

Started on	Friday, 12 March 2021, 2:30 PM
State	Finished
Completed on	Friday, 12 March 2021, 2:54 PM
Time taken	23 mins 38 secs
Grade	8.00 out of 8.00 (100%)

Question **1**

Correct

Mark 3.00 out of 3.00

[3 marks] Consider a polygon ABC with coordinate values A =(-28, 8, 28), B =(28, -20, 36), and C =(44, 32, -52). The polygon is scaled with respect to (80, 72, 76) with scale factor s_x , s_y and s_z along x, y and z-axis. After scaling, A1 (-82, -24, 52), B1(2, -66, 56) and C1 (26, 12, 12) are the new coordinate values for A, B, C, respectively. Compute the values of s_x , s_y and s_z [All calculation should be done with 3 decimal places (round off)].

a) s_x =



b) s_y =



c) s_z =



Your answer is correct.

Answer with detailed calculation:

$$s_x = round((x_1 - x_{ref})/(x - x_{ref}), 3)$$

$$s_y = round((y_1 - y_{ref})/(y - y_{ref}), 3)$$

$$s_z = round((z_1 - z_{ref})/(z - z_{ref}), 3)$$

With respect to point A

$$s_x = round((-82 - 80)/(-28 - 80), 3) = 1.5$$

$$s_y = round((-24 - 72)/(8 - 72), 3) = 1.5$$

$$s_z = round((52 - 76)/(28 - 76), 3) = 0.5$$

With respect to point B

$$s_x = round((2 - 80)/(28 - 80), 3) = 1.5$$

$$s_y = round((-66 - 72)/(-20 - 72), 3) = 1.5$$

$$s_z = round((56 - 76)/(36 - 76), 3) = 0.5$$

With respect to point C

$$s_x = round((26 - 80)/(44 - 80), 3) = 1.5$$

$$s_y = round((12 - 72)/(32 - 72), 3) = 1.5$$

$$s_z = round((12 - 76)/(-52 - 76), 3) = 0.5$$

[Allowed Error Rate less than 5%]

Question **2**

Correct

Mark 5.00 out of 5.00

[5 marks] A point P(40, 40) is reflected with respect to a line $y = 4x + 9$. Let P1 be the reflected point. Answer the following questions. [All calculation should be done with 3 decimal places (round off)]

a) [4 marks] Write the combine transformation matrix (M)

M =	<input type="text" value="-0.882"/>	<input type="text" value="0.471"/>	<input type="text" value="-4.235"/>
	<input type="text" value="0.471"/>	<input type="text" value="0.882"/>	<input type="text" value="1.059"/>
	0	0	1

[No partial marking]

✓

b) [1 mark] Write the coordinate value for P1.

P1 =

x

y

[No partial marking]

✓

Your answer is correct.

Answer with detailed calculations:

theta = round(atan(4), 3) = 1.326 # in radian
cos_theta = round(cos(1.326), 3) = 0.242 # cos function input in radian
sin_theta = round(sin(1.326), 3) = 0.97 # sin function input in radian

Translate line to origin ie. translation by (0, -b) (Matrix T1)

100

01-9

001

#Rotate line clock wise tan-1(m) such that line align with x- axis (Matrix R1)

0.2420.970

-0.970.2420

001

#Reflection with respect to x- axis (Matrix R)

100

0-10

001

#Inverse rotation of R1 ie. anti-clock wise tan-1(m) (Matrix R2)

0.242-0.970

0.970.2420

001

Inverse Translate of T1 (Matrix T2)

100

019

001

#####Combine matrix calculation #####

#Combined Transformation Matrix M = T2*R2*R*R1*T1

```
# C1 = R1*T1
0.242  0.97  -8.73
-0.97  0.242  -2.178
0  0  1

# C2 = R*C1 = R*(R1*T1)
0.242  0.97  -8.73
0.97  -0.242  2.178
0  0  1

# C3 = R2*C2 = R2*(R*(R1*T1))
-0.882  0.469  -4.225
0.469  0.882  -7.941
0  0  1

# M = C4 = T2*C3 = T2*(R2*(R*(R1*T1)))
-0.882  0.469  -4.225
0.469  0.882  1.059
0  0  1

# P1 = M*P
p1_x = round(-0.882*40 + 0.469*40 + -4.225, 3) = -20.745
p1_y = round(0.469*40 + 0.882*40 + 1.059, 3) = 55.099
[Allowed Error Rate less than 5%]
```

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