15/12/2021, 13:12 Part-1

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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 sx, sy and sz 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 sx, sy and sz [All calculation should be done with 3 decimal places (round off)].

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c)
$$sz = 0.5$$

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Your answer is correct.

Answer with detailed calculation:

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

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

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

With respect to point A

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

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

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

With respect to point B

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

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

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

With respect to point C

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

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

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

[Allowed Error Rate less than 5%]

Question **2**Correct

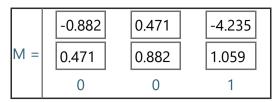
Mark 5.00 out of

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)]

Part-1

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



[No partial marking]



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

$$P1 = (-20.67), 55.179$$

[No partial marking]

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Your answer is correct.

Answer with detailed calculations:

theta = round(atan(4), 3) = 1.326 # in radian $\cos_{theta} = \operatorname{round}(\cos(1.326), 3) = 0.242$ # $\cos_{theta} = \operatorname{round}(\sin(1.326), 3) = 0.97$ # $\sin_{theta} = \cos_{theta} =$

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

- 1 0 0
- 0 1 -9
- 0 0 1

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

- 0.242 0.97 0
- -0.97 0.242 0
- 0 0 1

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

- 1 0 0
- 0 -1 0
- 0 0 1

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

- 0.242 -0.97 0
- 0.97 0.242 0
- 0 0 1

Inverse Translate of T1 (Matrix T2)

- 1 0 0
- 0 1 9
- 0 0 1

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

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

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```
\# 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%]
```

■ Part-1

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Part-2 ►