PERCEPTUAL ABILITY 1

TOPICS COVERED

- The PAT
- Keyholes
- Top-Front-End
- Angle Ranking
- Hole Punching
- Cube Counting
- Pattern Folding

The PAT

What does this section test?

How does this section test its content?

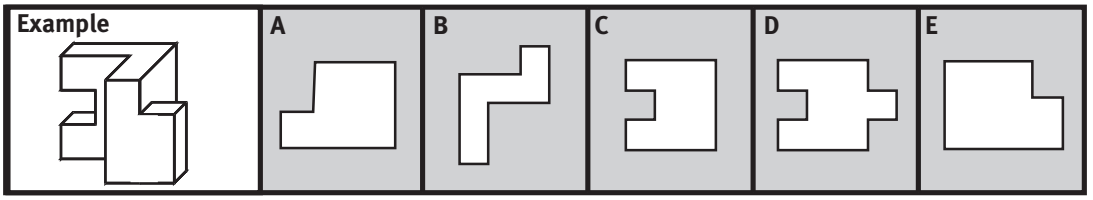
Timing

60 minutes, 90 questions

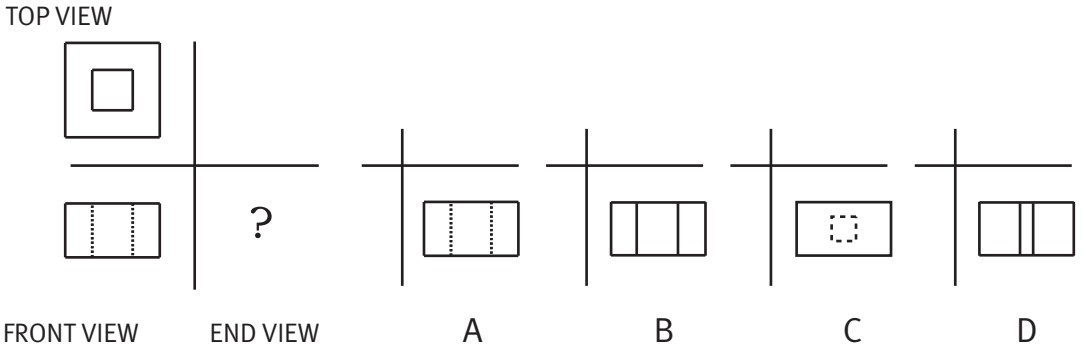
The Subsections

15 questions per subsection

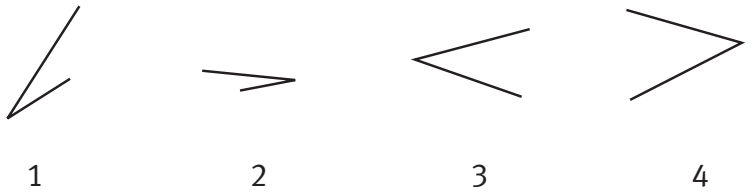
Keyholes (12.5 minutes recommended)



Top-Front-End (12.5 minutes recommended)

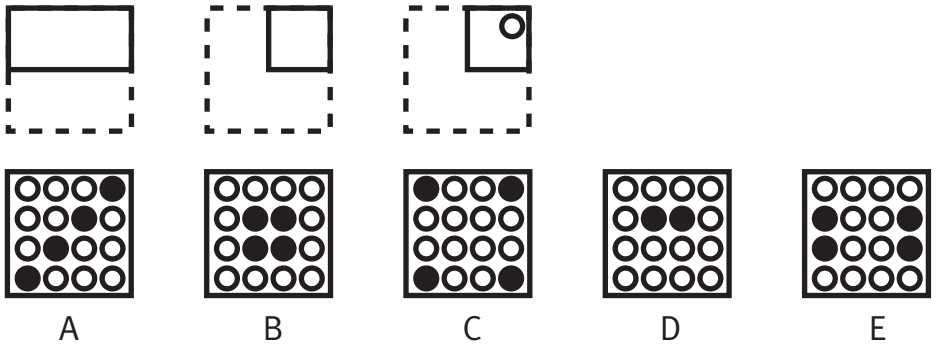


Angle Ranking (5 minutes recommended)

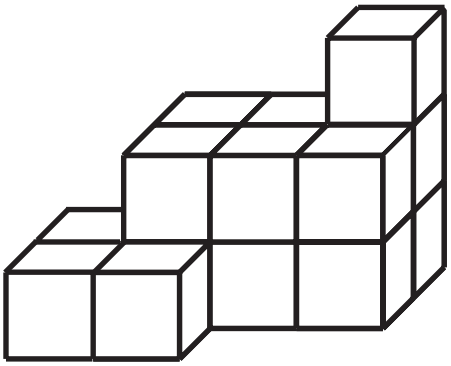


(A) 2-1-3-4
(B) 1-2-4-3
(C) 1-2-3-4
(D) 2-1-4-3

Hole Punching (5 minutes recommended)



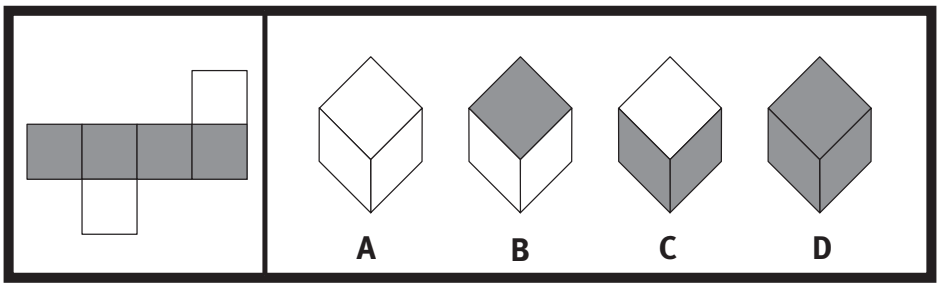
Cube Counting (10 minutes recommended)



How many cubes have one of their sides painted?

A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

Pattern Folding (15 minutes recommended)



Keyholes

PART 1

For each question, a three-dimensional object is displayed at left. This figure is followed by outlines of five openings or apertures.

The assignment is the same for each question. Imagine how the object at left looks from all directions, not just the one shown. Choose one of the five openings presented that would allow the object to pass through if the proper sides were inserted first.

Basic Rules:

1) The irregular object at left may be rotated in any manner. It may be inserted through the aperture starting with a side not shown.

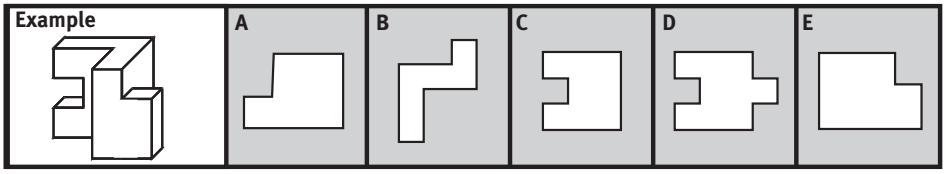
2) Once the irregular object has started through the aperture, it may not be rotated or turned in any way. The object must pass completely through the aperture. The aperture is always the exact shape of the external outline of the object.

3) Both the irregular object and openings are drawn to the same scale. It is possible that a correct opening may be too small for the object even though it is the proper shape.

4) There are no irregularities in any hidden part of the object. If a figure has symmetric indentations, hidden portions are symmetric with visible parts.

5) There is only one correct answer choice for each object.

Example



The correct answer is choice (B) since the object would pass through this aperture if the bottom were inserted first.

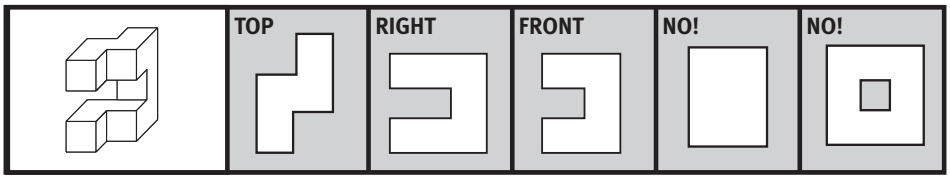
Proceed to Questions

Overview

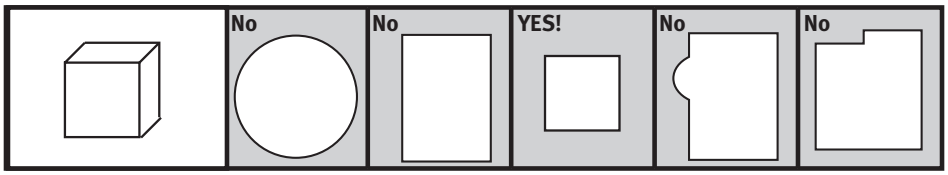
Keyholes are the first section of the PAT. A 3D object is presented, and you must determine through which of five openings this object can pass.

The Rules

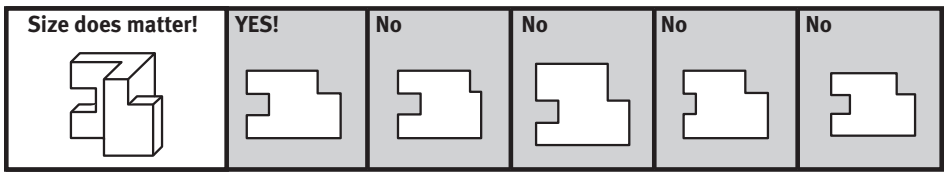
The object can pass through the opening in any orientation.



The object cannot be rotated once it has started through the opening. The external outline of the object is the exact shape of the opening.

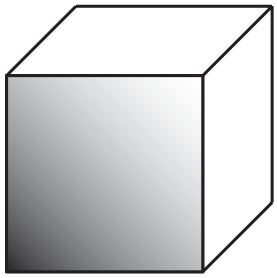


The object and opening are drawn to the same scale.

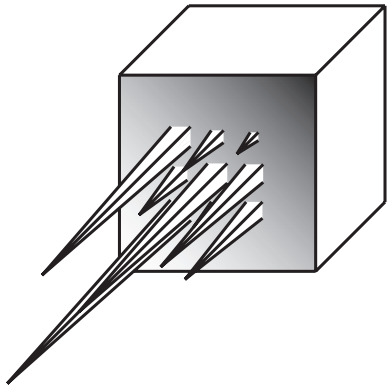


There are no irregularities in any hidden part of the object.

Here is the front of the object . . .



Could this be the back?



There is only one correct answer.

Strategies

Projections

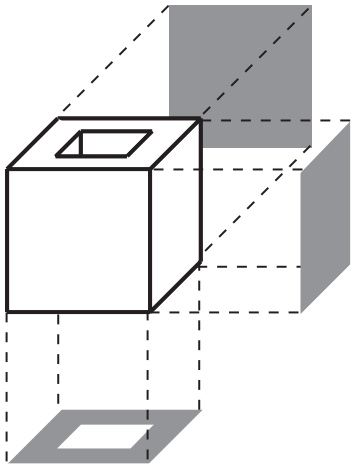
- Back
- Bottom
- Right

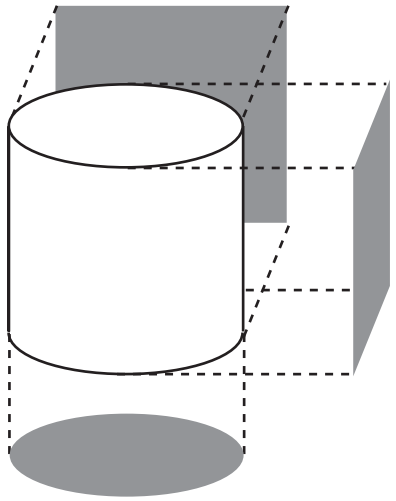
Crushing the Object

Projections

A projection is a two-dimensional "shadow" of a three-dimensional object.

Examples



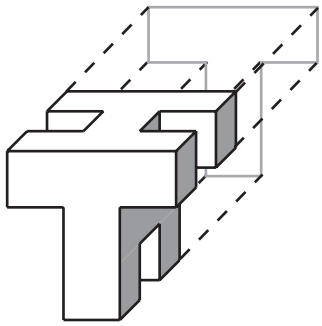


What will a sphere fit through?

What will a pyramid fit through?

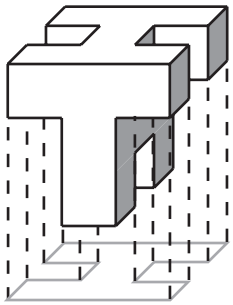
Practice with Projections

a.



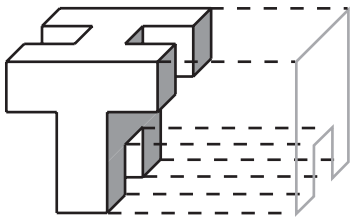
Draw the back projection here.

b.

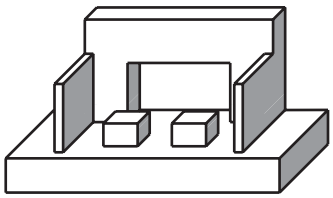


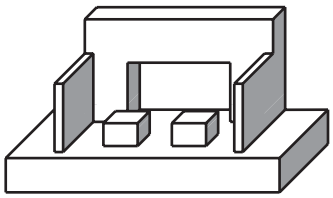
Draw the bottom projection here.

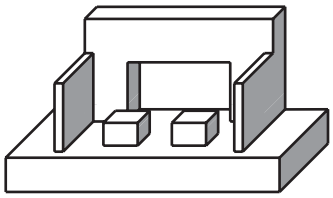
c.

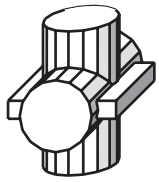


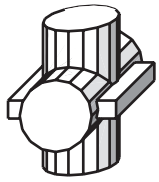
Draw the right projection here.

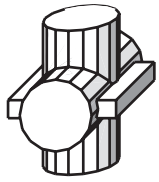
d. 	Draw the back projection here.

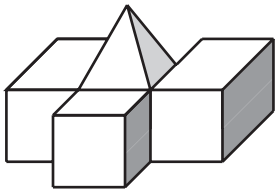
e. 	Draw the bottom projection here.

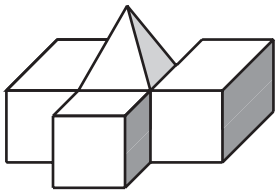
f. 	Draw the right projection here.

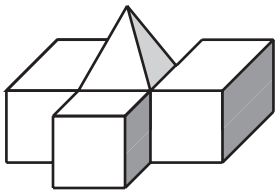
g. 	Draw the back projection here.

h. 	Draw the bottom projection here.

i. 	Draw the right projection here.

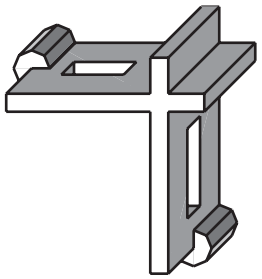
j. 	Draw the back projection here.

k. 	Draw the bottom projection here.

l. 	Draw the right projection here.

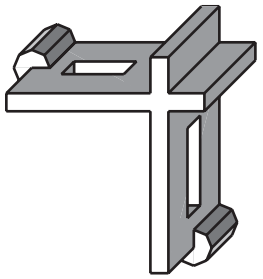
Left vs. Right Projections

m.



Draw the right projection here.

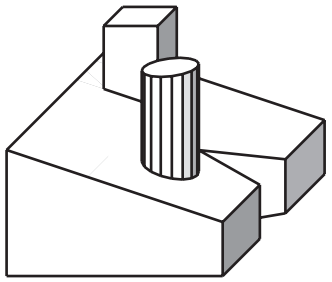
n.



Draw the left projection here.

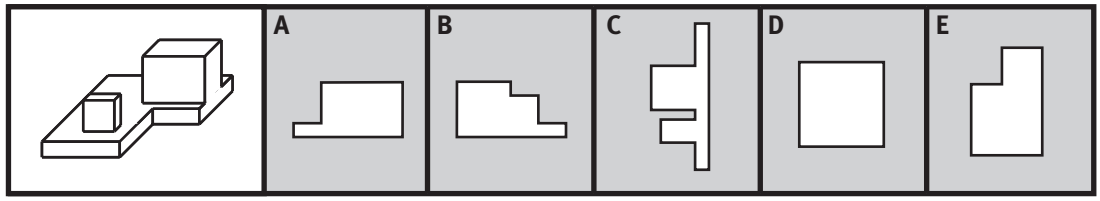
Judging Distance in 3D

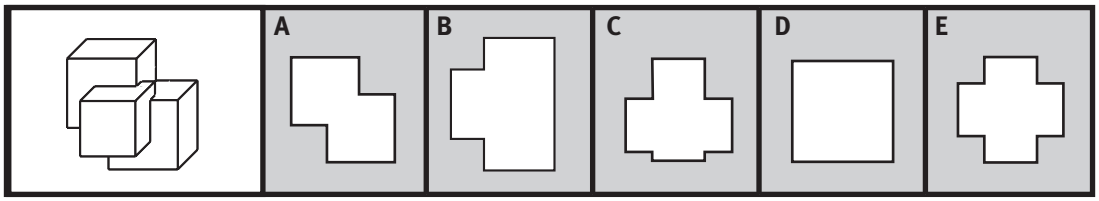
o.

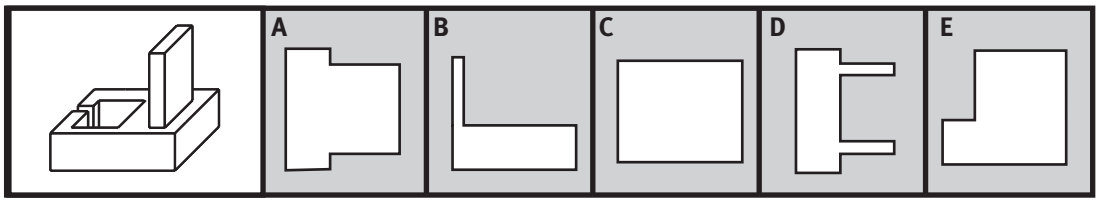


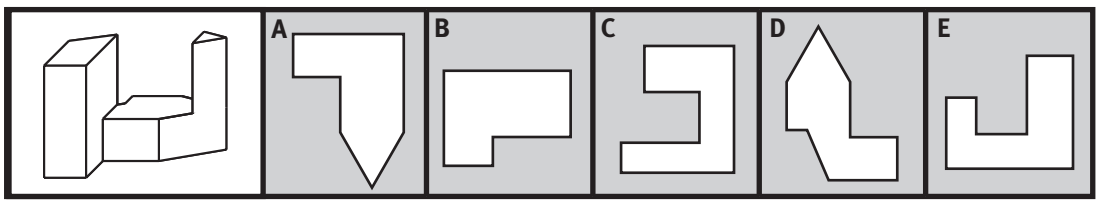
Which is taller: the square column or the circular column?

Practice Questions



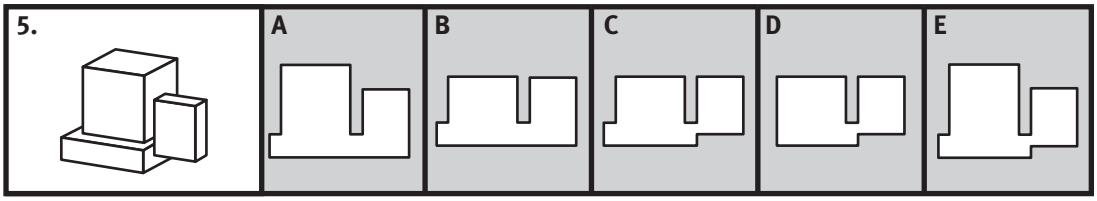




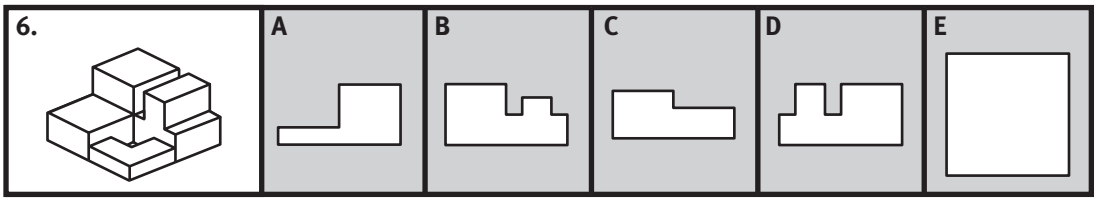


Practice Questions

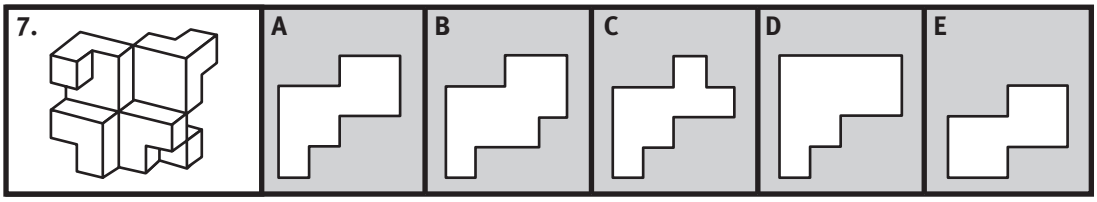
5.



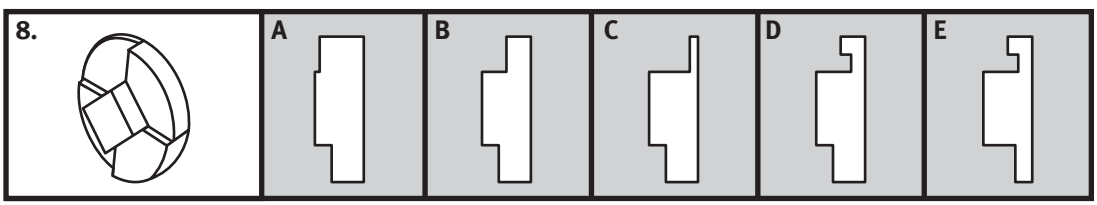
6.



7.



8.



Top-Front-End

PART 2

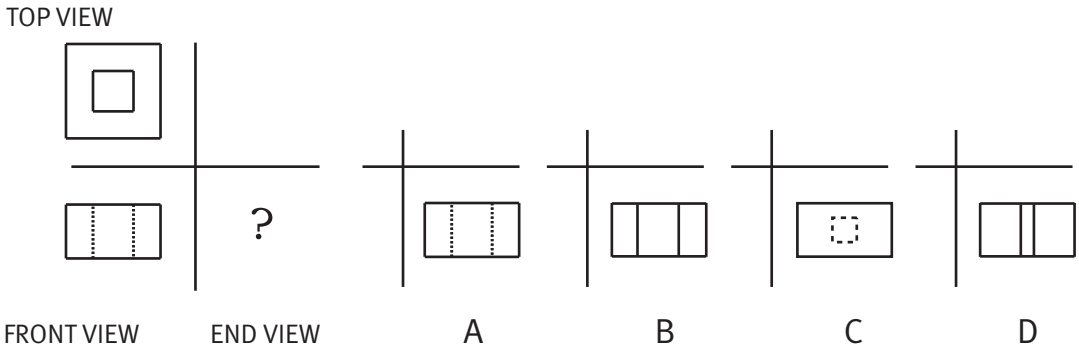
Presented are top, front, and end views of various solid objects. All views are presented without perspective. Points in the viewed surface are presented along parallel lines of sight.

The TOP VIEW image of the object presents the projection of looking down on the object. The FRONT VIEW image presents a view of the object from the front. The END VIEW illustrates a lateral view of the object from the right. These views are always in the same position.

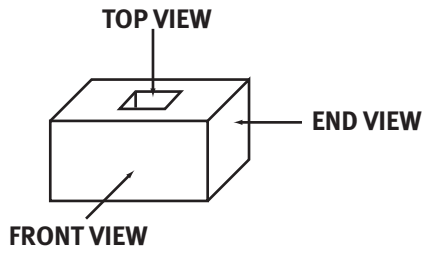
Lines that cannot be seen in some perspectives are represented by DOTTED lines.

The problems that follow present two views of a particular object. Four alternatives are shown to complete the set. Select the correct alternative. Try the following example:

Example Choose the correct END VIEW.



The correct answer is choice (A). The following views are shown:



Proceed to Questions

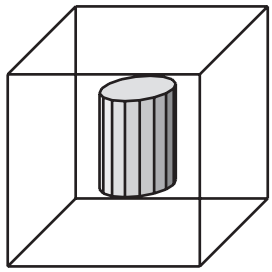
Overview

Two views of an object are presented and you must extrapolate the third.

The Rules

Presented are top, front, and end views of various solid objects.

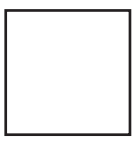
This means that you will never encounter a hollow object, like a box, with another shape hidden within.



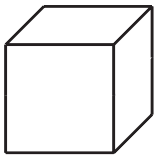
You will never see an object like this cube with a cylinder hidden inside. All objects will be solid.

All views are presented without perspective. Points in the viewed surface are presented along parallel lines of sight.

No Perspective

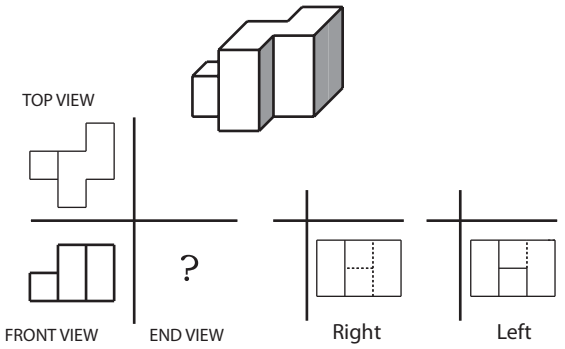


Perspective

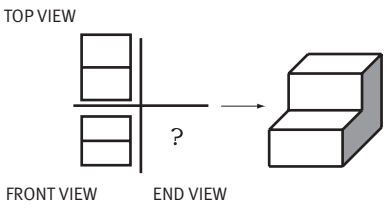


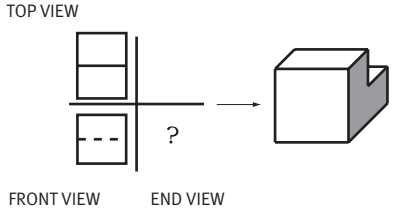
The TOP VIEW, FRONT VIEW, and END VIEW are always presented in the same positions relative to a cross on the left of the page.

The END VIEW is a lateral view of the object from the right.



Edges of the object that cannot be seen are represented by DOTTED lines.



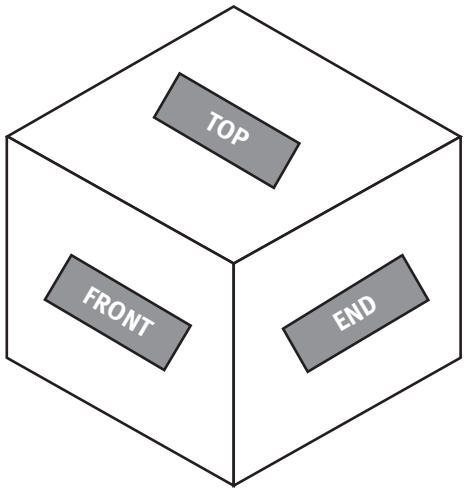


Strategies

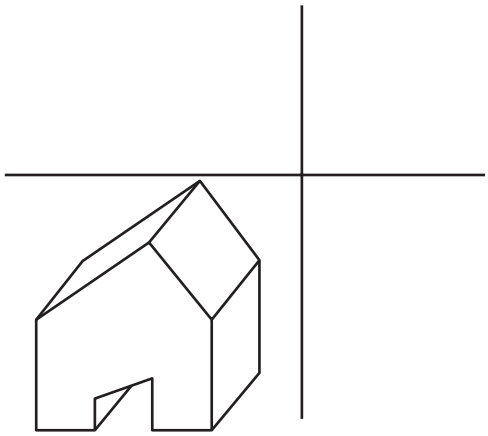
Event Theory

- Angles
- Edges
- Lines

Fold the Quadrants



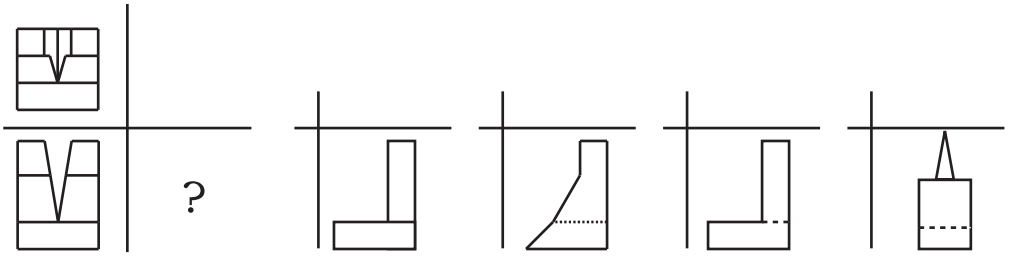
Hidden vs. Visible Events



Practice Questions

9. Choose the correct **END VIEW**.

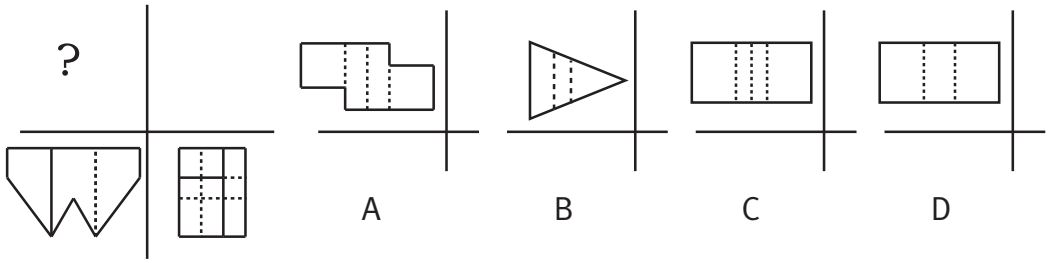
TOP VIEW



FRONT VIEW END VIEW

10. Choose the correct **TOP VIEW**.

TOP VIEW

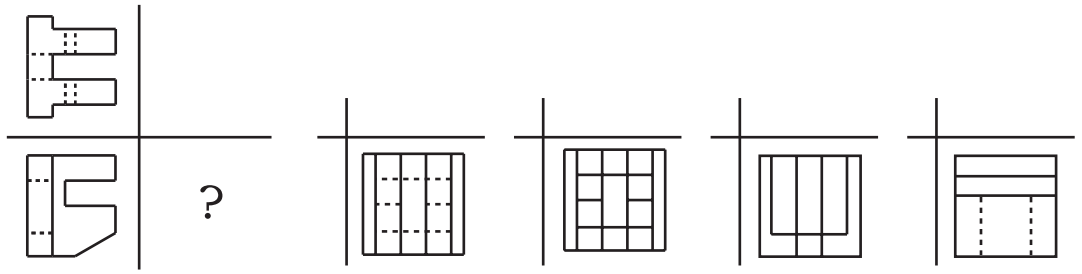


FRONT VIEW END VIEW

Practice Questions

11. Choose the correct **END VIEW**.

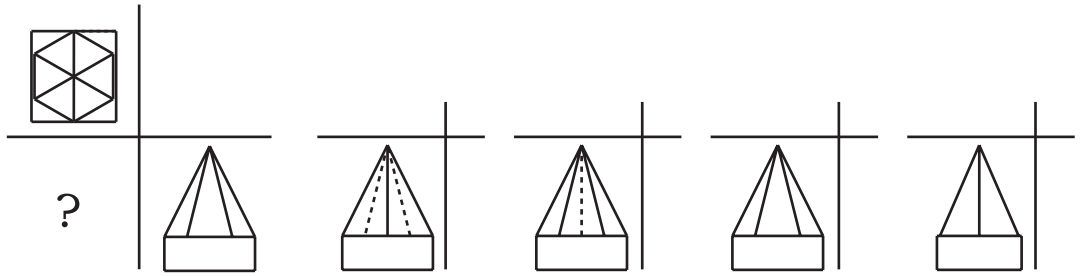
TOP VIEW



FRONT VIEW END VIEW

12. Choose the correct **FRONT VIEW**.

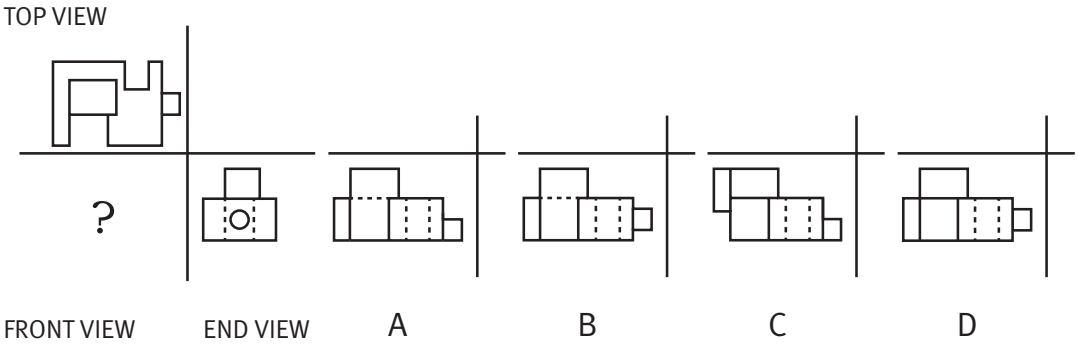
TOP VIEW



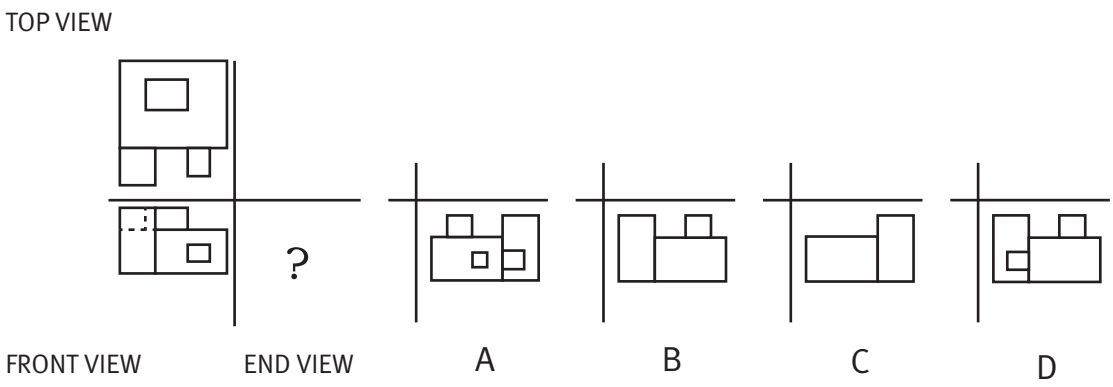
FRONT VIEW END VIEW

Practice Questions

13. Choose the correct **FRONT VIEW**.



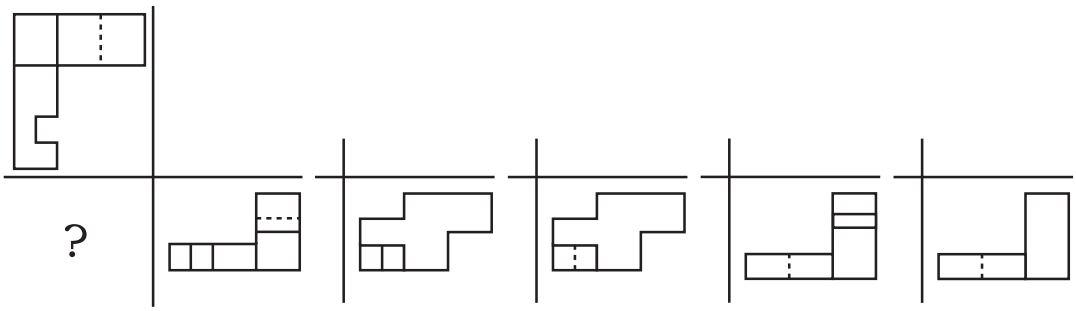
14. Choose the correct **END VIEW**.



Practice Questions

15. Choose the correct **FRONT VIEW**.

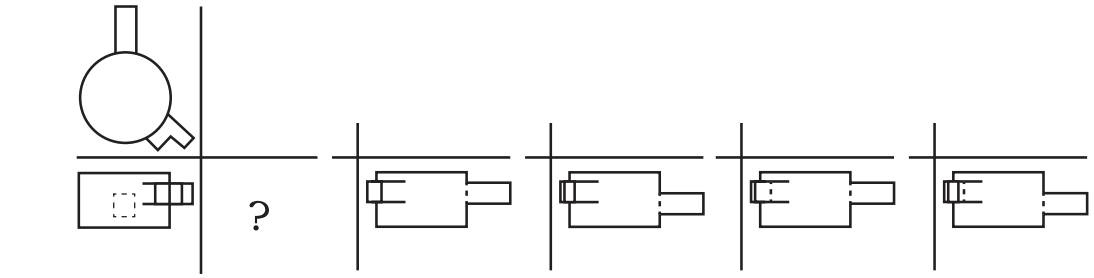
TOP VIEW



FRONT VIEW END VIEW

16. Choose the correct **END VIEW**.

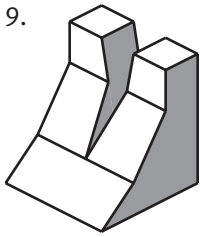
TOP VIEW



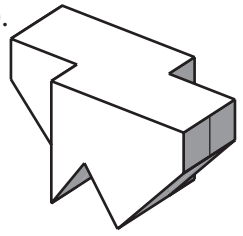
FRONT VIEW END VIEW

Top-Front-End 3D Images

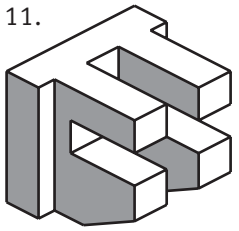
9.



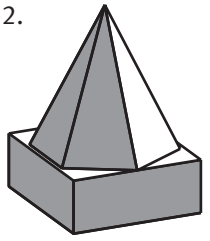
10.



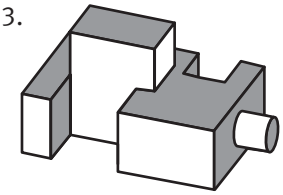
11.



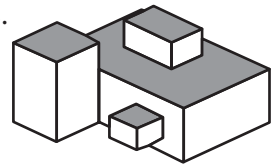
12.



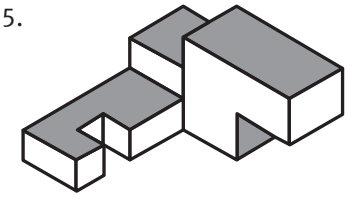
13.



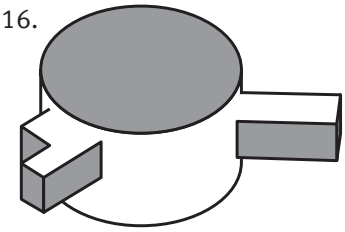
14.



15.



16.



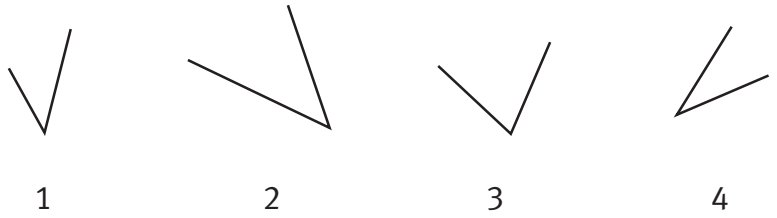
Angle Ranking

PART 3

Each question in this section presents four INTERIOR angles, labeled 1 through 4. Examine the four interior angles presented in each question.

Rank each question's angles in order from smallest to largest. Select the answer choice that represents the correct ranking. Try the following example:

Example



(A) 4-1-2-3
(B) 2-1-4-3
(C) 1-4-2-3
(D) 3-2-1-4

The correct ranking of the angles from small to large is 4-1-2-3. Therefore, the correct answer is choice (A).

Proceed to Questions

Overview

Four angles are given and must be ranked in order of increasing angle.

The Rules

Each question in this section presents four INTERIOR angles, labeled 1 through 4.

Strategies

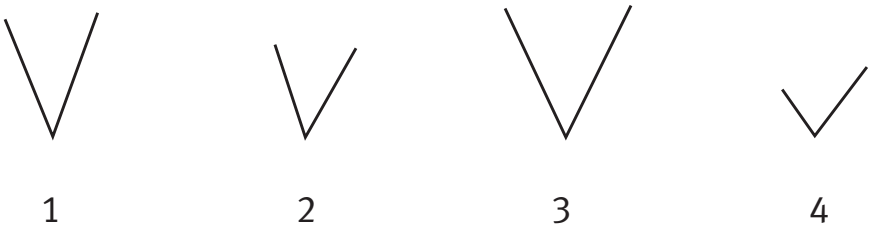
Smallest and Largest Angles

Blocking

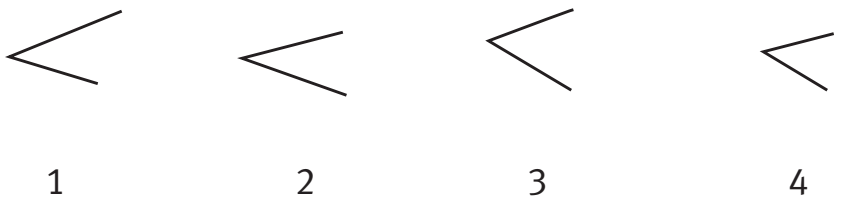
Stacking

Practice Questions

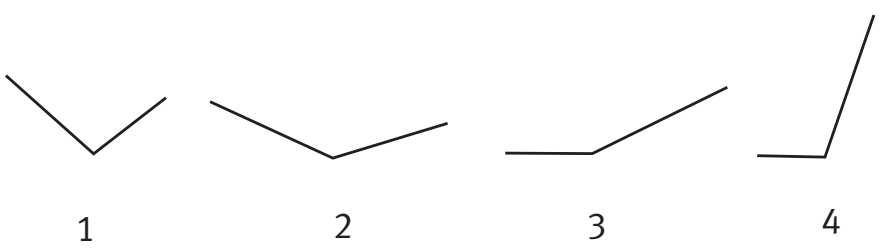
(A) 2-1-4-3
(B) 2-3-4-1
(C) 2-4-1-3
(D) 1-2-3-4



(A) 1-3-4-2
(B) 1-2-4-3
(C) 2-1-3-4
(D) 1-2-3-4



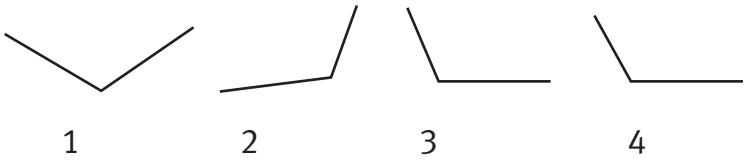
(A) 1-2-3-4
(B) 2-1-3-4
(C) 2-1-4-3
(D) 1-4-2-3



(A) 4-1-3-2
(B) 2-3-4-1
(C) 1-4-2-3
(D) 1-4-3-2

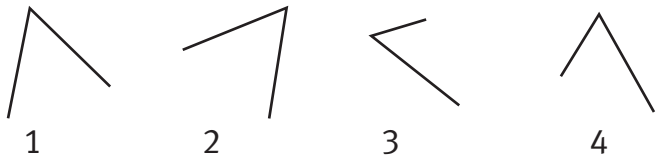
Practice Questions

21.



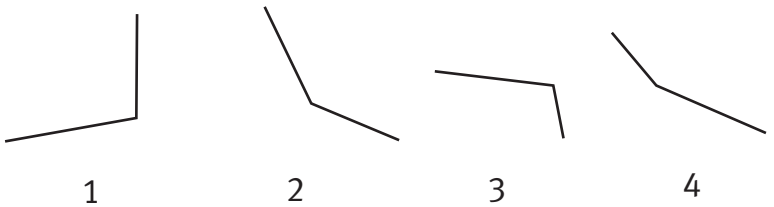
(A) 1-3-2-4
(B) 3-1-2-4
(C) 3-1-4-2
(D) 1-3-4-2

22.



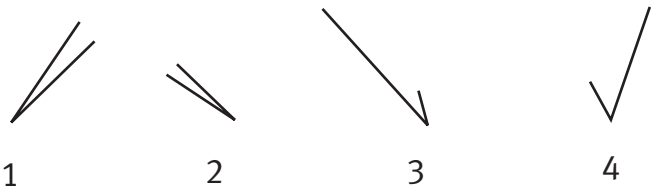
(A) 1-3-2-4
(B) 1-2-3-4
(C) 3-1-2-4
(D) 3-2-1-4

23.



(A) 3-1-2-4
(B) 3-1-4-2
(C) 1-3-2-4
(D) 1-3-4-2

24.



(A) 2-3-4-1
(B) 2-1-3-4
(C) 1-4-3-2
(D) 4-3-1-2

Hole Punching

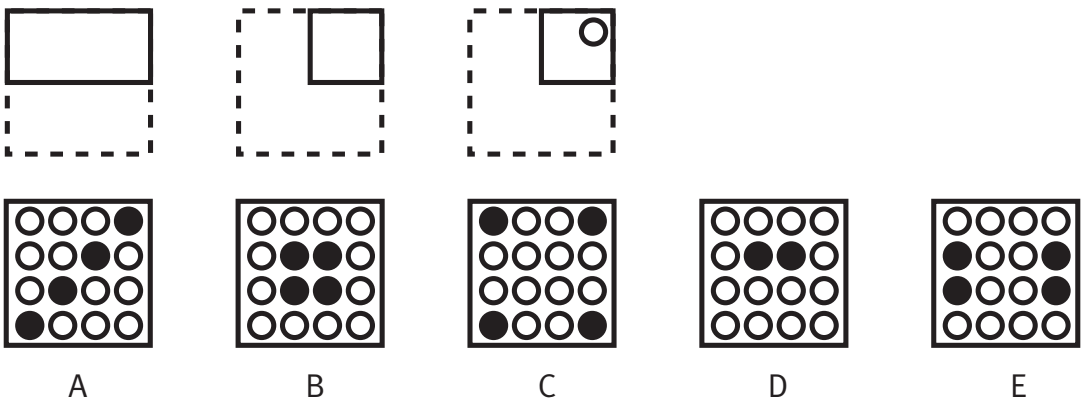
PART 4

In these questions, a flat, square piece of paper is folded one or more times. Broken lines indicate the original position of the paper, and solid lines indicate the position of the folded paper. The folded paper remains within the boundaries of the original, flat sheet. The paper is not turned or twisted. There are one, two, or three folds per question.

After the final fold is performed, a hole is punched in the paper. Once the hole is punched, mentally unfold the paper and determine the position(s) of the hole(s) on the original flat sheet.

Select the answer choice that represents the same pattern of dark circles that would reflect the position of holes on the unfolded sheet. There is only one correct pattern for each question. Try the following example:

Example



The correct answer is choice (C).

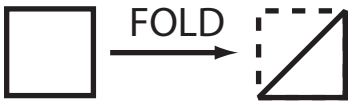
Proceed to Questions

Overview

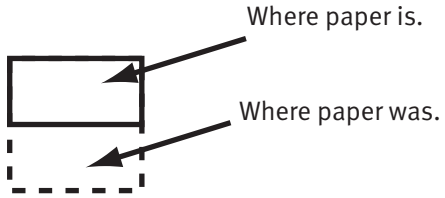
You must identify where the holes punched in a folded piece of paper will be when the piece of paper is unfolded.

The Rules

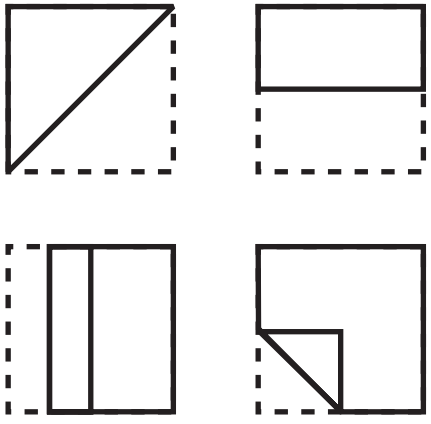
A flat, square piece of paper is folded one or more times.



Broken lines indicate the original position of the paper, and solid lines indicate the position of the folded paper. The folded paper remains within the boundaries of the original, flat sheet. The paper is not turned or twisted.

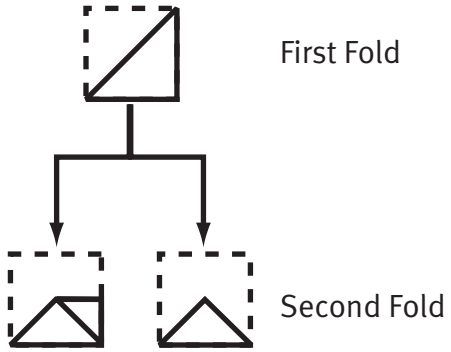


Determine how the paper was folded by looking at its position before and after the fold.



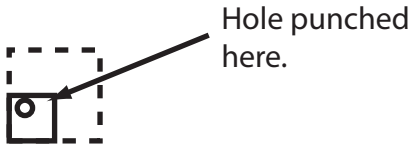
These are the possible first folds.

There are one, two, or three folds per question.



Here are two of the many possible second folds following the given first fold.

After the final fold is performed, one or more holes are punched in the paper. Once the holes are punched, mentally unfold the paper and ascertain the positions of the holes on the original flat sheet.



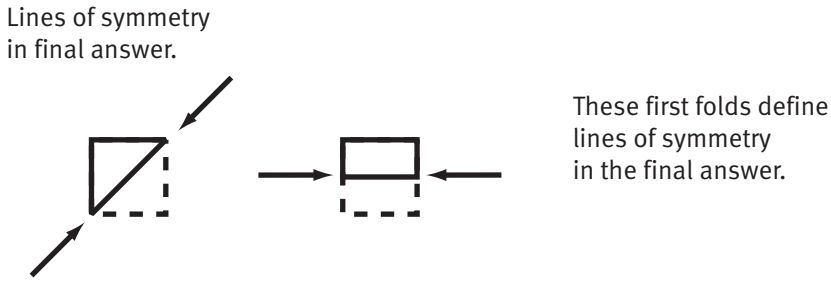
Notice that the location of the hole being punched is indicated by the outline of a circle.

The location of the hole punched is constrained by the fact that no "half " holes are generated. However, a hole may be punched along a fold so that when the paper is unfolded, a single "whole" hole results from the "half" punch.

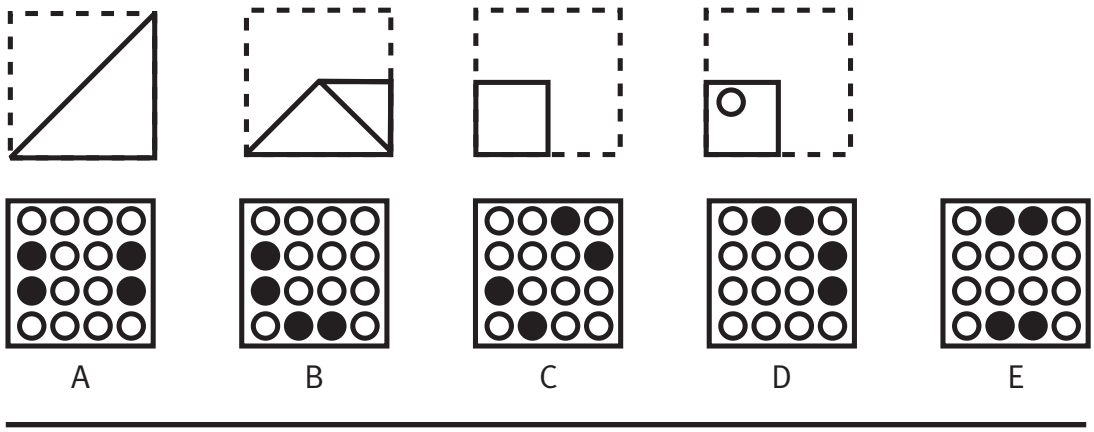
Strategies

First Fold Line of Symmetry

The first fold is particularly important for determining the symmetry of the final solution.



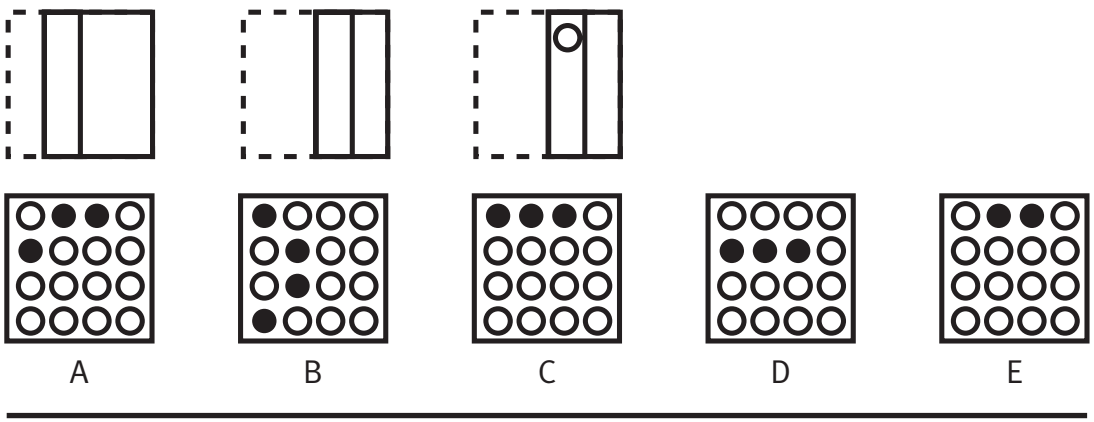
Practice with Lines of Symmetry



Number of Folds

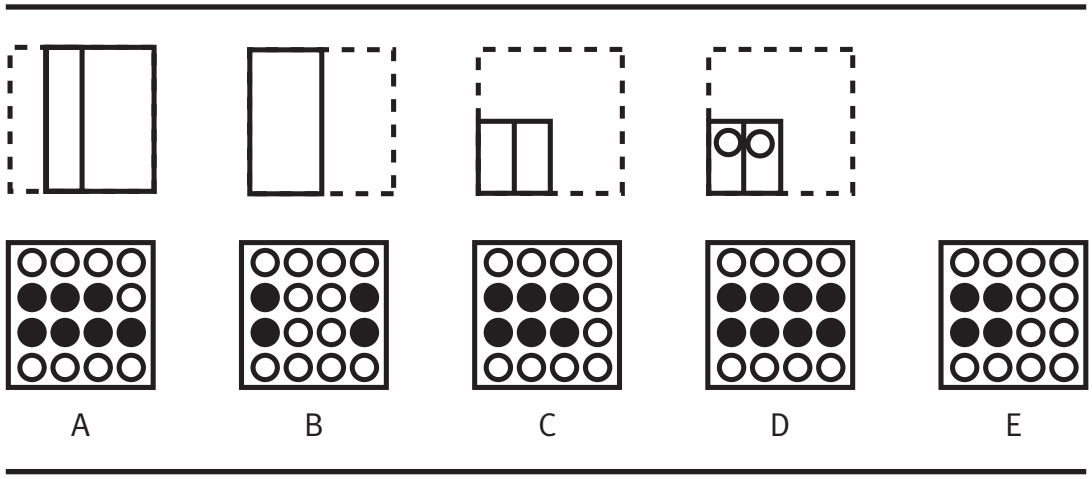
Layers of Paper

Practice with Number of Folds and Layers of Paper



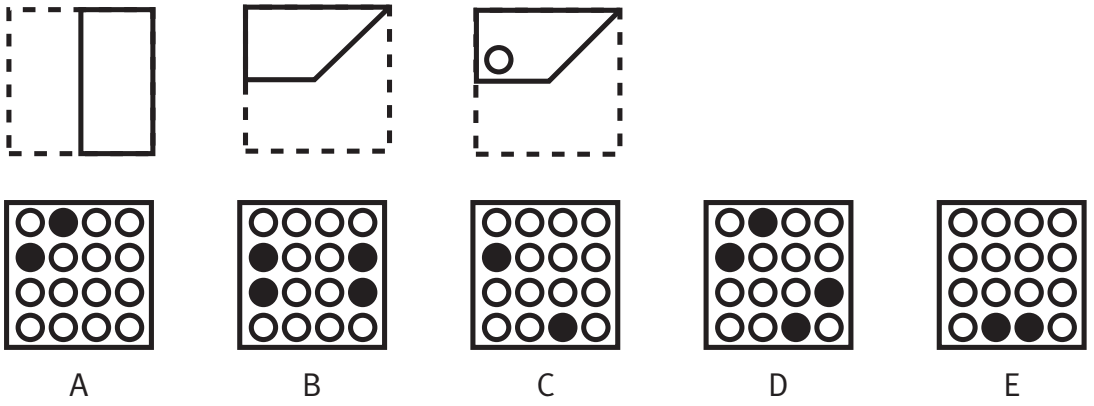
Number of Punches

Practice with Number of Punches

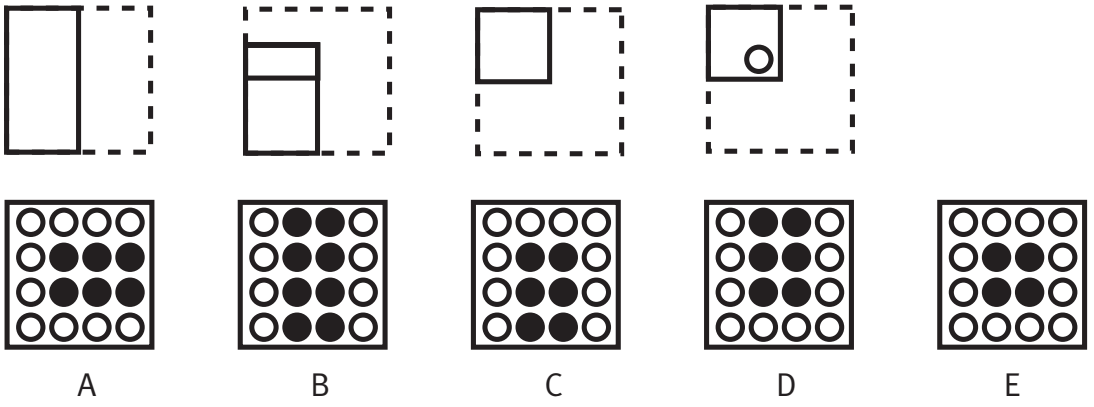


Practice Questions

25.

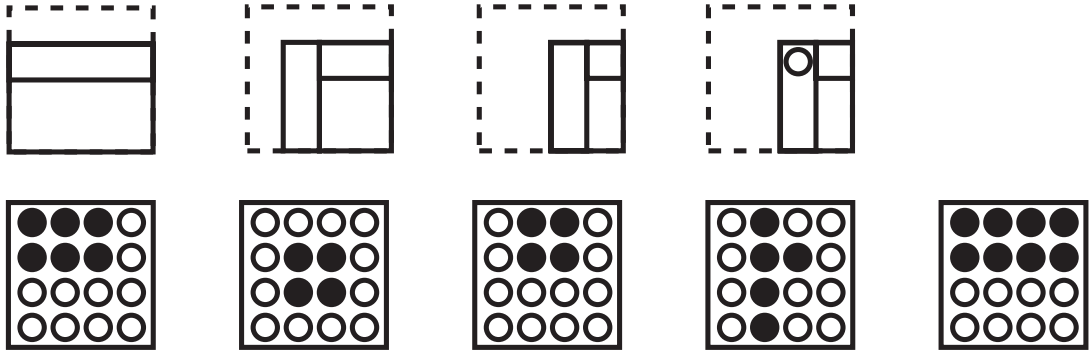


26.

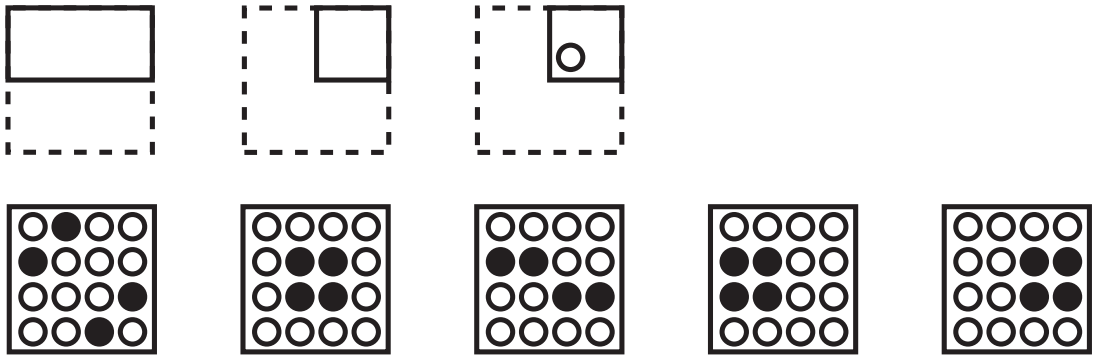


Practice Questions

27.

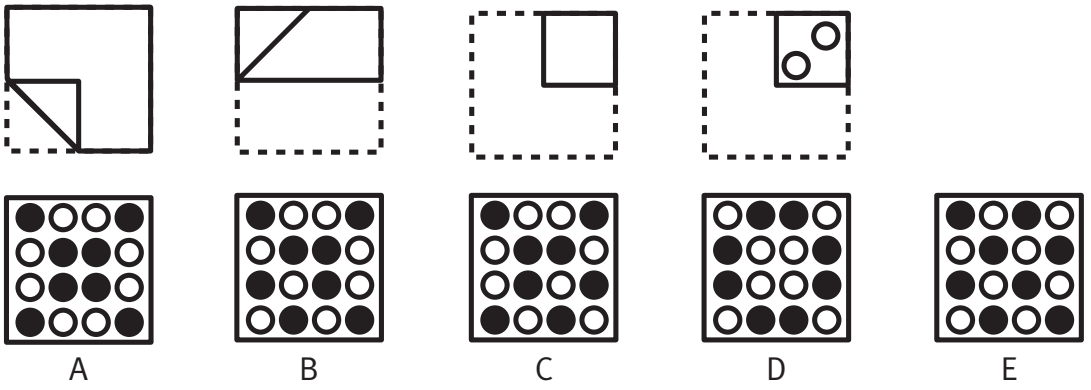


28.

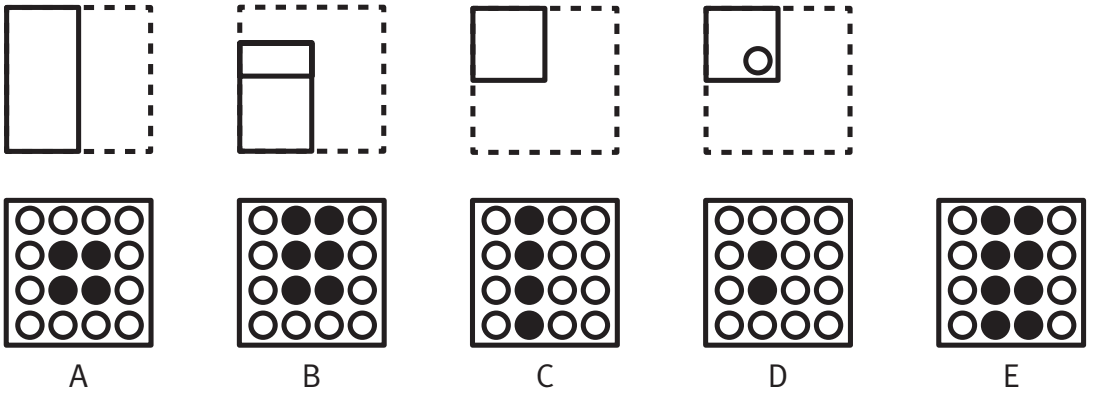


Practice Questions

29.

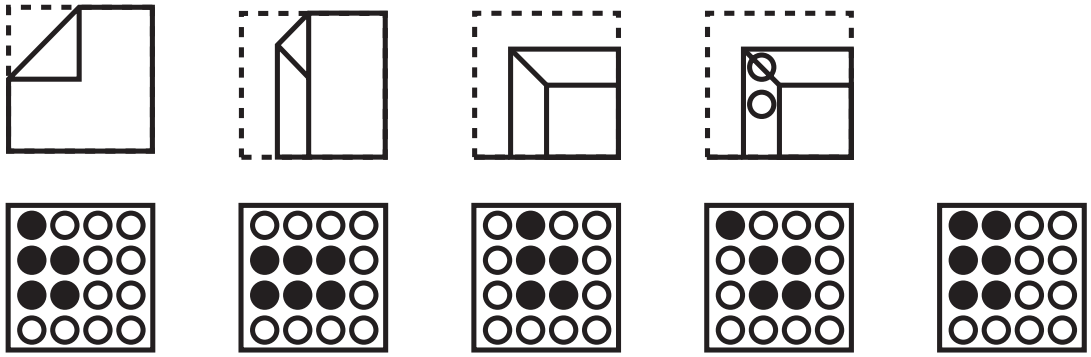


30.

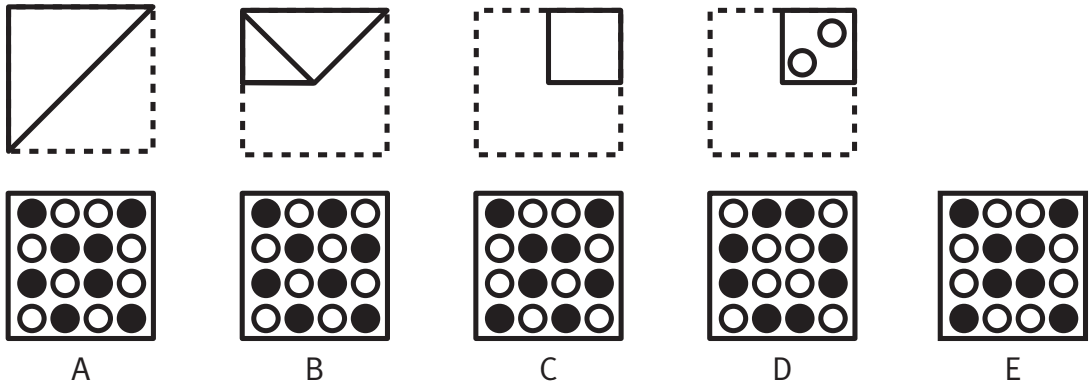


Practice Questions

31.



32.



Cube Counting

PART 5

Each figure presented in this section has been constructed by cementing together identical cubes. After being cemented, each figure was varnished on all sides EXCEPT for the bottom (the side on which the figure rests). The only hidden cubes are the ones necessary to support other cubes in the figure.

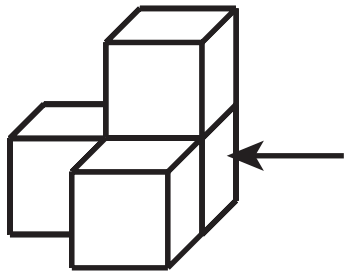
Examine each figure carefully regarding the number of sides on each cube that have been varnished. The following questions ask for this information. Select the correct answer choice from the ones provided. Try the following example:

Example

In the Example Figure, how many cubes have two of their exposed sides painted?

A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

Example Figure



The correct answer is choice A. The cube is indicated with an arrow above.

Proceed to Questions

Overview

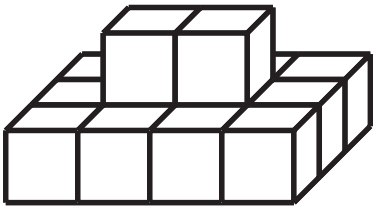
A stack of cubes is given. You must determine how many cubes have a particular number of exposed sides.

The Rules

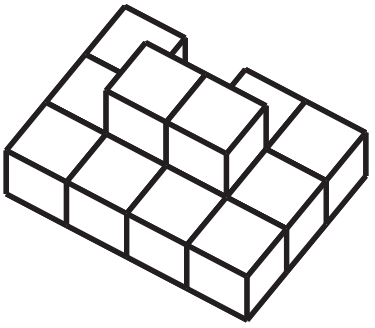
Each figure has been constructed by cementing together identical cubes.

After being cemented, each figure was painted on all sides EXCEPT for the bottom (the side on which the figure rests).

The only hidden cubes are the ones necessary to support other cubes in the figure.



How many cubes are in this stack?

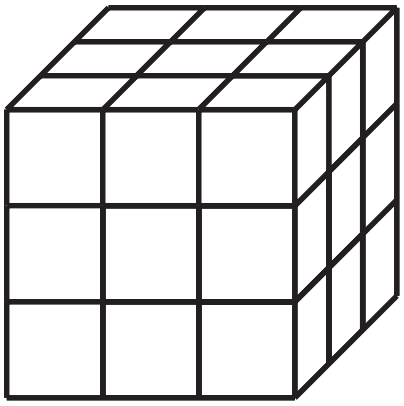


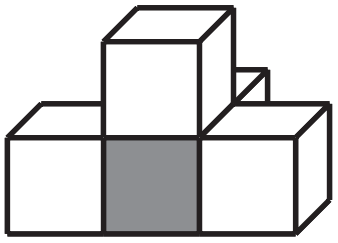
This is how you should interpret the stack of cubes shown above.

The Six Cubes of the PAT

One-Sider

In the diagram below, shade the cubes that have one side exposed.

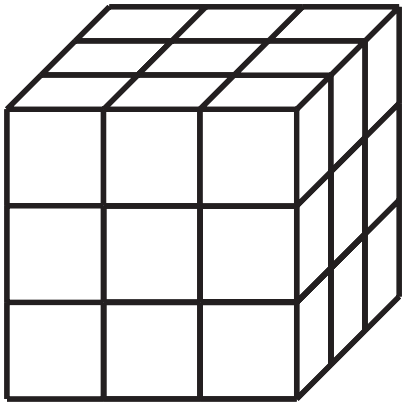


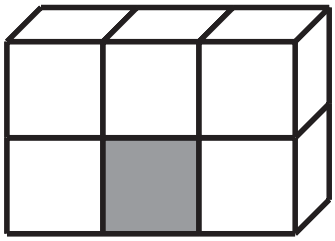


The One-Sider appears on the faces of complex figures.

Two-Sider

In the diagram below, shade the cubes that have two sides exposed.

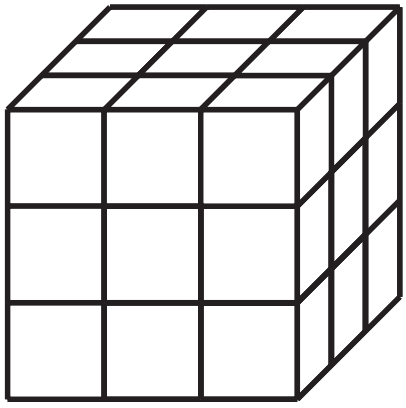


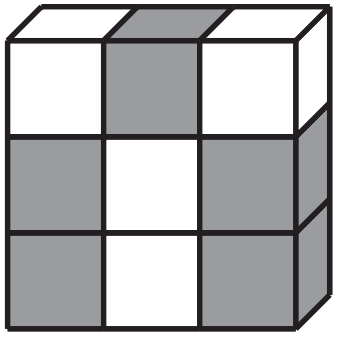


The Two-Sider appears on the bottoms of walls.

Three-Sider

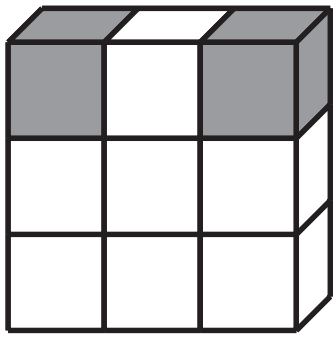
In the diagram below, shade the cubes that have three sides exposed.



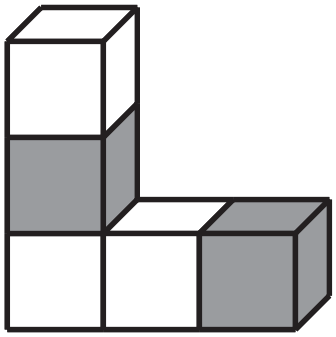


The Three-Sider appears on the edges of a wall of cubes.

Four-Sider



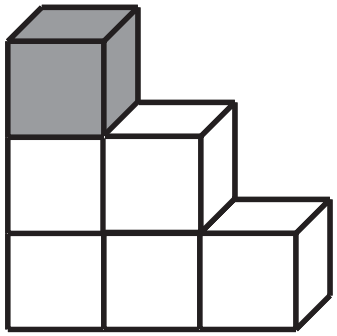
The Four-Sider appears on the corners of a wall of cubes.



The Four-Sider can also appear within a column of cubes.

Five-Sider

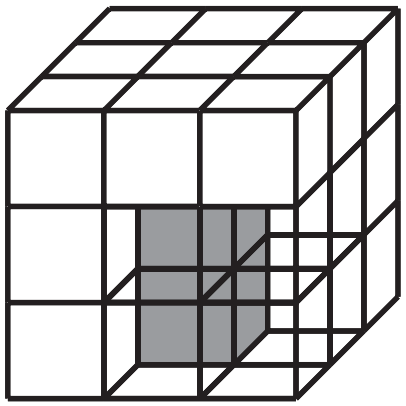
The cube with five sides exposed can only appear in the following way:



The Five-Sider sits up on a column of cubes.

No-Sider

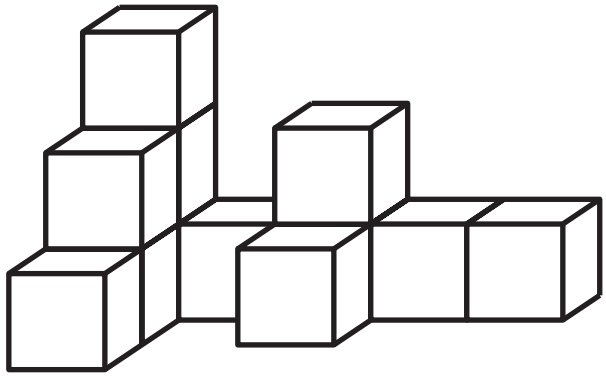
The cube with no exposed side can appear in the following way:



The No-Sider exists in the core of a complex figure.

Tallying the Cubes

Figure A



Sides	#
0	
1	
2	
3	
4	
5	
Total	

Practice Questions

33. In Figure A, how many cubes have two of their exposed sides painted?

A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

34. In Figure A, how many cubes have four of their exposed sides painted?

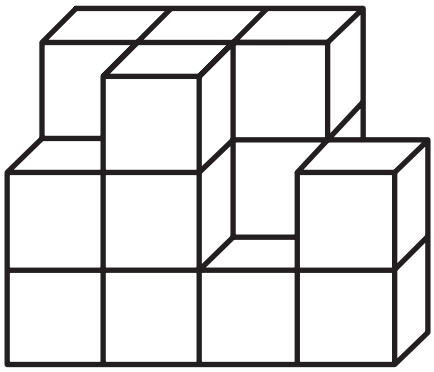
A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

35. In Figure A, how many cubes have five of their exposed sides painted?

A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

Tallying the Cubes

Figure B



Sides	#
0	
1	
2	
3	
4	
5	
Total	

Practice Questions

36. In Figure B, how many cubes have one of their exposed sides painted?

A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

37. In Figure B, how many cubes have three of their exposed sides painted?

A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

38. In Figure B, how many cubes have five of their exposed sides painted?

A. 1 cube
B. 2 cubes
C. 3 cubes
D. 4 cubes
E. 5 cubes

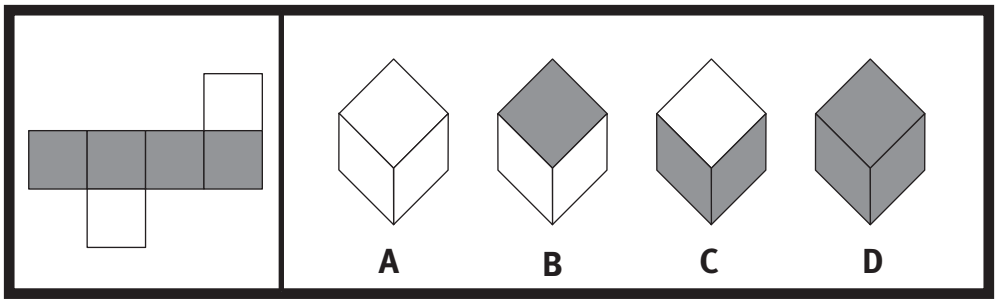
Pattern Folding

PART 6

In the following questions, a flat pattern is presented. This pattern will be folded into a three-dimensional figure, and the correct three-dimensional figure is one of the four answer choices illustrated at the right of the pattern. There is only one correct three-dimensional figure for each question. The pattern at left represents the outside of the figure.

Select the three-dimensional figure that directly corresponds to the pattern at left. Choose the appropriate answer choice. Try the following example:

Example



The correct answer is choice (C).

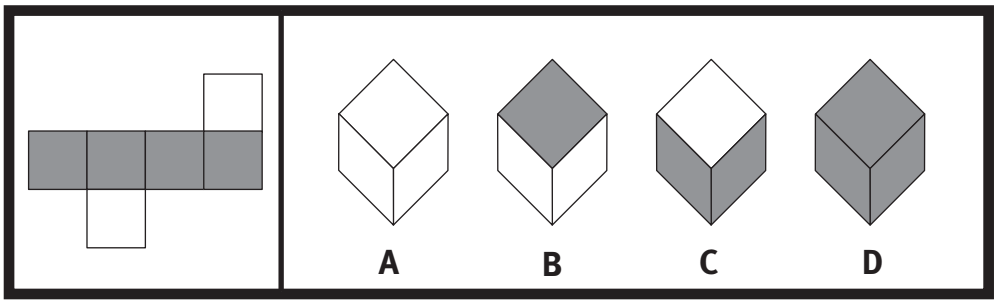
Proceed to Questions

Overview

Determine which three-dimensional shape is produced by folding a two-dimensional pattern.

The Rules

A flat pattern is presented at left.



There is only one correct three-dimensional figure for each question.

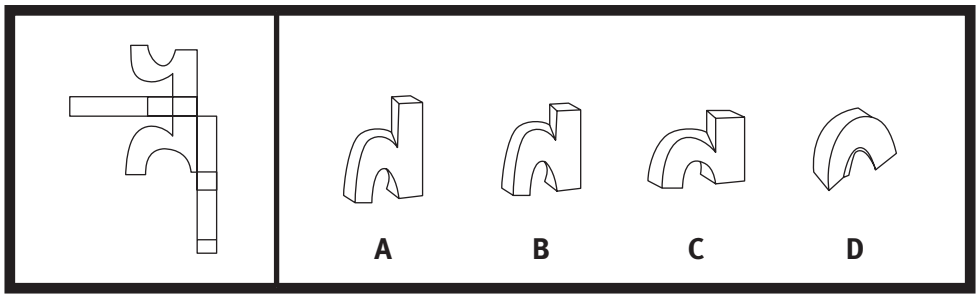
This means if two choices are different views of the same object, then neither is correct.

The flat pattern represents the *outside* of the figure.

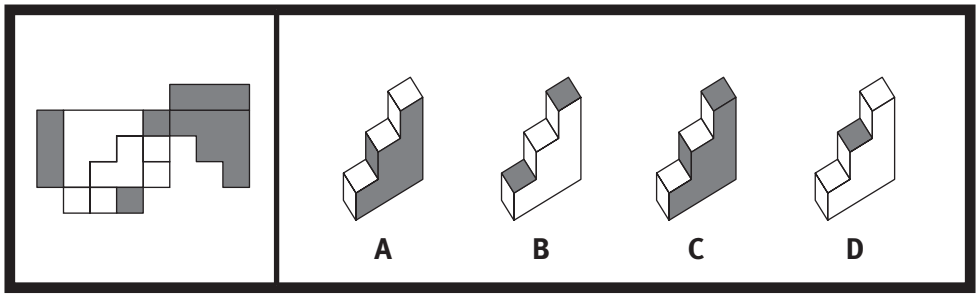
This means fold the flat pattern *into the page* in order to produce a three-dimensional object with the pattern facing out.

Strategies

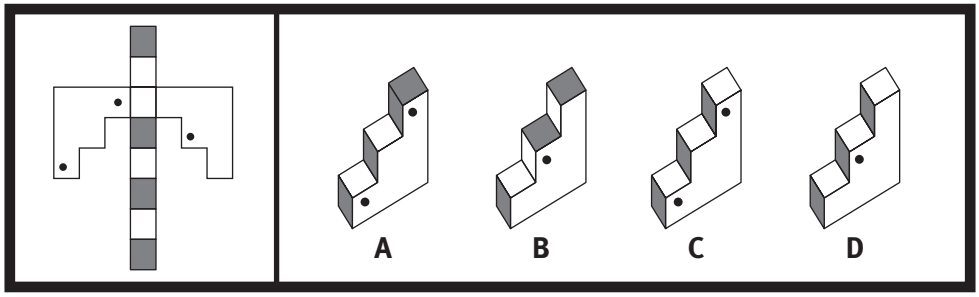
Unique Shape



Unique Shading

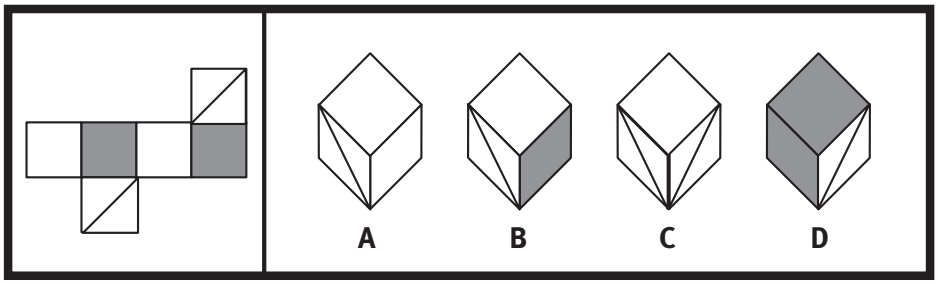


Key Landmark

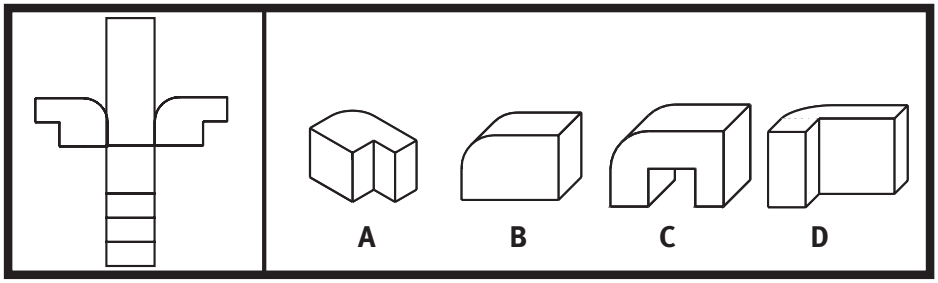


Practice Questions

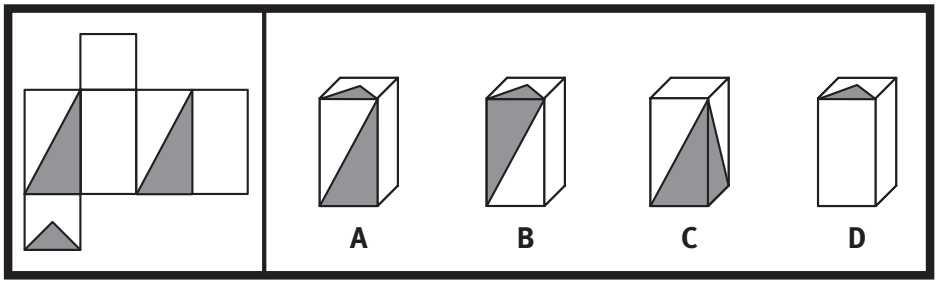
39.



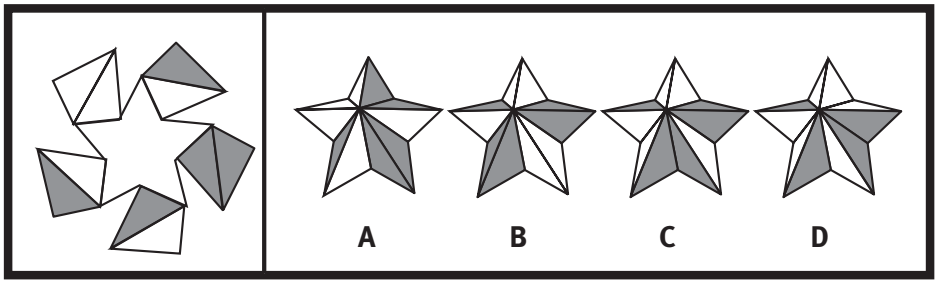
40.



41.

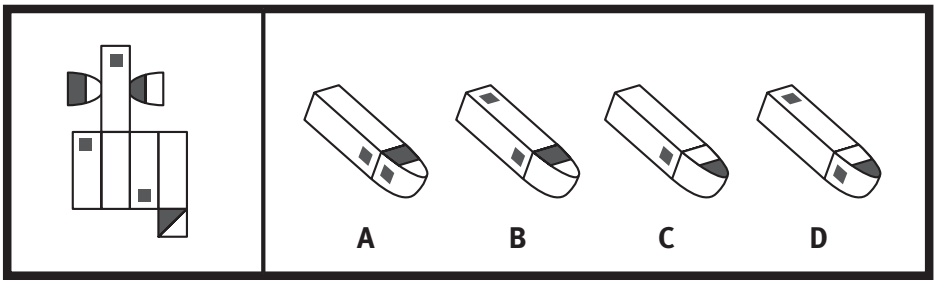


42.

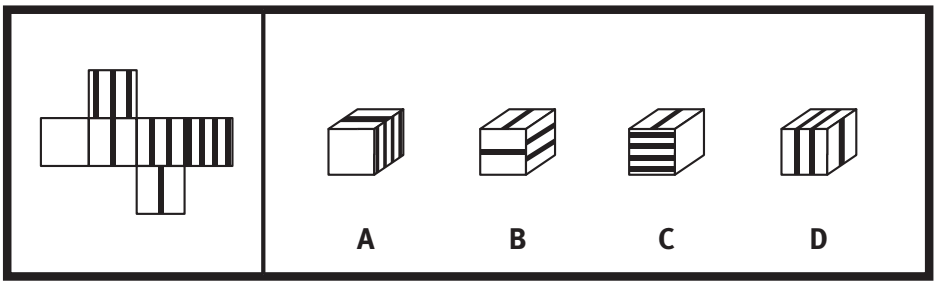


Practice Questions

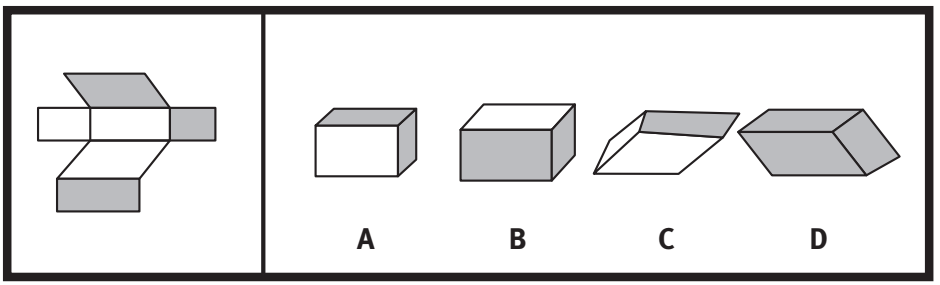
43.



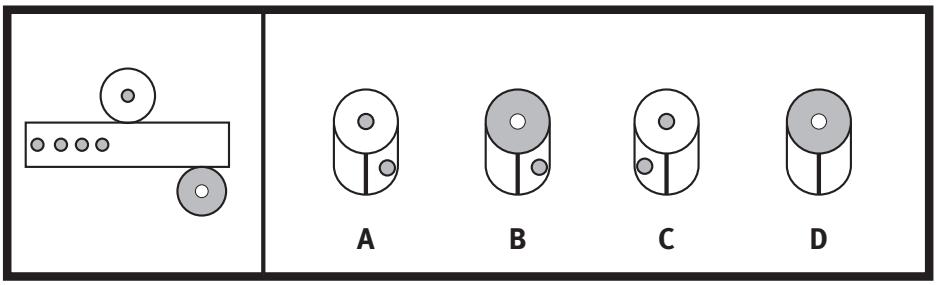
44.



45.



46.



Homework

Required Assignments*	Location
Complete Remaining Lesson Questions	Lesson Book
Perceptual Ability 1 Review	kaptest.com
Quantitative Reasoning 1 Preview	Review Notes Book
Quantitative Reasoning 1 Preview	kaptest.com

Personalized Assignments
Refer to your online resources for additional practice assignments and tools

*These assignments must be completed in order to fulfill the requirements of the Higher Score Guarantee.