Introduction to Engineering Design

Final Examination

Part B

High School Credit Performance

Spring 2009

PRACTICE EXAM

Student Name: _____

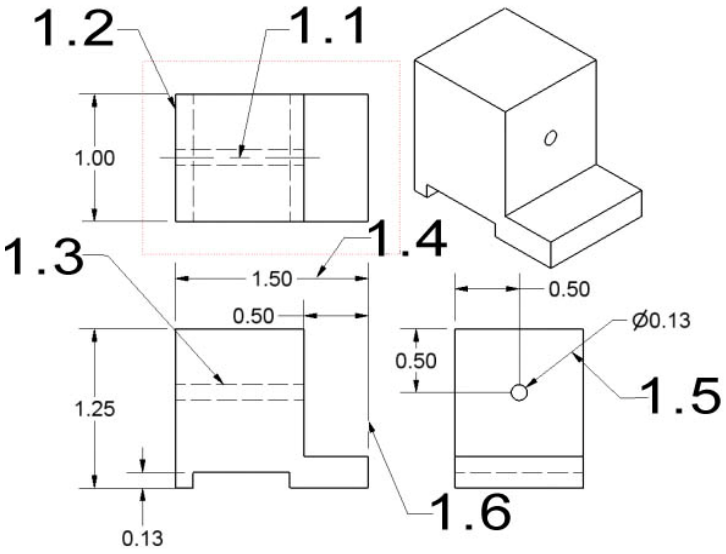
Date: _____

Class Period: _____

Total Points: _____

1. **Match each line type indicated in the illustration below with its corresponding name by placing the letter of the correct name from the answer bank in the numbered space provided. Answers may be used only once.**

   [6 POINTS - *1 point each*]



Answer Bank

A. Dimension Line
B. Hidden Line
C. Center Line
D. Construction Line
E. Object Line
F. Section Line
G. Extension Line
H. Leader Line

1.1_____ 1.4_____

1.2_____ 1.5_____

1.3_____ 1.6_____

2. **Match the correct term from the answer bank to the definition. Place the letter of the mass property in the space provided.**

   [4 POINTS – *1 point each*]

Answer Bank

A. Centroid (Center of Gravity)
B. Volume
C. Principal Axes
D. Mass
E. Surface Area
F. Moments of Inertia

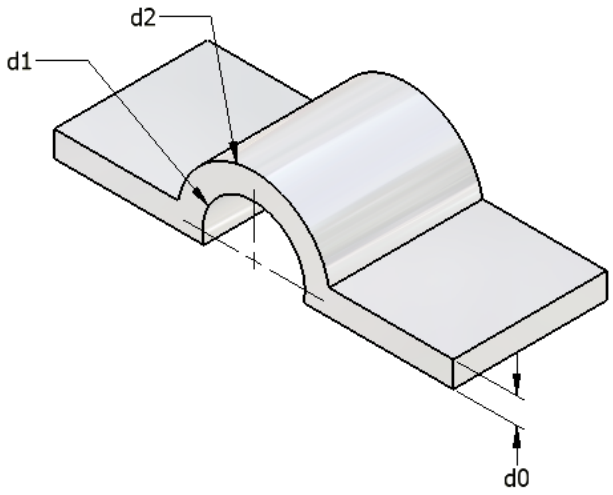
2.1 _____ is the amount of three-dimensional space an object takes up.

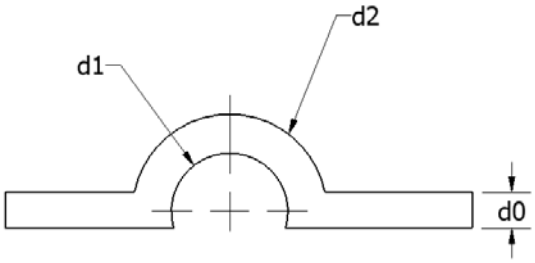
2.2 _____ is the extent of a 2-dimensional surface enclosed within a boundary.

2.3 _____ is a 3D point defining the geometric center of a solid.

2.4 _____ is the amount of matter in an object or the quantity of the inertia of the object

3. Using the dimension parameters shown on the drawing below, write the equation for dimension d0 so that the thickness of the part is uniform throughout its length.
[4 POINTS]

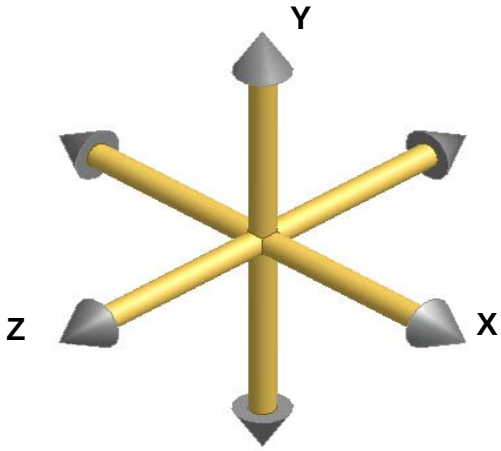




3. Ans: _____

4. List the 6 Degrees of Freedom (DOF) for the coordinate axis shown below.

[6 POINTS – *1 point each*]



4.1_____

4.2_____

4.3_____

4.4_____

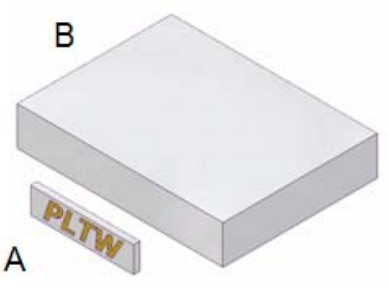
4.5_____

4.6_____

5. List the assembly constraints needed to completely constrain the parts in the three assemblies below. Describe how the constraints would be applied between the parts. Assume that Part B in each problem is the grounded part.

[6 POINTS – *2 points each*]

5.1 **A – Plate B – Block**

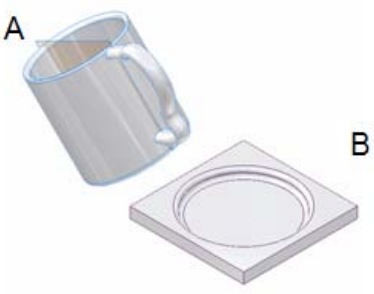


Constraint(s): _____

_____

_____

5.2 **A – Coffee Cup B – Base**

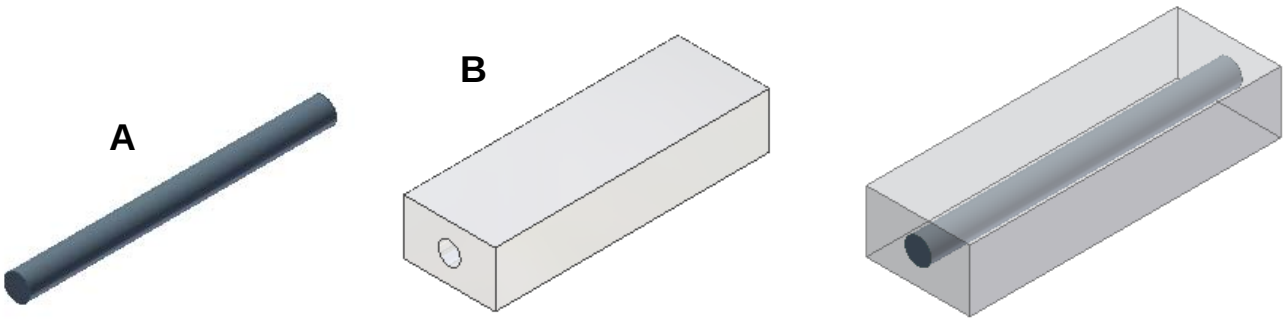


Constraint(s): _____

_____

_____

5.3 **A – Pin** **B – Pin**



Constraint(s): _____

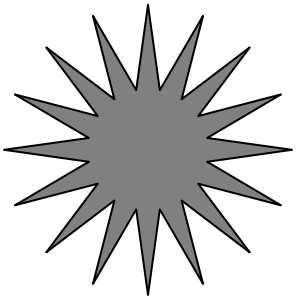
_____

6. Many successful designs incorporate the arrangement of individual elements called Design Principles. Look at the following examples and match the graphic with the appropriate design principles from the <u>Answer Bank</u>. Answers may be used only once.

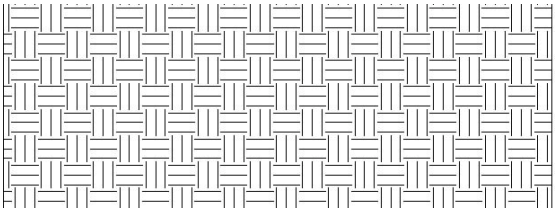
[4 POINTS – *1 point each*]

Answer Bank

- Opposition
- Subordination
- Transition
- Radial Balance
- Rhythm
- Emphasis
- Proportion
- Unity



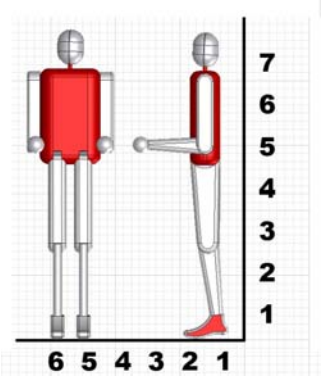
6.1 _____



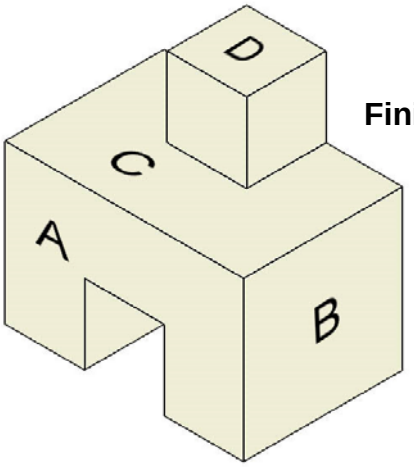
6.2 _____

6.3 _____

6.4 _____

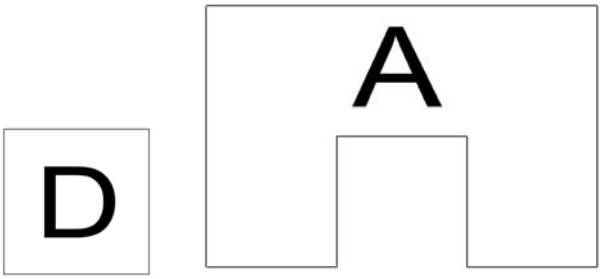


7. Whether sketching or creating mechanical parts with a 3-D solid modeling software, two common methods of creating parts are: additive (join) and/or subtractive (cut). Use the illustration of the Finished Model below to answer questions 7.1 – 7.4.
[4 POINTS]



Finished Model

Additive Problem:
Describe the two steps used to create the Finished Model using an additive part creation process. Use the two sketches to the right in your description. (*2 points*)



7.1 **Step 1**:

_____

_____

_____

_____

_____

7.2 **Step 2**:

_____

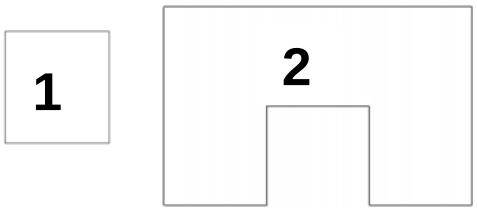
_____

_____

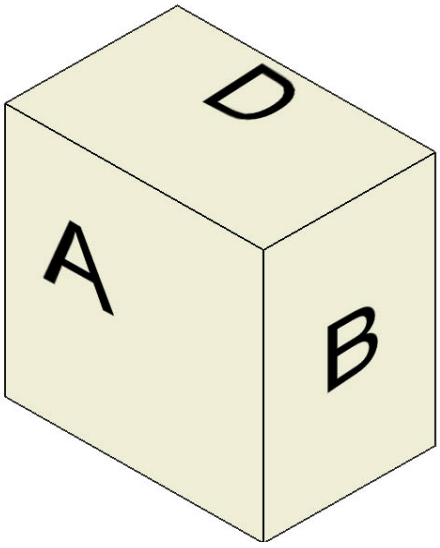
_____

_____

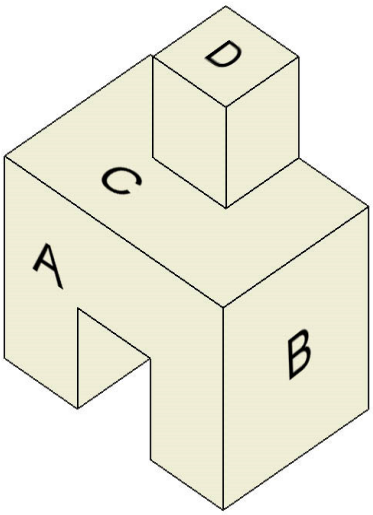
Subtractive Problem:
Describe how you would use the two sketches below to transform block ABD into the Finished Model using the subtractive method.
(*2-points*)



Block ABD



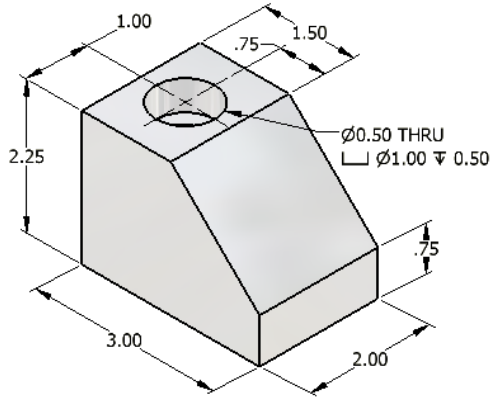
Finished Model



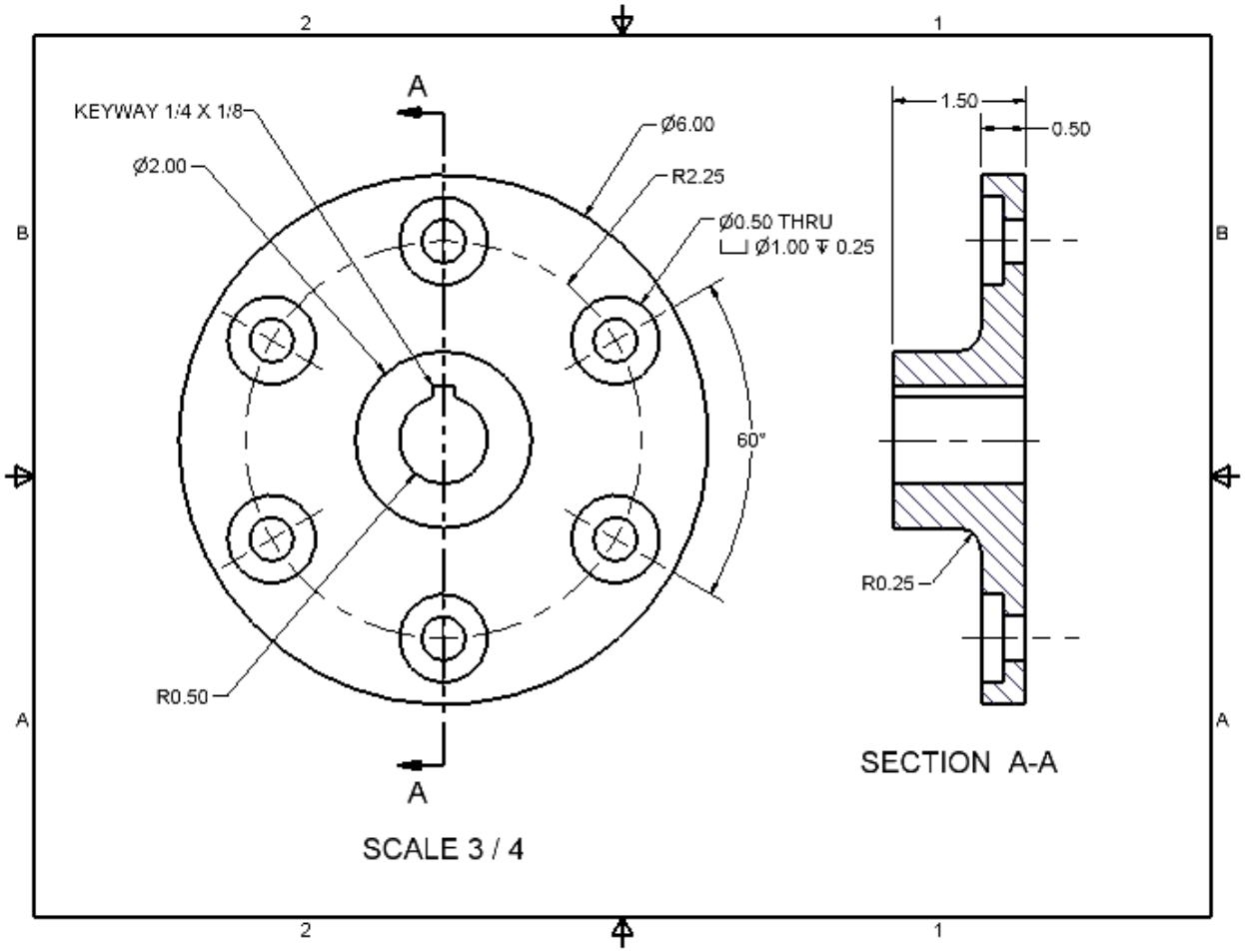
7.3 **Step 1**:_____
_____
_____
_____
_____

7.4 **Step 2**:_____
_____
_____
_____
_____

8. Sketch and dimension the three orthographic projections (front, top & right-side views) of the isometric part shown at right. Grid Scale: 1 square = ¼-inch [10 POINTS]



9. Use the drawing below to answer the following questions.



[6 POINTS – *1 point each*]

9.1 What is the fillet radius? _____

9.2 What is the depth of the counter bore? _____

9.3 What is the angular measurement between the counter bored holes? _____

9.4 What is the overall size of the keyway? _____

9.5 What is the distance from the center of the part to the center of the counter bored holes? _____

9.6 What is the overall thickness of the part? _____