



**ENGINEERING
AT ILLINOIS**

2016 Academic Challenge

ENGINEERING GRAPHICS TEST – REGIONAL

– This Test Consists of 40 Questions –

Engineering Graphics Test Production Team

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Mark Laingen, Illinois State University – Reviewer

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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 *****

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

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WYSE – Academic Challenge
Engineering Graphics Test (Regional) - 2016

1. According to Wikipedia™, an engineering drawing is a _____ document because it communicates all the needed information to the people who will expend resources turning the idea into a reality, and joins the purchase order as part of a contract.

- A. preliminary
- B. draft
- C. legal
- D. temporary
- E. planning

2. In orthographic projection, an ***inclined*** surface appears as a line in one of the three regular views because it is _____ one of the principal projection planes.

- A. parallel with
- B. oblique to
- C. tangent with
- D. inclined to
- E. perpendicular to

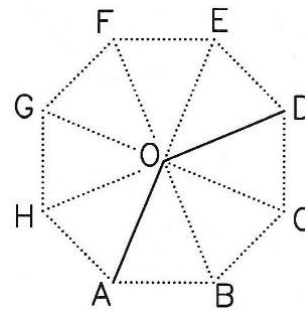
3. The words REMOVED, HALF, REVOLVED, FULL, and ALIGNED can describe types of:

- A. Set screw tips
- B. Weld joints
- C. Section views
- D. Sheet metal folds
- E. Keys

4. A sheet metal project requires a 27" x 6'-0" piece of sheet metal. How many square yards are required?

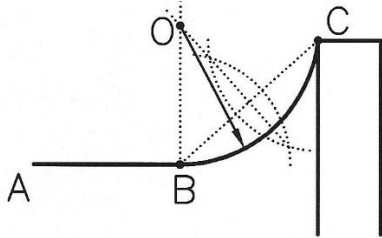
- A. 1
- B. 1.5
- C. 2
- D. 2.5
- E. 3

5. Identify the number of degrees (less than 180°) for angle A-O-D?

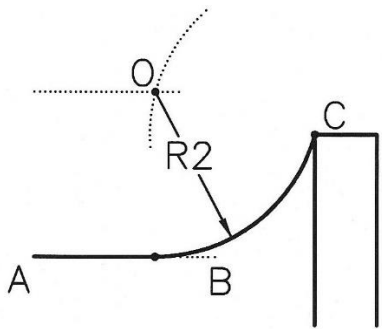


- A. 30°
- B. 45°
- C. 95°
- D. 105°
- E. 135°

6. Arc BC has an unspecified radius but needs to go through point C and yet be tangent to line AB at B. Point O is therefore found directly above point B and on a _____ line of chord BC.

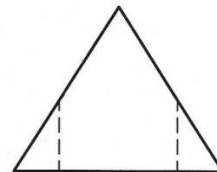
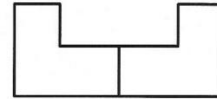


- A. radial
 B. ray
 C. tangent
 D. bisector
 E. parallel
7. The design below requires a 2" arc tangent with line AB and going through point C. Therefore, Center O is found at the intersection of a line _____ and a 2" arc swung from point C.



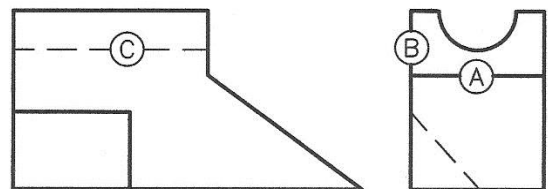
- A. parallel with line AB
 B. perpendicular to endpoint B
 C. tangent with line AB
 D. 75° above and left of point B
 E. 15° above and left of point C

8. In engineering graphics, it is common to number the vertices of an object in order to help solve a problem. How many unique vertices does this object have?



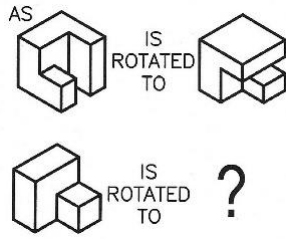
- A. 11
 B. 12
 C. 13
 D. 14
 E. 15
9. The figure below illustrates the three possible meanings of a multiview line: (A) only the edge where two surfaces intersect; (B) an "edge view" of a flat surface as a line; or (C) the maximum contour element of a curved surface.

In the front view (below left), how many of the seven visible lines have meaning B (an "edge view" of a flat surface as a line)?



- A. 2
 B. 3
 C. 4
 D. 5
 E. 6

10. The following is similar to a test item from the **Purdue Visualization of Rotations** test:

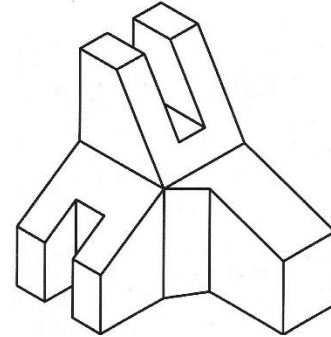


- A.
- B.
- C.
- D.
- E.

11. Of the following types of lines in the ASME "alphabet of lines," which is often drawn at a 45° angle?

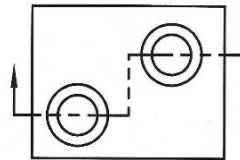
- A. Section lines
- B. Long break lines
- C. Center lines
- D. Stitch lines
- E. Phantom lines

12. In isometric grid sketches, normal edges of an object all fall on the isometric grid. How many inclined or oblique edges (non-isometric lines) are there with the object illustrated below?



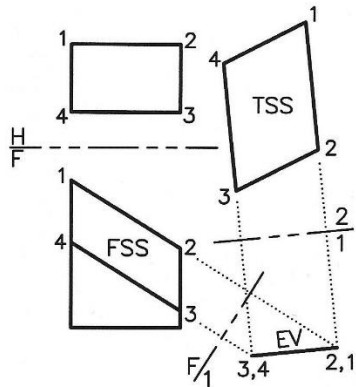
- A. 11
- B. 12
- C. 13
- D. 14
- E. 15

13. Which of the following is a proper offset section view of this object that features counterbored holes?



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

14. Study the auxiliary view illustration below, and then identify the FALSE statement.



- A. EV = estimated vector
- B. TSS = true size and shape
- C. F/1 = frontal/primary auxiliary fold line
- D. FSS = foreshortened size and shape
- E. 1/2 = primary/secondary auxiliary fold line

15. Identify the manufacturing process that could properly be accomplished with the tool illustrated below.

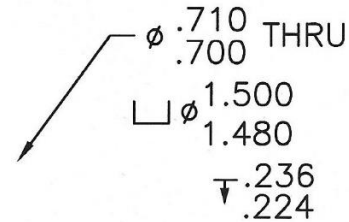


- A. Counterboring
- B. Broaching
- C. Riveting
- D. Reaming
- E. Countersinking

16. Within a 3D solid modeling program, some features may be called **cosmetic** features. By definition, these are features that appear somewhat realistic in the model, but are NOT geometrically constructed. Which of the following would be a likely example?

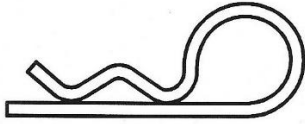
- A. Counterbores
- B. Chamfers
- C. Holes
- D. Threads
- E. Fillets

17. Identify the TRUE statement with respect to the **tolerances** expressed in this local note callout.



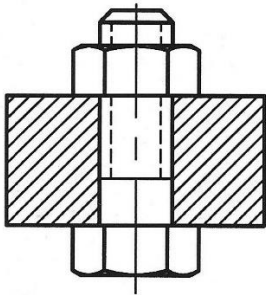
- A. The counterbore diameter has the least amount of tolerance
- B. The depth tolerance could also be expressed as $.230 \pm .006$
- C. The THRU hole has a maximum material condition of $.710$
- D. The hole diameter has the most tolerance
- E. The counterbore has a maximum material condition of 1.500

18. What type of pin is illustrated below?



- A. Clevis
- B. Cotter
- C. Woodruff
- D. Clip
- E. Circular

19. What name is applied to the method of screw thread representation shown below?

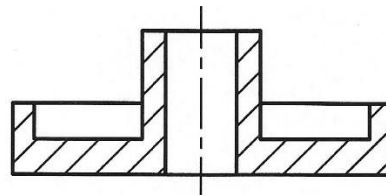


- A. Schematic
- B. Detailed
- C. Metric
- D. True projection
- E. Simplified

20. An engineer needs to design and create all the models and drawings for mass producing a pair of bolt cutters with seven unique parts and standard fasteners. Using a 3D parametric program, many options exist, but identify the **most likely** FALSE statement from the following:

- A. Part models can be individually modeled and stored as part files
- B. An assembly file can be created by importing, linking, and constraining the part models together
- C. Fasteners can be imported as parts from standard fastener libraries
- D. Drawing sheets with standard views can be created automatically from the part models, although all dimensions and notes will need to be added manually
- E. An assembly parts list can be generated automatically on an assembly drawing sheet, and it will update as parts are changed or added.

21. How many dimensions will be necessary to fully describe the size of this cylindrical part and all of its features?



- A. 7
- B. 8
- C. 9
- D. 10
- E. 11

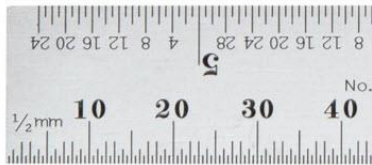
22. A newer symbol for local notes was recently added to the ASME standards:



What does this symbol represent?

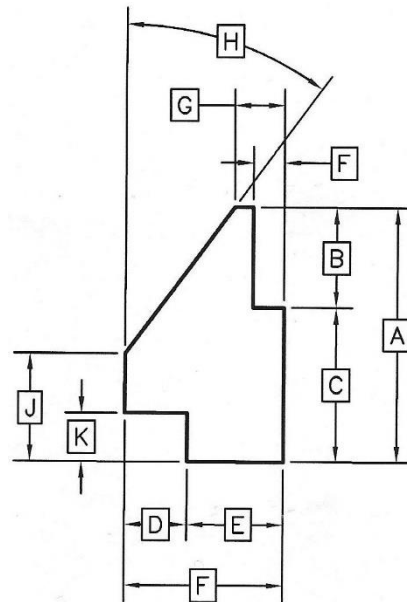
- A. Spherical face
- B. Secondary fillet
- C. Spotface
- D. Slope fast
- E. Special finish

23. This enlarged view of one end of a Starrett™ steel rule features both Imperial and Metric units. On the inch edge, the numeral 5 is 5" away from the other end of the scale. What numeral value would be assigned to the other end of the scale on the metric edge?



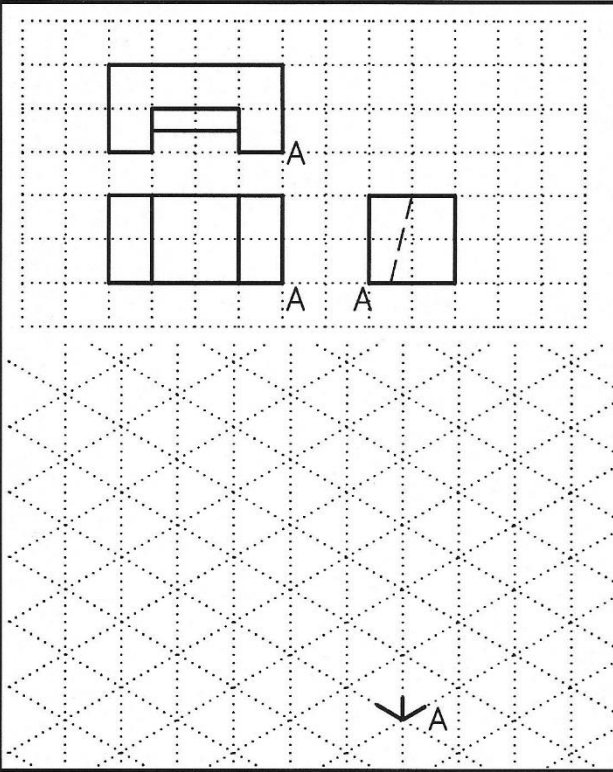
- A. 100
- B. 150
- C. 200
- D. 250
- E. 300

24. In the illustration below, how many dimensions, if any, should be removed to eliminate superfluous dimensioning?

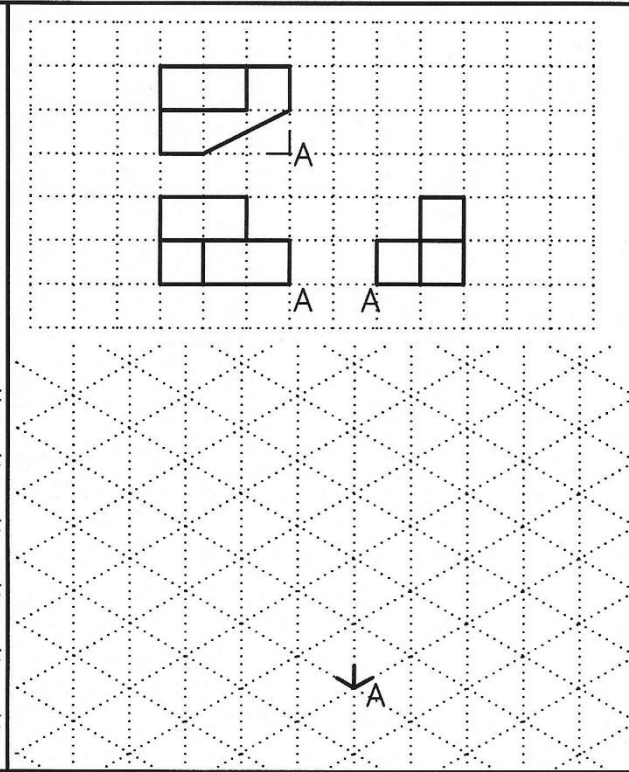


- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

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

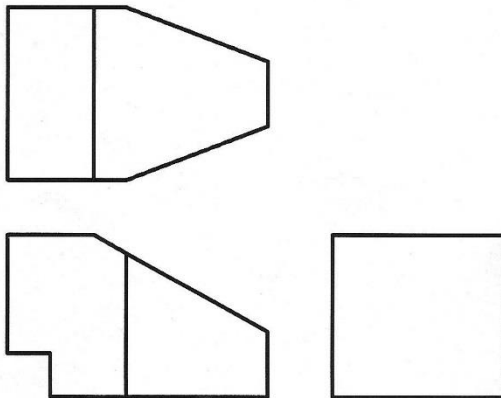


25. NUMBER OF LINE SEGMENTS:
A. 15 B. 16 C. 17 D. 18 E. 19

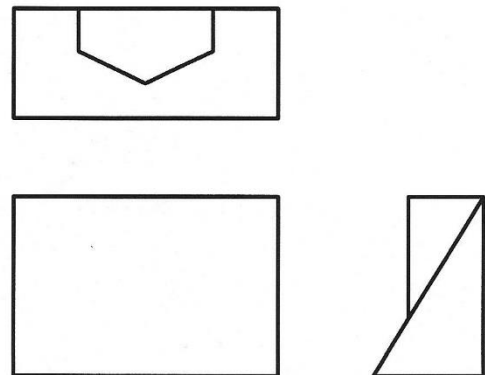


26. NUMBER OF LINE SEGMENTS:
A. 20 B. 21 C. 22 D. 23 E. 24

**PROBLEMS 27 & 28: MISSING LINE PROBLEMS: SELECT AN ANSWER THAT
CORRESPONDS WITH THE LEAST NUMBER OF LINE SEGMENTS (VISIBLE AND/OR
HIDDEN) STILL NEEDED TO COMPLETE A CORRECT AND VALID MULTIVIEW DRAWING**

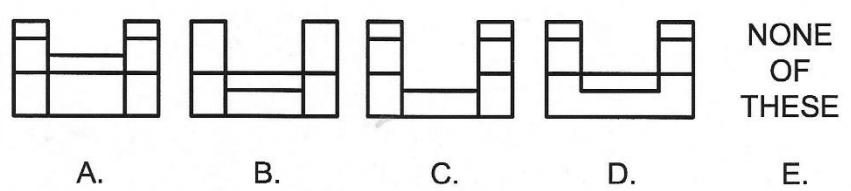
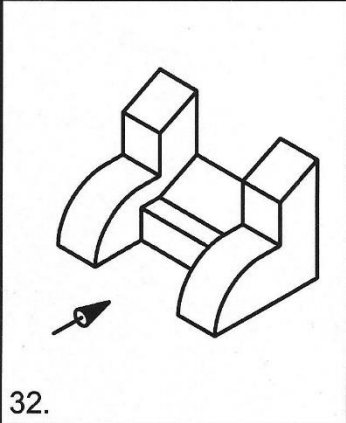
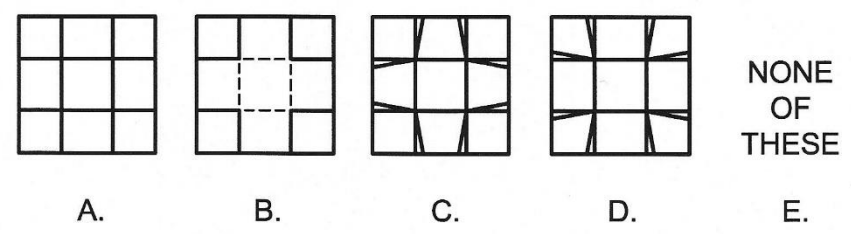
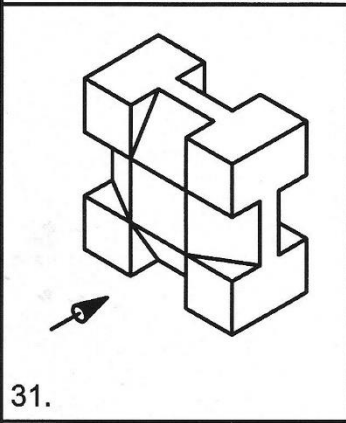
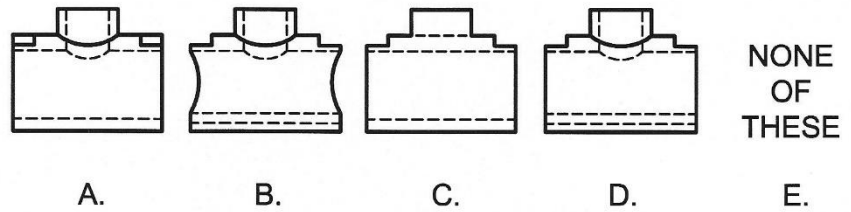
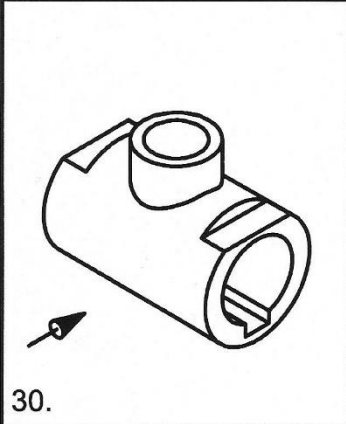
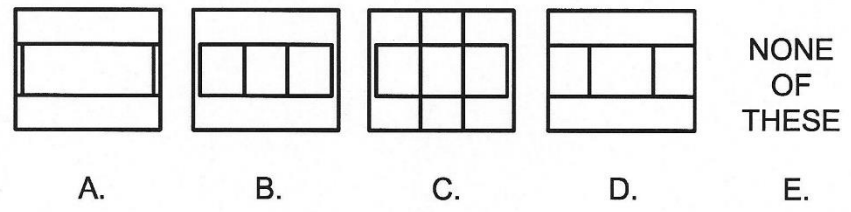
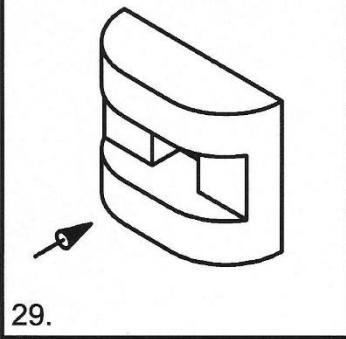


27. MINIMUM NUMBER OF LINES:
A. 3 B. 4 C. 5 D. 6 E. 7

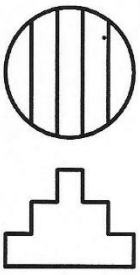
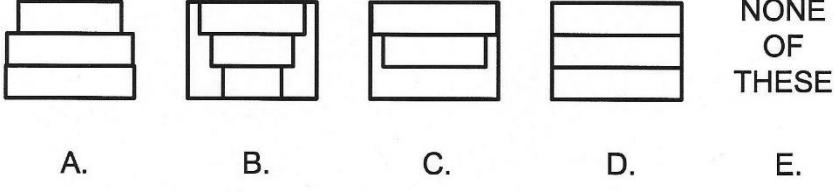
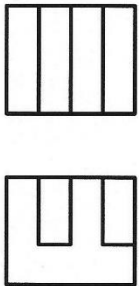
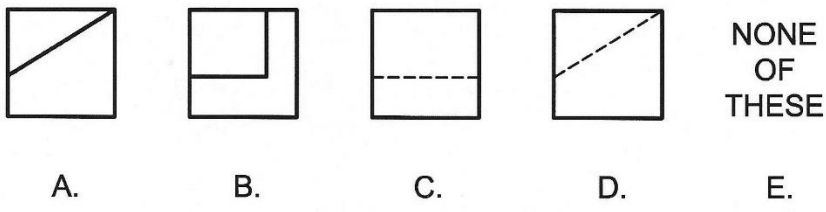
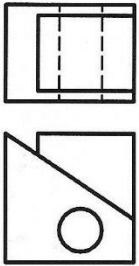
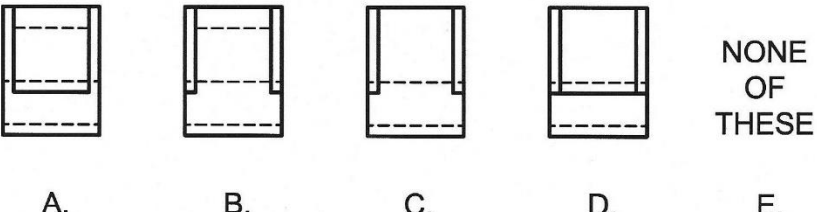
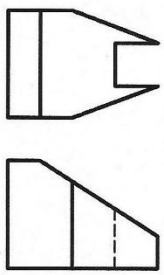
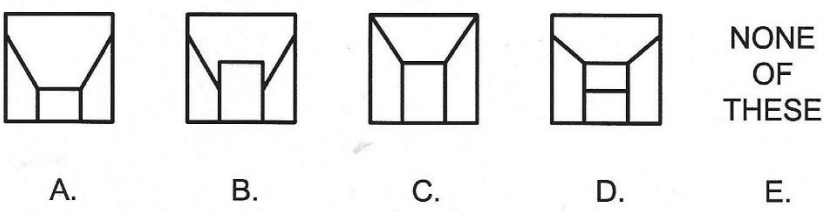


28. MINIMUM NUMBER OF LINES:
A. 3 B. 4 C. 5 D. 6 E. 7

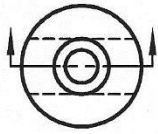
FOR EACH PROBLEM ON THIS PAGE, SELECT A FRONT VIEW
 NOTE: CENTER LINES OMITTED ON THIS TEST



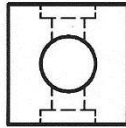
FOR EACH PROBLEM ON THIS PAGE, SELECT A SIDE VIEW
 NOTE: CENTER LINES OMITTED ON THIS TEST

<p>33.</p>  <p>?</p>	 <p>A. B. C. D. E.</p>
<p>34.</p>  <p>?</p>	 <p>A. B. C. D. E.</p>
<p>35.</p>  <p>?</p>	 <p>A. B. C. D. E.</p>
<p>36.</p>  <p>?</p>	 <p>A. B. C. D. E.</p>

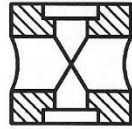
FOR EACH PROBLEM ON THIS PAGE, SELECT A FRONT SECTIONAL VIEW
 NOTE: CENTER LINES OMITTED ON THIS TEST



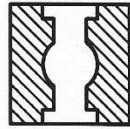
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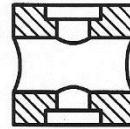
37.



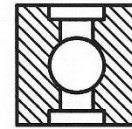
A.



B.



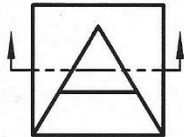
C.



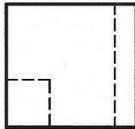
D.

NONE OF THESE

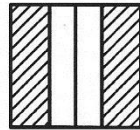
E.



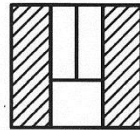
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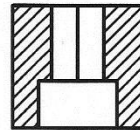
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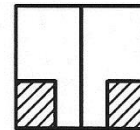
A.



B.



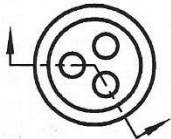
C.



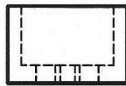
D.

NONE OF THESE

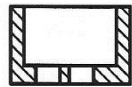
E.



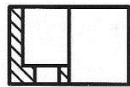
?



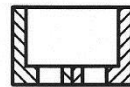
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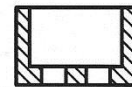
A.



B.



C.



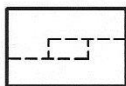
D.

NONE OF THESE

E.



?



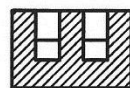
40.



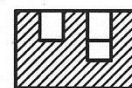
A.



B.



C.



D.

NONE OF THESE

E.