



Isometric Drawing

Mana Maths

Notes & Steps



Key idea

Isometric drawing shows 3D objects on flat paper. Vertical lines stay vertical, but horizontal lines are drawn at 30° to the horizontal. Use isometric dot paper to keep proportions correct.

Steps to draw a cube

1. Start at a dot. Draw a vertical line for the height.
2. From the bottom, draw a line up-right at 30° for the width.
3. From the bottom, draw a line up-left at 30° for the depth.
4. Complete the three visible faces using parallel lines.
5. Add dashed lines for hidden edges (optional).

Counting cubes



Count each cube including hidden ones. The drawing shows 2 cubes: one on top, one underneath on the right.

Common mistake

Drawing horizontal lines as truly horizontal instead of at 30° . In isometric, no line is truly horizontal except the base dots.

Notes & Steps



Example 1: Drawing a cube

Draw a cube of side 2 units on isometric paper.

Start with a vertical line of 2 units. From the bottom point, draw two lines at 30° of length 2 units each (one up-right, one up-left). Complete the three visible faces. Add hidden edges as dashed lines if needed.

Example 2: Counting cubes

An isometric drawing shows a shape with visible cubes in a $2 \times 2 \times 1$ arrangement (bottom layer of 4) plus 2 cubes on top of one corner. Total = 6 cubes.

Example 3: L-shape

An L-shaped solid has 3 cubes on the bottom row and 2 stacked on the leftmost cube. That's 5 cubes total: 3 base + 2 on top.

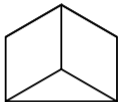
Try these

1. Draw a single cube on isometric paper.
2. How many cubes in a $2 \times 2 \times 2$ cube? (answer: 8)
3. Draw an L-shape of 3 cubes.

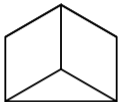
Common mistake

Forgetting hidden cubes when counting. A $2 \times 2 \times 2$ cube has 8 total but only 7 visible from most angles. Always account for all layers.

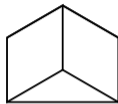
Start Tasks - Counting 3D Shapes



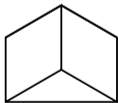
1. How many cubes are in this shape?



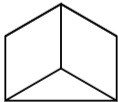
3. How many edges does a cube have?



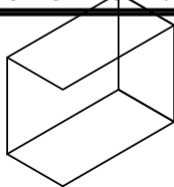
5. What is the volume of this cube if each unit = 1 cm^3 ?



2. How many faces does a cube have?

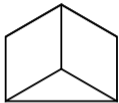


4. How many vertices (corners) does a cube have?



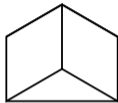
6. How many cubes

Start Tasks - Counting 3D Shapes



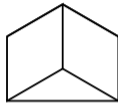
1. Cubes in this shape?

1



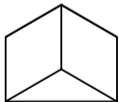
3. Edges of a cube?

12



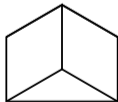
5. Volume = 1 cm^3 ?

1 cm^3



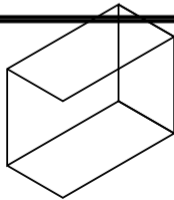
2. Faces of a cube?

6



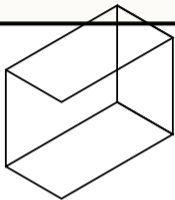
4. Vertices of a cube?

8

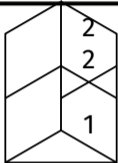


6. Cubes in cuboid?

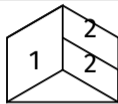
Start Tasks - Counting 3D Shapes



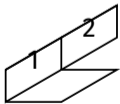
7. How many cubes are



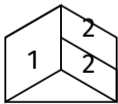
9. How many cubes in
this tower?



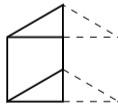
11. How many cubes
are hidden in the
L-shape?



8. How many cubes in
this step shape?

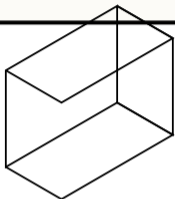


10. How many cubes in
this L-shape?

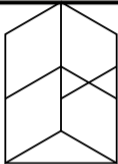


12. How many cubes
total (including
hidden)?

Start Tasks - Counting 3D Shapes

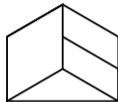


7. Hidden cubes?



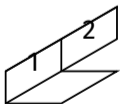
9. Cubes in tower?

3



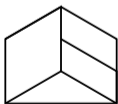
11. Hidden cubes?

2



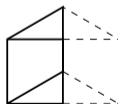
8. Cubes in steps?

3



10. Cubes in L-shape?

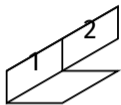
5



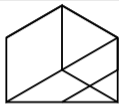
12. Total cubes?

1

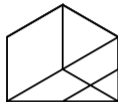
Start Tasks - Counting 3D Shapes



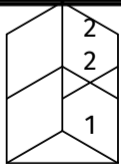
13. What is the volume of the step shape in cm^3 ?



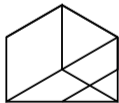
15. How many cubes are in this 2x2 arrangement?



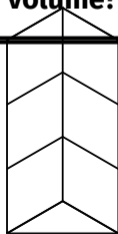
17. What is the total volume?



14. What is the volume of this tower?

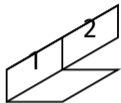


16. How many cubes are visible in this shape?



18. How many cubes in

Start Tasks - Counting 3D Shapes



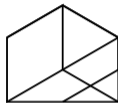
13. Volume of steps?

3 cm³



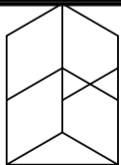
15. Cubes in 2x2?

4



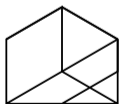
17. Total volume?

4 cm³



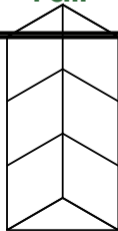
14. Volume of tower?

3 cm³



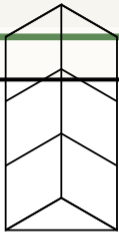
16. Visible cubes?

4

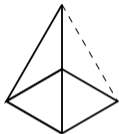


18. Cubes in tower?

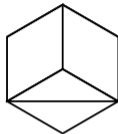
Start Tasks - Counting 3D Shapes



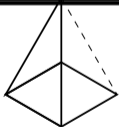
19. What is the surface area of the tower



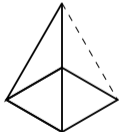
21. How many edges on a square pyramid?



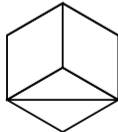
23. How many faces on a triangular prism?



20. How many faces does a square pyramid have?

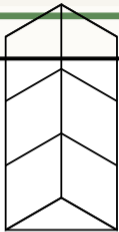


22. How many vertices on a square pyramid?



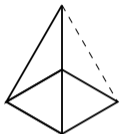
24. How many edges on a triangular prism?

Start Tasks - Counting 3D Shapes



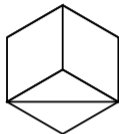
19. Exposed faces?

16 (count each visible)



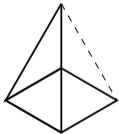
21. Pyramid edges?

8



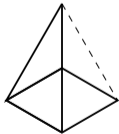
23. Prism faces?

5



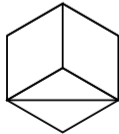
20. Pyramid faces?

5



22. Pyramid vertices?

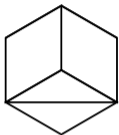
5



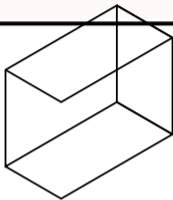
24. Prism edges?

9

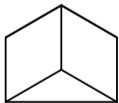
Start Tasks - Counting 3D Shapes



25. How many vertices on a triangular prism?

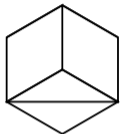


27. What 3D shape is shown here?



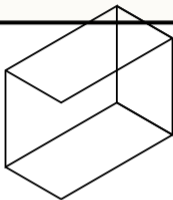
26. What 3D shape is shown here?

Start Tasks - Counting 3D Shapes



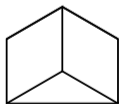
25. Prism vertices?

6



27. Shape name?

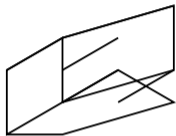
Cuboid



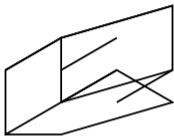
26. Shape name?

Cube

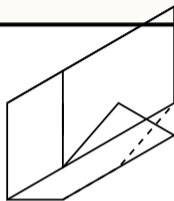
Build Tasks - 3D Analysis



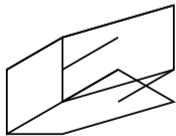
1. How many cubes in this 2x2x1 block?



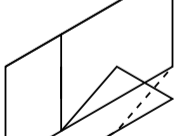
3. How many hidden cubes are there?



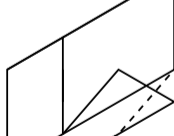
5. How many cubes are



2. If one cube = 1 cm³, what is the volume?

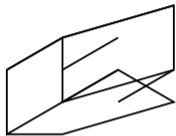


4. Count all cubes in



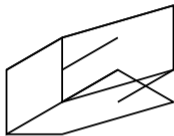
6. What is the total

Build Tasks - 3D Analysis



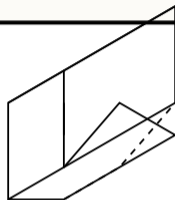
1. Cubes in $2 \times 2 \times 1$?

4

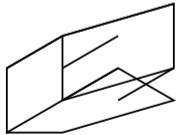


3. Hidden cubes?

1

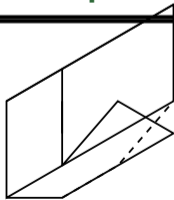


5. Hidden cubes?

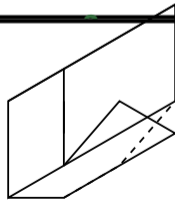


2. Volume?

4 cm^3

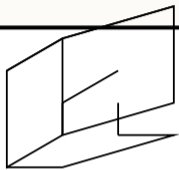


4. Cubes in composite?

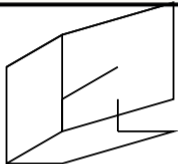


6. Total volume?

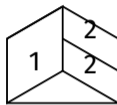
Build Tasks - 3D Analysis



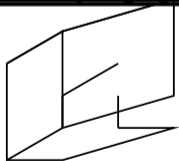
7. This shape has height 2. How many



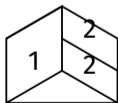
9. Calculate the volume



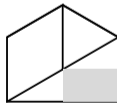
11. If each cube side = 2 cm, what is the volume of one cube?



8. How many cubes are hidden in this shape?

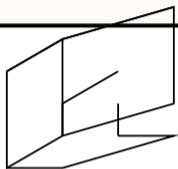


10. Volume of the L-shape?

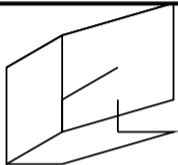


12. 1 cube is hidden (gray). How many total?

Build Tasks - 3D Analysis

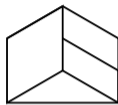


7. Height 2, how many cubes?



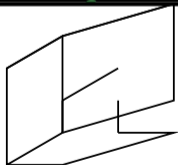
9. Volume?

6 cm³



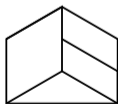
11. Side=2cm, volume of one cube?

8 cm³



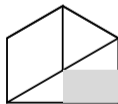
8. Hidden cubes?

2



10. L-shape volume?

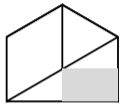
5 cm³



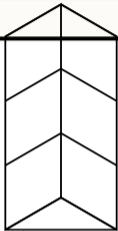
12. Total cubes (1 hidden)?

2

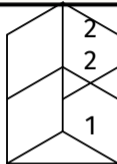
Build Tasks - 3D Analysis



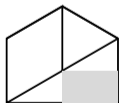
13. How many cubes are visible?



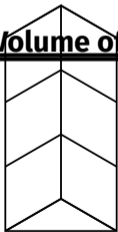
15. Volume of the



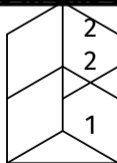
17. How many cubes are visible in this tower?



14. Volume of this shape?

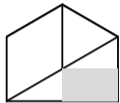


16. If each cube is 2 cm



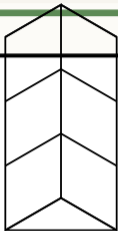
18. How many cubes are hidden?

Build Tasks - 3D Analysis

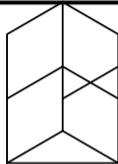


13. Visible cubes?

1

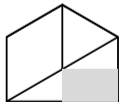


15. 4-cube tower
volume?



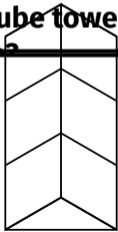
17. Visible cubes?

3

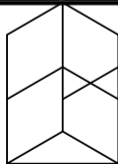


14. Volume?

2 cm³



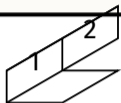
16. Cube=2cm, tower
height?



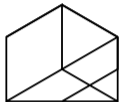
18. Hidden cubes?

0

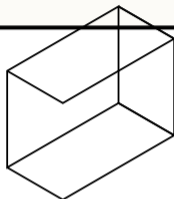
Build Tasks - 3D Analysis



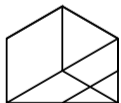
19. A step shape of 6 cubes: draw it mentally. How many levels?



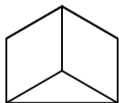
21. If painted, how many faces have paint?



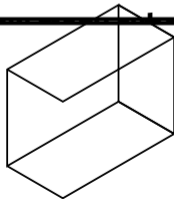
23. A 3x2x2 cuboid has



20. 4 cubes arranged 2x2. Exposed faces?

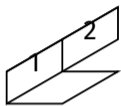


22. A cube has volume 27 cm^3 . Side length?



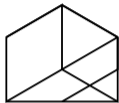
24. Hidden cubes in a

Build Tasks - 3D Analysis

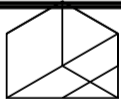


19. 6 cubes step —
levels?

$$3(3+2+1)$$

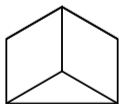


21. Painted faces?
Depends which faces
exposed

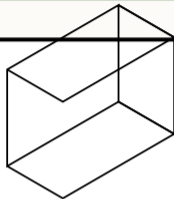


20. 4 cubes 2x2
exposed faces?

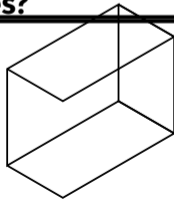
Check: top=4, sides=8,
bottom=4 = 16



22. Volume 27, side?
3 cm

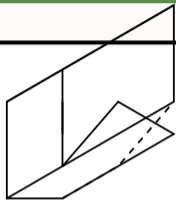


23. 3x2x2 cuboid
cubes?

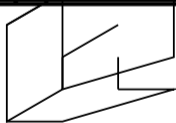


24. Hidden in 3x2x2?

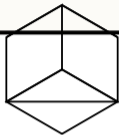
Build Tasks - 3D Analysis



25. Estimate: is this shape more or less

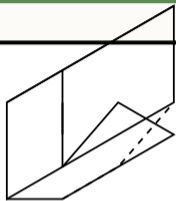


26. If each cube = 1 cm^3 , what is the volume of the

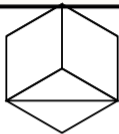


27. A triangular prism has a base of 3 cubes. How many total if height = 2?

Build Tasks - 3D Analysis

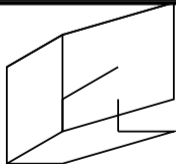


25. More or less than 10?



27. Prism base 3, height 2 total?

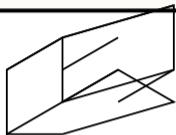
6 cubes



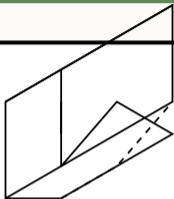
26. Volume in cm^3 ?

6 cm^3

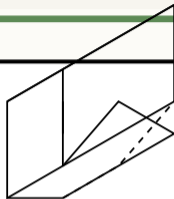
Push Tasks - 3D Reasoning



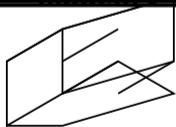
1. A 2x2x2 cube has 8 cubes. How many are hidden?



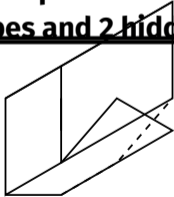
3. A shape has 5 visible cubes and 2 hidden.



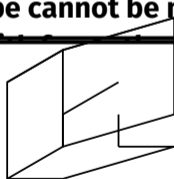
5. Prove that this shape cannot be made



2. If the 2x2x2 cube is dipped in paint, how many faces get paint?

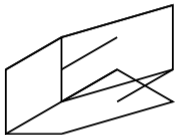


4. Draw a mental I-shape of 7 cubes.

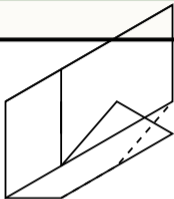


6. The shape has volume 8. How many

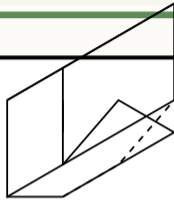
Push Tasks - 3D Reasoning



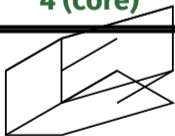
1. 2x2x2 hidden cubes?
4 (core)



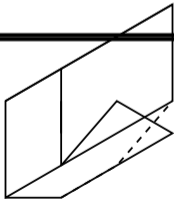
3. 5 visible + 2 hidden =
?



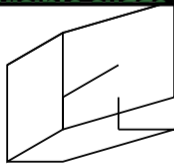
5. Prove >5 cubes
needed.



2. Painted faces on
2x2x2?
24 faces (6 faces \times 4)

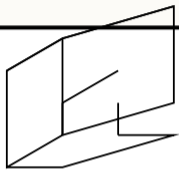


4. Mental 7-cube L
shape hidden?

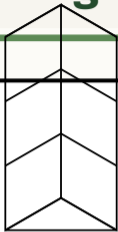


6. Volume 8, layers?
2 layers of 4

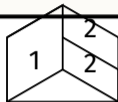
Push Tasks - 3D Reasoning



7. If volume = 12 and height = 3, what is the



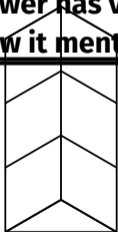
9. A tower has volume 6. Draw it mentally –



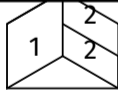
11. Prove the L-shape has exactly 5 cubes using a counting argument



8. Gray cube is hidden. How many total if another is hidden

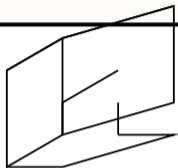


10. A tower uses 5

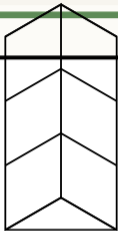


12. If you remove the corner cube, what happens to the

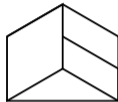
Push Tasks - 3D Reasoning



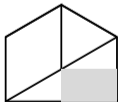
7. Volume 12, height 3,
base area?



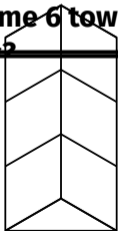
9. Volume 6 tower
config?



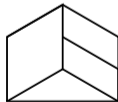
11. Prove 5 cubes.
3 base + 2 stack = 5



8. 1+1 hidden = total?
3

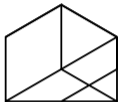


10. 5 cubes, 1 hidden =

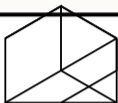


12. Remove corner
cube effect?
Volume drops to 4

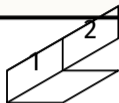
Push Tasks - 3D Reasoning



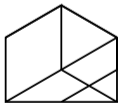
13. A 3x3x2 block has how many cubes total?



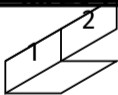
15. A 3x3x2 block is painted. How many cubes have paint on 3 faces?



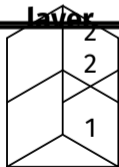
17. Explain why the step shape uses the formula $n(n+1)/2$ per layer.



14. Hidden cubes in a 3x3x2 block?

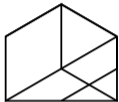


16. Step shape width=3, height=3, depth=2. How many

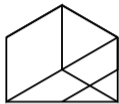


18. A tower of height 5 has volume 5. Same as

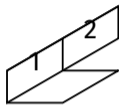
Push Tasks - 3D Reasoning



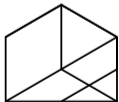
13. $3 \times 3 \times 2$ total?
18



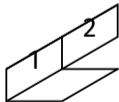
15. Painted 3 faces =
corners?
8 corner cubes



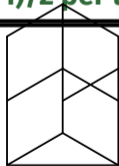
17. Formula
explanation.
 $n(n+1)/2$ per layer



14. $3 \times 3 \times 2$ hidden?
6

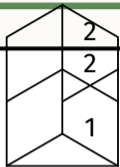


16. Width=3 height=3
depth=2 cubes?
 $12 (3+2+1 \times 2)$

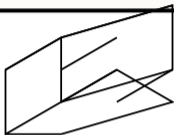


18. Height 5, volume 5
 $= 1 \times 1 \times 5?$

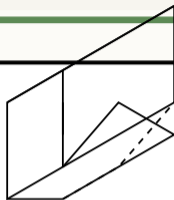
Push Tasks - 3D Reasoning



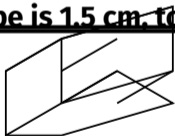
19. The tower is 4 cubes high. If each cube is 1.5 cm, total



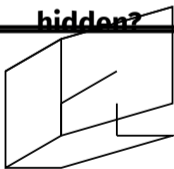
21. A $2 \times 2 \times 3$ has 12 cubes. How many hidden?



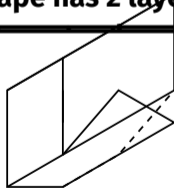
23. The composite shape has 2 layers.



20. A $2 \times 2 \times 2$ has 8 cubes. What dimensions give 12

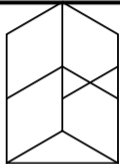


22. Design a shape with volume 7 that has



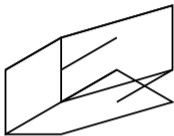
24. If bottom = 3×2 and top = 2×1 centered

Push Tasks - 3D Reasoning



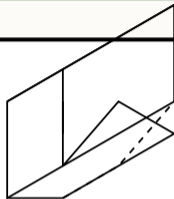
19. 4 cubes \times 1.5cm = ?

6 cm

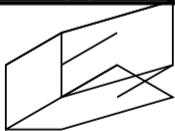


21. 2x2x3 hidden?

4

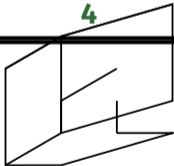


23. Bottom 4, top 2 total?



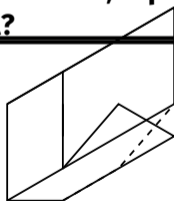
20. 12 cubes
dimensions?

3x2x2



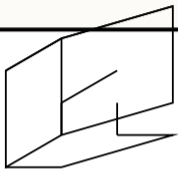
22. Volume 7, 3 hidden
shape.

Base 4 + top 3 with 2

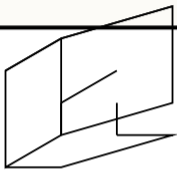


24. Bottom 3x2=6, top
2x1=2 total?

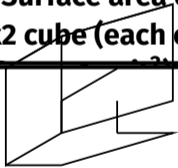
Push Tasks - 3D Reasoning



25. Surface area of a 2x2x2 cube (each cube

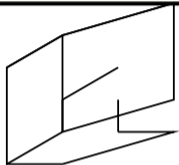


27. How many cubes have exactly 1 painted face?



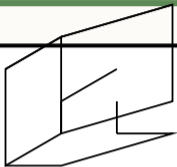
26. A 2x2x2 is dipped in paint then disassembled. How

Push Tasks - 3D Reasoning



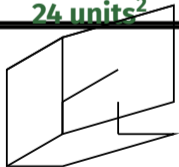
25. $2 \times 2 \times 2$ surface area?

24 units²



27. 1 painted face in $2 \times 2 \times 2$?

0 (every cube has >1 face exposed)



26. 0 paint in $2 \times 2 \times 2$?

0 (no interior cubes in)