

# 2020 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

Douglas Brandt, Eastern Illinois University – 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 \*\*\*

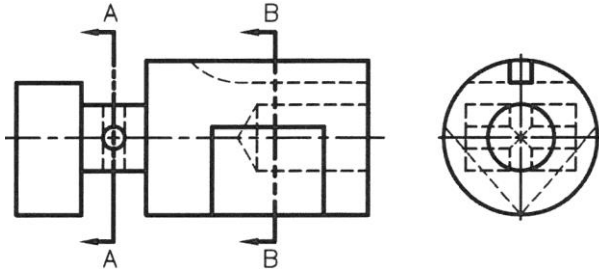
**DO NOT OPEN TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO!**

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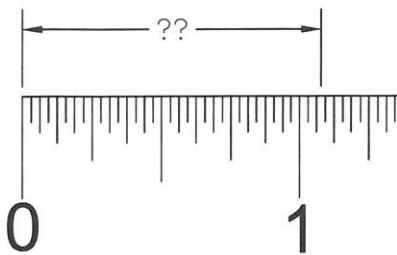
Academic Challenge  
 Engineering Graphics Test (State Finals) – 2020

1. Of the answers below, which line [from the alphabet of lines] does NOT show in the multiview illustration?



- A. Section line
- B. Visible line
- C. Hidden line
- D. Center line
- E. Cutting plane line

2. As the extension line doesn't hit perfectly, what measurement is the best estimate for the dimension shown?



- A. 1.062"
- B. 1.094"
- C. 1.125"
- D. 1.156"
- E. 1.188"

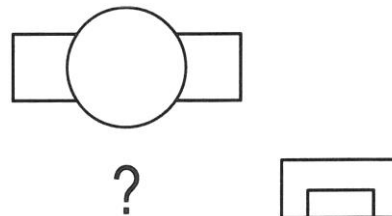
3. Which of the following scales reduces the drawing to a 1:360 ratio?

- A. 1" = 3'
- B. 3/32" = 1'
- C. 3" = 1'
- D. 1 = 30'
- E. 1/16" = 1'

4. Imagine [or sketch] two circles, each with a 1" radius, located 4" apart (center to center). A designer wishes to construct a 5" radius circle tangent to those two circles, but with one of the smaller circles "outside" the new circle, while the other is "inside" the new circle. How many options are there for the new center point location?

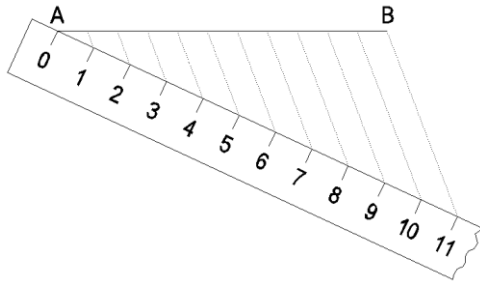
- A. 2
- B. 3
- C. 4
- D. None – the 5" circle is too large
- E. None – the 5" circle is too small

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



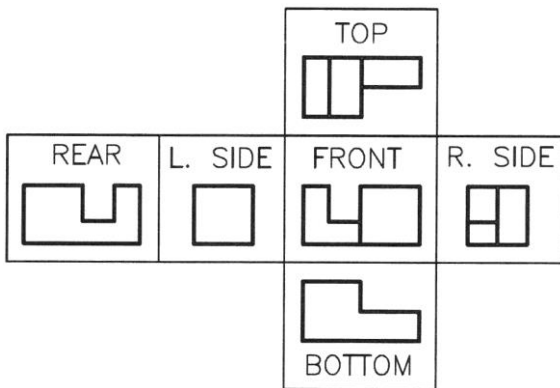
- A. 6
- B. 7
- C. 8
- D. 9
- E. 10

6. For the geometric construction shown below, what title is appropriate?



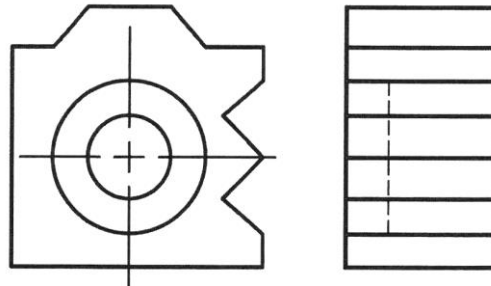
- A. Dividing a line segment into 11 equal parts
- B. Constructing 15° angle lines by 11-point offset method
- C. Determining 11 equal spaces along the angled strip by creating parallel lines at a 11° angle from line segment A-B
- D. Solving for the hypotenuse of a scalene triangle using the 11-8-5 ratio method
- E. Translating a 10" line into an 11" line

7. How many hidden line segments are missing from the six views?



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

8. In the multiview illustrated below, how many times did a visible line take precedence over another type of line?



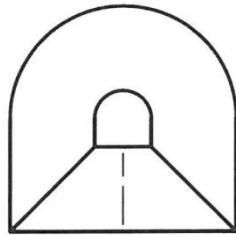
- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

9. What CAD topic does the menu "flyout" below represent?



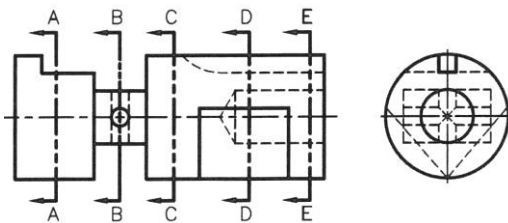
- A. Object snapping
- B. Constraints
- C. Annotations
- D. Display view control
- E. Boolean operations

10. What pictorial drawing term is illustrated by this "tunnel" drawing?



- A. axonometric
- B. oblique
- C. perspective
- D. isometric
- E. trimetric

11. Which of the removed sections will feature two holes crossing each other and forming an "X"?

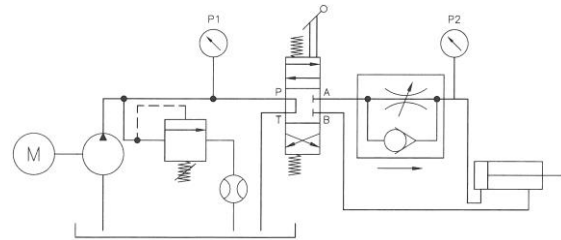


- A. A-A
- B. B-B
- C. C-C
- D. D-D
- E. E-E

12. \_\_\_\_\_ molding is an important process for making one-piece hollow plastic parts with thin walls, like plastic soda bottles.

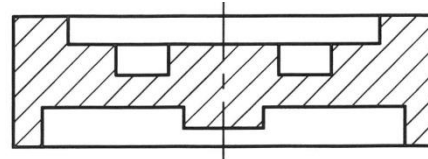
- A. Blow
- B. Hollow
- C. Bottle
- D. Thermoform
- E. Injection

13. One specialized field of engineering graphics is P&ID, as shown by the hydraulics application below. What does P&ID stand for?



- A. Piping & Instrumentation Diagram
- B. Process & Integration Design
- C. Production & Input Drawing
- D. Prescription & Inscription Diagram
- E. Prevention & Implementation Detail

14. A top view of a pulley-like wheel that matches the front view full section below, is comprised entirely of \_\_\_\_\_ visible circles, and \_\_\_\_\_ hidden circles, all concentric with one another.

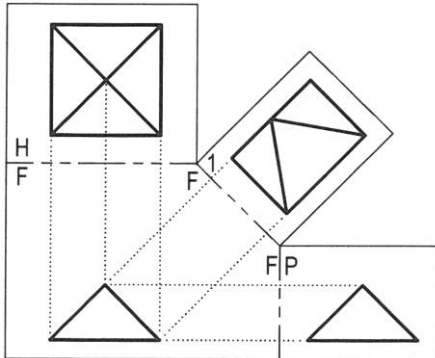


- A. 4;1
- B. 4;2
- C. 5;1
- D. 5-2
- E. 6;1

15. According to the most recent ASME standards, how should a 3/4" diameter hole be dimensioned?

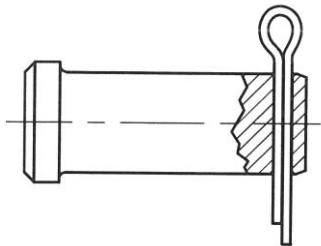
- A. 3/8 RADIUS
- B. 3/4" DIA
- C. R.375
- D. .75 DRILL
- E. n .750

16. The illustration below features the "unfolded" projection planes of a multiview projection of a pyramid. Identify the FALSE statement below:



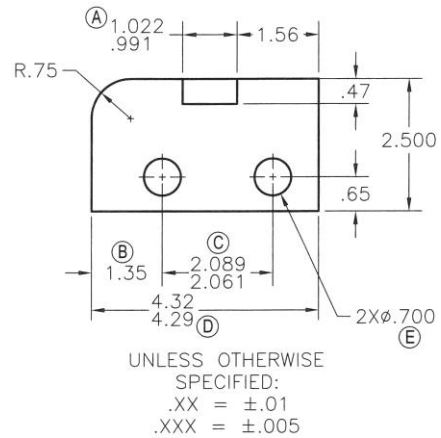
- A. The F|P label is on the folding line between a **frontal** plane and a **profile** plane
- B. There are no hidden lines missing
- C. There are no views that show a surface at true size and shape
- D. The F|1 label is on the folding line between a **frontal** plane and a primary **auxiliary** plane
- E. The H|F label is on the folding line between a **horizontal** plane and a **frontal** plane

17. What two types of pins are illustrated below?

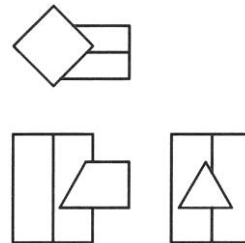


- A. Clevis pin and cotter pin
- B. Stick pin and spring key
- C. Spring pin and loop key
- D. Clevis pin and gib-head key
- E. Cotter pin and slip pin

18. Which dimension in the illustration below has the LARGEST tolerance?



- A. A
  - B. B
  - C. C
  - D. D
  - E. E
19. Select the CORRECT development of the triangular ductwork piece that intersects with the square duct.



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

20. There are certain application wherein "reverse" threads are desirable. With detailed representation, the crest and root lines will incline the opposite direction. Also, reverse threads are specified by adding \_\_\_\_\_ to the thread note.
- A. REV
  - B. 2A
  - C. R
  - D. LH
  - E. C

21. Select the one TRUE statement about engineering drawings of mass produced parts, dimensioned in inches:
- A. Dimensions numerals are placed with the aligned system, and read from the bottom or from the right
  - B. Most dimensions are usually specified to four decimal places
  - C. Over-dimensioning is permissible for toleranced dimensions
  - D. Dimensions should be created with lines that are thinner than the visible object lines
  - E. Dimensions are placed on the views if possible

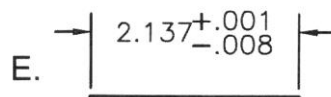
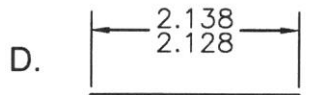
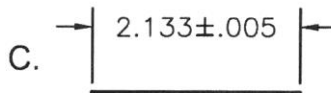
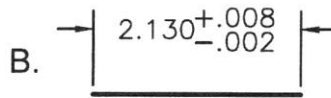
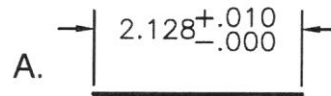
22. What is indicated by a dimension numeral with an arc above it, as shown below?



- A. Distance along an arc
- B. Approximate value
- C. Reference dimension
- D. Smooth surface finish
- E. Distance is not to scale

23. Fill in the blank with the most appropriate word:  
*"CAD was a revolutionary change in the engineering industry, where draftsmen, designers, and engineering begin to \_\_\_\_\_."*
- A. specialize
  - B. merge
  - C. conflict
  - D. separate
  - E. disappear

24. Which of the following dimensions is NOT equivalent to the others?



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

Two 2D shapes are shown on a grid. The first shape is a trapezoid with a horizontal line across its top. The second shape is a trapezoid with a rectangular notch at the bottom. Both shapes are labeled with the letter 'A'.

Two 2D shapes are shown on a grid. The first shape is a square with a diamond inscribed inside. The second shape is a rectangle with a diamond inscribed inside. Both shapes are labeled with the letter 'A'.

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

26. NUMBER OF LINE SEGMENTS:  
A. 8 B. 9 C. 10 D. 11 E. 12

**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 COMPLETE A CORRECT MULTIVIEW DRAWING**

A 2D shape with a semi-circular end on the right is shown. Below it are two other 2D shapes: a complex polygon with a notch and a simple square.

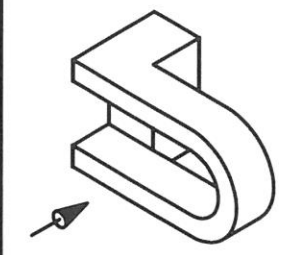
A 2D shape with a trapezoidal top and a pointed bottom is shown. To its right is a 2D shape consisting of a rectangle with a smaller rectangle on top.

27. MINIMUM NUMBER OF LINES:  
A. 7 B. 8 C. 9 D. 10 E. 11

28. MINIMUM NUMBER OF LINES:  
A. 3 B. 4 C. 5 D. 6 E. 7



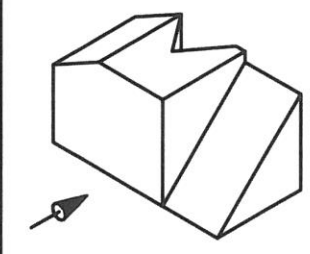
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 NOTE: CENTER LINES OMITTED ON THIS TEST



29.



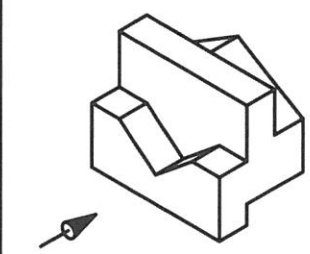
A. B. C. D. NONE OF THESE E.



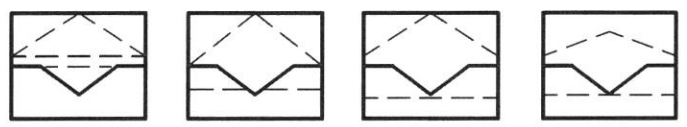
30.



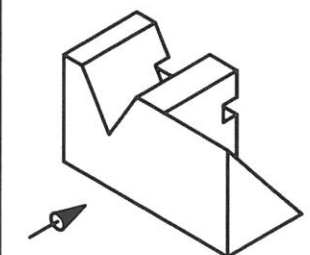
A. B. C. D. NONE OF THESE E.



31.



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

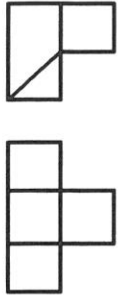
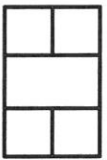
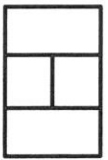
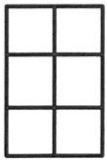
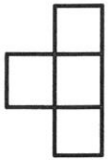
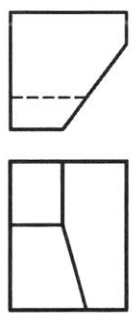


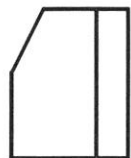

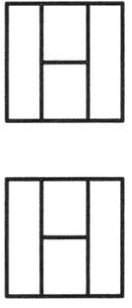



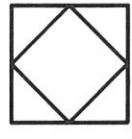
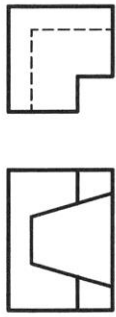
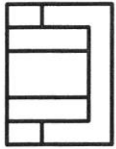
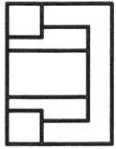

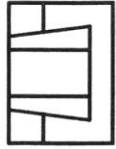


32.

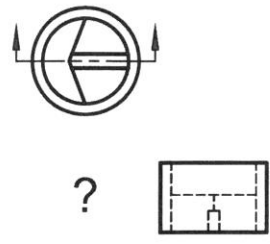

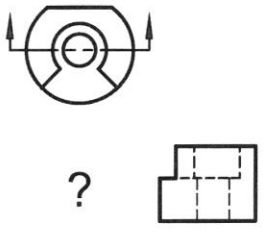

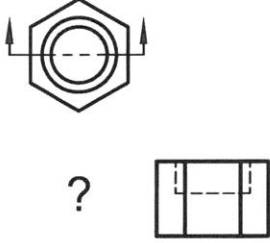

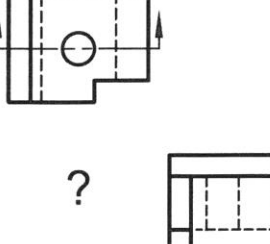
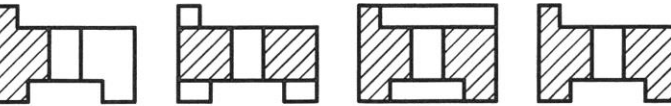


A. B. C. D. NONE OF THESE E.

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

<p>33.</p>  <p>?</p>	 <p>A.</p>  <p>B.</p>  <p>C.</p>  <p>D.</p> <p>NONE OF THESE</p> <p>E.</p>
<p>34.</p>  <p>?</p>	 <p>A.</p>  <p>B.</p>  <p>C.</p>  <p>D.</p> <p>NONE OF THESE</p> <p>E.</p>
<p>35.</p>  <p>?</p>	 <p>A.</p>  <p>B.</p>  <p>C.</p>  <p>D.</p> <p>NONE OF THESE</p> <p>E.</p>
<p>36.</p>  <p>?</p>	 <p>A.</p>  <p>B.</p>  <p>C.</p>  <p>D.</p> <p>NONE OF THESE</p> <p>E.</p>

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

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