

## Introductory Division – Guidelines for Preparation

### I. WRITTEN TEST GENERAL TOPICS – 25% of the Introductory Division score.

(Note: This test assumes that drafting students may be enrolled in courses that are uniquely CAD, or uniquely instrumental drafting, or a combination of the two. As a result, an attempt has been made to create questions that are common to all current formats, and not specific just to instrumental drafting or CAD. General questions about sketching, instrumental drafting, or CAD may be included, but not, for example, specific questions about CAD commands or pieces of equipment.)

#### A. The Field of Drafting

1. Terms general to the field of drafting
2. Geometric constructions and related terms
3. Multiview drawing principles and terms
4. Types of views and drawings

#### B. Basic Standards

1. Alphabet of lines (names and appearances)
2. ANSI/ASME lettering (uppercase, vertical, single-stroke Gothic)
3. View arrangement
4. Hidden line practice
5. Precedence of lines

#### C. Visualization

1. Questions about what things “look like”
2. Multiview missing view problems
3. Isometric-to-multiview problems

#### D. Basic Drafting Mathematics

1. Fraction-decimal conversion
2. Metric-inch conversion
3. Fractions

#### E. Basic Types of Views in Drafting

1. Section views
2. Auxiliary views
3. Pictorial drawing types (Isometric, Oblique, Perspective)

*(Note: Students will not be asked to know specific things about section views, auxiliary views, or pictorials, but may be asked to know that there are such types of drawings, or give a basic definition of these types of drawings.)*

### II. DRAWING TEST GENERAL TOPICS – 75% of the Introductory Division score.

#### A. Paper Layout

1. Drawing may be on A or B size paper
2. Contestant’s view arrangement should be standard

#### B. Multiview Drawing

1. Two or three views to be generated, perhaps one of the following:
  - a. Front, Top, Right Side
  - b. Front, Top, Left Side
  - c. Front, Right Side, Left Side
  - d. Front, Top, and Side view projected off Top
2. Problem will include the following lines:
  - a. Visible [Object] lines
  - b. Hidden lines
  - c. Center lines
3. Problem may include one or more of the following situations:
  - a. Rectangular and/or cylindrical shapes
  - b. Polygons (hexagons, octagons, etc.)
  - c. Intersections that REQUIRE projection principles to solve
4. Problem will NOT include:
  - a. Sectional views
  - b. Ellipses or Irregular curves

### III. BEST METHOD OF PREPARATION

- A. Look over the last two years’ problems, both Regional and State
- B. Board – Practice linework (with differing thicknesses) and lettering
- C. CAD – Practice distance checking commands

## Machine Division – Guidelines for Preparation

- I. PRELIMINARY PLANNING & SKETCHING – not necessarily scored separately  
(Note: This portion of the Machine Division allows contest sites with a lack of CAD stations for all divisions to create a laboratory flip-flop schedule. Students in the Machine CAD division spend approximately one hour planning and sketching before using the computer at many regional sites, and also at the state contest. Each regional may conduct this portion of the test according to their needs, and this portion may be judged at the discretion of the contest director. At the state contest, this portion is not directly scored, but does usually have an impact on the success of the contestant once they move to the CAD station.)
  
- II. DRAWING PROBLEM GUIDELINES
  - A. Paper Layout
    1. Drawing may be on B size or C size paper
    2. Contestant's view arrangement should be standard
  - B. Multiview Drawing
    1. Two or more views to be generated, perhaps one of the following:
      - a. Any "normal" view (Front, Top, Side, Bottom, Rear)
      - b. A "sectional" view
      - c. A "primary auxiliary" view [full or partial]
    2. Problem will include the following lines:
      - a. Visible [Object] lines
      - b. Hidden lines
      - c. Center lines
    3. Problem may include one or more of the following situations:
      - a. Rectangular shapes
      - b. Polygons (hexagons, octagons, etc.)
      - c. Cylindrical shapes
      - d. Intersections that REQUIRE projection principles to solve
    4. Problem will NOT include:
      - a. Sectional views
      - b. Ellipses
      - c. Irregular curves
  
- II. CAD vs BOARD DRAFTING
  - A. CAD contestants will be required to establish and use "layers" or "levels" properly
  - B. CAD contestants will be required to draw geometry at "real world" size, but scale the annotations to a given plotting scale (i.e. 1 = 1, 1 = 2, 2 = 1, etc.)
  - C. Board contestants may be required to draw geometry at a reduced scale
  
- III. BEST METHOD OF PREPARATION
  - A. Look over the last two years' problems, both Regional and State
  - B. Study ANSI/ASME Y14.5 or MIL-D-1000 Dimensioning Standards
  - C. Review callouts for holes, including threads, counterbores, countersinks, etc.
  - D. Review tolerance calculations for specified "fits"
  - E. CAD drafters – Know how to use CAD functions to establish dimensions, including functions for tolerancing and scaling, etc.
  - F. Board drafters – Practice how to make visible lines thicker, all lines black and shiny, and practice proper lettering technique

## Architectural Division – Guidelines for Preparation

### I. DRAWING PROBLEM GUIDELINES

#### A. Paper Layout

1. Drawing may be on B size or C size paper
2. Contestant's view arrangement should be logical and follow directions

#### B. Drawing Expectations

1. The problem will be presented as a "partial" sketch with dimensions, and/or written instructions
2. Reference materials may be provided from sources such as Architectural Graphic Standards
3. The project will involve some aspect of drawing a FLOOR PLAN, possibly including one or more of the following:
  - a. Some minor design work. (Need to know standard sizes for doors, halls, cabinets, appliances, garages, etc.)
  - b. Re-designing an existing floor plan
  - c. Adding on to an existing floor plan
  - d. Matching up a "first" floor plan to a "second-level" floor plan
  - e. Finding and correcting mistakes on a floor plan
4. The project may also involve one of the following types of architectural drawing:
  - a. Wall section detail
  - b. Elevation
  - c. Foundation plan
  - d. Interior section
  - e. Section view including stairs or cabinets
5. The problem will NOT include:
  - a. Pictorial Drawing
  - b. Rendering

### II. CAD vs BOARD DRAFTING

- A. Board drafters will be expected to use proper linework and lettering, and to be neat in all aspects of the drawing. Lettering is to be uppercase, single-stroke, Gothic-based lettering, including an acceptable architectural style.
- B. Board contestants will be required to draw the project at one or more standard architectural scales.
- C. CAD contestants will be required to establish and use "layers" or "levels" properly
- D. CAD contestants will be required to draw geometry at "real world" size, but scale the annotations to a given plotting scale (i.e.  $\frac{1}{4}'' = 1'-0''$ ,  $\frac{1}{2}'' = 1'-0''$ ,  $1'' = 1'-0''$ , etc.)

### III. BEST METHOD OF PREPARATION

- A. Look over the last two years' problems, both Regional and State
- B. Study and review architectural standards, including architectural style lettering
- C. Review standard sizes of architectural and construction items (Note: actual sizes needed for details)
- D. Review techniques for establishing dimensions that follow architectural practices
- E. CAD drafters – review the aspects of planning and creating a drawing for a particular plot scale, including dimensioning scale factor, note and label sizes, paper layouts, and symbol usage
- F. Board drafters – Practice how to make some lines thicker, all lines black and shiny, and practice proper lettering technique

## **Solids CAD Division – Guidelines for Preparation**

### **I. SOLID MODELING PROBLEM GUIDELINES**

- A. Contestants will be required to create up to 20 different models of abstract blocks.
- B. Working from pictorial drawings or orthographic projection drawings, contestants will have one hour to complete as many of the 20 blocks as possible.
- C. Contestants will be provided an answer sheet with three set of answers for each model:
  - 1. volume
  - 2. distance check-1
  - 3. distance check-2.No calculators may be used for the test.
- D. As each model is completed, it will be saved to disk or left in the CAD environment as proof of completion.

### **II. BEST METHOD OF PREPARATION**

- A. Practice software of your choice with various blocks of different shapes. See pilot test for examples, although new problems may increase in difficulty.
- B. Know how to perform mass property calculations using the software. Check answers against the sample test to ensure your program uses the same level of "accuracy" in determining the volume.
- C. Practice distance-checking commands.