# ✓ Congratulations! You passed!

**Grade received** 92.85%
**Latest Submission Grade** 92.86%
**To pass** 70% or higher

**Go to next item**

1. Which of the following is false about structure from motion?                    **0 / 1 point**

   ○ Orthographic cameras are assumed for the Tomasi-Kanade Solution

   ○ Multiple corresponding image points are known; 3D scene points are unknown

   ⦿ The camera's extrinsic parameters are not required

   ○ The camera's intrinsic parameters are required

   ⊗ **Incorrect**

2. Which of the following is true about orthographic projection?                    **1 / 1 point**

   ⦿ Projection lines are parallel to each other

   ○ Projection lines are perpendicular to each other

   ○ Projection lines are normal to each other

   ○ Projection lines are oblique to each other

   ⊘ **Correct**
   In orthographic projection, all projection lines are parallel to each other. The
   first option is the answer.

**3.** In orthographic projection, projection lines are _____ to the image plane.                **1 / 1 point**

○ Parallel

● Perpendicular

○ Oblique

○ Not parallel, perpendicular, or obligue

   ✓ **Correct**

     In orthographic projection, all projection lines are perpendicular to the image plane. The second option is the answer.

**4.** If you captured a perspective picture of the following scene from $10m$ away, it would be roughly equivalent to an orthographic image.                **1 / 1 point**



● True

○ False

   ✓ **Correct**

     A perspective camera becomes equivalent to an orthographic camera when the distance between the scene and the camera is large compared to the range of depths within the scene. Because the sculpture is relatively flat, a $10m$ distance would be more than enough to render the images equivalent.

**5.** If you captured a perspective picture of the following scene from $0.5m$ away, it would be roughly equivalent to an orthographic image.

**1 / 1 point**



○ True

◉ False

✓ **Correct**

A perspective camera becomes equivalent to an orthographic camera when the distance between the scene and the camera is large compared to the range of depths within the scene. Because the scene spans the entire desk, the variation of depths is large compared to the $0.5m$ distance between the scene and the camera, violating this assumption

**6.** Consider 3 image points of the form $\begin{bmatrix} u \\ v \end{bmatrix}$, $a = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$, $b = \begin{bmatrix} 1 \\ 8 \end{bmatrix}$, and $c = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$. Which of the following is the centroid-subtracted form of point $b$, $\begin{bmatrix} \tilde{u}_b \\ \tilde{v}_b \end{bmatrix}$?

**2 / 2 points**

○ $\begin{bmatrix} 0 \\ 3 \end{bmatrix}$

○ $\begin{bmatrix} 1 \\ 4 \end{bmatrix}$

○ $\begin{bmatrix} 2 \\ 13 \end{bmatrix}$

◉ $\begin{bmatrix} -1 \\ 3 \end{bmatrix}$

✓ **Correct**

The centroid of the three points is $\begin{bmatrix} \bar{u} \\ \bar{v} \end{bmatrix} = \begin{bmatrix} 2 \\ 5 \end{bmatrix}$, and thus

$$\begin{bmatrix} \tilde{u}_b \\ \tilde{v}_b \end{bmatrix} = \begin{bmatrix} 1 \\ 8 \end{bmatrix} - \begin{bmatrix} 2 \\ 5 \end{bmatrix} = \begin{bmatrix} -1 \\ 3 \end{bmatrix}$$

**7.**

Consider a scene point in the 3D world coordinate frame, $P = \begin{bmatrix} 5 \\ 3 \\ 2.5 \end{bmatrix}$. If the

camera's orientation is $i = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ and $j = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$, what centoid-subtracted

coordinates will it be projected to?

**2 / 2 points**

○ $\begin{bmatrix} 5 \\ 3 \end{bmatrix}$

○ $\begin{bmatrix} 1 \\ 1.25 \end{bmatrix}$

◉ $\begin{bmatrix} 2.5 \\ 3 \end{bmatrix}$

○ $\begin{bmatrix} -1 \\ 0.5 \end{bmatrix}$

✓ **Correct**

From lecture, we derived that for any point $P$, the point's centroid-subtracted
coordinates in the image can be calculated by the equation
$$\begin{bmatrix} \tilde{u}_P \\ \tilde{v}_P \end{bmatrix} = \begin{bmatrix} i^T \\ j^T \end{bmatrix} P.$$

**8.**

What is the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 5 \\ 3 & 4 & 7 \\ 4 & 5 & 9 \end{bmatrix}$ ?

**3 / 3 points**

○ 1

◉ 2

○ 3

○ 4

✓ **Correct**
  Since there are fewer columns than rows, the rank of the matrix is the
  maximum number of linearly independent columns. Column 1 and 2 are
  independent, but column 3 is the sum of column 1 and 2. Therefore, the rank
  of the matrix is 2. The second option is the answer.

**9.** Which of the following is true about singular value decompostion (SVD)?          **1 / 1 point**

○ SVD can be applied only when the matrix is a square matrix

○ SVD can be applied only when the matrix has full rank

○ SVD can be applied only when the matrix is invertible

◉ SVD can be applied to any matrix

✓ **Correct**
  SVD can be applied to any matrix. The last answer choice is correct.

**10.** For the Tomasi-Kanade algorithm for structure from motion, at least three images are          **1 / 1 point**
needed.

◉ True

○ False

✓ **Correct**
  At least three images are needed to enforce the orthonormality constraint. The
  first answer choice is correct.