



# 2024 Academic Challenge

## ENGINEERING GRAPHICS TEST – REGIONAL

– This Test Consists of 40 Questions –

### Engineering Graphics Test Production Team

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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!**

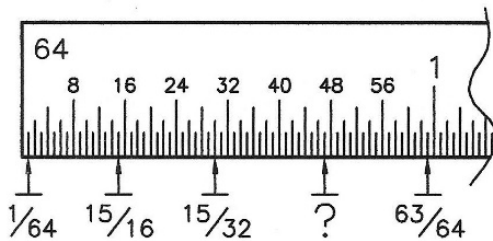
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Academic Challenge  
Engineering Graphics Test (Regional) - 2024

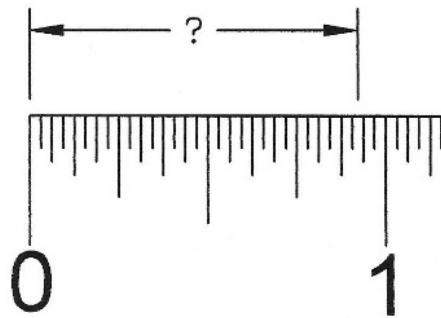
- Considering both architectural and engineering systems, which of the following is NOT a standard paper size?
  - 11" x 17"
  - 24" x 36"4
  - 22" x 34"
  - 8" x 12"
  - 17" x 22"

- What decimal measurement is equivalent to the tick mark that features a question mark?



- .719"
  - .726"
  - .734"
  - .742"
  - .750"
- What geometric shape is featured in screw threads, compression springs, and candy canes?
    - Helix
    - Parabola
    - Involute
    - Spiral
    - Cycloid

- As the extension line doesn't hit perfectly, what measurement is the **best estimate** for the dimension shown, halfway between two tick marks?

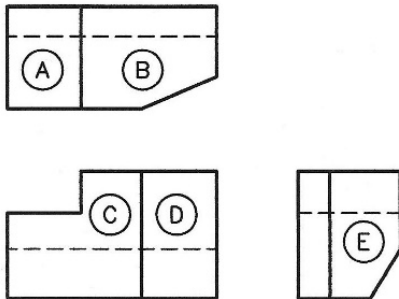


- 7/8"
  - 15/16"
  - 29/32"
  - 59/64"
  - 61/64"
- Most engineering drawings feature the dimensional numerals on the page in a **unidirectional** format. Most architectural drawings use the \_\_\_\_\_ system, wherein values line up with the dimension lines, and read from the bottom or right.
    - aligned
    - bidirectional
    - contour
    - linear
    - polar

6. If a line intersects a circle in two points, not going through the center, the line segment inside the circle is referred to as a \_\_\_\_\_ .

- A. Radial
- B. Chord
- C. Quadrant
- D. Tangent
- E. Sequent

7. Five surface shapes have been labeled in the drawing below. Which labeled surface shape is **NOT** appearing true size?

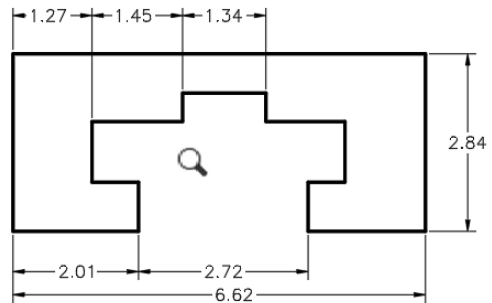


- A. A
- B. B
- C. C
- D. D
- E. E

8. One of the common formats for creating a drawing that can be printed as a hard-copy or viewed on a device without the CAD software itself being present is the PDF format. What does PDF stand for?

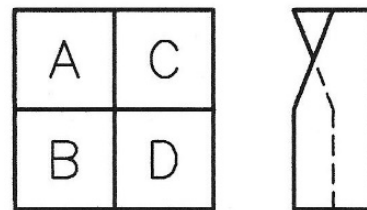
- A. Personal Drafting File
- B. Private Design File
- C. Printable Digital Format
- D. Public Drawing Format
- E. Portable Document Format

9. How many additional dimensions are needed to fully dimension this non-symmetrical shape?



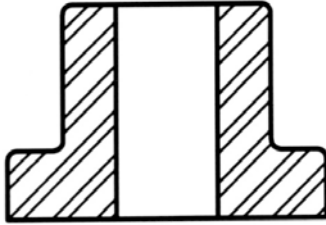
- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

10. With respect to a viewer in front of the object, looking at the front view (the one with labels), which of the following statements is **TRUE**?

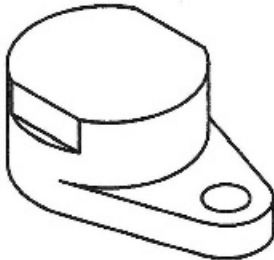


- A. A & C are on the same plane
- B. A is closer to the viewer than B
- C. B & C are inclined to the viewer
- D. C is closer to the viewer than D
- E. None of the four labeled surfaces appear true size

11. What can be determined for certain by analyzing the illustration below?

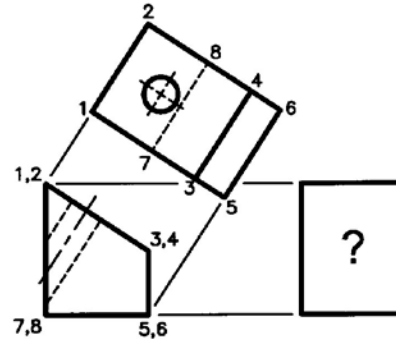


- A. The part is cylindrical
  - B. The hole is threaded
  - C. The hole is countersunk
  - D. The part is balanced
  - E. The part is made of steel
12. Often in a multiview drawing, a line represents the **maximum contour element** of a curved surface. In the **front** and **right side** views of the object shown below, how many **visible** and **hidden** lines will have that meaning?



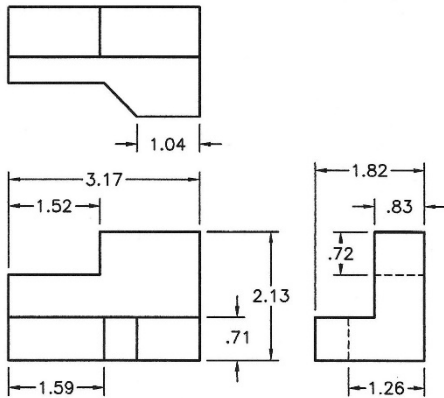
- A. 5
- B. 6
- C. 7
- D. 8
- E. 9

13. The illustration below features an auxiliary view looking through a hole drilled perpendicular to the inclined surface. With respect to the incomplete **right side view**, which of the statements below is **FALSE**?



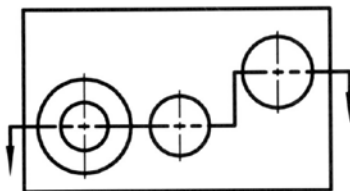
- A. A visible line segment for edge 3-4 is missing
  - B. The hole intersection at inclined surface 1-2-3-4 should appear as a visible circle
  - C. The hole intersection at surface 1-2-8-7 should appear as a hidden ellipse
  - D. The hole representation will include two straight hidden lines
  - E. Surface 1-2-4-3 will not show true size and shape
14. If a front view features four cutting-plane lines, there is also a chance there are four \_\_\_\_\_ section views within the drawing?
- A. removed
  - B. offset
  - C. broken-out
  - D. revolved
  - E. half

15. In dimensioning, the **contour rule** means place the dimension in the view where you best see the shape or profile of the feature. In the illustration below, how many dimensions, if any, break the contour rule?



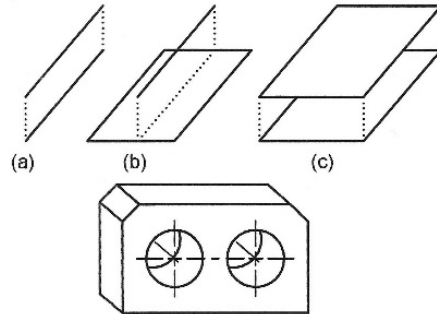
- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

16. In the front view below, a rectangular block features three holes: (l-r) a counterbored through hole, a blind drilled hole, and a single through hole. In a top view offset section (not shown), how many "bounded areas" will require section lines?



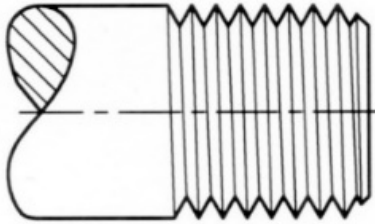
- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

17. The figure below illustrates three ways a parallelism relationship can exist between lines and planes. Identify the **FALSE** statement with respect to the object pictured below the three diagrams.



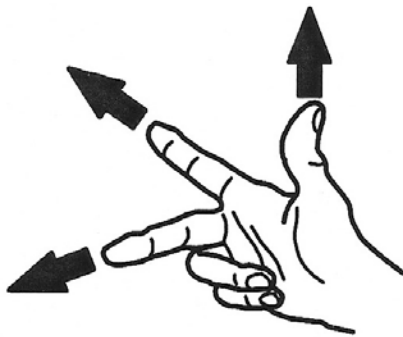
- A. The two axes of the holes are like two parallel lines
- B. The six edges that connect the front surface with the back surface are like lines all parallel with each other
- C. The front and back surfaces are like two parallel planes
- D. The eight edges of the two inclined surfaces are like lines all parallel with each other
- E. A hole axis and the top of the object is like a line parallel with a plane

18. In the illustration below, what is the most obvious sign that the screw threads are **NOT** drawn as **true projection**?



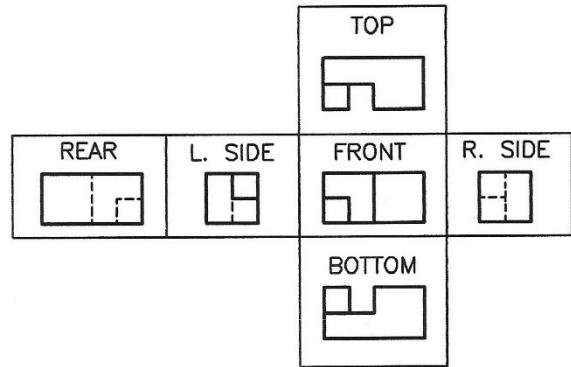
- A. The crests are not chamfered
- B. The crest and root lines are straight line segments
- C. The V-grooves are not the correct angle
- D. The roots are not rounded
- E. The crest and root lines slope the wrong direction

19. In 3D CAD modeling, what is often assigned to the index finger in the illustration below?



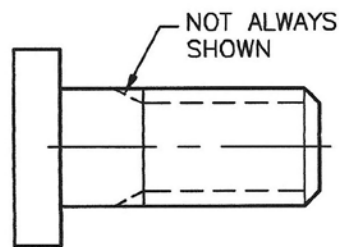
- A. Blue axis
- B. Width
- C. +Y
- D. Height
- E. +X

20. The illustration below features the six principal views of an object arranged in a standard orthographic glass box development. Which view is in error?



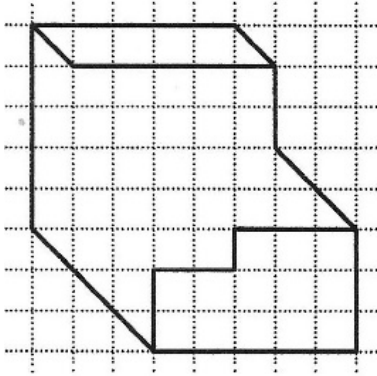
- A. Top
- B. Right side
- C. Bottom
- D. Left side
- E. Rear

21. As illustrated on the simplified thread representation below, a local note states that the given line is not always shown. What does that line indicate?



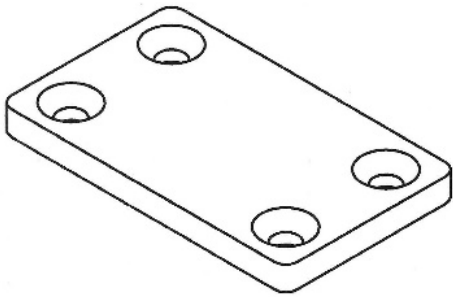
- A. A runout
- B. An undercut
- C. A neck
- D. A reverse chamfer
- E. A portion of the part that has partial threads

22. The oblique pictorial illustration below illustrates an object with all normal surfaces. At minimum, how many line segments are missing?



- A. 4
- B. 5
- C. 6
- D. 7
- E. 8

23. In the illustration below, the holes featured in the part are \_\_\_\_\_ for flat-head screws.



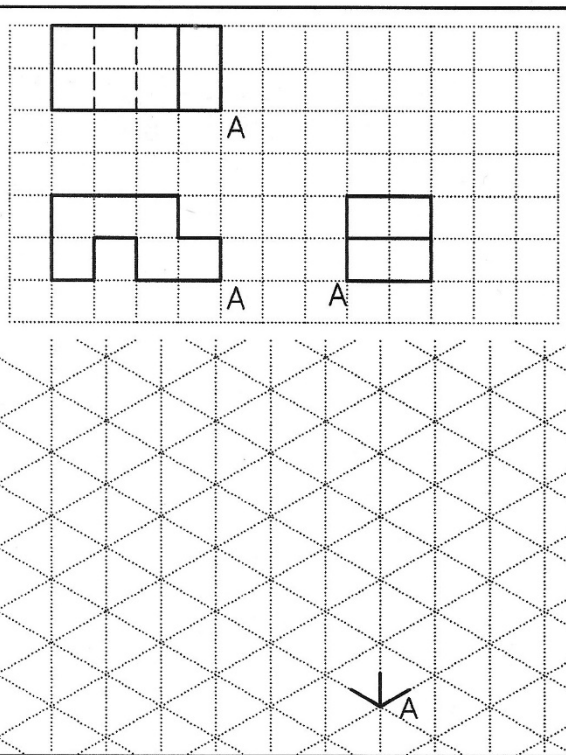
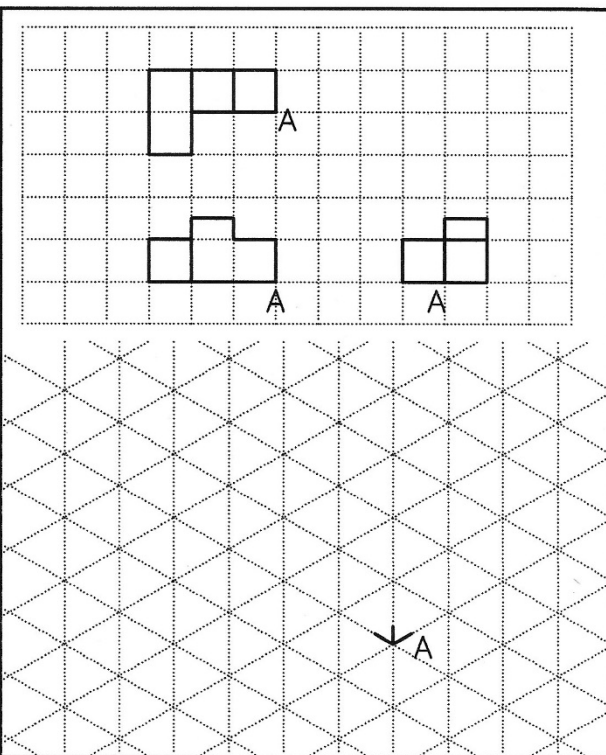
- A. countersunk
- B. reamed
- C. broached
- D. spot-faced
- E. counterbored

24. Mass-produced parts, in order to ensure that every part will fit properly with the other parts in assembly, must have a permissible amount of "oversize" and/or "undersize" for each dimension. For example, the size dimension of a hole will have two values, together called the \_\_\_\_\_, and the difference between the two values is known as the \_\_\_\_\_.

- A. clearance; allowance
- B. limits; tolerance
- C. dimensions; clearance
- D. allowance; limits
- E. tolerance; allowance



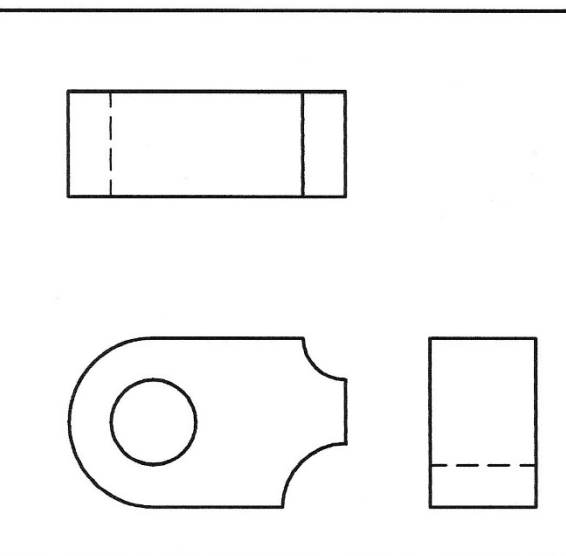
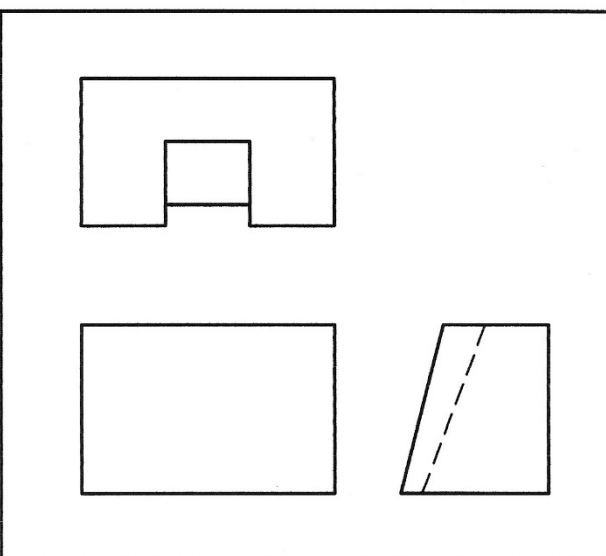
**PROBLEMS 25 & 26: CREATE ISOMETRIC SKETCHES  
SELECT AN ANSWER THAT REPRESENTS THE NUMBER OF SEGMENTS REQUIRED**

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

26. NUMBER OF LINE SEGMENTS:  
A. 19 B. 20 C. 21 D. 22 E. 23

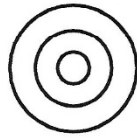
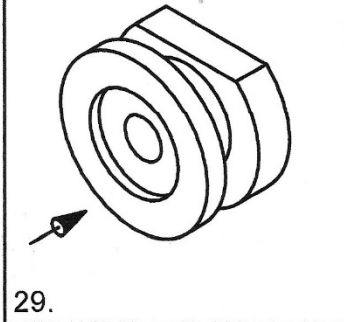
**PROBLEMS 27 & 28: MISSING LINE PROBLEMS: SELECT AN ANSWER THAT  
CORRESPONDS WITH THE LEAST NUMBER OF MISSING LINE SEGMENTS (VISIBLE  
AND HIDDEN) IT WILL TAKE TO CREATE A CORRECT MULTIVIEW DRAWING**

	
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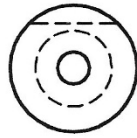
27. MINIMUM NUMBER OF LINES:  
A. 1 B. 2 C. 3 D. 4 E. 5

28. MINIMUM NUMBER OF LINES:  
A. 2 B. 3 C. 4 D. 5 E. 6

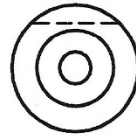
FOR EACH PROBLEM, SELECT THE CORRECT FRONT VIEW  
 NOTE: CENTER LINES OMITTED ON THIS TEST PAGE



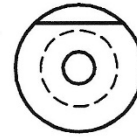
A.



B.

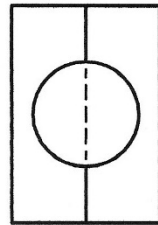
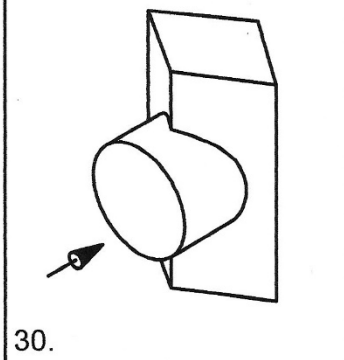


C.

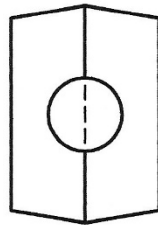


D.

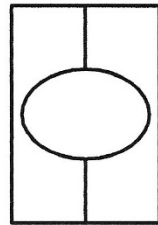
NONE  
OF  
THESE  
E.



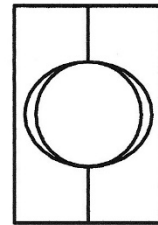
A.



B.

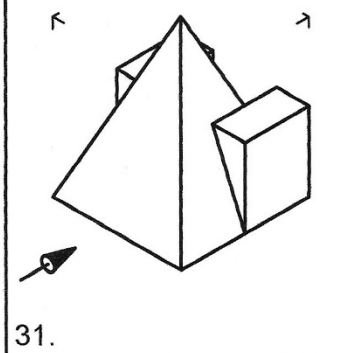


C.

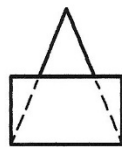


D.

NONE  
OF  
THESE  
E.



A.



B.

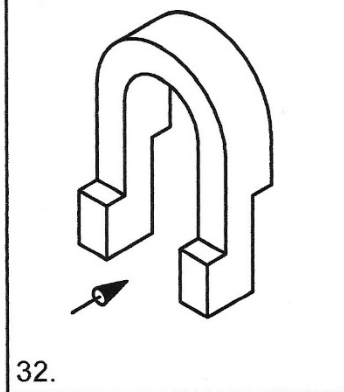


C.

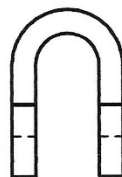


D.

NONE  
OF  
THESE  
E.



A.



B.

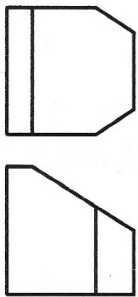
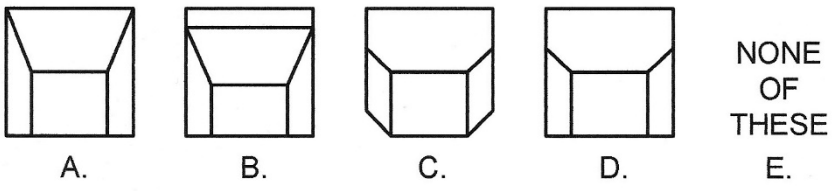
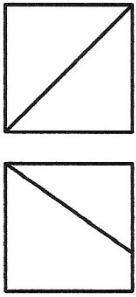
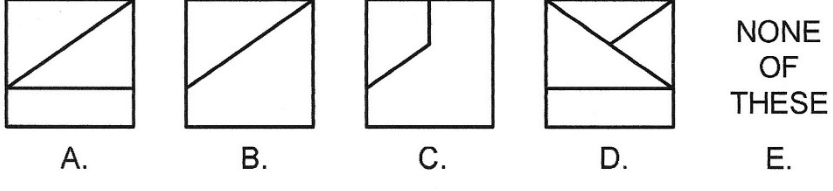
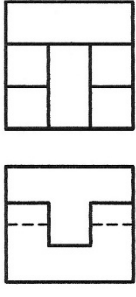
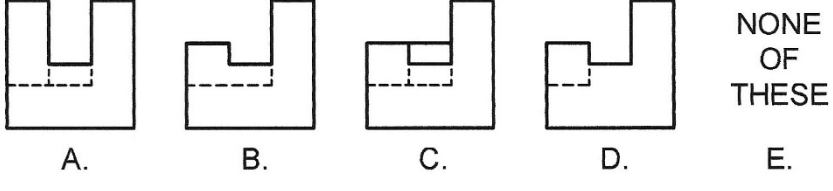
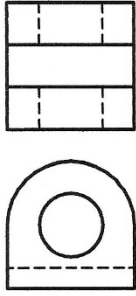
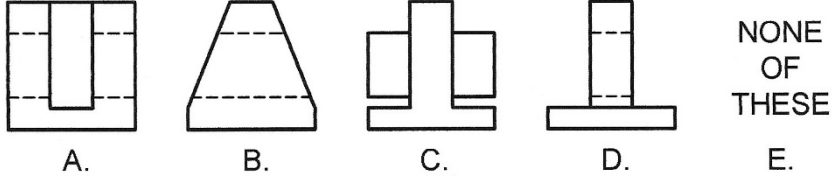


C.



D.

NONE  
OF  
THESE  
E.

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

37.

?

A. B. C. D. E.

38.

?

A. B. C. D. E.

39.

?

A. B. C. D. E.

40.

?

A. B. C. D. E.

# SCRATCH PAPER

# SCRATCH PAPER

