Design Project 1: Group 3

Group Members

- Nathan Karasch
- Yiqiu Chen
- Josh McPherson
- Ben Steele
- Michael Boysen

Group Norms *(Ranked in order of weight of importance, with 1 being most important and 6 being least important)*

1) Complete your share of the work.
2) Show up to meetings.
3) Respond to texts and emails promptly.
4) A majority vote will apply to split decisions.
5) We will meet in Parks Library near the main stairwell and move to a study room once everyone is present.
6) Snacks during meetings are a must.

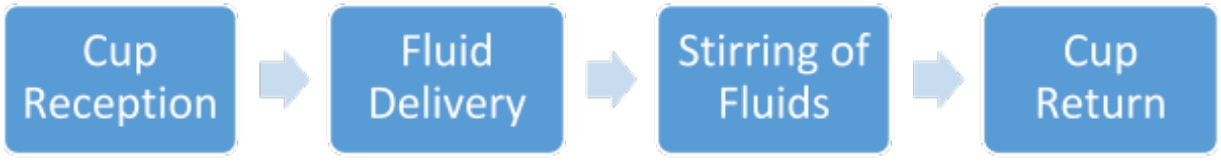
Three Options from Brainstorming Session

- Cocktail Maker
- Laundry Folder
- Rotating Water Massage Shower Head

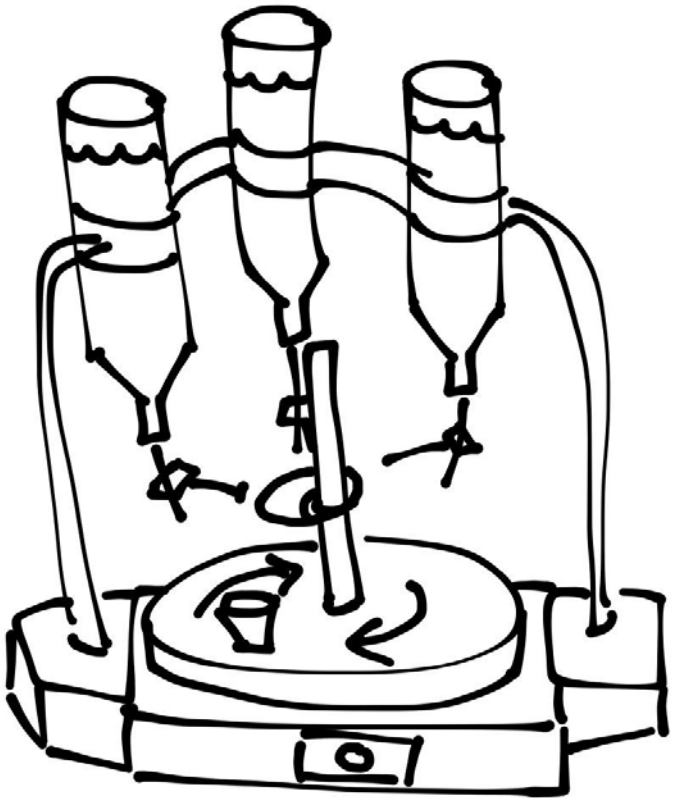
Which Option We Chose and Why

We have chosen the Cocktail Maker for several reasons. First, this option was the least complicated: the shower head and laundry folder would require far more calculations and design than would be possible for the project. Furthermore, the other options were far more complicated for the task they were to perform: it would be easier to do the task yourself. Lastly, the Cocktail Maker caught the interest of the entire group generating excitement and motivation for the project.

Function Tree



Diagram



Cup Reception / Return

For the cup reception/return the plate should have one to three cup holders which can stabilize the cup(s) from sliding around due to the stirring motion. The cup begins in front of the user and ends in front of the user. Care should be taken not to have anything splash during delivery of the fluids or movement of the cup.

Fluid Delivery

In terms of delivering the fluid to the cup, we are all in agreement that a cam will determine the timing of a valve that will open and close and decide when the ingredients are flowing and not flowing respectively. What we haven't quite decided on yet is whether we want the follower to push into place a cap that will cover the valve and turn off the flow of the fluids, or if the follower will simply open/close a flexible "pinch" valve, controlling the flow of liquid.

Stirring of Fluids

We have tossed around several ideas on how to mix the ingredients a little better once we actually get them in the cup. Some of the ideas include: a) putting a cover on the cup and shaking it up and down; b) having a stirring stick enter down into the cup and rotate in small circles; c) vibrating the cup; and d) gently moving the cup up and down. We haven't set anything in stone, but we were leaning towards a gentle up and down motion because of its low level of complexity, and its small capacity for failure (it isn't very likely to result in a mess from the spilling of liquids or tipping of a glass).

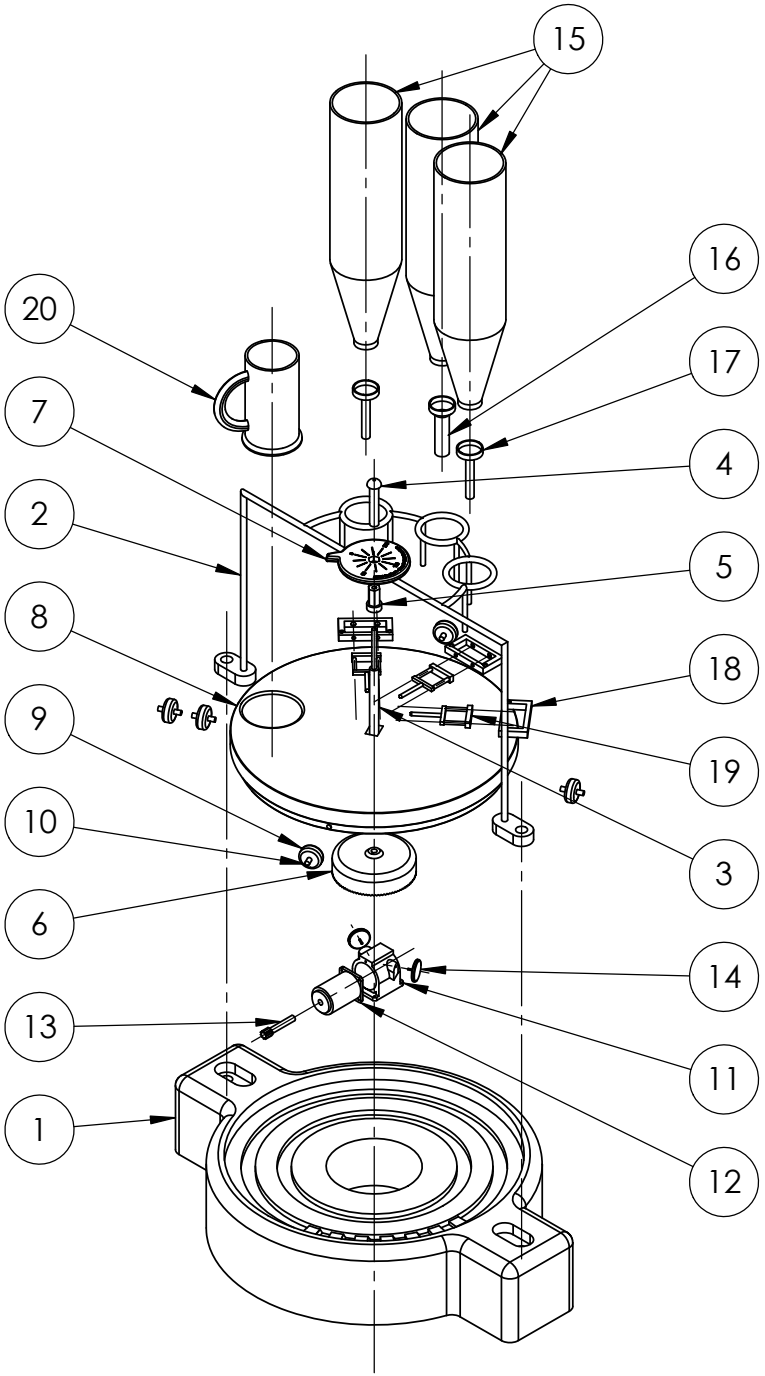
Additional Information

Some of the design constraints include the proper amount of fluid to be released for each bottle, the volume for each bottle, material choice (since we're dealing with consumables), the amount of stirring motion, and the ability to accurately open the valves to get the fluid into the cup without making a mess.

The cam would be located on the shaft coming out of the top of the plate. The dwell time would correspond to the amount of time each valve is opened to allow fluid to flow into the cup. When the drink passes under its corresponding valve, the cam will be at the point where it opens up the valve to release the fluid. Since the cam rotates with the plate, the motion would only need to repeat once; upon one revolution, the cup is returned to its starting position in front of the user.

The follower would only need to displace ½ to 1 inches to open the valve that controls the flow of the liquid into the cup.

This model would require 10-15 parts: (1) revolving disk, (1) shaft, (1) cam, (3) tubes, (1) bottle (used three times), (1) valve (used three times), (1) follower (used three times), and (1) frame assembly. The cup would also be modeled for demonstration purposes even though it's not part of the system, and a simple motor model would also be created without any details to show how it connects to the plate and shaft. Additionally, the stir mechanism may require a small number of parts, but it may also be built into the design of the plate or frame assembly.



ITEM NO.	PART NUMBER	Exploded Standard/QTY.
1	Frame - Base	1
2	Frame - Rack	1
3	Shaft - Shaft Lower	1
4	Shaft - Shaft Upper	1
5	Shaft - Hexagonal Adapter	1
6	Shaft - Gear	1
7	Shaft - Cam	1
8	Plate - Plate	1
9	Plate - Wheel	5
10	Plate - Wheel Axis	5
11	Motor - Mounting Bracket	1
12	Motor - Body	1
13	Motor - Gear Shaft	1
14	Motor - Angled Support Wheel	2
15	Misc - Bottle	3
16	Hose - Big	1
17	Hose - Small	2
18	Valve - Base	3
19	Valve - Follower	3
20	Misc - Cup	1

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

	NAME	DATE
DRAWN	N. Karasch	11/18/14
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

Section 7 - Group 3

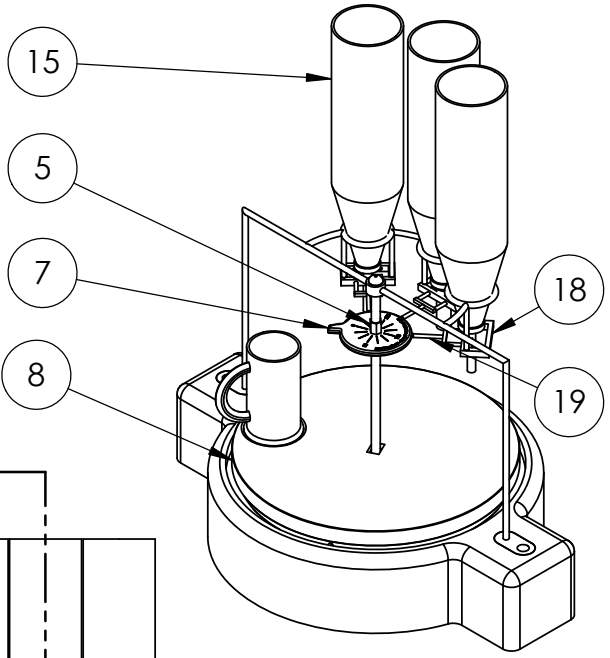
TITLE:

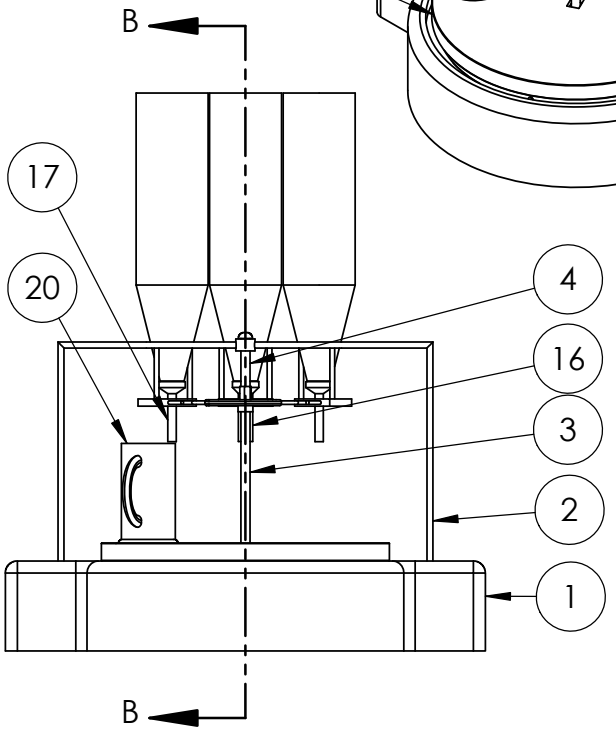
Drink Mixer Exploded View

SIZE	DWG. NO.	REV
A		

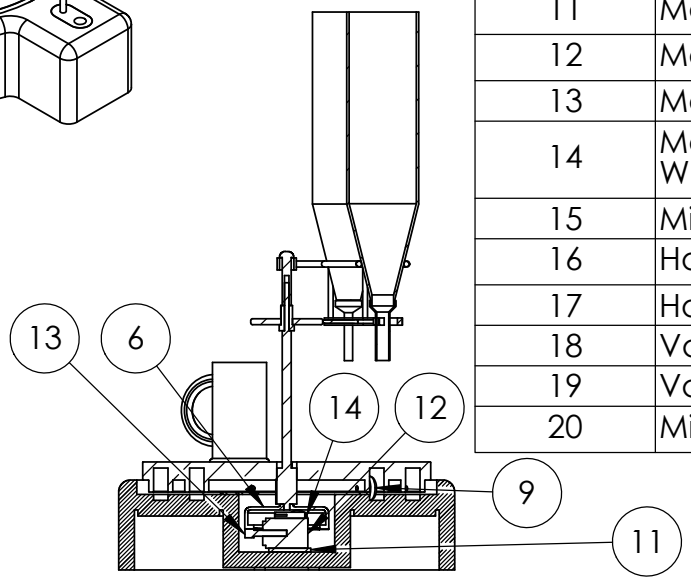
SCALE: 1:8 | SHEET 1 OF 1

5 4 3 2 1





SECTION B-B
SCALE 1 : 8



ITEM NO.	PART NUMBER	Exploded Standard/QTY.
1	Frame - Base	1
2	Frame - Rack	1
3	Shaft - Shaft Lower	1
4	Shaft - Shaft Upper	1
5	Shaft - Hexagonal Adapter	1
6	Shaft - Gear	1
7	Shaft - Cam	1
8	Plate - Plate	1
9	Plate - Wheel	5
10	Plate - Wheel Axis	5
11	Motor - Mounting Bracket	1
12	Motor - Body	1
13	Motor - Gear Shaft	1
14	Motor - Angled Support Wheel	2
15	Misc - Bottle	3
16	Hose - Big	1
17	Hose - Small	2
18	Valve - Base	3
19	Valve - Follower	3
20	Misc - Cup	1

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

	NAME	DATE
DRAWN	N. Karasch	11/18/14
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

Section 7 - Group 3

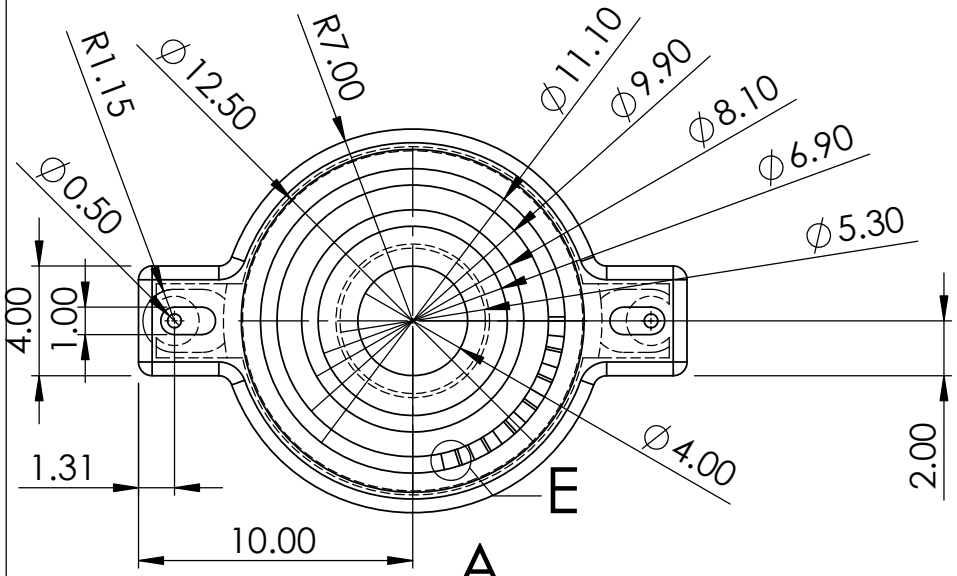
TITLE:

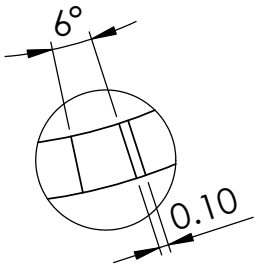
Drink Mixer

SIZE	DWG. NO.	REV
A		

SCALE: 1:8 | SHEET 2 OF 2

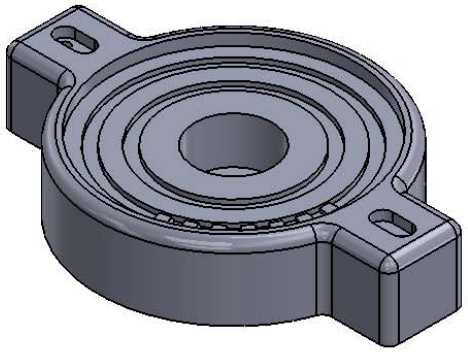
5 4 3 2 1

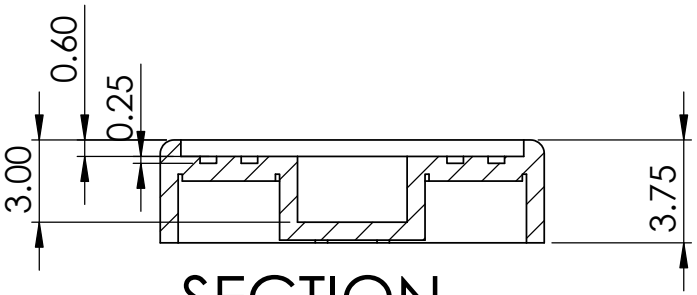




DETAIL E

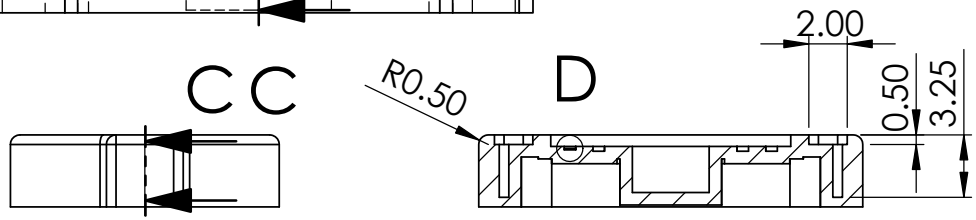
SCALE 1 : 2



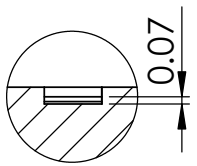


SECTION A-A

SCALE 1 : 7



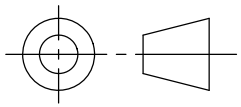
SECTION C-C



DETAIL D

SCALE 1 : 2

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	J. McPherson	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

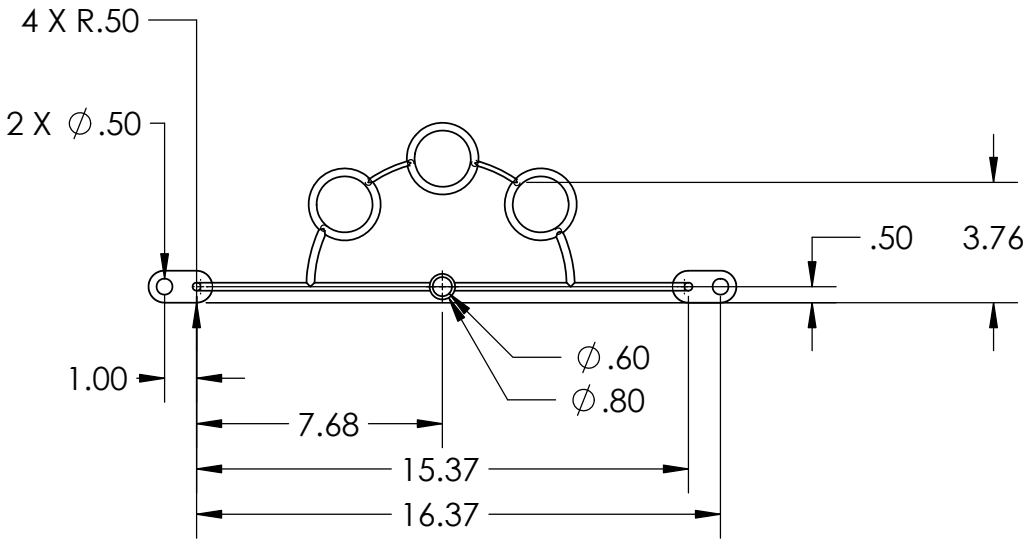
TITLE:

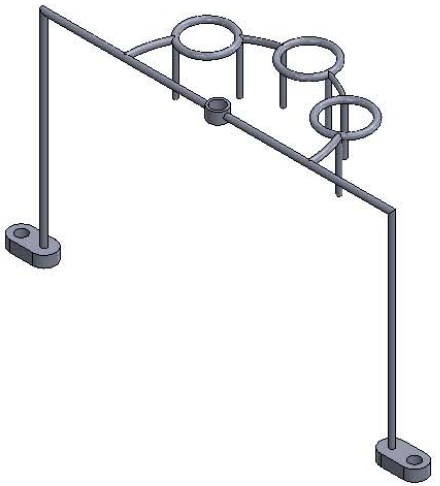
Frame - Base

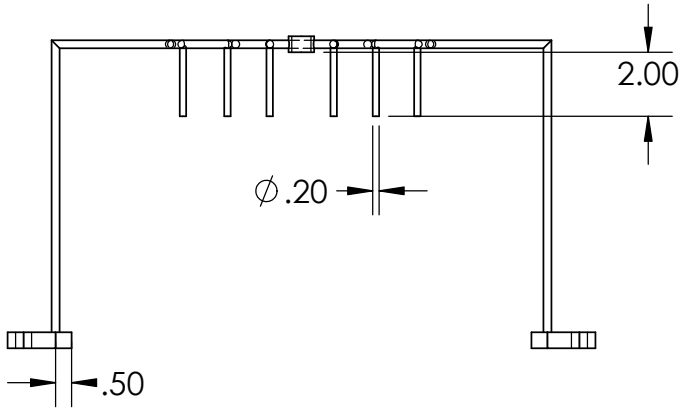
SIZE	DWG. NO.	REV
A	1	

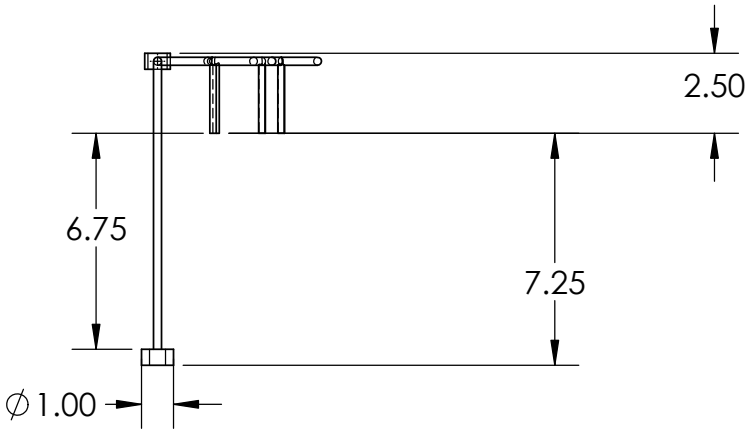
SCALE: 1:10 | SHEET 1 OF 1

5 4 3 2 1









UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	J. McPherson	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

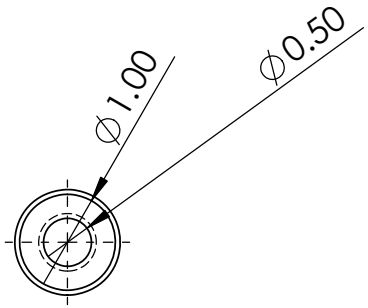
TITLE:

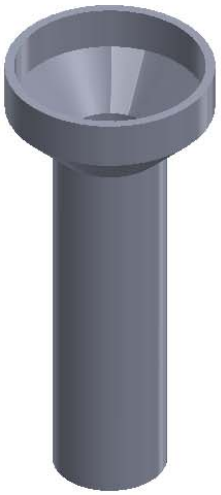
Frame - Rack

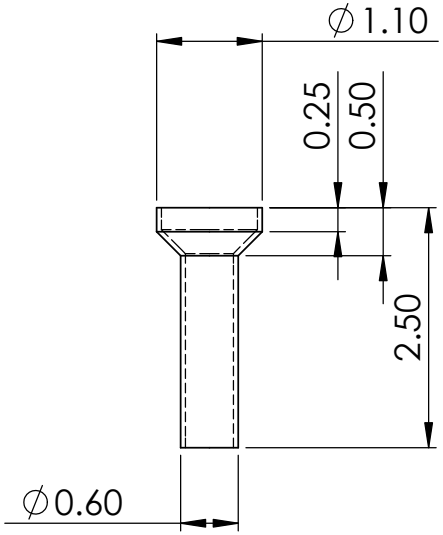
SIZE	DWG. NO.	REV
A	2	

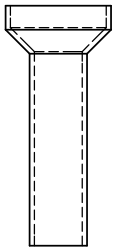
SCALE 1: 6 | SHEET 1 OF 1

5 4 3 2 1

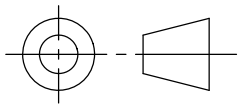








UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

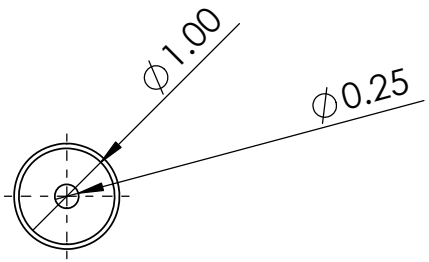
TITLE:

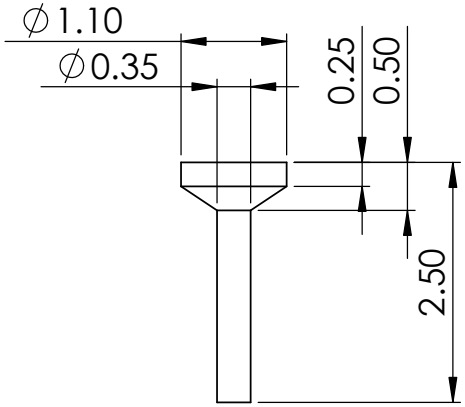
Hose - Big

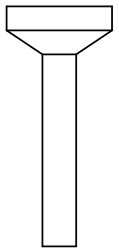
SIZE	DWG. NO.	REV
A	16	

SCALE: 1:1 | SHEET 1 OF 1

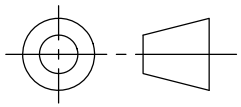
5 4 3 2 1







UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

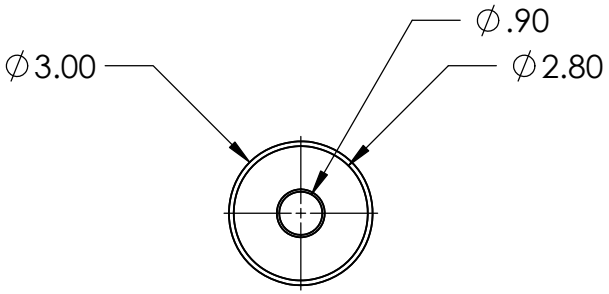
TITLE:

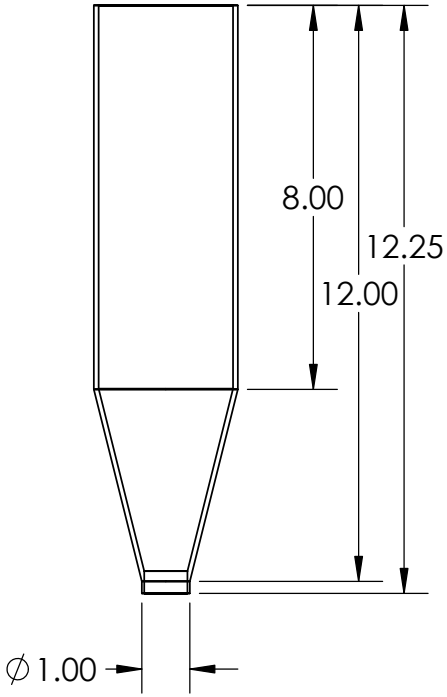
Hose - Small

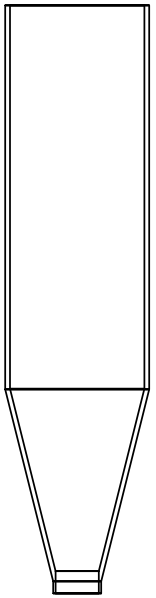
SIZE	DWG. NO.	REV
A	17	

SCALE: 1:1 | SHEET 1 OF 1

5 4 3 2 1

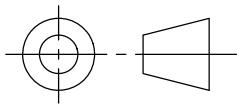






UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		

COMMENTS:
Entire piece is shelled out to a thickness of .10 inches.



Section 7 - Group 3

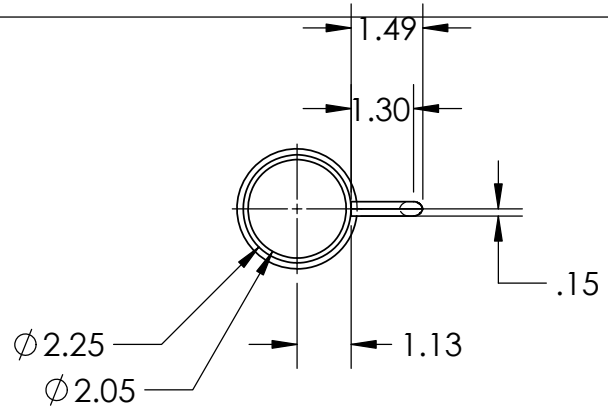
TITLE:

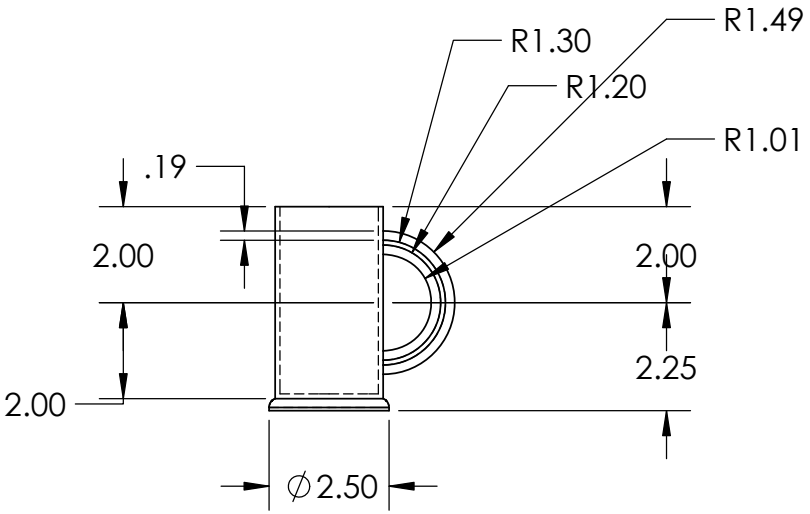
Bottle

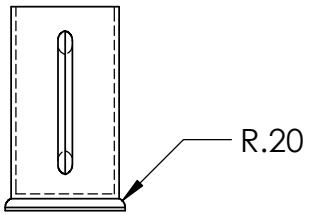
SIZE	DWG. NO.	REV
A	15	

SCALE: 1:4 | SHEET 1 OF 1

5 4 3 2 1







UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

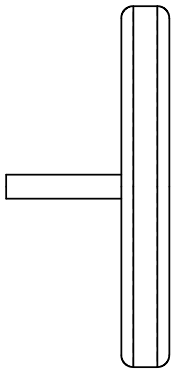
TITLE:

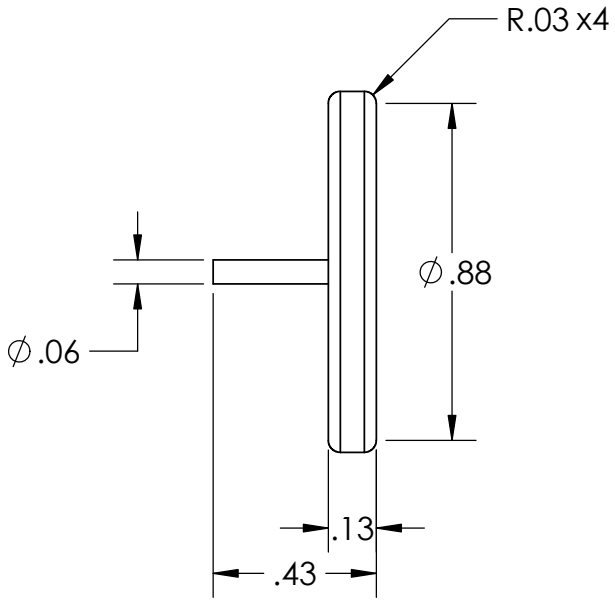
Cup

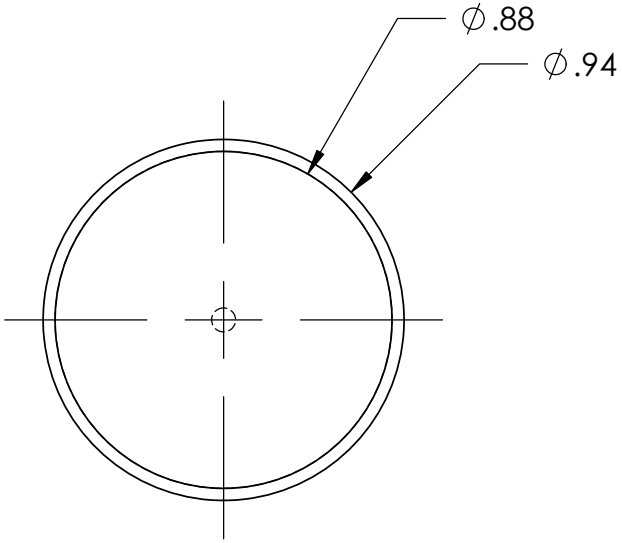
SIZE	DWG. NO.	REV
A	20	

SCALE: 1:4 | SHEET 1 OF 1

5 4 3 2 1







UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

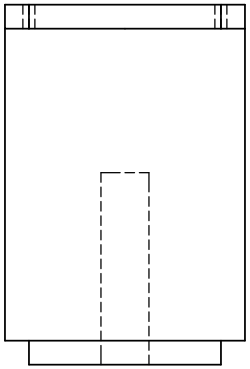
TITLE:

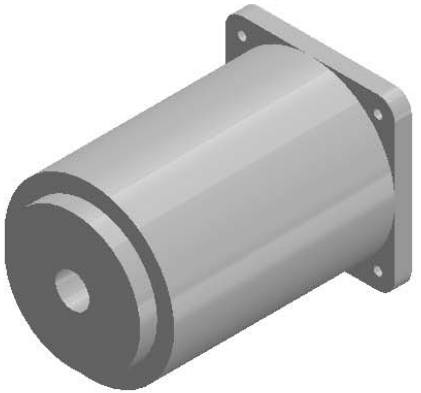
Angled Support Wheel

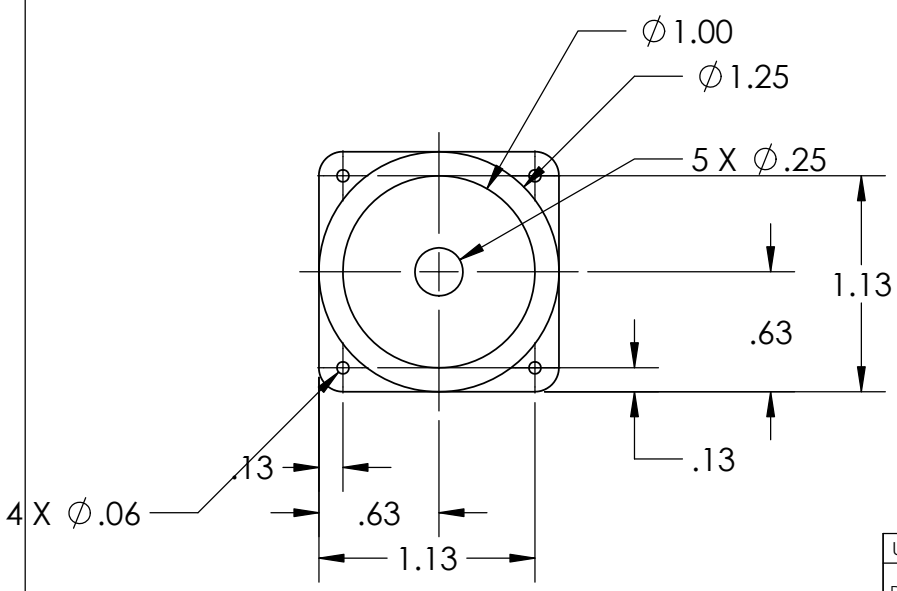
SIZE	DWG. NO.	REV
A	14	

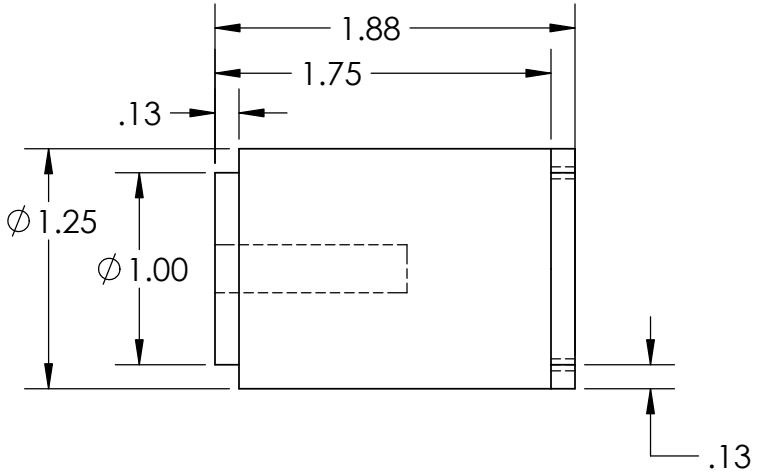
SCALE: 2:1 | SHEET 1 OF 1

5 4 3 2 1

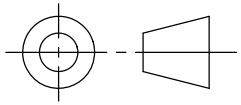








UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

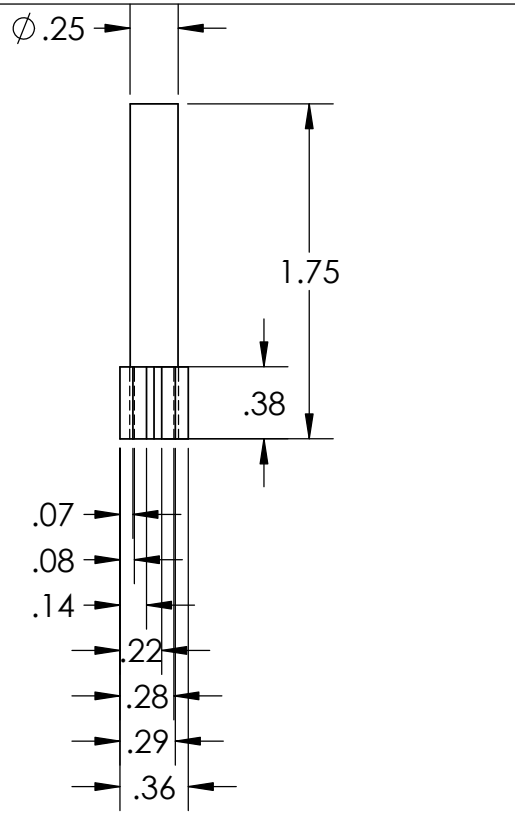
TITLE:

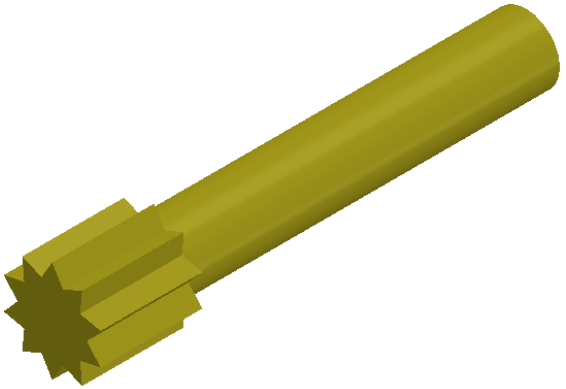
Motor Body

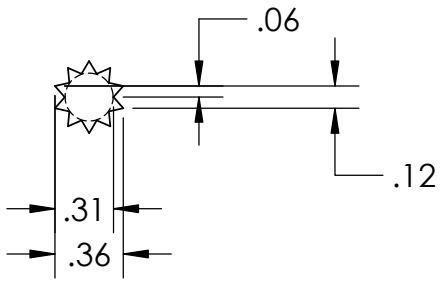
SIZE	DWG. NO.	REV
A	12	

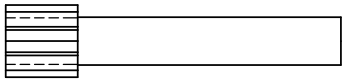
SCALE: 1:1 | SHEET 1 OF 1

5 4 3 2 1









UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

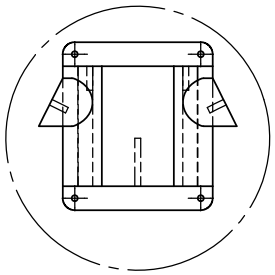
TITLE:

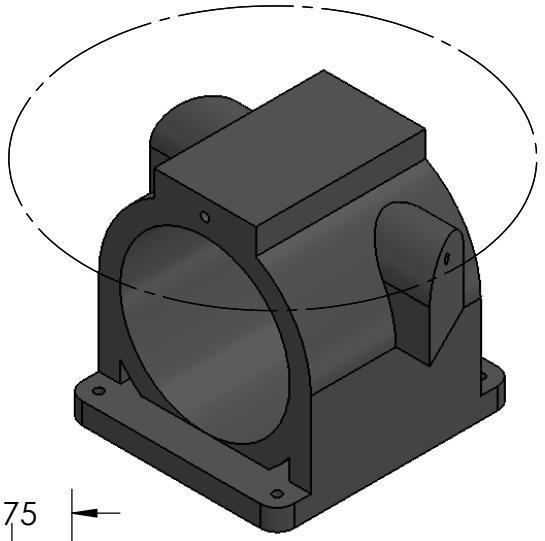
Gear Shaft

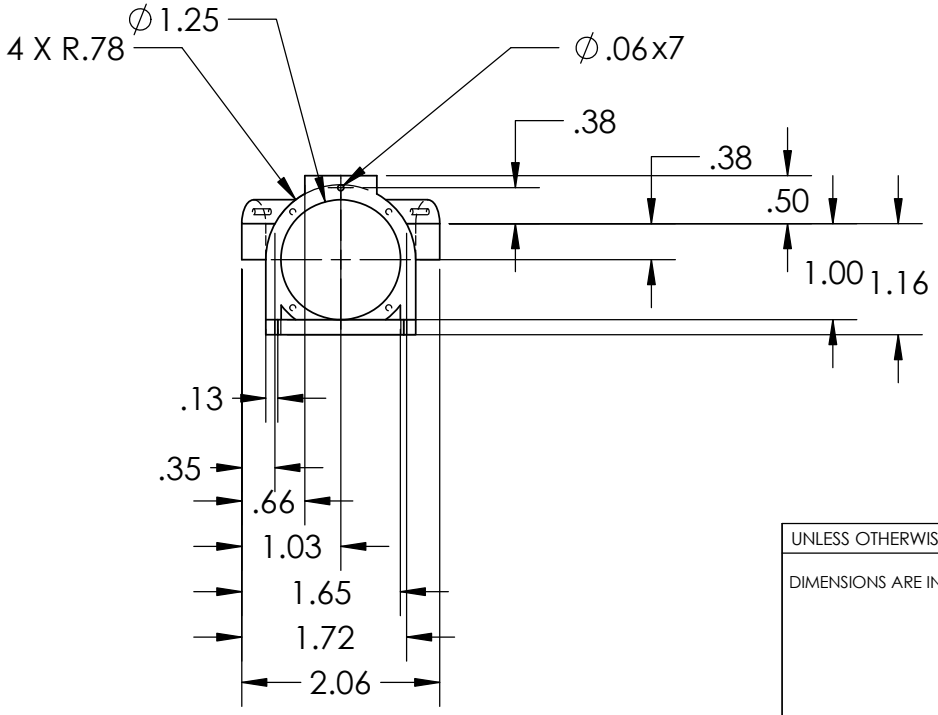
SIZE	DWG. NO.	REV
A	13	

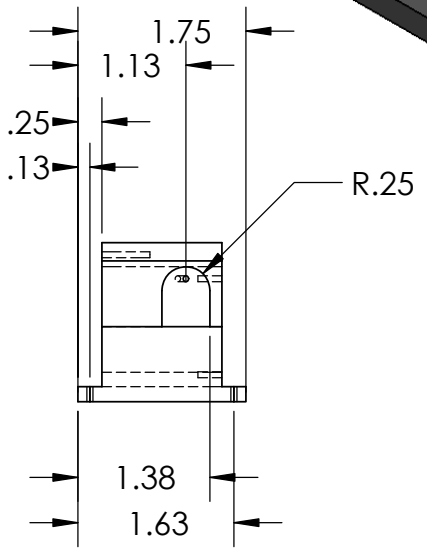
SCALE: 2:1 | SHEET 1 OF 1

5 4 3 2 1

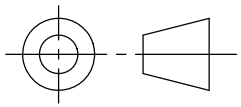








UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	M. Boysen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

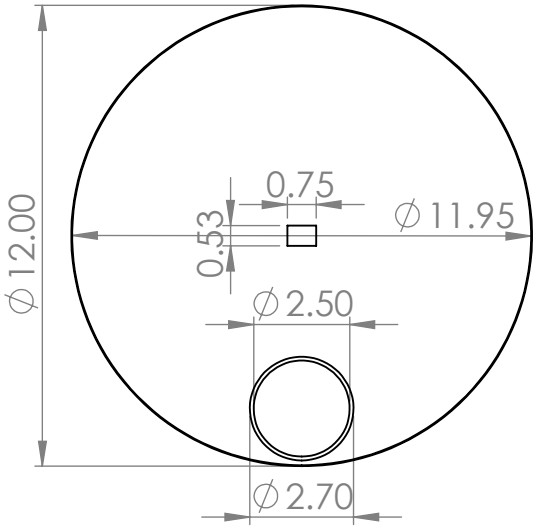
TITLE:

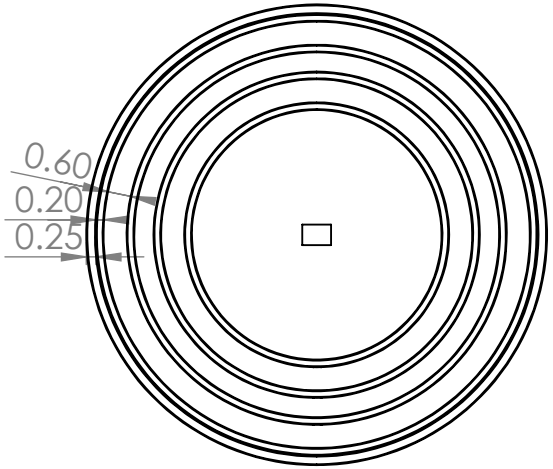
Motor Mounting Bracket

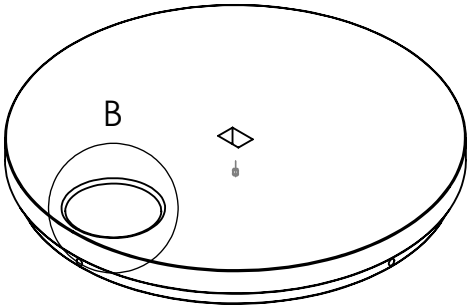
SIZE	DWG. NO.	REV
A	11	

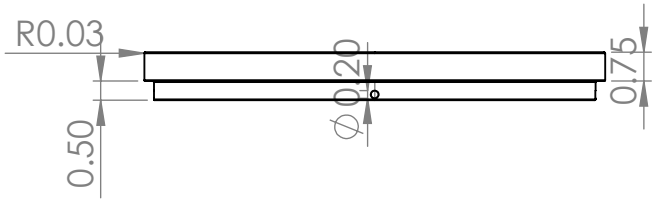
SCALE: 1:2 | SHEET 1 OF 1

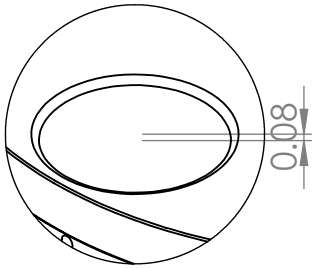
5 4 3 2 1

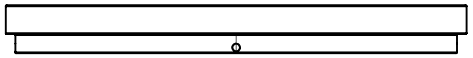






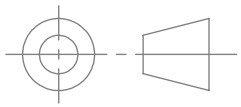






DETAIL B
SCALE 2 : 5

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	Yiqiu Chen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

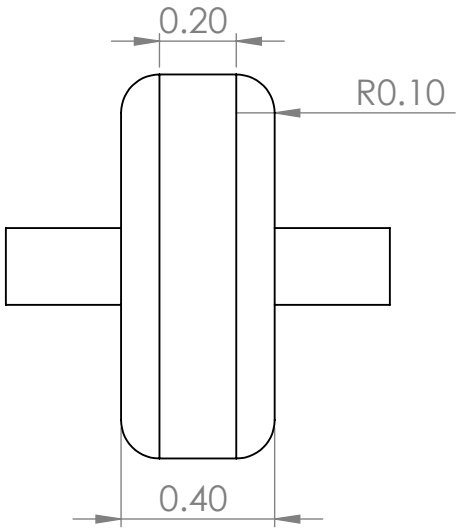
TITLE:

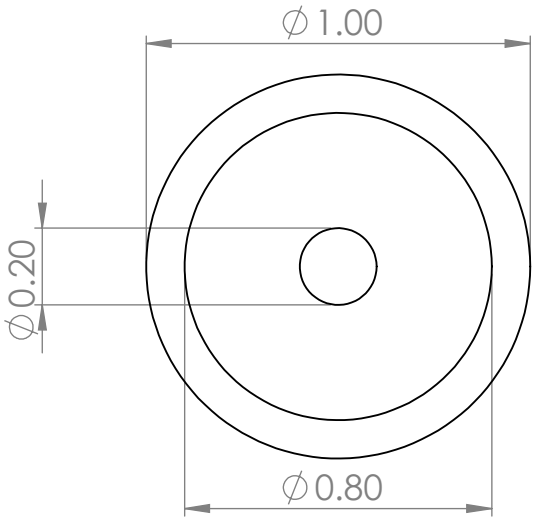
Plate

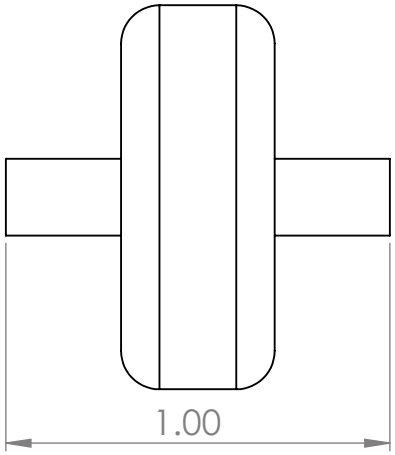
SIZE	DWG. NO.	REV
A	8	

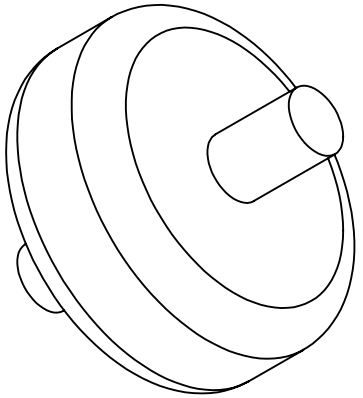
SCALE: 1:5 | SHEET 1 OF 1

5 4 3 2 1

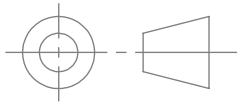








UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	Yiqiu Chen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

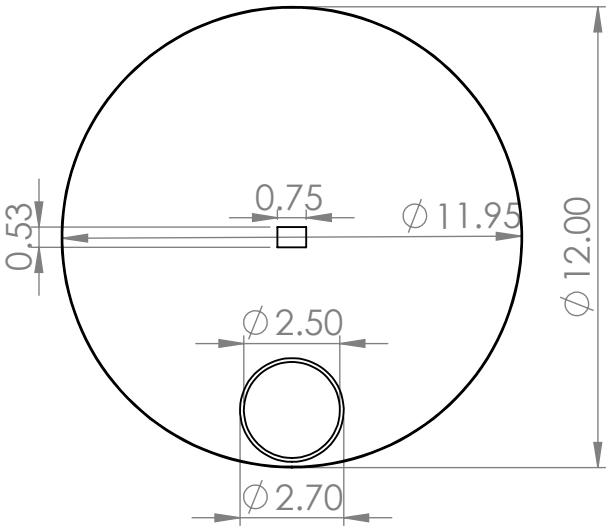
TITLE:

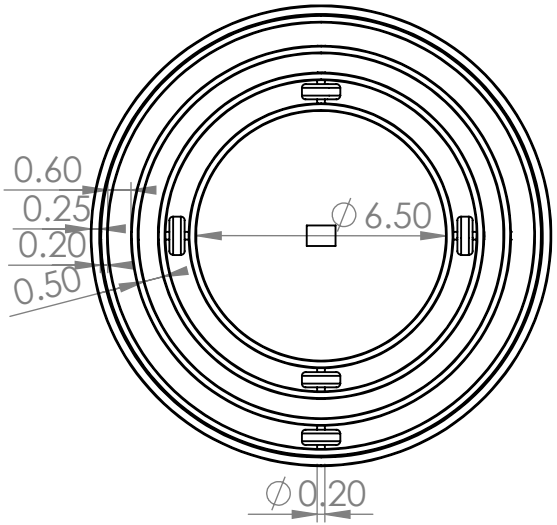
Wheel System

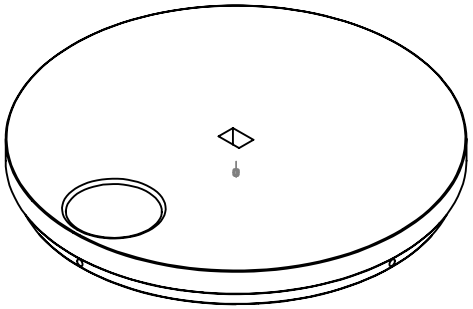
SIZE	DWG. NO.	REV
A	9 and 10	

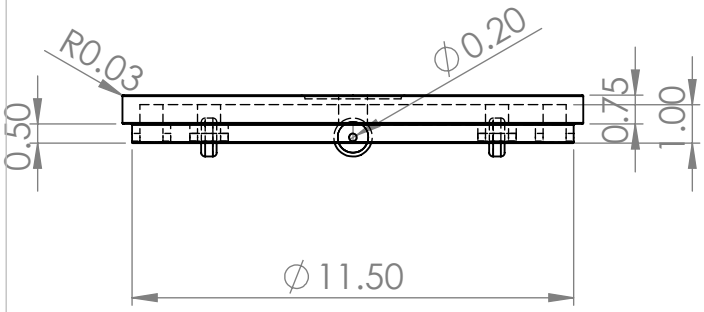
SCALE: 2:1 SHEET 1 OF 1

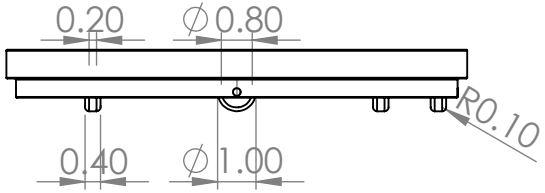
5 4 3 2 1



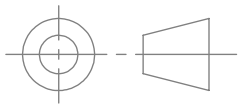








UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	Yiqiu Chen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

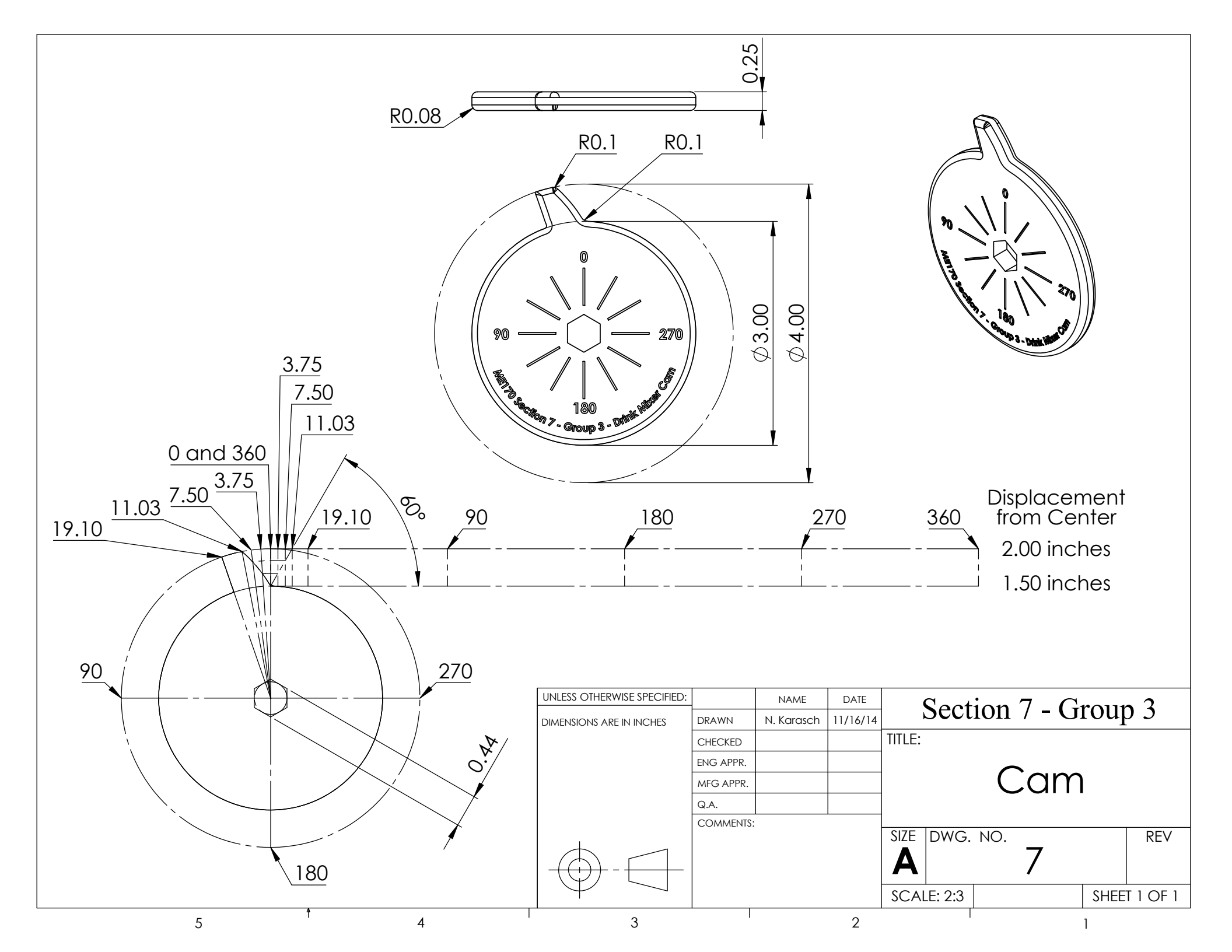
TITLE:

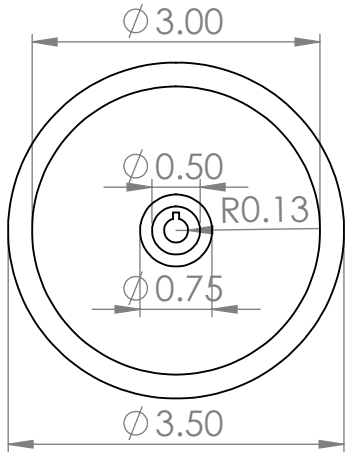
Plate Assembly

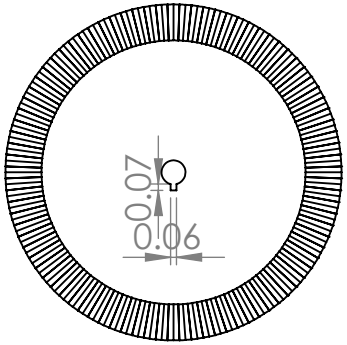
SIZE	DWG. NO.	REV
A	8, 9, and 10	

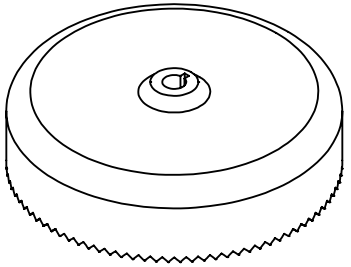
SCALE: 1:5 | SHEET 1 OF 1

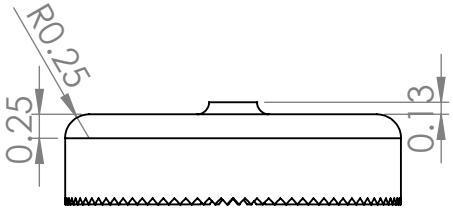
5 4 3 2 1

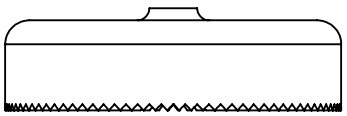

0.25
R0.08
R0.1
R0.1
0
90
270
180
MET170 Section 7 - Group 3 - Drink Mixer Cam
⌀3.00
⌀4.00
3.75
7.50
11.03
0 and 360
3.75
7.50
11.03
19.10
19.10
60°
90
180
270
360
Displacement from Center
2.00 inches
1.50 inches
90
270
180
0.44
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
NAME
DATE
DRAWN
N. Karasch
11/16/14
CHECKED
ENG APPR.
MFG APPR.
Q.A.
COMMENTS:
Section 7 - Group 3
TITLE:
Cam
SIZE
A
DWG. NO.
7
REV
SCALE: 2:3
SHEET 1 OF 1
5
4
3
2
1



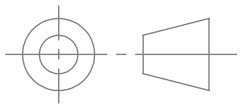








UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	Yiqiu Chen	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		



Section 7 - Group 3

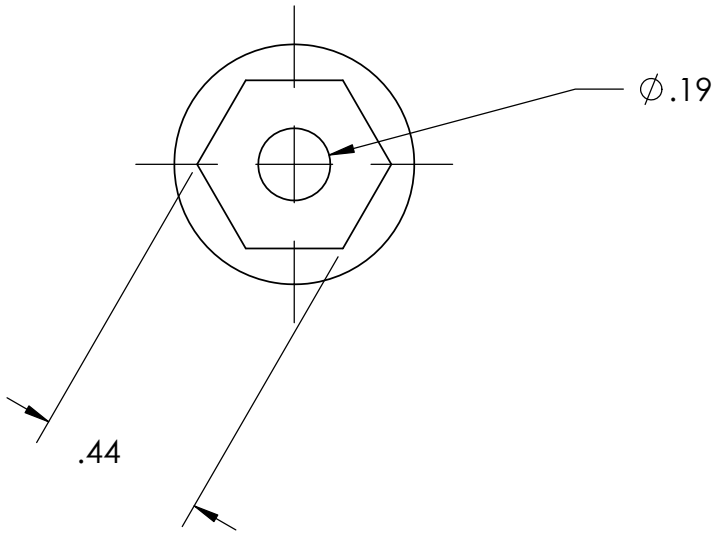
TITLE:

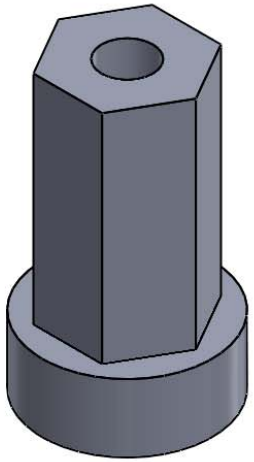
Gear

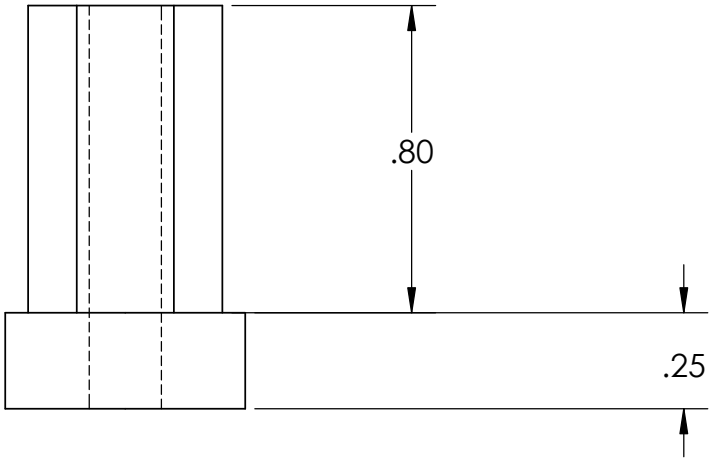
SIZE	DWG. NO.	REV
A	6	

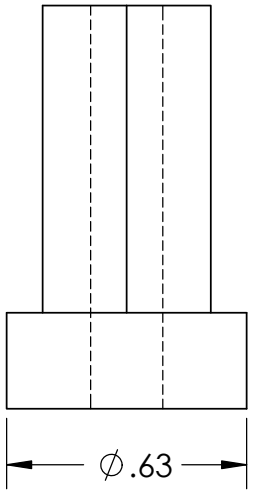
SCALE: 1:2 | SHEET 1 OF 1

5 4 3 2 1









UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	B. Steele	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

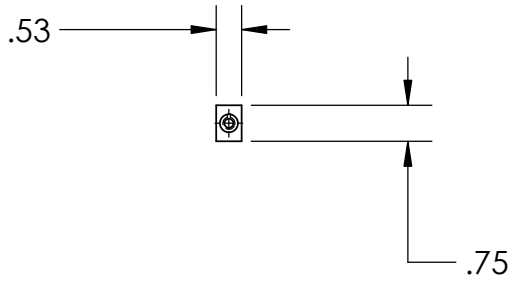
TITLE:

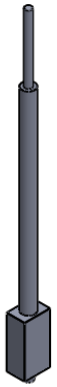
Shaft - Adapter

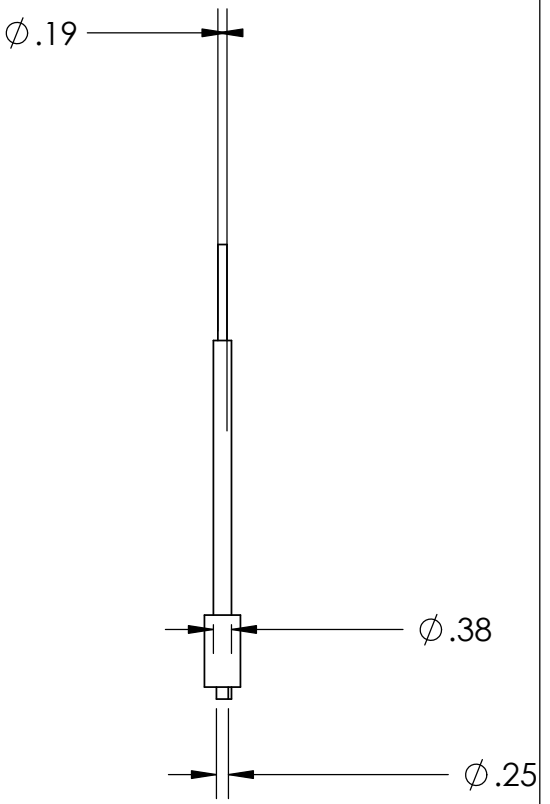
SIZE	DWG. NO.	REV
A	5	

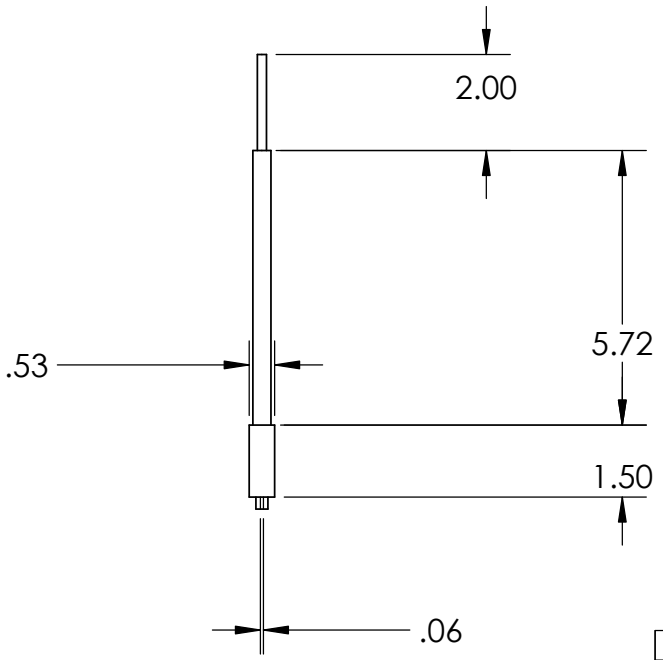
SCALE: 2:1 | SHEET 1 OF 1

5 4 3 2 1









UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	B. Steele	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

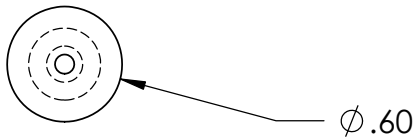
TITLE:

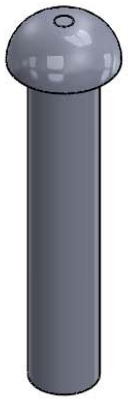
Shaft - Lower

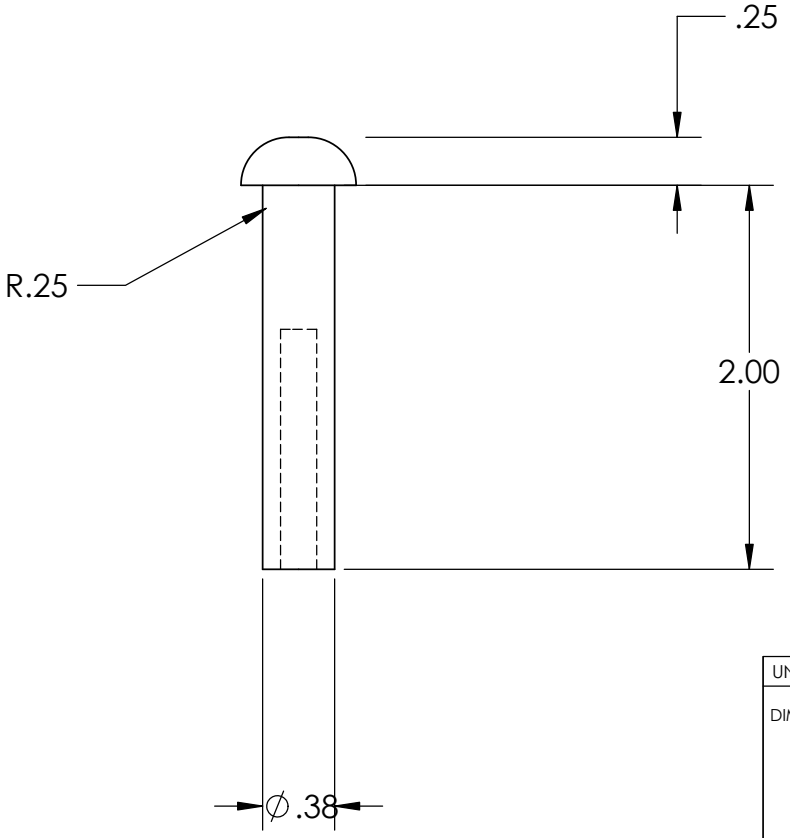
SIZE	DWG. NO.	REV
A	3	

SCALE: 1:4 | SHEET 1 OF 1

5 4 3 2 1







UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	B. Steele	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

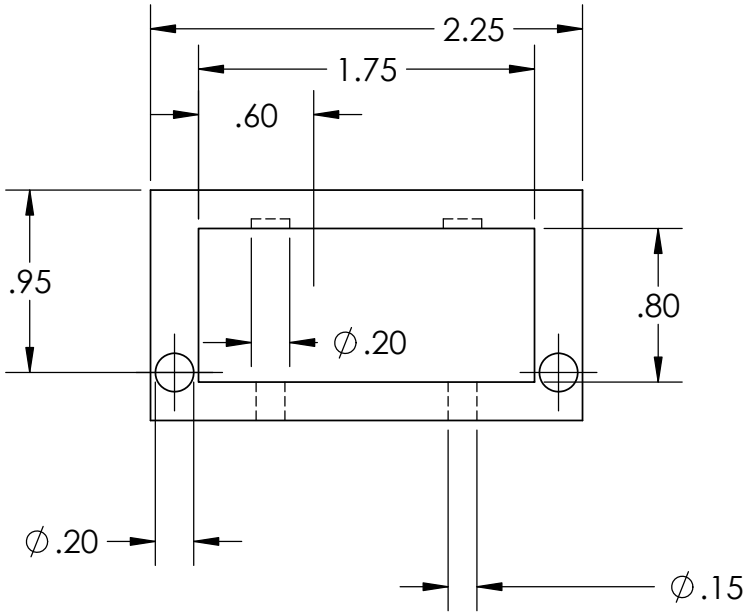
TITLE:

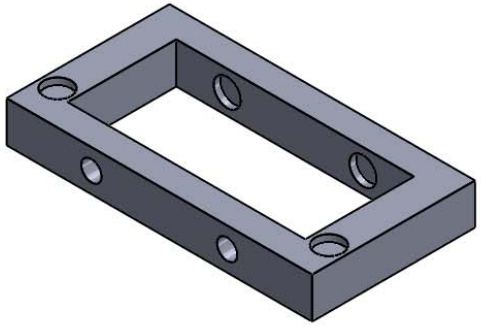
Shaft - Upper

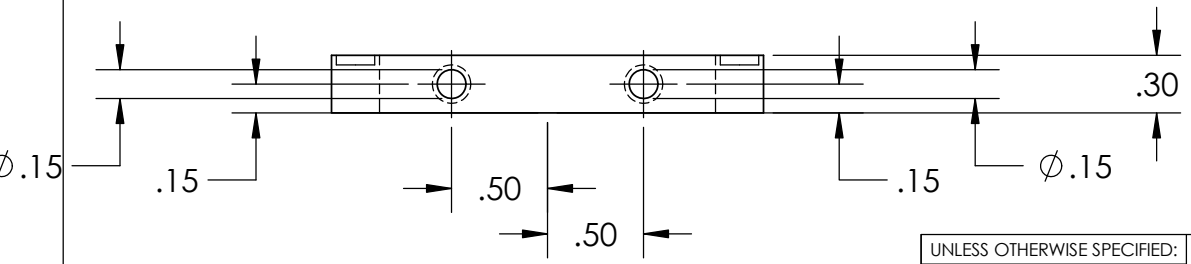
SIZE	DWG. NO.	REV
A	4	

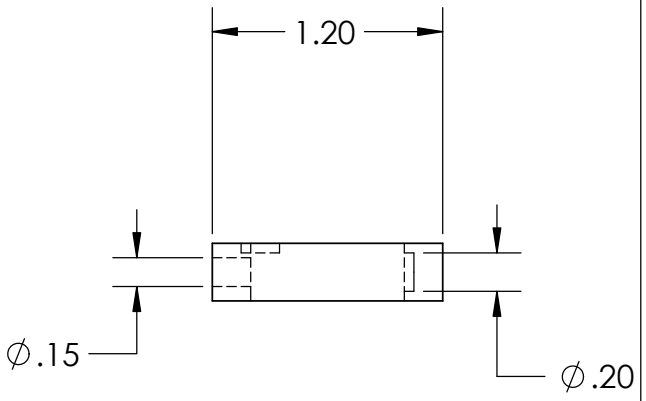
SCALE: 1:1 | SHEET 1 OF 1

5 4 3 2 1









UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	B. Steele	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

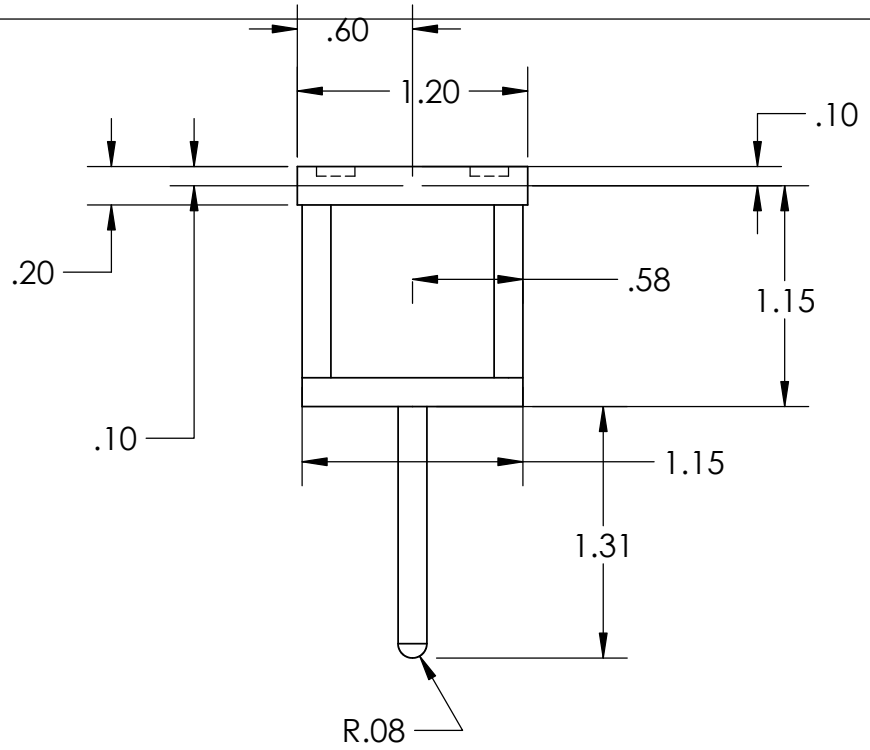
TITLE:

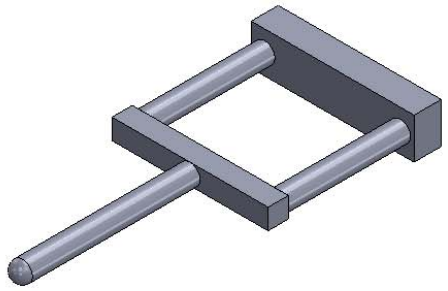
Valve - Base

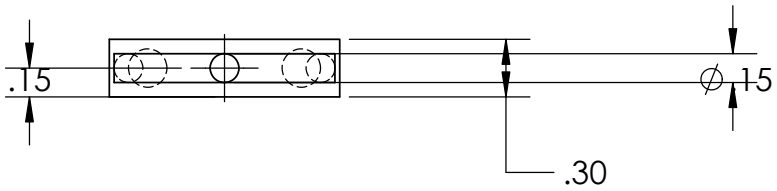
SIZE	DWG. NO.	REV
A	18	

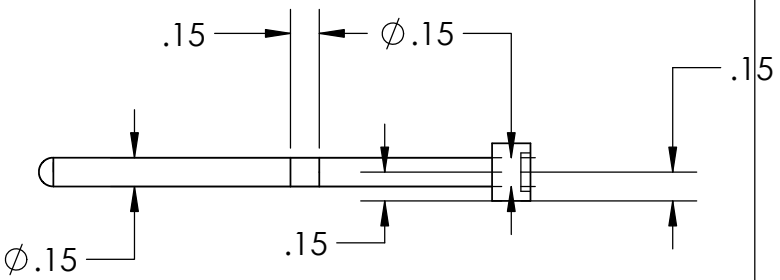
SCALE: 1:1 | SHEET 1 OF 1

5 4 3 2 1









UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	B. Steele	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

TITLE:

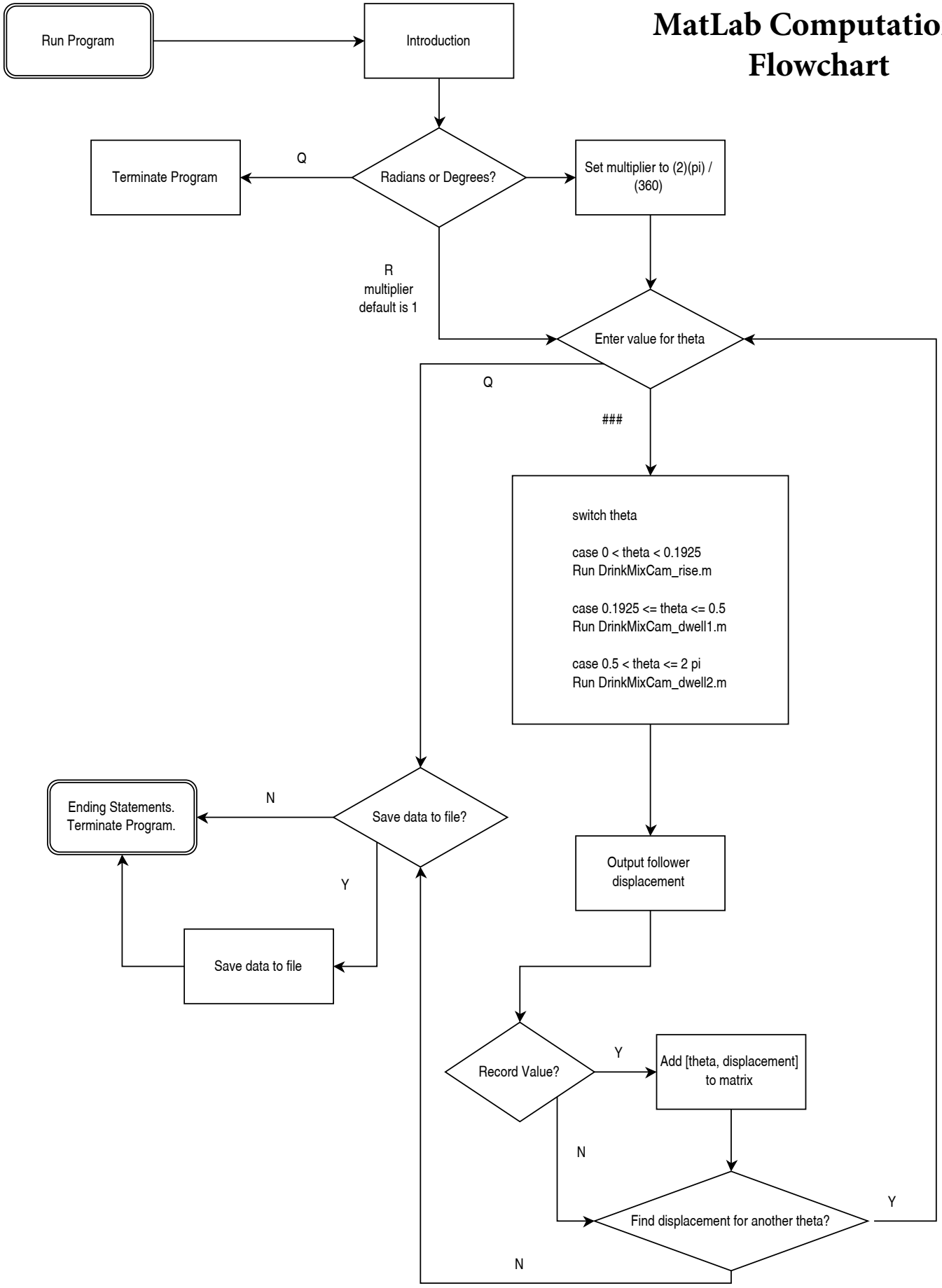
Valve - Follower

SIZE	DWG. NO.	REV
A	19	

SCALE: 1:1 | SHEET 1 OF 1

5 4 3 2 1

MatLab Computational Flowchart



Matlab Mathematical Modeling Program

DrinkMixCam_main.m

```
%% DRINK MIX CAM MATHEMATICAL MODELING PROGRAM

% ME 170, Section 7, Group 3

% This program takes the input theta of the rotational position of the cam
% and outputs the follower displacement at that position. A graph shows the
% cam profile with the specified theta position plotted along the graph. It
% also outputs the results as text and has the option of recording all
% points to a .dat file for use in other applications.

%% IMPORTANT NOTE:
% This script requires the following functions:
%     DrinkMixCam_rise.m
%     DrinkMixCam_dwell1.m
%     DrinkMixCam_dwell2.m

%% Initialized Variables
myData = [0, 0];
riseEndPoint = 0.5 / ( tan(pi/3) * 1.5);
    % Cam angle for riseEndPoint is equal to the max
    % follower displacement [0.5] divided by the
    % quantity tan(angle of rise) [tan(pi/3)] times
    % the radius [1.5] of the cam at displacement = 0
dwellOneEndPoint = 1/3;
graphX = zeros([0,251]);
graphY = zeros([0,251]);
graphTheta = zeros([0,251]);
firstPlot = 0;
runningIndex = 0;
Name = {'1';'2';'3'};
Theta = [0;0;0];
Abscissa = [0;0;0];
Displacement = [0;0;0];
calcX = 0;
calcY = 0;

%% Introductory Text
fprintf('\n\n************** Drink Mixer Cam Modeling **************\n\n');
fprintf('              ME 170, Section 7, Group 3\n');

%% Question - Radians or Degrees?
inputLoop = 1;
while inputLoop ~= 0
    inputMethod = input('\nDo you want: (R)adians, (D)egrees, or (Q)uit?
','s');
    switch inputMethod
```

```
        case {'R', 'r', 'radians', 'Radians', 'RADIANS'}    % Theta will be
in radians.
            multiplier = 1;
            unitsShort = 'rad';
            inputLoop = 0;
        case {'D', 'd', 'degrees', 'Degrees', 'DEGREES'}    % Theta will be
in degrees.
            multiplier = pi/180;
            unitsShort = 'deg';
            inputLoop = 0;
        case {'Q', 'q', 'quit', 'Quit', 'QUIT'}             % Run
DMCQuitProgram script.
            fprintf('\nProgram Terminated.\n\n');
            return;
        otherwise                   % Invalid response.
            if inputLoop < 4
                inputLoop = inputLoop + 1;
                fprintf('Invalid Response\n');
            else
                fprintf('Program Terminated: Too many invalid
responses.\n\n');
                return;
            end
    end
end

%% RUN LOOP OPEN
runLoopRunning = 1;
while runLoopRunning == 1

%% Question - Value for Theta?
inputLoop = 1;
while inputLoop ~= 0
    initThetaValue = input('\nEnter the value for Theta:  ');
    if isempty(initThetaValue) == 0
        inputLoop = 0;
    else
        fprintf('Invalid Response\n');
        inputLoop = inputLoop + 1;
    end
    if inputLoop == 4
        fprintf('Program Terminated: Too many invalid responses.\n\n');
        return;
    end
end

if multiplier == 1
    % Bound: 0 <= thetaValue < 2pi
    if initThetaValue >= 2*pi
        thetaValue = rem(initThetaValue,2*pi);
        fprintf('\n***** Value bounded: %.3f radians equals %.3f radians.
*****\n\n',initThetaValue,thetaValue);
    elseif initThetaValue < 0
        thetaValue = 2*pi + rem(initThetaValue,2*pi);
        fprintf('\n***** Value bounded: %.3f radians equals %.3f radians.
*****\n\n',initThetaValue,thetaValue);
```

```
    else
        thetaValue = initThetaValue;
    end
else
    % Bound: 0 <= thetaValue < 360
    if initThetaValue >= 360
        thetaValue = rem(initThetaValue,360);
        fprintf('\n***** Value bounded: %.3f degrees equals %.3f degrees.
*****\n\n',initThetaValue,thetaValue);
    elseif initThetaValue < 0
        thetaValue = 360 + rem(initThetaValue,360);
        fprintf('\n***** Value bounded: %.3f degrees equals %.3f degrees.
*****\n\n',initThetaValue,thetaValue);
    else
        thetaValue = initThetaValue;
    end
end

%% Calculations

% Specified theta calculations

oldCalcX = calcX;
oldCalcY = calcY;
calcTheta = thetaValue * multiplier;  %calcTheta will be used in the
calculations and will always be in radians.
if calcTheta < riseEndPoint
    [calcX, calcY] = DrinkMixCam_rise(calcTheta);
elseif calcTheta >= riseEndPoint && calcTheta <= dwellOneEndPoint
    [calcX, calcY] = DrinkMixCam_dwell1(calcTheta);
else
    [calcX, calcY] = DrinkMixCam_dwell2(calcTheta);
end

% Graph Calculations

for i = 1:251   % graphTheta = [0:0.05:2*pi];
    graphTheta(i) = (i-1)*0.025;
    if graphTheta(i) < riseEndPoint
        [graphX(i), graphY(i)] = DrinkMixCam_rise(graphTheta(i));
    elseif graphTheta(i) >= riseEndPoint && graphTheta(i) <= dwellOneEndPoint
        [graphX(i), graphY(i)] = DrinkMixCam_dwell1(graphTheta(i));
    else
        [graphX(i), graphY(i)] = DrinkMixCam_dwell2(graphTheta(i));
    end
end

%% Output (Text and Graph)
% Text
fprintf('    Theta: %.3f\n',initThetaValue);
fprintf('       Abscissa (inches):     %.3f\n',calcX);
fprintf('       Displacement (inches): %.3f\n',calcY);

% Graph
if firstPlot == 0
```

```
    figure;
    hold on;
    grid on;
    plot(graphX,graphY,'r','LineWidth',2);
    plot(calcX,calcY,'bd','LineWidth',1.5);
    oldCalcX = calcX;
    oldCalcY = calcY;
    plot(oldCalcX,oldCalcY,'kd','LineWidth',1.5);
    title('Drink Mixer Cam Mathmatical Model');
    xlabel('Abscissa (inches)');
    ylabel('Follower Displacement (inches)');
    legend('Cam Profile','Current Theta','Previous Theta(s)');
    firstPlot = 1;
end
plot(oldCalcX,oldCalcY,'kd','LineWidth',1.5);
plot(calcX,calcY,'bd','LineWidth',1.5);
text(9.5,0.375,strcat({'\color{blue}   Theta =
'},num2str(initThetaValue,'%5.3f'),{'
'},unitsShort),'HorizontalAlignment','right','BackgroundColor',[1 1 1]);
text(9.5,0.35,strcat({'\color{blue}Abscissa = '},num2str(calcX,'%5.3f'),{'
inches'}),'HorizontalAlignment','right','BackgroundColor',[1 1 1]);
text(9.5,0.325,strcat({'\color{blue}Displacement =
'},num2str(calcY,'%5.3f'),{'
inches'}),'HorizontalAlignment','right','BackgroundColor',[1 1 1]);

%% Question - Record Value?
recordValue = input('Record this value? (Y/N)  ','s');

switch recordValue
    case {'Y','y','yes','Yes','YES'}
        % Table Management
        runningIndex = runningIndex + 1;
        Name(runningIndex,1) = {num2str(runningIndex)};
        Theta(runningIndex,1) = initThetaValue;
        Abscissa(runningIndex,1) = calcX;
        Displacement(runningIndex,1) = calcY;
        fprintf('...Value recorded.\n');
    case {'N','n','no','No','NO'}
        fprintf('...Value not recorded.\n');
    case {'Q','q','quit','Quit','QUIT'}
        % Table Management
        runningIndex = runningIndex + 1;
        Name(runningIndex,1) = {num2str(runningIndex)};
        Theta(runningIndex,1) = initThetaValue;
        Abscissa(runningIndex,1) = calcX;
        Displacement(runningIndex,1) = calcY;
        fprintf('...Value recorded. Terminating the program...\n\n');
        runLoopRunning = 0;
    otherwise
        % Table Management
        runningIndex = runningIndex + 1;
        Name(runningIndex,1) = {num2str(runningIndex)};
        Theta(runningIndex,1) = initThetaValue;
        Abscissa(runningIndex,1) = calcX;
        Displacement(runningIndex,1) = calcY;
        fprintf('...Invalid response. Value recorded by default.\n');
```

```
end

%% Question - Input Another Value?
inputLoop = 1;
while inputLoop ~= 0
    recordValue = input('Input another value? (Y/N)  ','s');

    switch recordValue
        case {'Y','y','yes','Yes','YES'}
            inputLoop = 0;
        case {'N','n','no','No','NO','Q','q','quit','Quit','QUIT'}
            inputLoop = 0;
            fprintf('...Terminating the program...\n\n');
            runLoopRunning = 0;
        otherwise
            inputLoop = inputLoop + 1;
            fprintf('...Invalid response.\n');
            if inputLoop == 4
                fprintf('Too many invalid responses: Terminating
Program.\n\n');
                return
            end
    end
end

%% RUN LOOP CLOSE
end

%% Save data to file and terminate the program.
RESULTS = table(Theta,Abscissa,Displacement,'RowNames',Name);
inputLoop = 1;
while inputLoop ~= 0
    saveData = input('Save recorded data to file? (Y/N)  ','s');
    switch saveData
        case {'Y','y','yes','Yes','YES'}
            inputFileName = input('Enter a name for the file (without
extensions):  ','s');
            if isempty(inputFileName) == 0
                fileName = strcat(inputFileName,'.dat');
            else
                fileName = 'DrinkMixCam_Results.dat';
            end
            writetable(RESULTS,fileName);
            fprintf('\nData saved to %s.\n',fileName);
            RESULTS     % Displays the final results
            fprintf('Program Terminated.\n\n');
            inputLoop = 0;
        case {'N','n','no','No','NO','Q','q','quit','Quit','QUIT'}
            fprintf('\nData was not saved. Program terminated.\n\n');
            inputLoop = 0;
        otherwise
            if inputLoop < 4
                inputLoop = inputLoop + 1;
                fprintf('Invalid Response\n');
            else
                fileName = 'DrinkMixCam_Results.dat';
```

```
                writetable(RESULTS,fileName);
                fprintf('Too many invalid responses. Data saved by default to
DrinkMixCam_Results.dat.\n');
                RESULTS    % Displays the final results
                fprintf('Program Terminated.\n\n');
                inputLoop = 0;
            end
    end
end
```

DrinkMixCam_rise.m

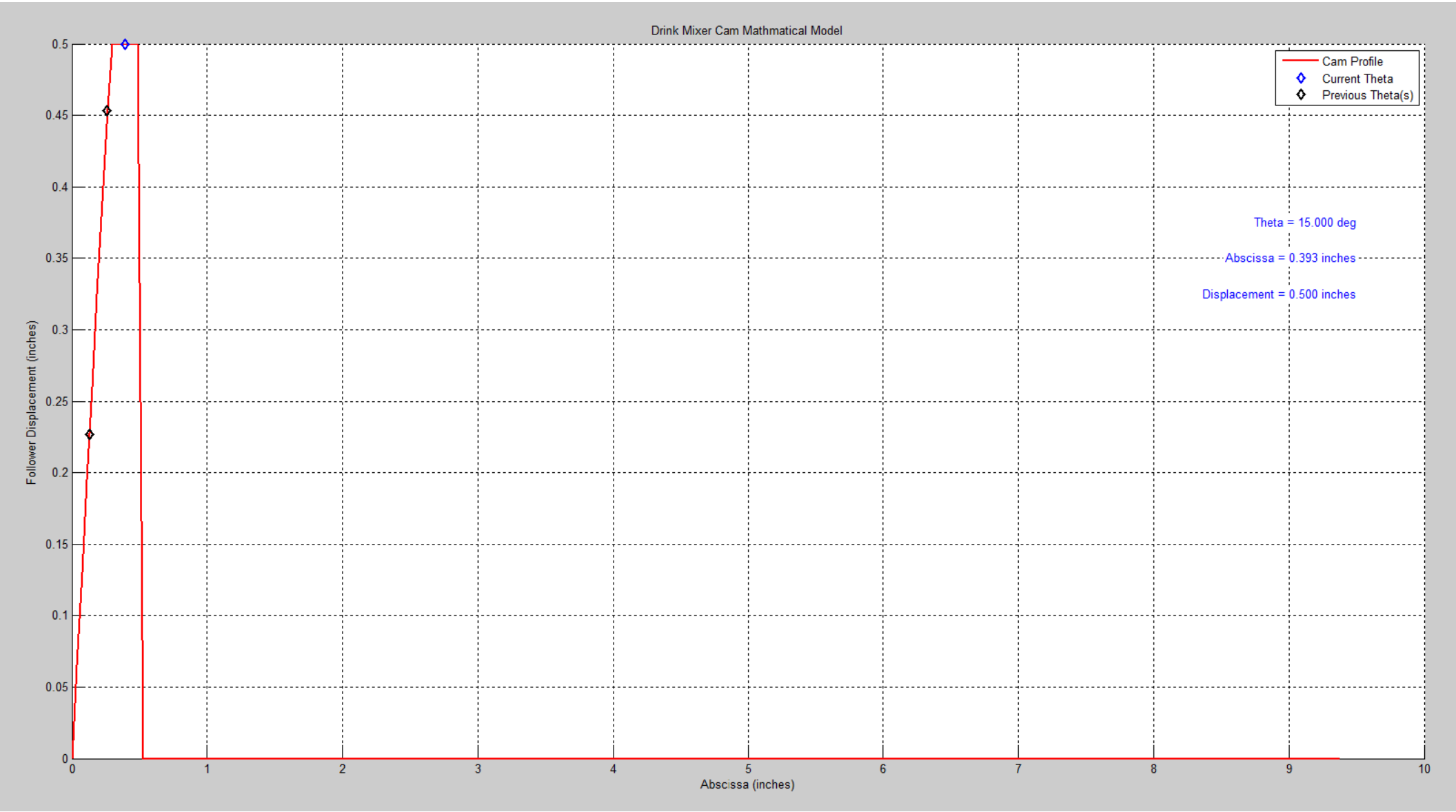
```
function [ X, Y ] = DrinkMixCam_rise( theta )
%DRINKMIXCAM_RISE Calculates follower displacement during the rise interval
%   X = ( (theta - theta_0) / (theta_1 - theta_0) ) * d_1
%   Y = tan(phi_1) * ( (theta - theta_0) / (theta_1 - theta_0) ) * d_1

X = (theta/(0.5/(tan(pi/3)*1.5)))*(0.5/tan(pi/3));
Y = tan(pi/3)*(theta/(0.5/(tan(pi/3)*1.5)))*(0.5/tan(pi/3));

end
```

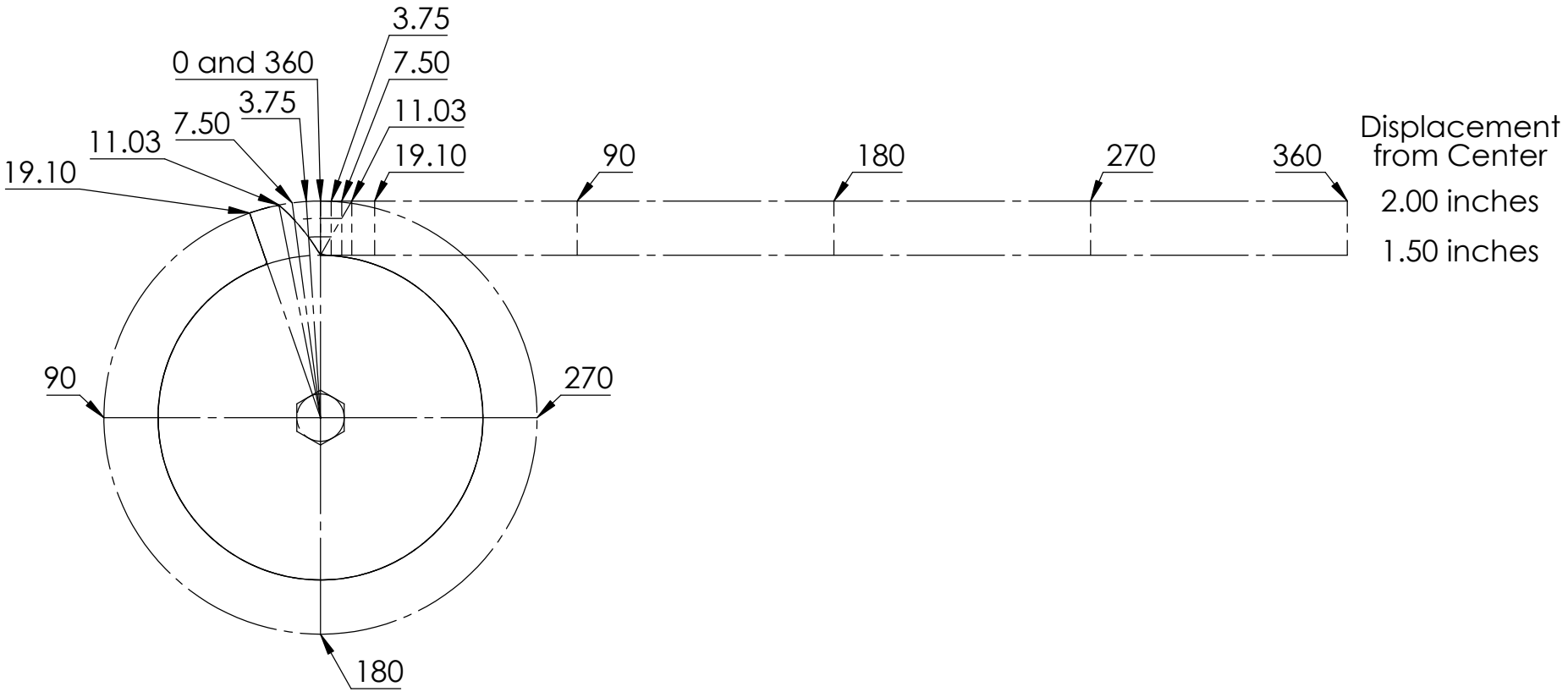
DrinkMixCam_dwell1.m

```
function [ X, Y ] = DrinkMixCam_dwell1( theta )
%DRINKMIXCAM_DWELL1 Calculates follower displacement during dwell_1 interval
%   X = d_1 + (theta - theta_1)/(theta_2-theta_1) * d_2
%   Y = Y_t

X = (0.5/tan(pi/3)) + (((theta-(0.5/(tan(pi/3)*1.5))) / ((1/3)-
(0.5/(tan(pi/3)*1.5)))) * (0.5-(0.5/tan(pi/3))));
Y = 0.5;

End
```

DrinkMixCam_dwell2.m

```
function [ X, Y ] = DrinkMixCam_dwell2( theta )
%DRINKMIXCAM_DWELL2 Calculates follower displacement during dwell_2 interval
%   X = d_1 + d_2 + d_3 + (theta - theta_3)/(theta_4 - theta_3) * d_4
%   Y = 0

X = 0.5 + ( ((theta-(1/3)) / ((2*pi)-(1/3))) * ((2*pi*1.5)-0.5) );
Y = 0;

end
```


Drink Mixer Cam Mathmatical Model
Cam Profile
Current Theta
Previous Theta(s)
Theta = 15.000 deg
Abscissa = 0.393 inches
Displacement = 0.500 inches
Follower Displacement (inches)
Abscissa (inches)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0
1
2
3
4
5
6
7
8
9
10



UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	N. Karasch	11/16/14
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
	COMMENTS:		

Section 7 - Group 3

TITLE:

Cam Profile

SIZE	DWG. NO.	REV
A		

SCALE: 2:3 | SHEET 1 OF 1

5 4 3 2 1

Follower Displacement Data Table

Theta (degrees)	Abscissa (inches)	Displacement (inches)
0.0	0.0000	0.0000
3.0	0.0785	0.1360
6.0	0.1571	0.2721
9.0	0.2356	0.4081
12.0	0.3142	0.5000
15.0	0.3927	0.5000
18.0	0.4712	0.5000
21.0	0.5498	0.0000
30.0	0.7854	0.0000
60.0	1.5708	0.0000
90.0	2.3562	0.0000
120.0	3.1416	0.0000
150.0	3.9270	0.0000
180.0	4.7124	0.0000
210.0	5.4978	0.0000
240.0	6.2832	0.0000
270.0	7.0686	0.0000
300.0	7.8540	0.0000
330.0	8.6394	0.0000

RAPID PROTOTYE JOB

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Department of Mechanical Engineering

1. Complete this form and upload drawing and/or part files. Print completed form ad print copies of drawings/ files.
2. Have instructor, TA or Advisor sign your job request. Billing information required.
3. Submit your job request in 1260 Hoover, right outside Lab Supervisor's Office in the tan tray

Approval By:	ADARSH KRISHNAMURTHY	k-Adarsh	10/14/2014
(Instructor, TA, Project Advisor)	Print Name	Signature	Date

Department Billing Information: ME 170 CLASS PROJECT

Department Account Number

Boyd Lab Supervisor Approval Date

Student Information: Name Section 7, Group 3 Date Submitted 10/13/14

Email NKARASCH@IASTATE.EDU Phone 651-477-2811

Date Needed by Project Name Drink Mixer Cam

Student ID Number Signature Date

I hereby authorize Mechanical Engineering permission to assess charges on my university bill for services rendered

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3. Check which machine you want to use for your project

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Department or Student

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Technician's Notes

Name Date # Hours Worked

Notes

Name Date # Hours Worked

Notes

Name Date # Hours Worked

Notes

Name Date # Hours Worked

Notes