2022 Academic Challenge

ENGINEERING GRAPHICS TEST – STATE FINALS

– This Test Consists of 40 Questions –

Engineering Graphics Test Production Team
Ryan K. Brown, Illinois State University – Author/Team Leader
Ted Branoff, 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!

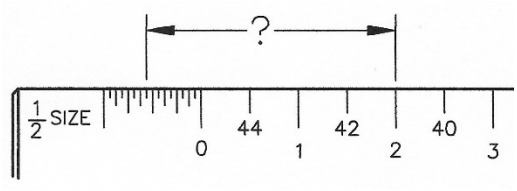
Academic Challenge
Engineering Graphics Test (State Finals) – 2022

1. The most extensive ASME drafting standard is Y14.5-2018 and is entitled _____ and Tolerancing.

   A. Dimensioning
   B. Drafting
   C. Specifications
   D. Measuring
   E. Geometrics

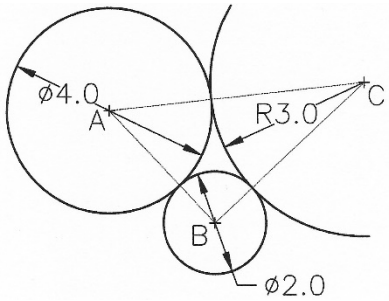
2. This mechanical engineer scale has a ½ size scale along one edge, and a ¼ size scale along the same edge, but measuring from the other end.

   What measurement is indicated below?



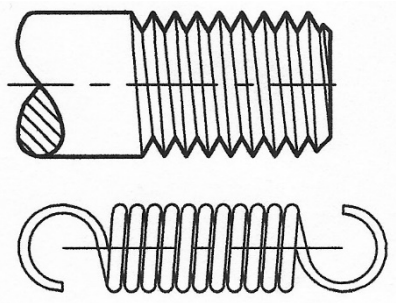
   A. 1.280”
   B. 2.562”
   C. 5.125”
   D. 10.250”
   E. 41.625”

3. Analyze the geometric construction diagram below, and then identify one **TRUE** statement?



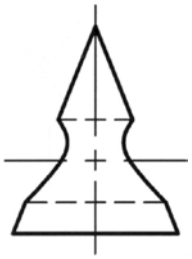
   A. Angle A-C-B is a 30° angle.
   B. There are six points of tangency shown
   C. Angle A-B-C is a right angle
   D. Line AB is the same angle “away from” horizontal as Line AC
   E. Triangle A-B-C is an isosceles triangle

4. What geometric form is unique to the two fasteners illustrated below?



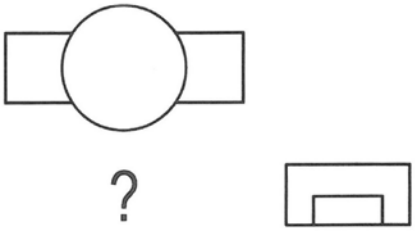
   A. Spiral
   B. Parabola
   C. Ogee Curve
   D. Involute
   E. Helix

5. Which description of the front view illustrated below is TRUE?



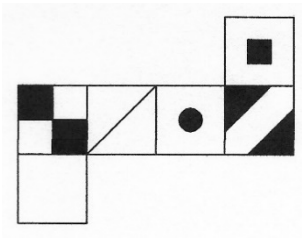
   A. A square-based pyramid with a round hole left to right
   B. A round-based cone with a square hole left to right
   C. A hexagon-based pyramid with a round hole left to right
   D. A round-based cone with a round hole left to right
   E. A square-based pyramid with a square hole left to right

6. Given a top and right side view, how many line segments will it take to create the front view of the object?



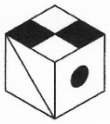
   A. 8
   B. 9
   C. 10
   D. 11
   E. 12

7. In this test of spatial visualization, which of the cubes is a correct match of the flat pattern foldout?



A. 

B. 

C. 

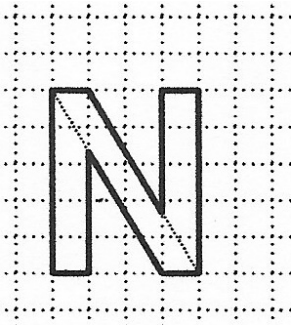
D. 

E. 

8. A sheet metal project requires a 24” x 60” piece of sheet metal. How many square yards are required?

   A. 1.11
   B. 2.35
   C. 5.50
   D. 6.00
   E. 10.00

9. How many line segments will be required to create an oblique “3D” drawing of the block lettering “N”? (Note: The depth is the distance corner-to-corner across one grid block.)



A. 7

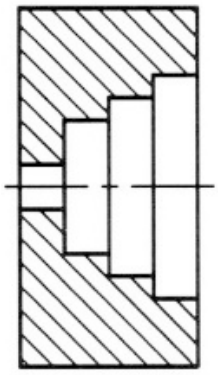
B. 8

C. 9

D. 10

E. 11

10. The illustration below is a full section <u>right side view</u> of an object. If the front view features five circles, how many will be hidden?



A. 0

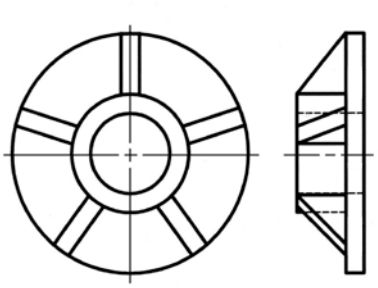
B. 1

C. 2

D. 3

E. 4

11. Given a regular front and right side view of a hub plate, and permission to change one view to a sectional view, what sectional technique is a good option for this object?



A. Use a half section view

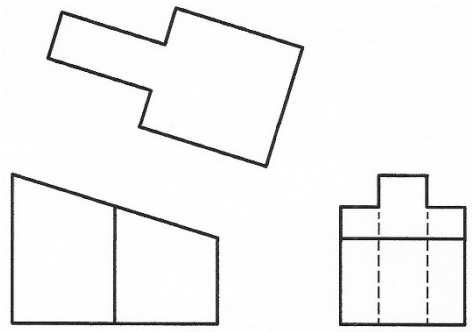
B. Use an aligned section cutting plane through the rib at “5-o’clock”

C. Pretend the countersunk hole is not countersunk

D. Use a broken out section in the front view only

E. Use a conventional “S-Break” on the side view

12. The multiview drawing below features an auxiliary view. However, the auxiliary view is incomplete. How many ***visible*** and ***hidden*** line segments are missing?



A. 2

B. 3

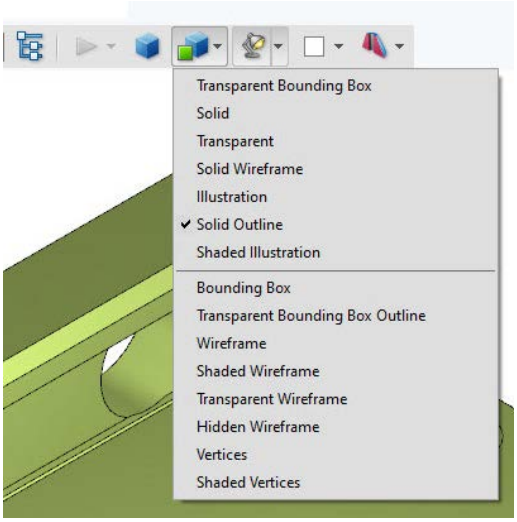
C. 4

D. 5

E. 6

13. In Adobe Reader™, a 3D PDF file can be viewed, and a menu allows the user to dynamically interact with a 3D model.

    Of the five Adobe™ pull-down menu names listed below, which is the logical name for the pull-down menu shown?



    A. Model Render Mode
    B. Toggle Cross Section
    C. Background Color
    D. Use Perspective Projection
    E. Enable Extra Lighting

14. For creating a part with additive manufacturing equipment, the CAD system may need to generate an STL file, a common file format for this technology. Which of the following was the name of an early rapid prototyping system that led to the STL acronym?

    A. SequenTial Liquid technology
    B. STereoLithography
    C. Solid Thermo-Laminating
    D. SelecTive Laser sintering
    E. Systematic Thin Layer

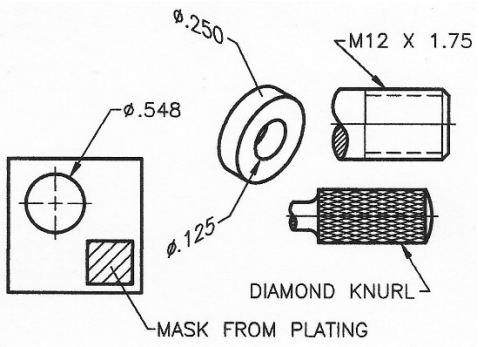
15. What product material is common for the manufacturing process represented in the picture below?

    A. Sheet metal
    B. Plastic
    C. Wax
    D. Metal wire
    E. Wood

16. Based on standard practices for dimensioning, which of the following usually has the **largest** value?

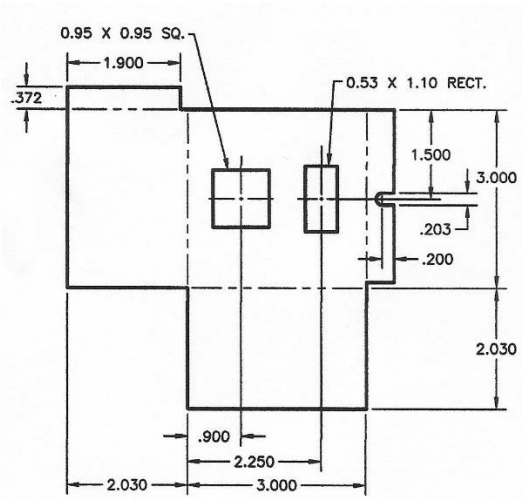
    A. Distance between the visible outline of the view and the closest dimension line
    B. Lettering height for the numeric dimension value
    C. Distance that an extension line runs past the last arrowhead
    D. Arrow length
    E. Gap between the extension line and the visible line or corner of an object

17. Two of the leader lines shown in the six applications below are missing the arrowhead. In ASME practice, what type of arrow is recommended for these two applications?



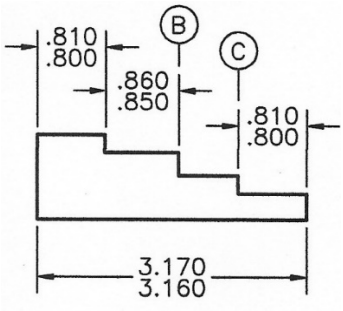
A. Hollow triangle arrow
B. An X
C. Solid filled round dot
D. Open tailed arrow
E. Solid filled square

18. What term has a relationship to the phantom lines shown in the drawing below?



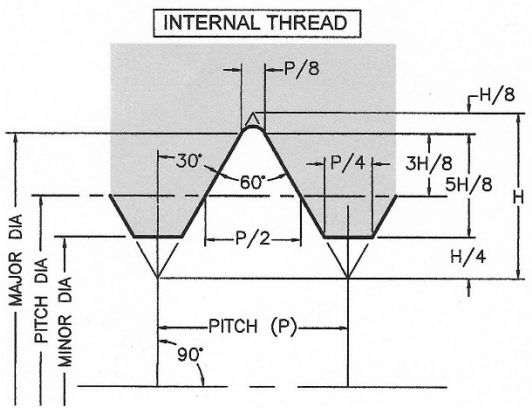
A. Bend allowance
B. Cut lines
C. Punch pattern
D. Base line
E. Extension line

19. There are four width measurements for this geometric shape. Based on the dimensions and tolerances given, what are the limits between B and C?



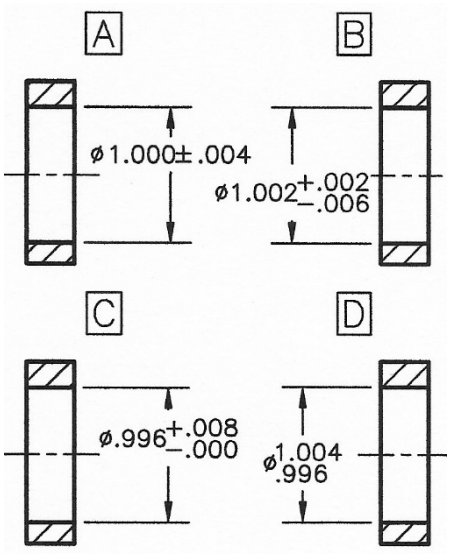
A. .670” - .700”
B. .680” - .710”
C. .690” - .720”
D. .700” - .710”
E. .700 - .740”

20. The shaded portion of the diagram below shows the exact manufacturing specifications for an **internal** Unified thread form. While based on a sharp V pattern, notice the _____ is shown rounded.



A. root
B. tip
C. flank
D. crest
E. height

21. In the illustration below, four holes have been dimensioned and given a tolerance. Which of the four, if any, has the largest tolerance?

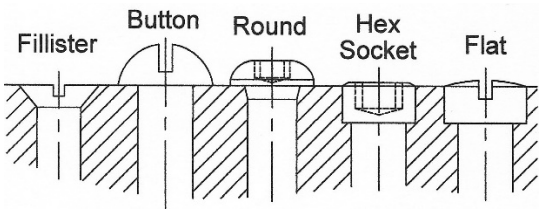


A. A
B. B
C. C
D. D
E. All of these have the same tolerance

22. In standard dimensioning practice, lines used in dimensioning may or may not have “gaps” as they associate with other lines. Which situation described below **DOES** require a gap?

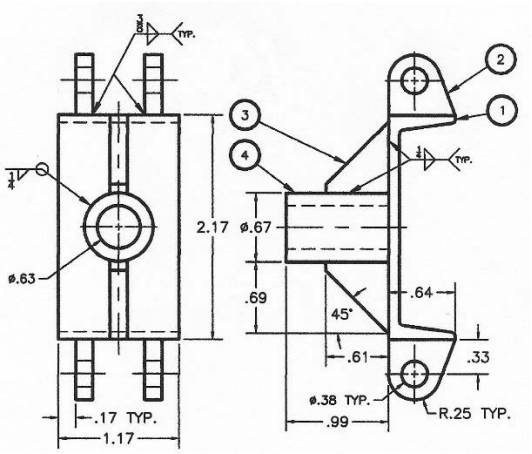
A. When two extension lines cross each other
B. When an extension line crosses a visible line
C. Where an extension line connects to the visible line corner
D. When a leader line crosses a extension line
E. When a center line “becomes” an extension line

23. How many, if any, of the fastener heads below are mislabeled?



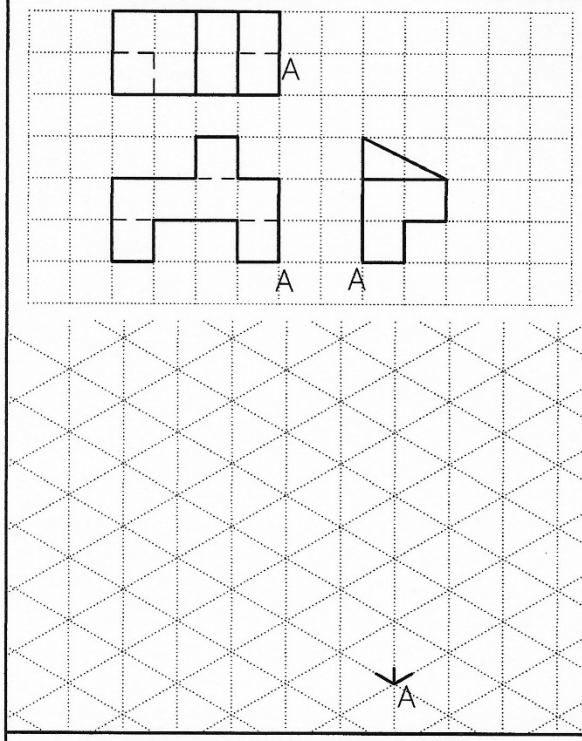
A. 0
B. 1
C. 2
D. 3
E. 4

24. In the welding drawing below, how many total pieces will be welded together to make one final (inseparable assembly) part?



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

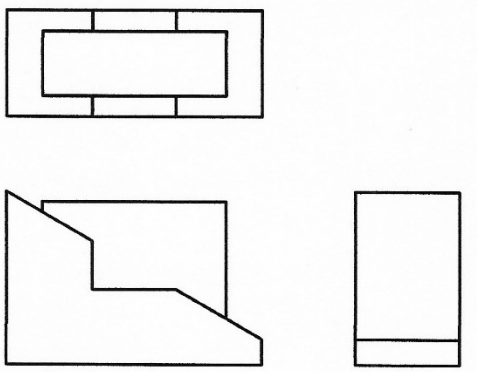
PROBLEMS 25 & 26: CREATE ISOMETRIC SKETCHES
SELECT AN ANSWER THAT REPRESENTS THE NUMBER OF SEGMENTS REQUIRED



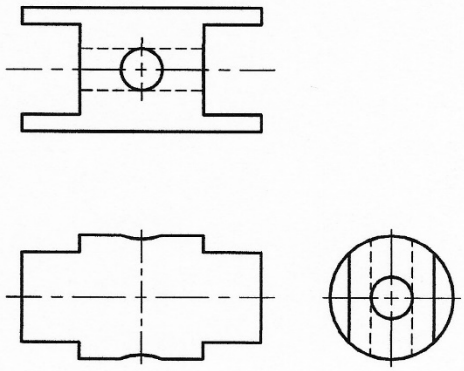
25. NUMBER OF LINE SEGMENTS:
A. 19 B. 20 C. 21 D. 22 E. 23

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

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

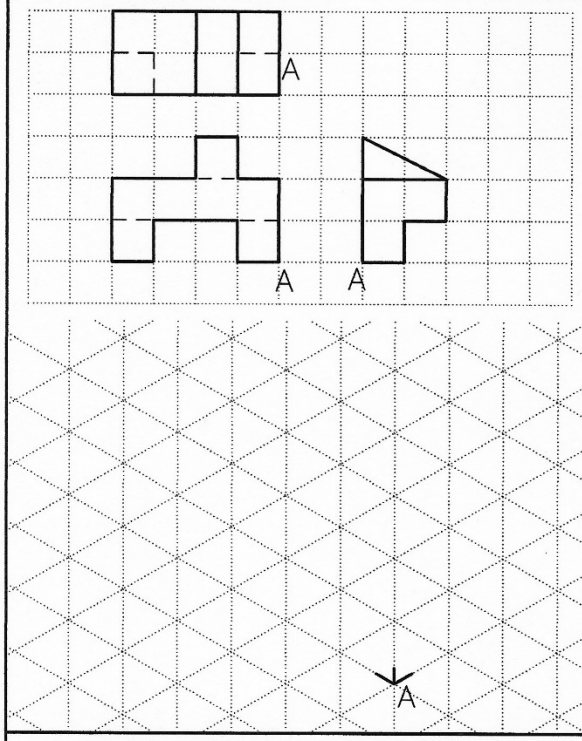


27. MINIMUM NUMBER OF LINES:
A. 5 B. 6 C. 7 D. 8 E. 9

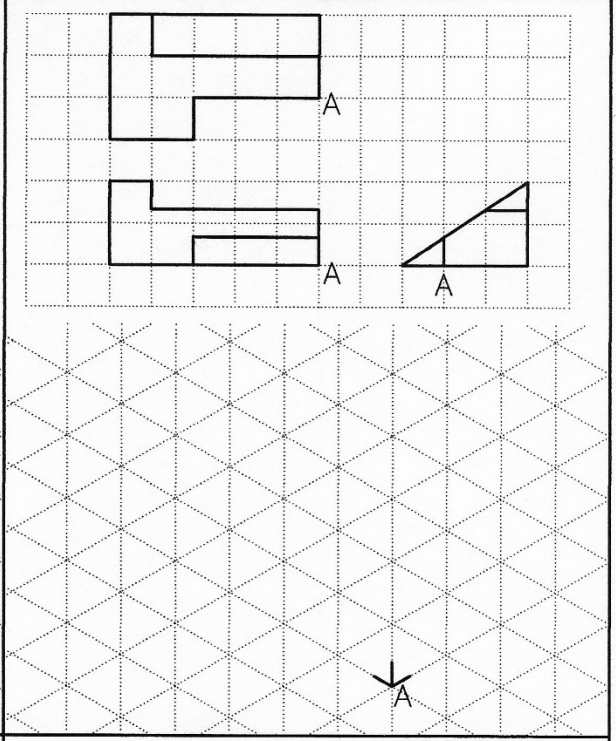


28. MINIMUM NUMBER OF LINES:
A. 9 B. 10 C. 11 D. 12 E. 13

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

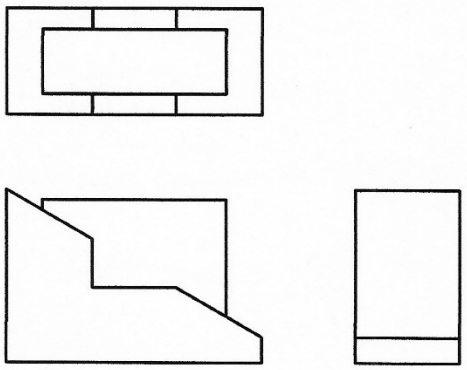


25. NUMBER OF LINE SEGMENTS:
A. 19 B. 20 C. 21 D. 22 E. 23

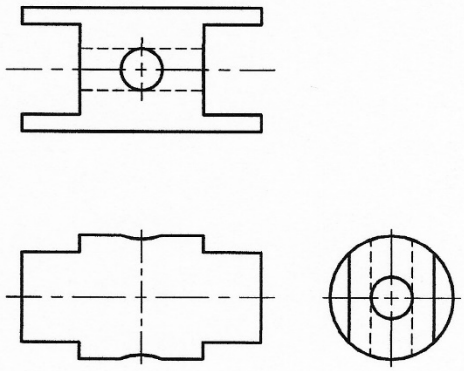


26. NUMBER OF LINE SEGMENTS:
A. 16 B. 17 C. 18 D. 19 E. 20

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



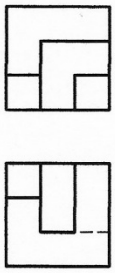
27. MINIMUM NUMBER OF LINES:
A. 5 B. 6 C. 7 D. 8 E. 9



28. MINIMUM NUMBER OF LINES:
A. 9 B. 10 C. 11 D. 12 E. 13

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

33.



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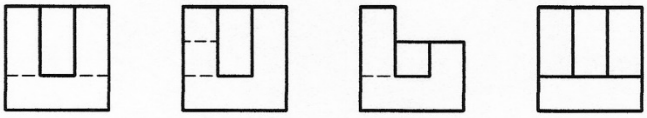
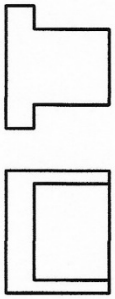


A. B. C. D. NONE OF THESE E.

34.



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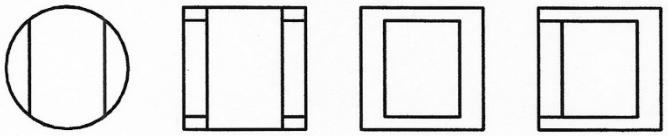
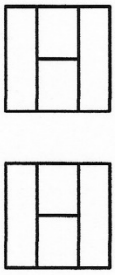


A. B. C. D. NONE OF THESE E.

35.



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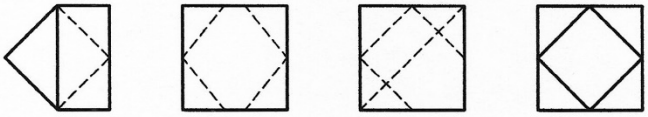
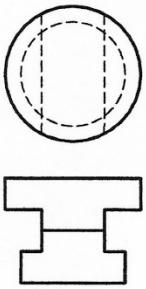


A. B. C. D. NONE OF THESE E.

36.



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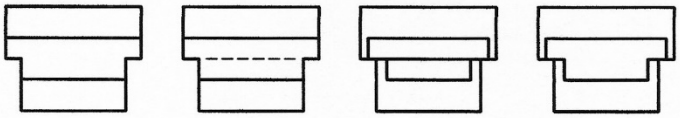
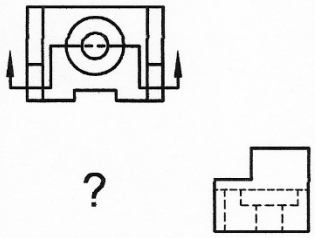


A. B. C. D. NONE OF THESE E.

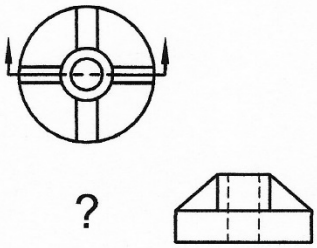
FOR EACH PROBLEM ON THIS PAGE, SELECT A FRONT SECTIONAL VIEW
NOTE: CENTER LINES OMITTED ON THIS TEST

37.



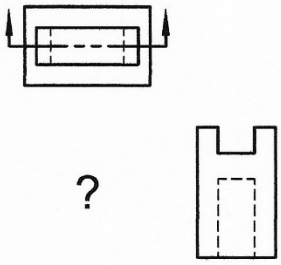
A. B. C. D. NONE OF THESE E.

38.



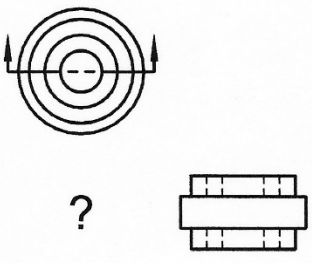
A. B. C. D. NONE OF THESE E.

39.



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

40.



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

Academic Challenge
Engineering Graphics Test (State Finals) – 2022
ANSWER KEY

Question Number	Answer	Question Number	Answer
1.	A	21.	E
2.	B	22.	C
3.	C	23.	E
4.	E	24.	A
5.	D	25.	E
6.	C	26.	C
7.	D	27.	E
8.	A	28.	D
9.	E	29.	C
10.	D	30.	E
11.	B	31.	B
12.	E	32.	D
13.	A	33.	B
14.	B	34.	A
15.	B	35.	C
16.	A	36.	D
17.	C	37.	B
18.	A	38.	A
19.	C	39.	D
20.	D	40.	E