



2022 Academic Challenge

REGIONAL ENGINEERING GRAPHICS EXAM

Engineering Graphics Test Production Team

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Ted Branoff, Illinois State University – Reviewer

GENERAL DIRECTIONS

Please read the following instructions carefully. This is a timed test; any instructions from the test supervisor should be followed promptly.

The test supervisor will give instructions for filling in any necessary information on the answer sheet. Most Academic Challenge sites will ask you to indicate your answer to each question by marking an oval that corresponds to the correct answer for that question. One oval should be marked to answer each question. Multiple ovals will automatically be graded as an incorrect answer.

Be sure ovals are marked as  , not  ,  ,  , etc.

If you wish to change an answer, erase your first mark completely before marking your new choice.

You are advised to use your time effectively and to work as rapidly as you can without losing accuracy. Do not waste your time on questions that seem too difficult for you. Go on to the other questions, and then come back to the difficult ones later if time remains.

Time: 40 Minutes

Number of Questions: 40

DO NOT OPEN TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO!

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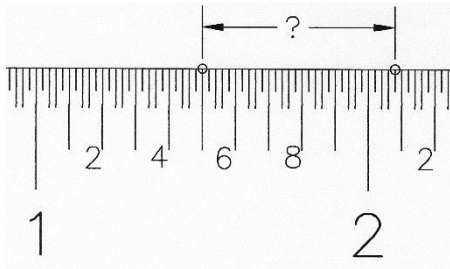
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2022 Academic Challenge Regional Engineering Graphics Exam

1. Which of the following is the ASME standard symbol for *diameter*?

- A. \varnothing
- B. \sphericalangle
- C. \square
- D. ∇
- E. \odot

2. What numeric value is correct for the distance shown in the illustration below?

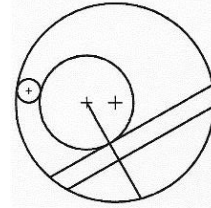


- A. 0.44"
- B. 0.54"
- C. 0.58"
- D. 2.08"
- E. 2.12"

3. On a factory layout drawing, a scale of $3/16" = 1'-0"$ is indicated. Which of the following ratios matches that scale?

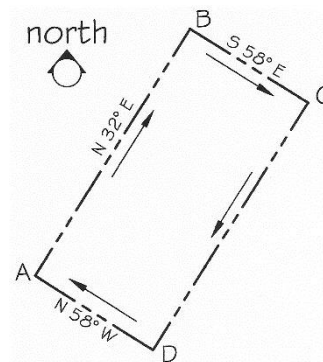
- A. 1:16
- B. 1:24
- C. 1:32
- D. 1:48
- E. 1:64

4. What geometric term is NOT featured in the figure below?



- A. Paralellism
- B. Perpendicularity
- C. Concentricity
- D. Eccentricity
- E. Tangency

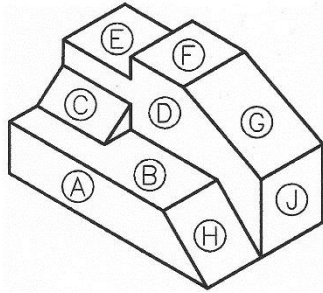
5. In civil engineering, a property line is labeled with a bearing, which gives the acute angle to the EAST or WEST of NORTH, or to the EAST or WEST of SOUTH, depending on the surveyor's path. In the illustration below, the surveyor records a bearing of N 32° E for property side AB. If the surveyor continues around the rectangular property in a clockwise fashion, what is the bearing of property side CD?



- A. S 58° W
- B. N 32° E
- C. N 32° W
- D. S 32° W
- E. S 58° E

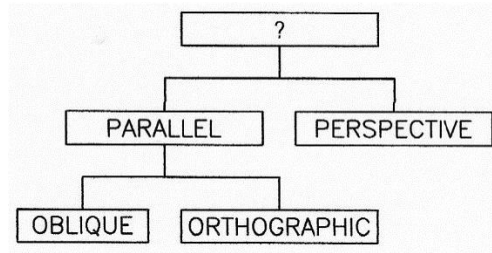
6. Surface A is a **normal** surface as it is parallel with a **frontal** plane, but perpendicular to a **profile** plane and a **horizontal** plane above. Surface G is an **inclined** surface, as it is perpendicular to the **frontal** plane, but **inclined** to the profile and **horizontal** planes.

How many of the LABELED surfaces, both **normal** and **inclined**, are **perpendicular** to the **profile** plane?



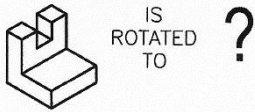
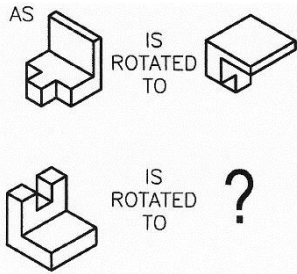
- A. 2
 B. 3
 C. 4
 D. 5
 E. 6
7. With respect to the illustration in the previous question, how many of the LABELED surfaces are **perpendicular** to the **horizontal** plane above the object?
- A. 2
 B. 3
 C. 4
 D. 5
 E. 6

8. With respect to engineering drawing systems, what term best fills in the chart below?



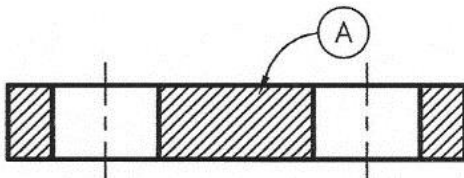
- A. ANGLES
 B. PROJECTIONS
 C. MULTIVIEWS
 D. RENDERINGS
 E. VIEWS
9. What area of engineering graphics would be associated with the following words: OFFSET, REMOVED, HALF, BROKEN-OUT, REVOLVED, AND FULL?
- A. Section views
 B. Set screw tips
 C. Weld joints
 D. Sheet metal folds
 E. Auxiliary views
10. Which of the following measurements best defines the **major diameter** of a screw thread?
- A. Crest-to-Crest
 B. Chamfer-to-Chamfer
 C. Flank-to-Flank
 D. Root-to-Root
 E. Tip-to-Tip

11. The following is similar to a test item from the **Purdue Visualization of Rotations** test. Select the correct answer



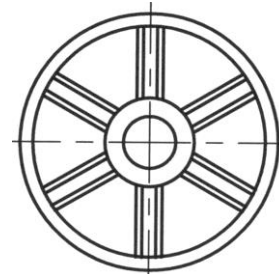
- A.
- B.
- C.
- D.
- E.

12. The area indicated by "A" is sometimes called hatching. What is the official ASME name for the lines used to create the hatching?



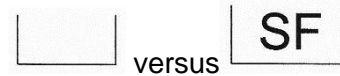
- A. Cutting plane lines
- B. Slice lines
- C. Section lines
- D. Angle lines
- E. Phantom lines

13. To show the shape of the spoke material, what type of sectional view could be placed directly on the front view illustrated below?



- A. Offset
- B. Full
- C. Half
- D. Revolved
- E. Removed

14. What is the primary difference in the manufacturing processes represented by the two symbols illustrated below?

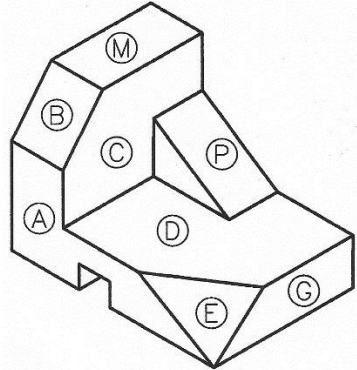


- A. Diameter
- B. Tool used
- C. Angle of cut
- D. Number of sides
- E. Depth

15. If a shaft has a limit dimension value of .525"-.533", and the mating part hole has a limit dimension value of .536"-.547", what is the **allowance**?

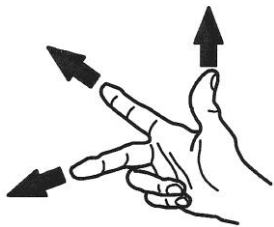
- A. .003"
- B. .011"
- C. .012"
- D. .014"
- E. .022"

16. For the object identified below, if the front view shows the true shape and size of surface A, then what view would feature the true size and shape of surface P?



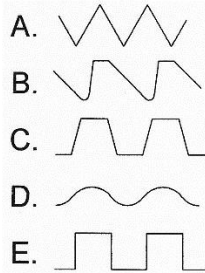
- A. Top view
- B. Right side view
- C. Primary auxiliary view projected from the front view
- D. Primary auxiliary view projected from the top view
- E. Primary auxiliary view projected from the right side view

17. In 3D CAD modeling, what is often assigned to the right hand thumb in the illustration below?



- A. Blue
- B. Height
- C. 0°
- D. A
- E. +X

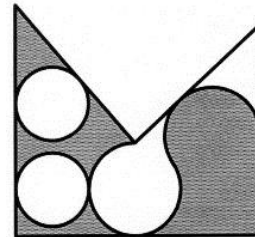
18. Light bulbs screw into sockets that have a standard thread form known as the “Edison Screw” or ES. Of the thread forms illustrated below, which is the ES standard?



19. What CAD term applies to a pre-built collection of 2D CAD symbols or 3D CAD models?

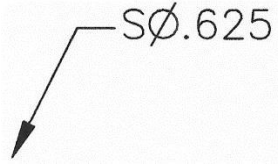
- A. Appendix
- B. Library
- C. Center
- D. Storehouse
- E. Table

20. How many “points of tangency” are featured in the geometric shape featured below?



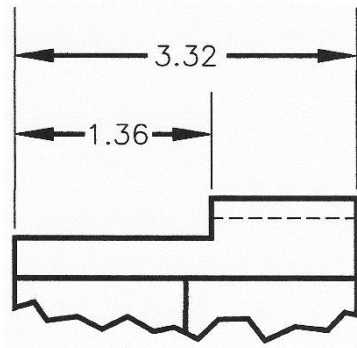
- A. 5
- B. 6
- C. 7
- D. 8
- E. 9

21. What does the “S” mean in the local note illustration below?



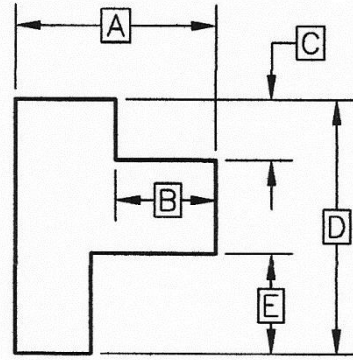
- A. Square
- B. Standard
- C. Smooth
- D. Special
- E. Spherical

22. In the illustration below, the 1/8” lettering for the dimension numerals is the correct size. However, there are some other issues with the dimensioning. Identify the ONE answer that is a **FALSE** statement with respect to the dimensions.



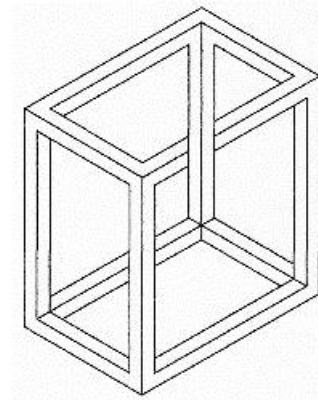
- A. The dimension lines should not be thick
- B. The extension lines go too far past the arrows
- C. The gap between the extension lines and object should be about 3 times as much
- D. The extension lines are properly drawn as thin lines
- E. The arrows are approximately twice the size they should be

23. Of the five dimensions shown below, which one is placed the **poorest**?



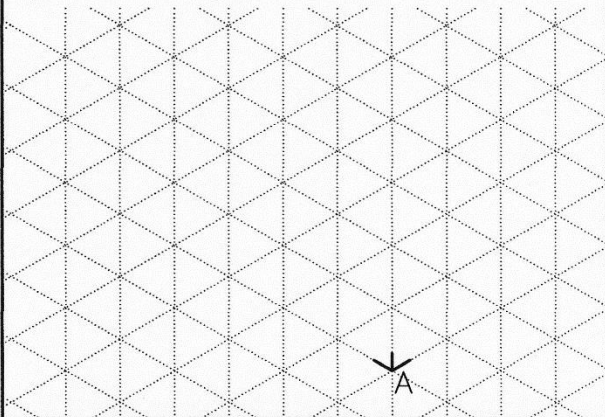
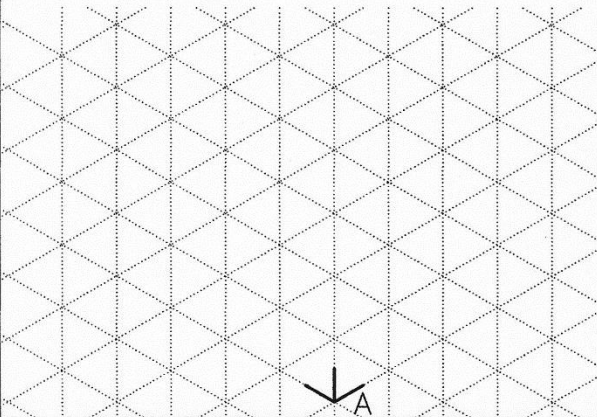
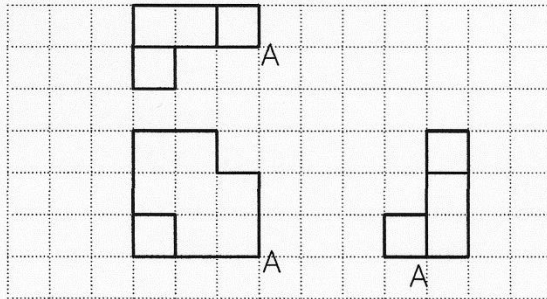
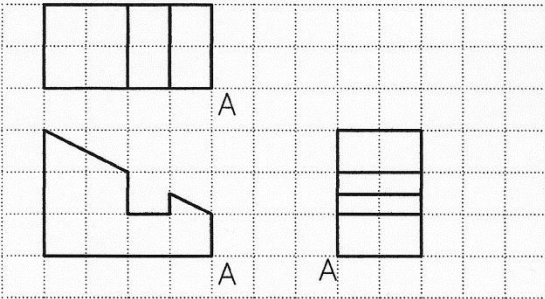
- A. A
- B. B
- C. C
- D. D
- E. E

24. What pictorial drawing method was used to create the optical illusion illustrated below?



- A. Isometric
- B. Oblique
- C. Orthographic
- D. 2-point perspective
- E. Trimetric

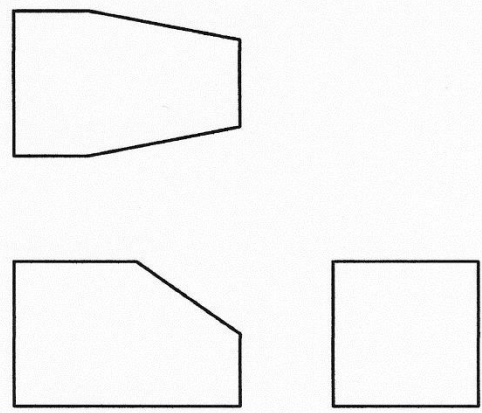
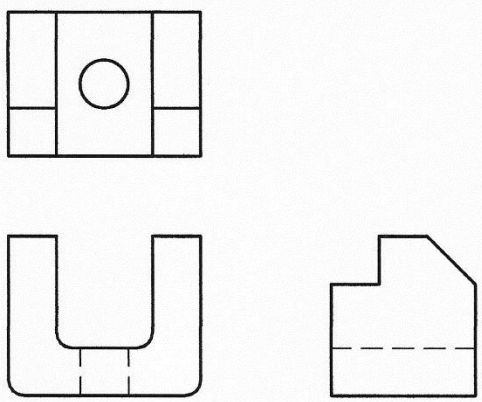
PROBLEMS 25 & 26: CREATE ISOMETRIC SKETCHES
 SELECT AN ANSWER THAT REPRESENTS THE NUMBER OF SEGMENTS REQUIRED



25. NUMBER OF LINE SEGMENTS:
 A. 16 B. 17 C. 18 D. 19 E. 20

26. NUMBER OF LINE SEGMENTS:
 A. 23 B. 24 C. 25 D. 26 E. 27

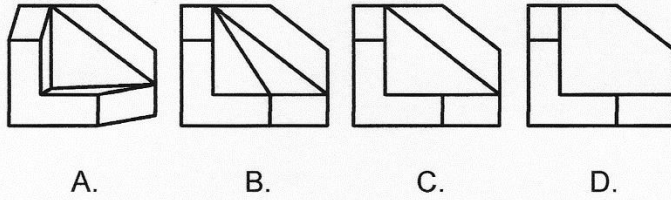
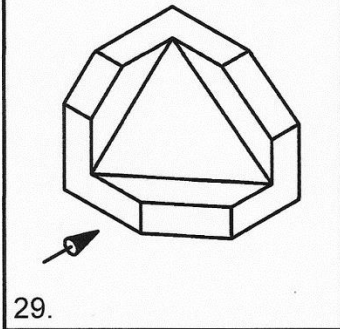
PROBLEMS 27 & 28: MISSING LINE PROBLEMS: SELECT AN ANSWER THAT
 CORRESPONDS WITH THE LEAST NUMBER OF MISSING LINE SEGMENTS (VISIBLE
 AND HIDDEN) IT WILL TAKE TO CREATE A CORRECT MULTIVIEW DRAWING



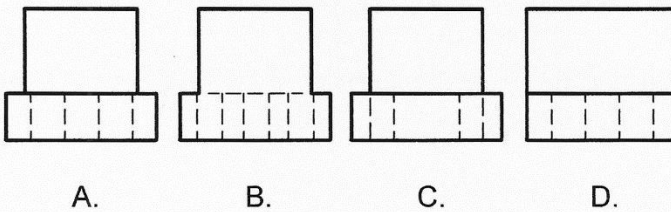
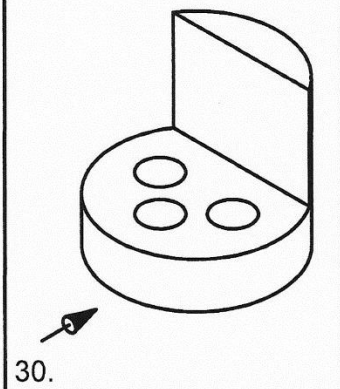
27. MINIMUM NUMBER OF LINES:
 A. 4 B. 5 C. 6 D. 7 E. 8

28. MINIMUM NUMBER OF LINES:
 A. 4 B. 5 C. 6 D. 7 E. 8

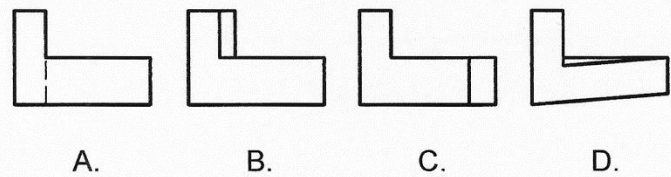
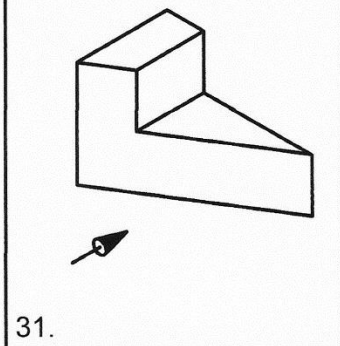
FOR EACH PROBLEM, SELECT THE CORRECT FRONT VIEW
 NOTE: CENTER LINES OMITTED ON THIS TEST PAGE



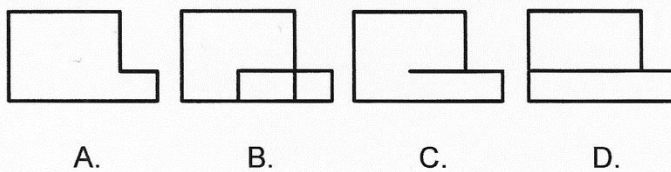
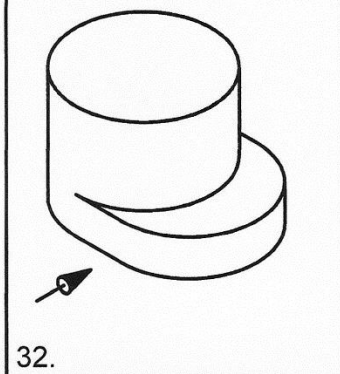
NONE
OF
THESE
E.



NONE
OF
THESE
E.



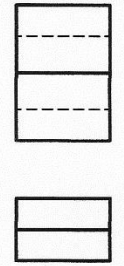
NONE
OF
THESE
E.



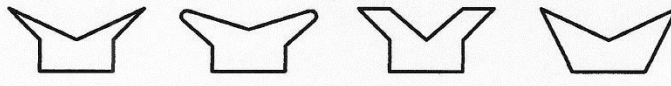
NONE
OF
THESE
E.

FOR EACH PROBLEM, SELECT THE CORRECT SIDE VIEW
 NOTE: CENTER LINES OMITTED ON THIS TEST PAGE

33.



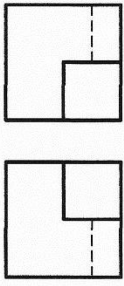
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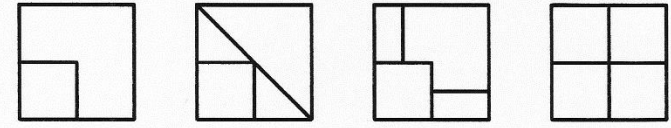
A. B. C. D.

NONE OF THESE
E.

34.



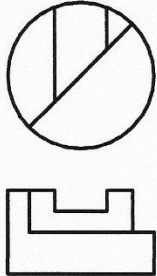
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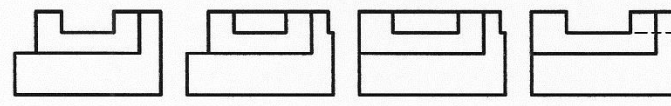
A. B. C. D.

NONE OF THESE
E.

35.



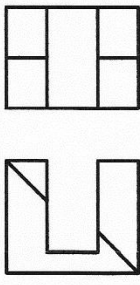
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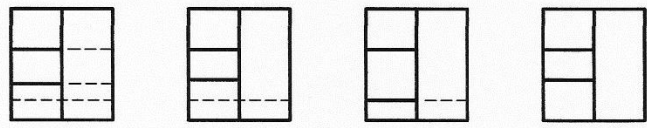
A. B. C. D.

NONE OF THESE
E.

36.



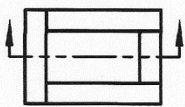
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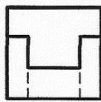
A. B. C. D.

NONE OF THESE
E.

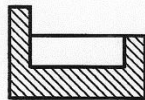
FOR EACH PROBLEM, SELECT THE CORRECT FRONT SECTIONAL VIEW
 NOTE: CENTER LINES OMITTED ON THIS TEST PAGE



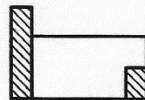
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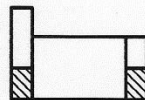
37.



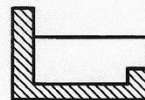
A.



B.



C.



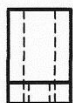
D.

NONE OF THESE

E.



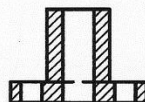
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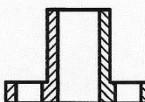
38.



A.



B.



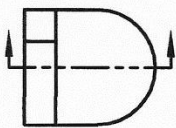
C.



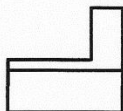
D.

NONE OF THESE

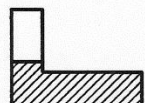
E.



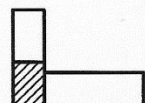
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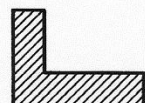
39.



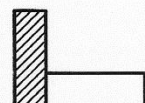
A.



B.



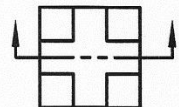
C.



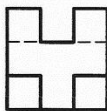
D.

NONE OF THESE

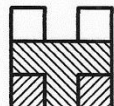
E.



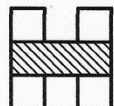
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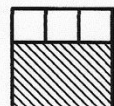
40.



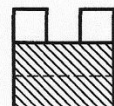
A.



B.



C.



D.

NONE OF THESE

E.