



**ENGINEERING
AT ILLINOIS**

2017 Academic Challenge

ENGINEERING GRAPHICS TEST – SECTIONAL

– This Test Consists of 40 Questions –

Engineering Graphics Test Production Team

Ryan K. Brown, Illinois State University – Author/Team Leader

Mark Laingen, Illinois State University – Reviewer

Sahid L. Rosado Lausell, 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!

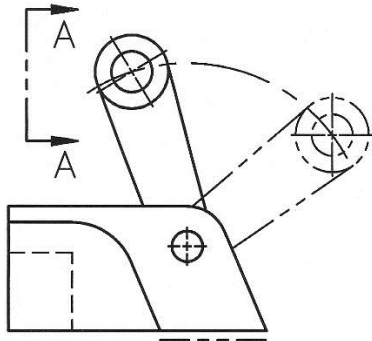
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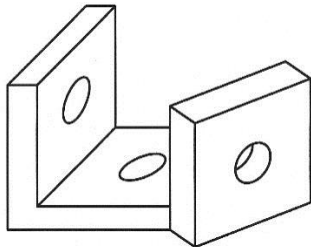
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WYSE – Academic Challenge
Engineering Graphics Test (Sectional) – 2017

1. In the illustration below, how many standard types of ASME lines are represented?

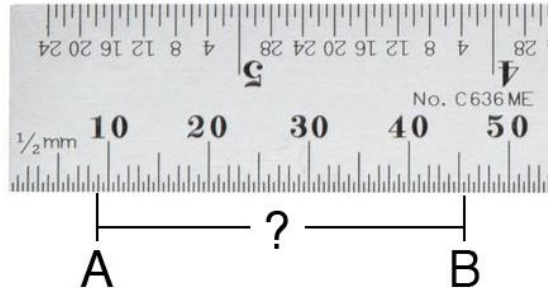


- A. 3
B. 4
C. 5
D. 6
E. 7
2. To create a multiview drawing of the part illustrated below, what views would allow for a true size and shape of all surfaces that feature the round view of a hole?

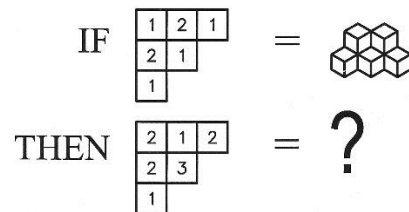


- A. Front, top, and right side views
B. Front, top, left side, and partial primary auxiliary projected off top view
C. Front, top, and left side views
D. Front, top, and rear views
E. Front, left side, right side, and partial primary auxiliary projected off right side view

3. In the illustration below, identify the distance from A to B?



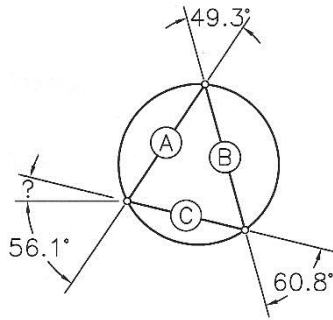
- A. 35.5 mm
B. 4.55"
C. 3.6 cm
D. 1.55"
E. 36.5 mm
4. Identify an isometric pictorial of an object that has a top view as indicated by the "height" numbers on the top view.



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

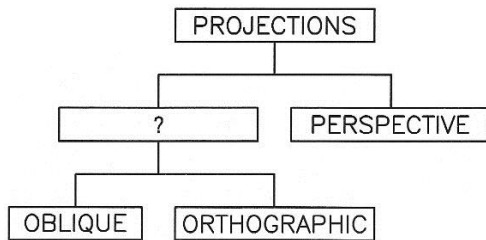
5. Which of the following is NOT a device for measuring distance?
- A. Caliper
 - B. Micrometer
 - C. Machinist rule
 - D. Multimeter
 - E. Feeler gauge

6. In the illustration below, identify the missing angle.



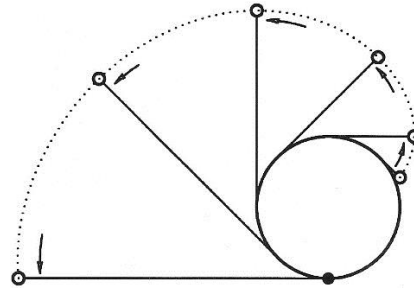
- A. 3.9°
- B. 13.8°
- C. 15.0°
- D. 22.8°
- E. 33.9°

7. With respect to **orthographic projection** theory, what term best fills the “?” box in the illustration below?



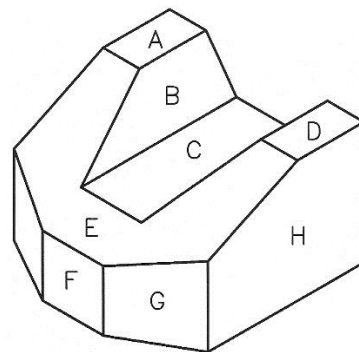
- A. Multiview
- B. Parallel
- C. Auxiliary
- D. First Angle
- E. Axonometric

8. The illustration below shows multiple positions of a ball attached by string to a cylinder. What geometric term is applied to the path the ball moves as the string, always taut, unwraps from the pole?



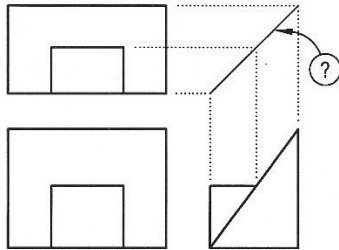
- A. Involute
- B. Spiral
- C. Parabola
- D. Ogee curve
- E. Elliptical

9. In engineering graphics textbooks, flat surfaces are often identified as **normal**, **inclined**, or **oblique**. Identify the set of surface labels below that are all the same type.



- A. A, B, and C
- B. B, E, and G
- C. C, E, and F
- D. D, A, and G
- E. E, F, and H

10. The process of constructing a multiview drawing with traditional 2D methods (versus automatic generation from a 3D solid model) requires precise alignment of views that allows for dimensional projection. As illustrated below, a _____ line may be used to help transfer the depth dimensions between the top view and the right side view.



- A. periscope
 B. corner
 C. miter
 D. depth
 E. bisector
11. There are three ways a flat surface may be oriented to a plane of projection (POP): **perpendicular**, **parallel**, or **inclined**. Therefore, a flat surface projects onto a POP in one of three ways, either **true size and shape** (TSS), **foreshortened shape** (FS), or as an **edge view** line (EV). Identify the **TRUE** statement below:
- A. If a surface is perpendicular to a POP, it projects as an EV
 B. If a surface is parallel to a POP, it projects FS
 C. If a surface is inclined to a POP, it projects TSS
 D. If a surface is perpendicular to a POP, it projects TSS
 E. If a surface is inclined to a POP, it projects as an EV

12. Identify the **TRUE** statement about sectional view cutting planes.
- A. They are always imaginary
 B. They are always placed on a center plane
 C. They always bend 90° through offset features
 D. They always appear in the same view as the section line hatching
 E. They are always represented by a **thick** line that features dashes and **two** arrowheads
13. Identify the **FALSE** statement about sectional views of a single part:
- A. Visible lines never cross through section-lined areas
 B. Hidden lines are usually omitted in the sectional view
 C. All section lines must be parallel
 D. The section-lined area is never bounded by a hidden line
 E. Section lines are usually thick and bold, evenly spaced at 45°
14. With respect to the following five terms: **coincidence**, **concentricity**, **parallelism**, **perpendicularity**, and **equality of diameter**, how might these terms be related to the creation of a 2D profile sketch within a 3D solid modeling program?
- A. Primitives
 B. Standards
 C. Constraints
 D. Tolerances
 E. Boolean operators

15. In a 3D CAD modeling program such as **Inventor™** or **Solidworks™**, what term describes the record of all the modeling steps? *Hint: It is often displayed in a browser-like window.*

- A. Plan
- B. List
- C. Tree
- D. Chart
- E. Layers

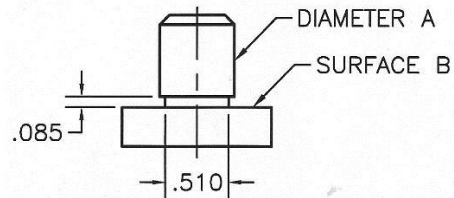
16. In general, which of the following is a **FALSE** statement with respect to dimensioning machine parts?

- A. Notes should be horizontal on the drawing sheet
- B. Leader shoulders should extend from the first letter or the last letter of the local note
- C. Dimension lines of adjacent dimensions should be aligned in chain fashion when feasible
- D. Extension lines for overall dimensions should connect two views that are close to each other
- E. Dimension figures do not need inch marks included

17. Two nearly identical threaded shafts have only one difference- one is a “single-start” thread form, and one is a “double-start” thread form. Therefore, which of the following would definitely be different also?

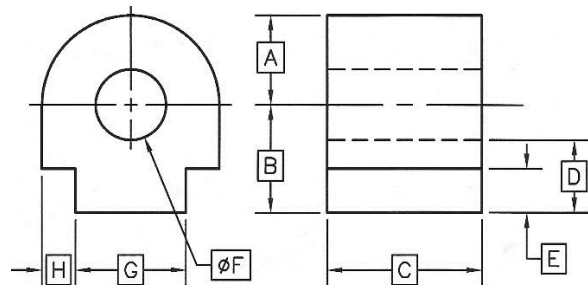
- A. Pitch
- B. Major diameter
- C. Thread form
- D. Lead
- E. Class of fit

18. The metal part illustrated below is to be created on a lathe from round stock, and features an “undercut.” The view is complete. What is the **likely** purpose of incorporating an undercut into the design of this part?



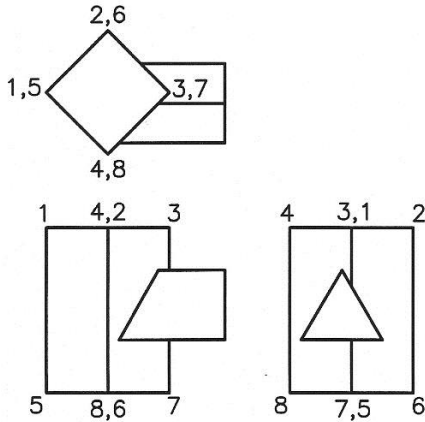
- A. Because a sharp corner between Diameter A and Surface B is hard to manufacture with a cutting tool
- B. To accommodate a washer
- C. To help the thread cutting tool create full threads on the cylinder
- D. To accommodate a retaining ring
- E. The fillet weld needs a groove in which to reside

19. Of the dimensions shown in the illustration below, which one can remain on the view, while the others should be moved to the other view, or deleted, or replaced?



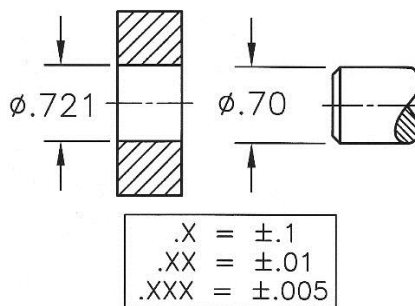
- A. A
- B. B
- C. C
- D. D
- E. E

20. Analyze the solid object below. It is comprised of a union of a square prism and a triangular prism. (Note: Hidden lines are not shown.) Eight (8) vertices have been numbered within the drawing to assist with the analysis. If all vertices need labeled, how many **additional** numerals are needed?



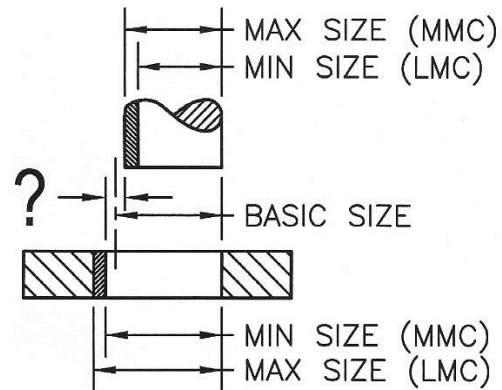
- A. 6
- B. 7
- C. 8
- D. 9
- E. 10

21. What is **loosest fit** for the pair of mating parts illustrated below?



- A. .006"
- B. .010"
- C. .016"
- D. .026"
- E. .036"

22. What term is missing from the illustration below?



- A. Fit
- B. Deviation
- C. Range
- D. Tolerance
- E. Allowance

23. For the thread note 3/8-16 UNC-2A, what does the "U" stand for?

- A. Unified
- B. Uniform
- C. Unidirectional
- D. Universal
- E. Unfinished

24. The engineer, designer, or drafter should apply dimensions to features and arrange them in such a way as to represent the _____ of the features.

- A. surface quality
- B. minimum sizes
- C. form variation
- D. maximum sizes
- E. functional purpose

**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

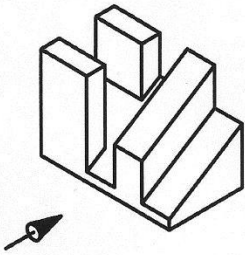
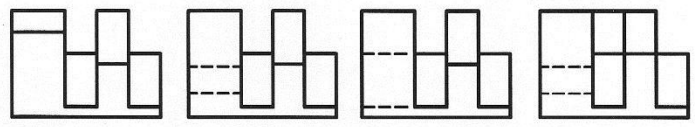
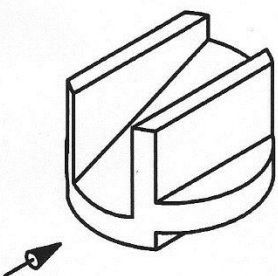
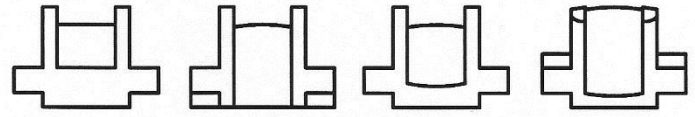
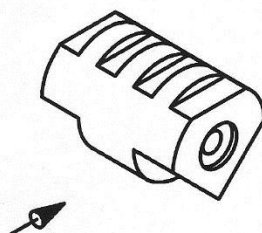
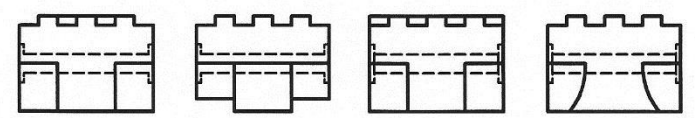
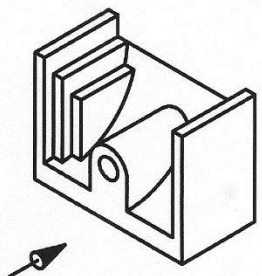
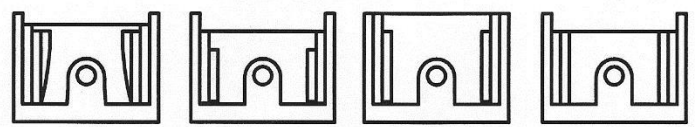
26. NUMBER OF LINE SEGMENTS:
A. 17 B. 18 C. 19 D. 20 E. 21

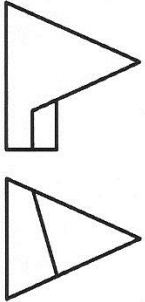
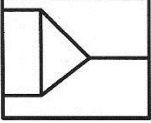
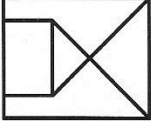
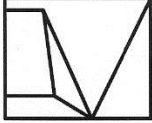
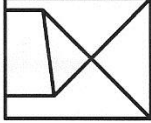
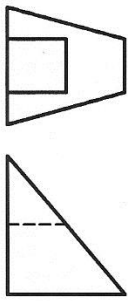
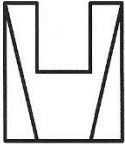
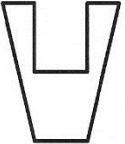
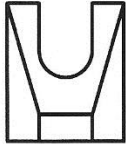

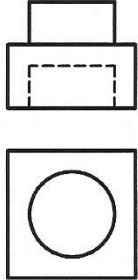
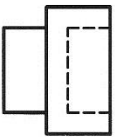
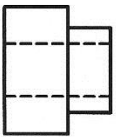
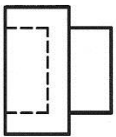
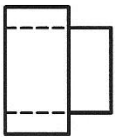
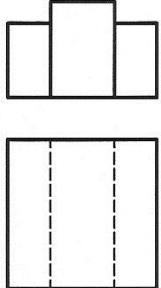
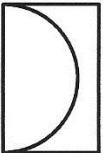

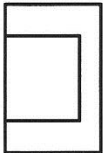
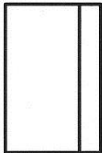
**PROBLEMS 27 & 28: MISSING LINE PROBLEMS: SELECT AN ANSWER THAT
CORRESPONDS WITH THE LEAST NUMBER OF MISSING LINE SEGMENTS (VISIBLE
AND HIDDEN) IT WILL TAKE TO CREATE A CORRECT MULTIVIEW DRAWING**

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

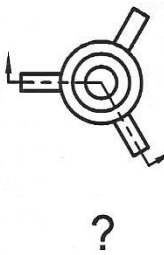
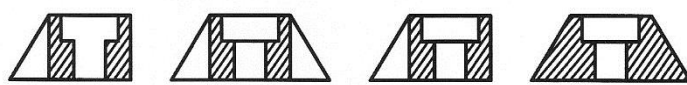
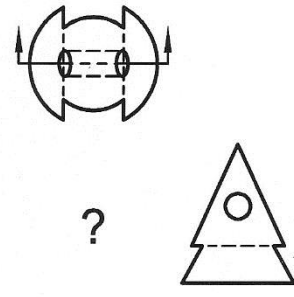
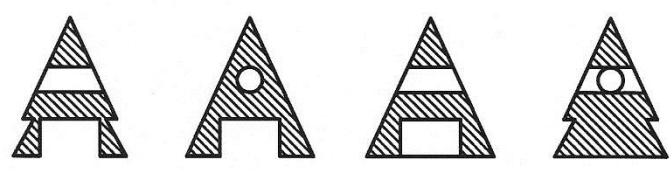
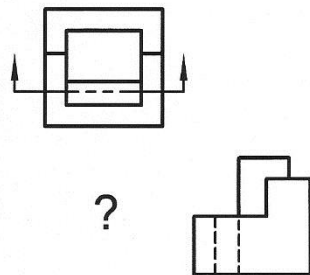
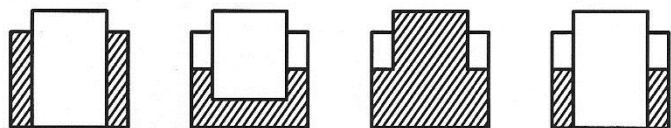
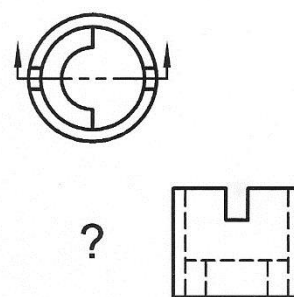
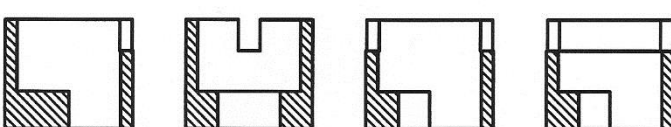
28. MINIMUM NUMBER OF LINES:
A. 4 B. 5 C. 6 D. 7 E. 8

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

<p>29.</p> 	 <p>A. B. C. D. E. NONE OF THESE</p>
<p>30.</p> 	 <p>A. B. C. D. E. NONE OF THESE</p>
<p>31.</p> 	 <p>A. B. C. D. E. NONE OF THESE</p>
<p>32.</p> 	 <p>A. B. C. D. E. NONE OF THESE</p>

		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

<p>37.</p>  <p>?</p>	 <p>A. B. C. D.</p> <p>NONE OF THESE</p> <p>E.</p>
<p>38.</p>  <p>?</p>	 <p>A. B. C. D.</p> <p>NONE OF THESE</p> <p>E.</p>
<p>39.</p>  <p>?</p>	 <p>A. B. C. D.</p> <p>NONE OF THESE</p> <p>E.</p>
<p>40.</p>  <p>?</p>	 <p>A. B. C. D.</p> <p>NONE OF THESE</p> <p>E.</p>