



2013 Academic Challenge

ENGINEERING GRAPHICS TEST – SECTIONAL

– This Test Consists of 40 Questions –

Engineering Graphics Test Production Team

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Mary Weaver, WYSE – Coordinator of Test Production

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 (Sectional) - 2013

1. In addition to the geometric definition, which of the following, if any, would NOT be found on an engineering detail drawing of mass-produced parts?
 - A. Surface quality specifications
 - B. Size and location dimensions
 - C. Tolerances
 - D. Material used to make part
 - E. All of the above would be found

2. Fill in the blank with the word that would complete the sentence as a STRONG principle common to reading prints and interpreting engineering drawings:
“DO NOT _____ DRAWING”
 - A. SCALE
 - B. FAX
 - C. FOLD
 - D. COPY
 - E. SCAN

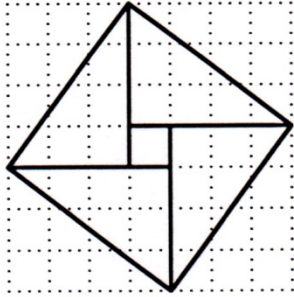
3. Until recently, engineering drawings were the sole method of transferring information from the design team to the manufacturing team. In recent decades another method has arisen, called MBD. For example, in MBD, the information captured by the CAD software can be fed automatically into a CAM system. What does MBD stand for?
 - A. Machine Build Driven
 - B. Mixed Boolean Directive
 - C. Model-Based Definition
 - D. Made By Design
 - E. Manufacturing Bore & Drill

4. According to many textbooks, technical drawing is the visual _____ of industry.
 - A. art
 - B. language
 - C. system
 - D. plan
 - E. mathematics

5. Which of the following model railroad scales is nearest in scale factor to the architectural scale of $\frac{1}{4}'' = 1'0''$?
 - A. N scale (1:160)
 - B. H0 scale (1:87)
 - C. 00 scale (1:76)
 - D. 0 scale (1:43.5)
 - E. L (Lego) scale (1:38)

6. Fill in the blank of this quote by Leonardo da Vinci with the proper word:
“There are three aspects to perspective. The first has to do with how the size of objects seems to _____ according to distance: the second, the manner in which colors change the farther away they are from the eye; the third defines how objects ought to be finished less carefully the farther away they are.”
 - A. convolute
 - B. curve
 - C. rotate
 - D. increase
 - E. diminish

7. Which of the following would be the best caption for the diagram shown?



- A. Visual proof of the Pythagorean theorem with 3-4-5 triangles (i.e. $25 \text{ in}^2 - 9 \text{ in}^2 = 16 \text{ in}^2 = 4 \text{ in}^2 \times 4$)
- B. The short side length of a 30-60 triangle is 50% of the hypotenuse length
- C. The area of an inscribed square is 50% of the area of the outer square
- D. All squares can be divided evenly into 8 equal triangles
- E. The area of a triangle is $\frac{1}{2}$ height times $\frac{4}{7}$ base
8. The front view of an orthographic projection is projected onto a frontal plane that is usually oriented parallel with the object's normal face. If the frontal plane remains stationary, what two rotation steps would cause the front view to become an isometric projection?

Rotate the object ____° and then tilt the object forward ____°.

- A. 30°;45°
- B. 35.264°;45°
- C. 45°;30°
- D. 45°;35.264°
- E. 45°;45°

9. Visualize (or sketch) the following geometric construction steps and then choose an answer that describes the resulting shape.

- i. Create Circle 1 with any diameter
- ii. Create Circle 2 with same radius with a center point at "3 o'clock" on Circle 1
- iii. Create Circle 3 with same radius with a center point at "9 o'clock" on Circle 1
- iv. Connect all points on Circle 1's circumference that coincide with the circumference or the center point of Circle 2 and/or Circle 3

- A. Square
- B. Rectangle
- C. Trapezoid
- D. Hexagon
- E. Octagon

10. Architectural drawings utilize section view principles to illustrate the floor plan of a house with a cutting _____ about 4 feet above the floor.

- A. edge
- B. view
- C. plane
- D. shadow
- E. blade

11. The manufacturing processes of **sawing**, **shearing**, **torching**, and **chiseling** are all considered sub-categories of _____.

- A. cutting
- B. assembling
- C. forging
- D. blacksmithing
- E. boilermaking

12. Oblique drawings are based on a projection system that is different than orthographic projection. Select the TRUE statement below about **oblique projections**:

- A. Projection lines are not parallel with each other
- B. Projection lines are not perpendicular to the plane of projection
- C. Projectors converge toward a station point
- D. Multiple projection planes are required
- E. Projectors converge toward a vanishing point

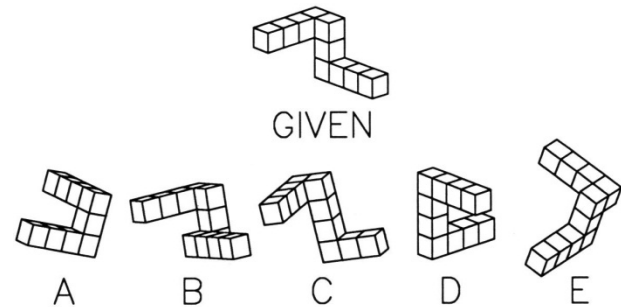
13. A benefit of CAD modeling is the potential of applying FEA software, a numerical (and now graphical) means of analyzing structural strength and material behavior. What does FEA stand for?

- A. Finished Engineers Analysis
- B. Formal Euler's Assessment
- C. Fixed Elasticity Axioms
- D. Future Equation Algebra
- E. Finite Element Analysis

14. Which of the following will most likely require a dimension line that is in the form of an arc?

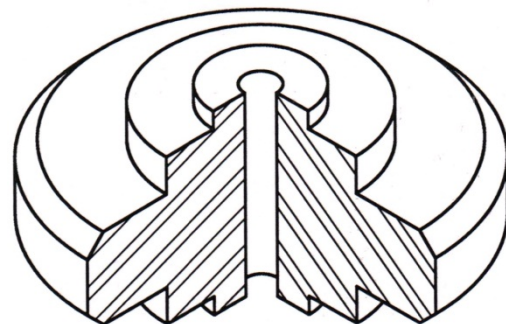
- A. Diameter of a bolt circle
- B. Size radius of a larger fillet
- C. Counter-bore depth dimension
- D. Angular dimension for wedge surface
- E. Location dimension for a hole

15. One aspect of engineering graphics is **spatial visualization**, which is sometimes measured by **mental rotation** exercises. Which of the multiple choice options is a rotation of the given object?



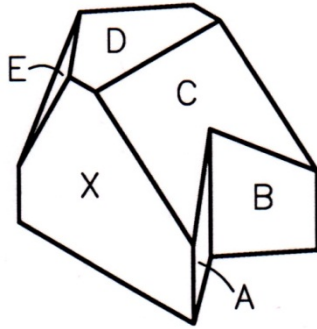
- A. A
- B. B
- C. C
- D. D
- E. E

16. The pictorial below shows an object that illustrates the principle of a _____ section view.



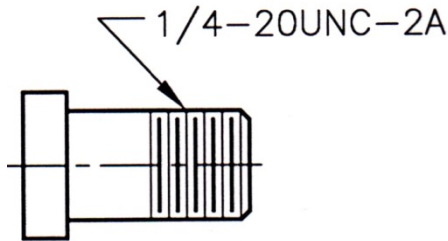
- A. half
- B. broken-out
- C. full
- D. quarter
- E. removed

17. For the object represented in the illustration below, if Surface X is true size and shape in the front view, which of the surfaces would require a **secondary auxiliary** view to show the true size and shape?



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

18. In the thread note illustrated below, what does the 2 of the 2A portion of the thread note callout represent?



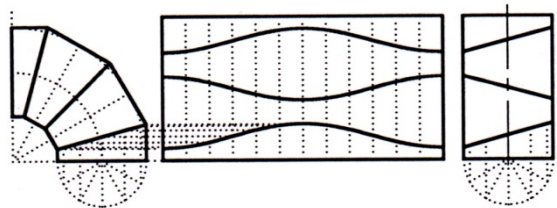
- A. Indicates an external thread
- B. Class of fit (precision quality)
- C. Indicates thread is left-handed
- D. Pitch is two threads/inch
- E. Indicates a double thread

19. Read the three statements below and determine a thread design feature that could be applied to improve design.

- i. *A nut that holds the blade on a circular table saw should tighten as the blade spins.*
- ii. *The thread that holds the pedal on a bicycle should not loosen while riding.*
- iii. *A welder's acetylene supply line connection needs to protect against oxygen supply line being connected at that junction.*

- A. Use multiple thread such as double or triple
- B. Use power thread form such as Acme
- C. Use left-handed thread
- D. Use extra fine threads
- E. Use metric threads

20. The illustration below, showing the construction of a 90° four-section elbow, is from a classic 1957 textbook by Bernard Leighton Wellman entitled **Technical Descriptive Geometry**. From which of the following chapter titles of that textbook would you expect to find this figure?

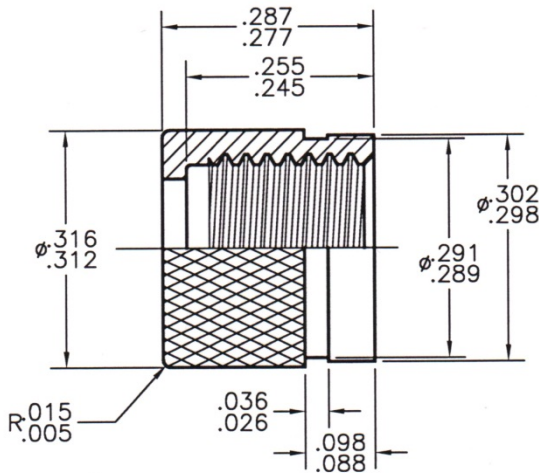


- A. Development of surfaces
- B. Revolution
- C. Warped Surfaces
- D. Double-curved surfaces
- E. Intersection of surfaces

21. Which of the following is likely to be the least important to the amount of tolerance specified for a particular fit between two parts?
- A. The machinist's ability to work with the level of precision specified
 - B. The company's standard title block specifies the tolerances for dimensions not otherwise specified
 - C. The cost of producing the parts at the level of precision specified
 - D. The parts may not function well because some parts may be too loose
 - E. The life of the parts may be shortened if the parts don't fit well

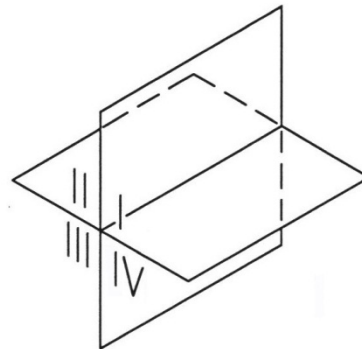
23. In standard dimensioning practice, lines used in dimensioning may or may not have "gaps" as they associate with other lines. Identify the situation described below that does require a gap:
- A. Where an extension line connects to the visible line corner
 - B. When two extension lines cross each other
 - C. When an extension line crosses a visible line
 - D. When a leader line crosses a visible line
 - E. When a center line "becomes" an extension line

22. This **coupling nut** is to be soldered to a washer-like part with a hole diameter of .304"-.310". What are the "**limits of fit**" for the knurled diameter that proves the nut will not slip into the hole?



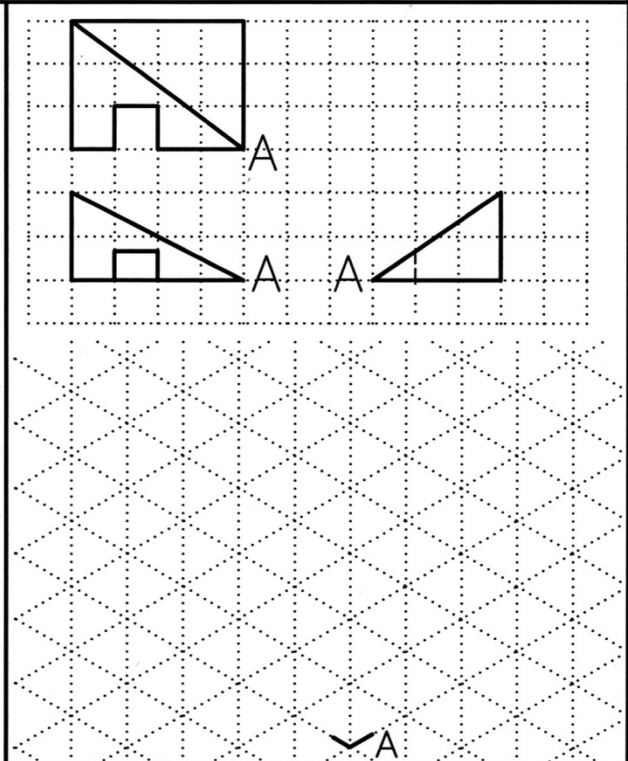
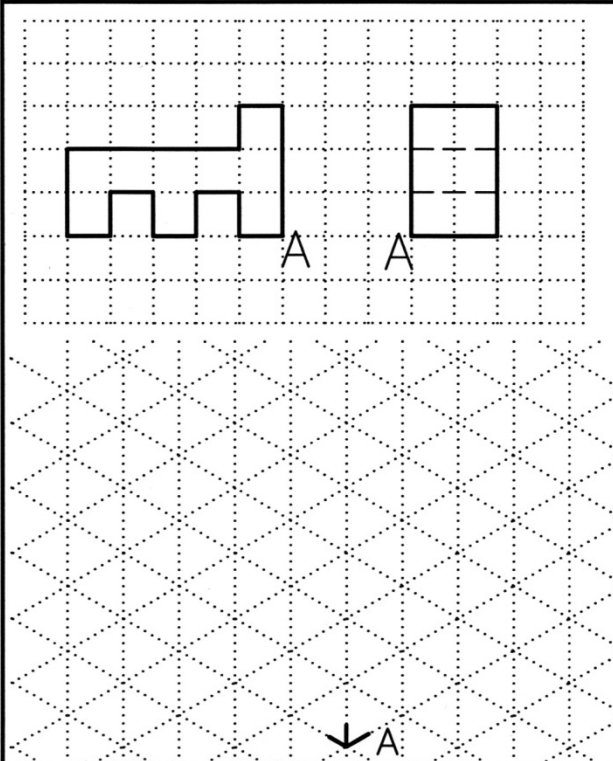
- A. .002" – .012"
- B. .013" – .021"
- C. .006" – .008"
- D. .008" – .016"
- E. .006" – .012"

24. Gaspard Monge, a French mathematician, is considered the "father of descriptive geometry." The illustration below shows Monge's division of space into four quadrants. Which of the quadrants, if any, hold more importance for American orthographic projection?



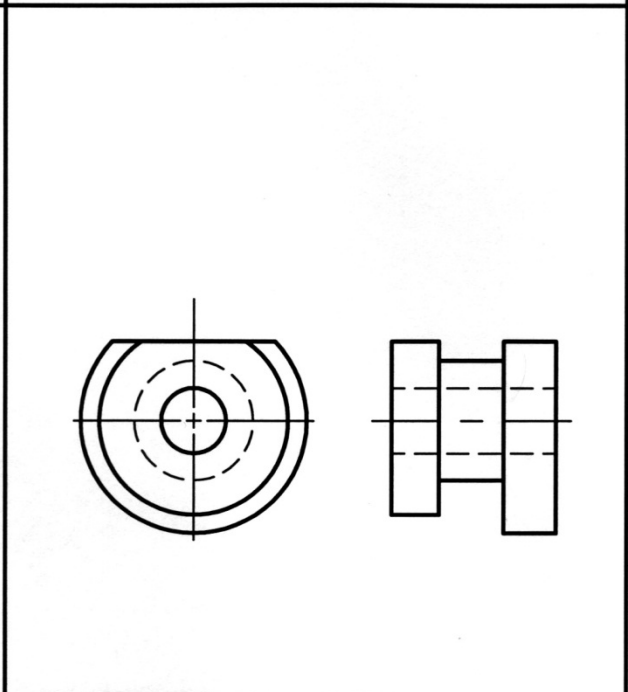
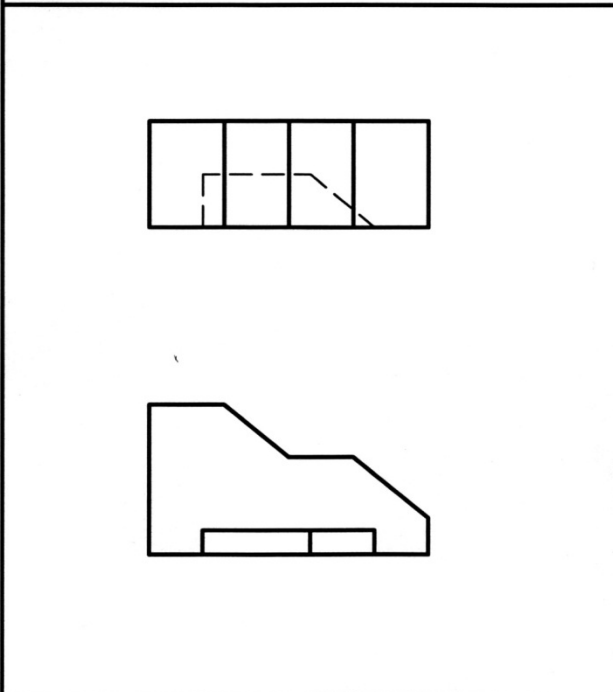
- A. First quadrant
- B. Second quadrant
- C. Third quadrant
- D. Fourth quadrant
- E. All quadrants hold equal importance

PROBLEMS 25 & 26: CREATE ISOMETRIC SKETCHES.
 PROBLEMS 27 & 28, DIMENSION COMPLETELY, BUT NO SUPERFLUOUS.



25. NUMBER OF LINE SEGMENTS:
 A. 15 B. 17 C. 19 D. 21 E. 23

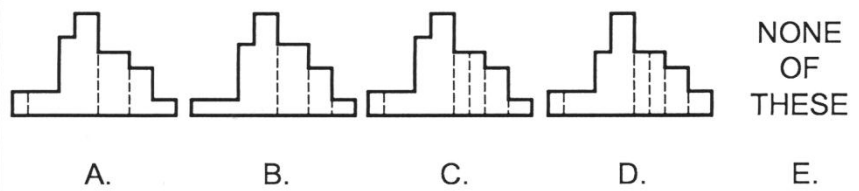
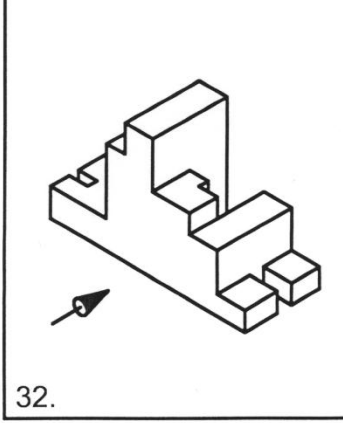
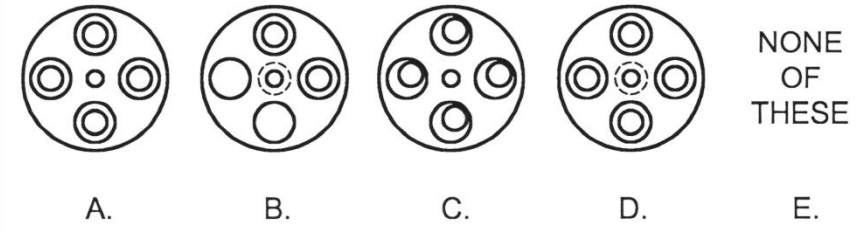
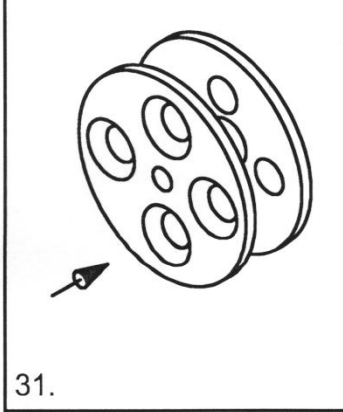
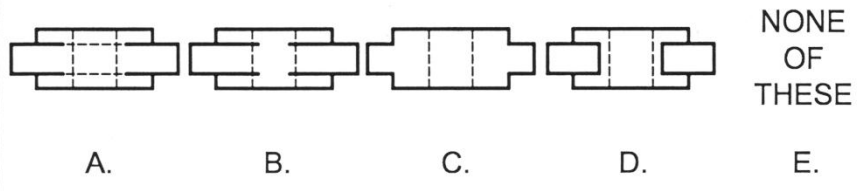
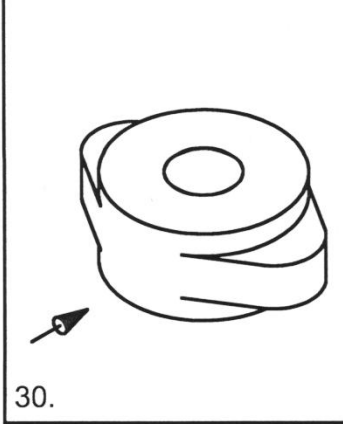
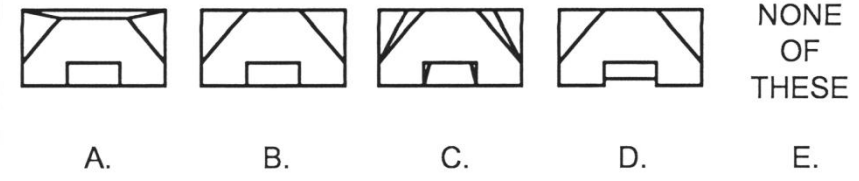
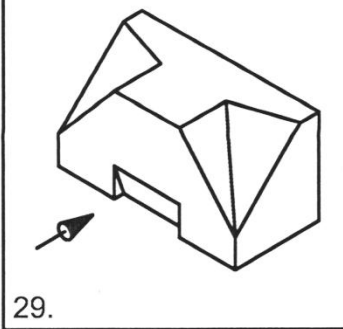
26. NUMBER OF LINE SEGMENTS:
 A. 9 B. 10 C. 11 D. 12 E. 13


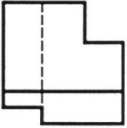
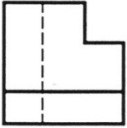
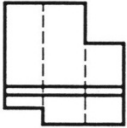
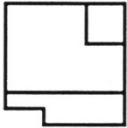


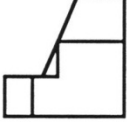
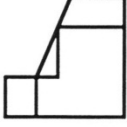

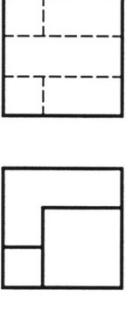
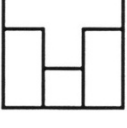


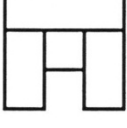


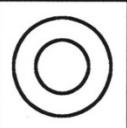
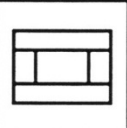
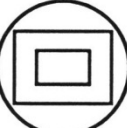


27. MINIMUM NUMBER OF DIMENSIONS:
 A. 9 B. 10 C. 11 D. 12 E. 13

28. MINIMUM NUMBER OF DIMENSIONS:
 A. 8 B. 9 C. 10 D. 11 E. 12

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>NONE OF THESE</p> <p>A. B. C. D. E.</p>					
<p>34.</p>  <p>?</p>	    <p>NONE OF THESE</p> <p>A. B. C. D. E.</p>					
<p>35.</p>  <p>?</p>	    <p>NONE OF THESE</p> <p>A. B. C. D. E.</p>					
<p>36.</p>  <p>?</p>	    <p>NONE OF THESE</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

37.

?

A. B. C. D. E. NONE OF THESE

38.

?

A. B. C. D. E. NONE OF THESE

39.

?

A. B. C. D. E. NONE OF THESE

40.

?

A. B. C. D. E. NONE OF THESE