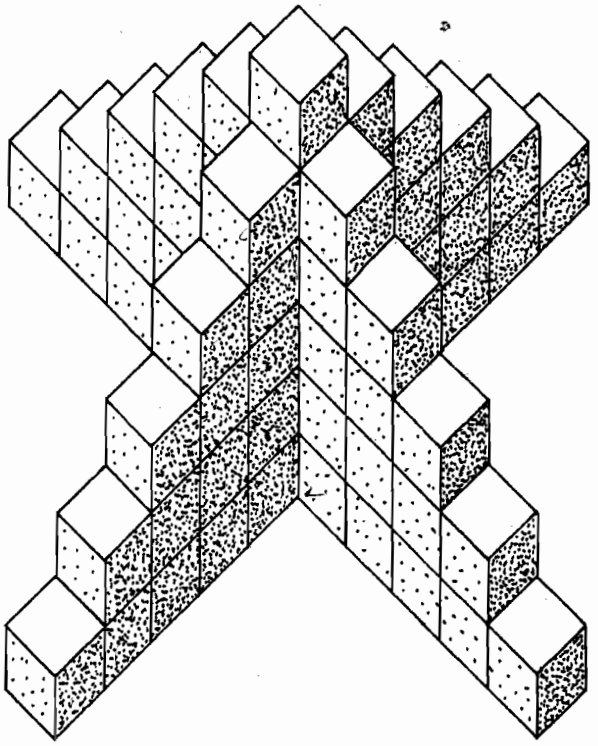
$2n^2-2n+n$ 2

$\boxed{2n^2-n}$ ✓

0

Skeleton Tower

T5



1. How many cubes are needed to build this tower?
   Show your calculations

66 cubes ✓ 2

$4(5+4+3+2+1)+6$

↑ # of sides ↑ sides ↑ middle column

2. How many cubes are needed to build a tower like this, but 12 cubes high?
   Explain how you figure out your answer.

270 cubes ✗ 0

I used the formula $4(11+10+9+8+7+6+5+4+3+2+1)+12$ ✓

bad $= 4(66)+6^{x} = 264+6 = 270$

2

1

T5

Skeleton Tower (continued)

3. How would you calculate the number of cubes needed for a tower *n* cubes high?

I would use the formula $4\left(\frac{n(n-1)}{2}\right)+n$ ✓ 2

sides of tower

# of cubes center column height

✓ # of cubes per side $(1+2+3+4+\ldots+(n-1))$

2