



2023 Academic Challenge

SECTIONAL ENGINEERING GRAPHICS EXAM

Engineering Graphics Test Production Team

Ryan Brown, Illinois State University – Author/Team Leader

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!

©2023 Eastern Illinois University

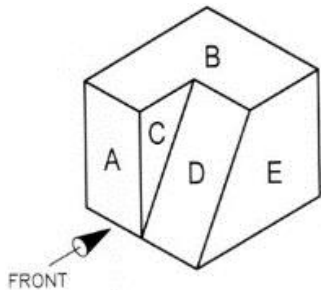
All rights reserved

Academic Challenge
2023 Sectional Engineering Graphics Exam

1. For ASME Y14.24-2020 (available for purchase at the ASME.ORG website), the description reads, "This _____ defines the types of engineering drawings most frequently used to establish engineering requirements."

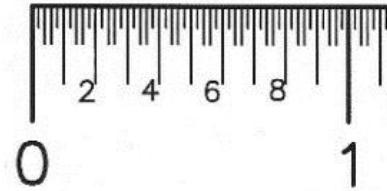
Which of the words below fills in the blank?

- A. policy
 - B. code
 - C. standard
 - D. book
 - E. document
2. Analyze the appearance of the five labeled surfaces in the pictorial. For a multiview of this object with three regular views (front, top, and right side), identify the **TRUE** statement:

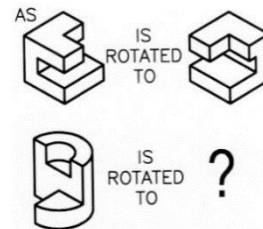


- A. Surface D appears true size and shape in two views
- B. Surface B appears true size and shape in two views
- C. Surface E appears true size and shape in two views
- D. Surface C appears as a line only in the top view
- E. Surface A appears true size and shape in only one view

3. On the scale illustrated below, what is the distance from the tick mark identified as "2" to the tick mark identified as "8"?

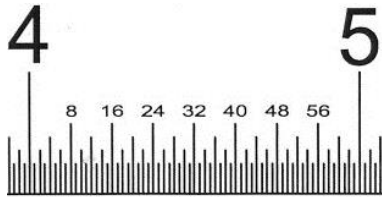


- A. .06"
 - B. .6"
 - C. 3/4"
 - D. 600 mm
 - E. 6 cm
4. The following is similar to a test item from the **Purdue Visualization of Rotations** test. Select the correct answer from the five choices:

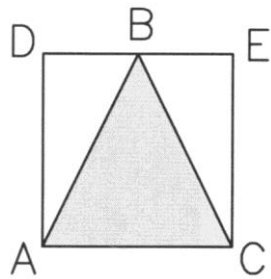


- A.
- B.
- C.
- D.
- E.

5. In the illustration below, what do the numbers between the 4 and the 5 represent?

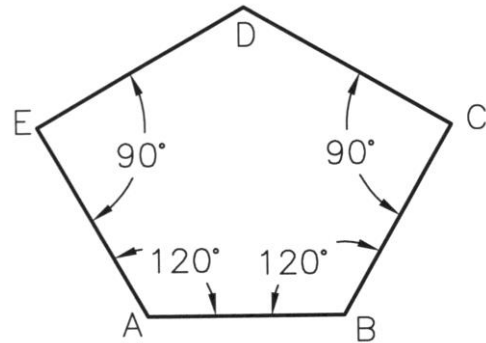


- A. Thousandths of an inch
 B. Hundredths of an inch
 C. Numerators for 1/32" divisions
 D. Numerators for 1/64" divisions
 E. Millimeter labels
6. Given 2" square (A-D-E-C), with an included isosceles triangle (A-B-C), which of the following statements is **TRUE**?

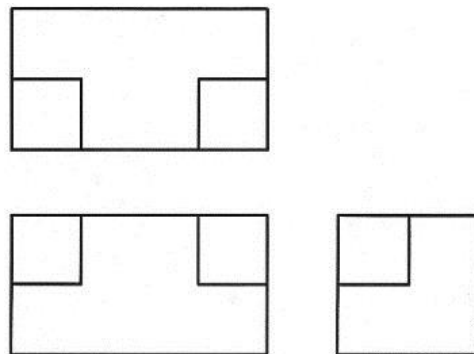


- A. The area of the triangle A-B-C is 2.66 in²
 B. Triangle A-B-C is a right triangle
 C. Triangle A-B-C is an equilateral triangle
 D. Angle A-B-C is less than 60°
 E. Side A-B is 2.828" long

7. How many degrees are there in Angle D?

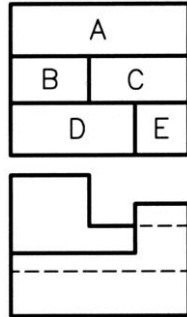


- A. 110°
 B. 120°
 C. 130°
 D. 140°
 E. 150°
8. Analyze and visualize the object illustrated in the multiview below, comprised entirely of **normal** surfaces. Considering all surfaces, even behind and below, how many are there?



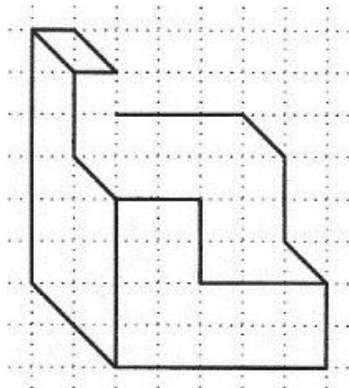
- A. 11
 B. 12
 C. 13
 D. 14
 E. 15

9. Analyze the front and top view below, with the shape of surfaces A through E visible only in the **top view**. Identify the **TRUE** statement:



- A. Surface E is at the lowest level
- B. Surface D is furthest back
- C. Surface C is higher than Surface B
- D. Surface D is higher than Surface E
- E. Surface A is lower than Surface D

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

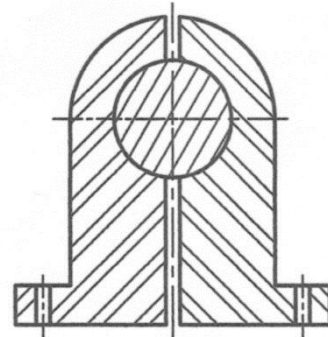


- A. 5
- B. 6
- C. 7
- D. 8
- E. 9

11. Which of the following statements about full section views of an individual part (with general purpose section lines) is a **FALSE** statement?

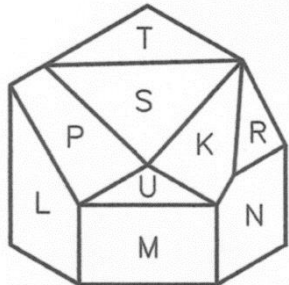
- A. Visible lines never cross through section-lined areas
- B. Section lines are usually thick and bold, evenly spaced, and at a 45° angle
- C. Hidden lines are usually omitted in the sectional view except for simplified thread representation
- D. All the section lines should be parallel
- E. The section-lined area is never bounded by a hidden line

12. By reading the section view below, what can be determined with certainty about this sub-assembly?



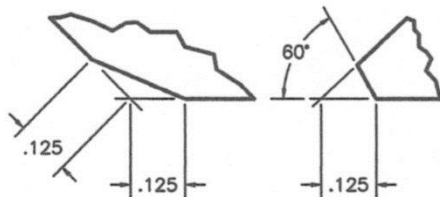
- A. This is an assembly of three parts
- B. The round part is a bolt
- C. The assembly features two brass parts
- D. The small holes are designed for fasteners
- E. The slot in the middle is for a gasket

13. For the object illustrated below, if a **front view** features the true shape and size of **surface L**, then what view would feature the true size and shape of **surface R**.



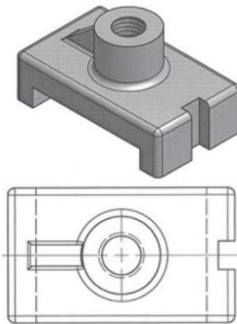
- A. A primary auxiliary view projected adjacent to the front view
- B. A primary auxiliary view projected adjacent to a right side view
- C. A primary auxiliary view projected adjacent to a top view
- D. A secondary auxiliary view projected adjacent to the primary described in answer A above
- E. A regular right side view

14. *Fill in the blank:* The ASME Y14.5 illustration below clarifies how to specify the dimensions for _____ in cases wherein two surfaces are not perpendicular to each other.



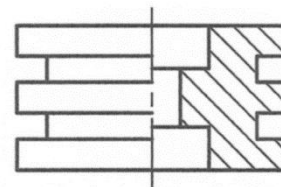
- A. strikes
- B. fillets
- C. chamfers
- D. breaks
- E. broaches

15. The top view (shown below the pictorial view) was computer generated. For the top view, what is the **most obvious** difference between it and a view created by a traditional drafter?



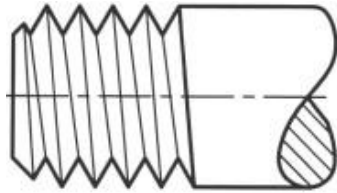
- A. The threaded hole is shown differently with a hidden line circle.
- B. "Tangency elements" are showing where flat surfaces meet curved surfaces.
- C. Some hidden lines are missing.
- D. The visible lines should be thicker than the hidden lines, but it is hard to tell on some prints.
- E. The center lines are incorrectly shown.

16. Which common 3D CAD modeling function would be ideal for efficiently modeling this pulley part by drawing the hatched area and then applying the CAD function?



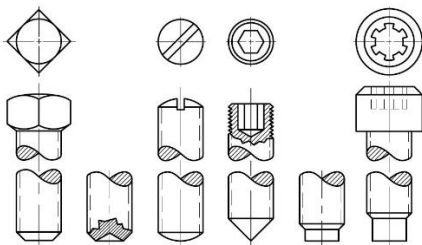
- A. EXTRUDE
- B. UNION
- C. SUBTRACT
- D. SHELL
- E. REVOLVE

17. What is the **thread angle** for the standard thread form illustrated below?



- A. 15°
- B. 30°
- C. 45°
- D. 60°
- E. 75°

18. What fastener is the subject of the “heads and tips” illustration below?

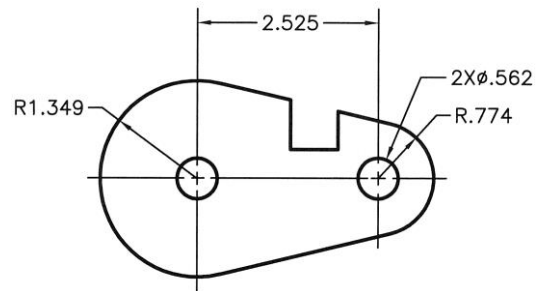


- A. Machine screw
- B. Wood screw
- C. Set screw
- D. Stove bolt
- E. Cap screw

19. Which of the following is usually **TRUE** about a leader line used to dimension the size of a hole?

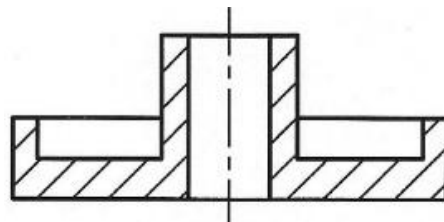
- A. It should be tangent with the circle
- B. It should be drawn at a 60° angle (from horizontal)
- C. It should touch the circle at “12 o’clock”
- D. It should go through the circle and cross through the center point
- E. It should have an arrow on one end, and a shoulder on the other

20. For this gasket drawing, how many additional dimensions are required in this view?



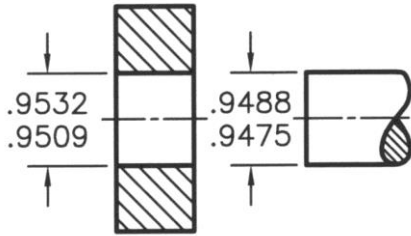
- A. 3
- B. 4
- C. 5
- D. 6
- E. 7

21. The drawing below is missing a “round” top view that features a cutting plane line. With or without that view, 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. What is the **allowance** for the two parts shown below?

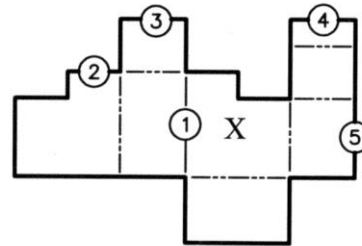
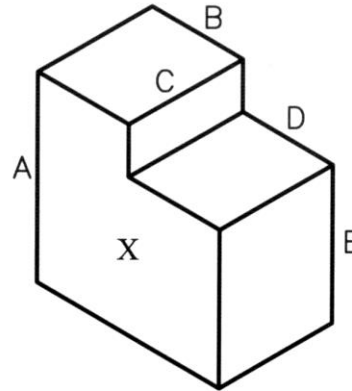


- A. .0013"
- B. .0021"
- C. .0023"
- D. .0044"
- E. .0057"

23. One drawing shows a part with a .875" thick bar. Another drawing is of a housing that features a .888" slot on a part that mates with the bar. Each drawing has a general note in the title block that all 3-place dimensions have a tolerance of plus/minus .005". If the parts pass inspection, what is the **range of fit** for the bar and slot?

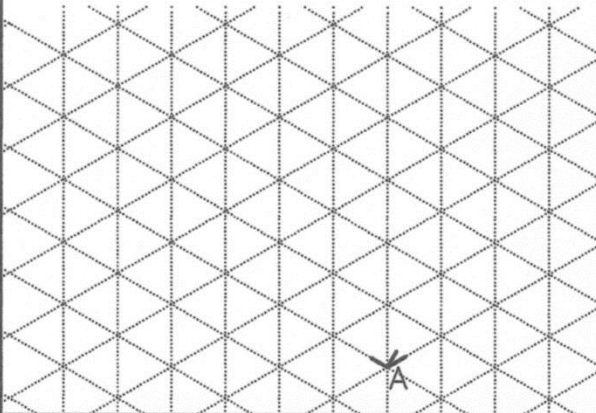
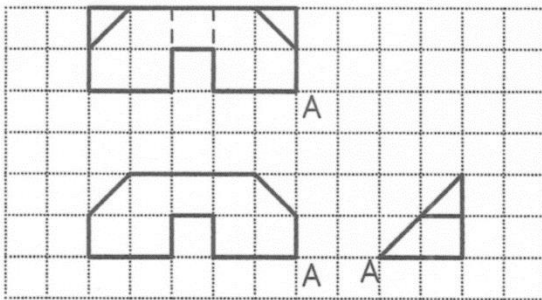
- A. .003" – .013"
- B. .013" – .023"
- C. .018" – .028"
- D. .013" – .033"
- E. .003" – .023"

24. Examine this object with edges A through E identified. Surface X is also marked to help you orient to the developed shape below the pictorial. Which letter-number pair below is **NOT** a proper match?

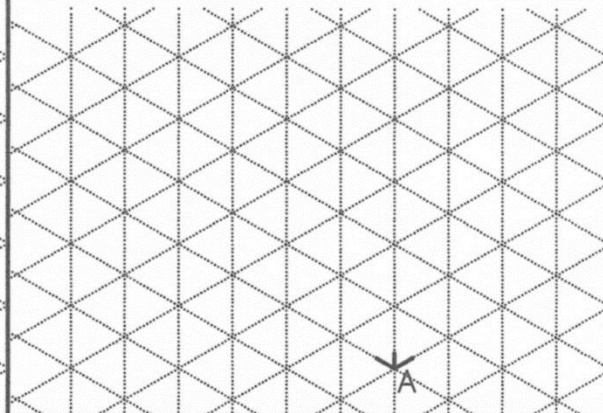
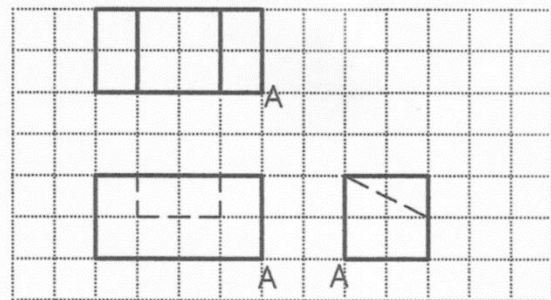


- A. A = 1
- B. B = 2
- C. C = 3
- D. D = 4
- E. E = 5

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

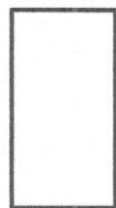
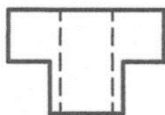


25. NUMBER OF LINE SEGMENTS:
A. 15 B. 16 C. 17 D. 18 E. 19

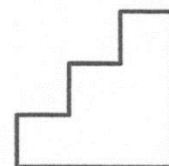
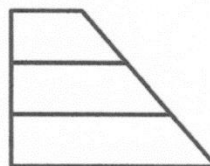
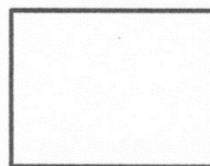


26. NUMBER OF LINE SEGMENTS:
A. 13 B. 14 C. 15 D. 16 E. 17

**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 CREATE A CORRECT AND VALID MULTIVIEW DRAWING**

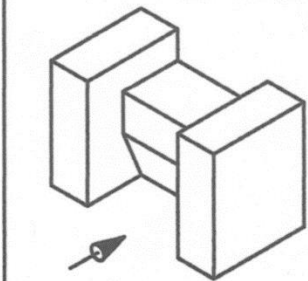


27. MINIMUM NUMBER OF LINES:
A. 4 B. 5 C. 6 D. 7 E. 8

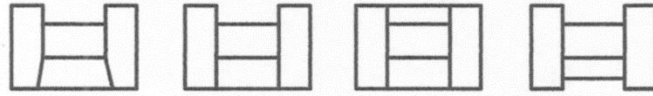


28. MINIMUM NUMBER OF LINES:
A. 5 B. 6 C. 7 D. 8 E. 9

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



29.



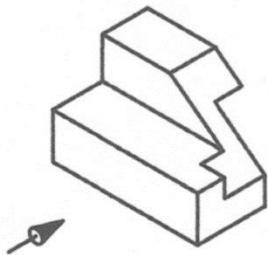
A.

B.

C.

D.

NONE
OF
THESE
E.



30.



A.

B.

C.

D.

NONE
OF
THESE
E.



31.



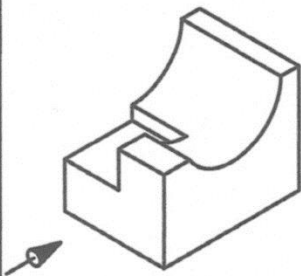
A.

B.

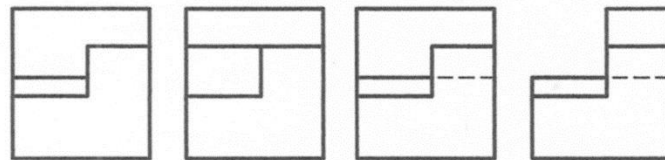
C.

D.

NONE
OF
THESE
E.



32.



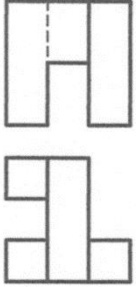
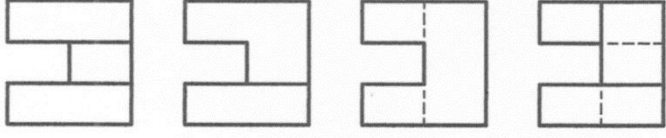
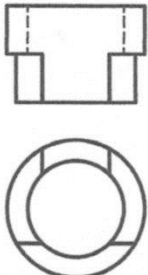
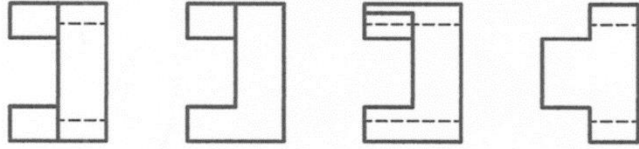
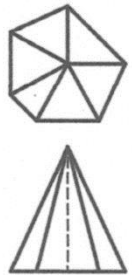
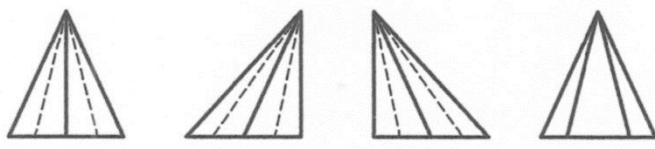
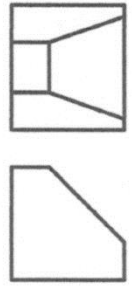
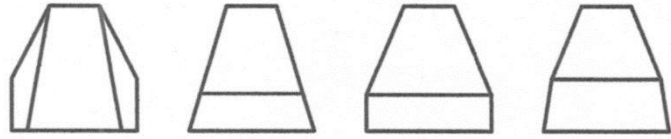
A.

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. 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

