1) A public cloud provides access to anyone for a cloud resource. A private cloud also provides access to a cloud resource, but the access is restricted to authorized users. A community cloud is similar to a private cloud, in the sense that access to the cloud resource is restricted, but in a community cloud, all members who are part of the community that has the resource can use it.

2) \[ x^2 + 2y^2 \rightarrow \min \quad \text{v.c. } 2x + y = 1 \]

\[ f = x^2 + 2y^2 \]
\[ g = 2x + y = 1 \]
\[ J = x^2 + 2y^2 + \lambda (2x + y - 1) \]

\[ \frac{\partial J}{\partial x} = 2x + 2\lambda = 0, \quad 2x = -2\lambda \]
\[ x = -\lambda \]

\[ \frac{\partial J}{\partial y} = 4y + \lambda = 0 \]
\[ 4y = -\lambda \]
\[ y = -\frac{\lambda}{4} \]

\[ z(-\lambda) = -\frac{\lambda}{4} = 1 \]

\[ -2x - \frac{\lambda}{4} = 1 \]
\[ -2x - \frac{\lambda}{4} = 1 \]
\[ -8x - \lambda = 1 \]
\[ -8x = 1 \]
\[ x = -\frac{1}{8} \]

\[ \lambda = -\frac{4}{9} \]

\[ x = \frac{4}{9} \]
\[ y = \frac{4}{9} \]

\[ z = \frac{4}{9} \cdot \frac{1}{9} = \frac{1}{9} \]

\[ x = \frac{4}{9}, \quad y = \frac{4}{9} \]
To figure the optimal arrangement of computer assignment for data processing
To optimize server location, based by population density, to minimize average time

3) Using the least squares method

\[ m = \frac{\overline{xy} - \overline{x} \cdot \overline{y}}{\overline{x^2} - (\overline{x})^2}, \quad \text{where} \quad \overline{xy} = \frac{1}{n} \sum_{i=1}^{n} x_i \cdot y_i \]

\[ \overline{x} = \frac{1}{n} \sum_{i=1}^{n} x_i, \quad \overline{y} = \frac{1}{n} \sum_{i=1}^{n} y_i, \]

\[ \overline{x^2} = \frac{1}{n} \sum_{i=1}^{n} \overline{x}_i^2 \]

\[ b = \overline{y} - m \overline{x} \]

\[ \overline{xy} = \frac{1}{3} (-1 \cdot .9 + 0 \cdot 0 + 1 \cdot 1.1) = \frac{1}{3} (-2) = \frac{2}{3} \]

\[ \overline{x^2} = \frac{1}{3} (-1^2 + 0^2 + 1^2) = \frac{2}{3} \]

\[ \overline{y} = \frac{1}{3} (-.9 + 0 + 1.1) = \frac{-2}{3} \]

\[ \overline{x} = \frac{1}{3} (-1 + 0 + 1) = 0 \]

\[ m = \frac{\frac{2}{3} - 0}{\frac{2}{3} - 0} = \frac{\frac{2}{3}}{\frac{2}{3}} = \frac{2}{3} \cdot \frac{3}{2} = \frac{6}{6} = 1 \]

\[ b = \frac{2}{3} - 1 \cdot 0 = \frac{2}{3} \]

\[ m = 1 \]

\[ b = \frac{2}{3} \]
4) Given the values \( x_1, \ldots, x_k, y_1, \ldots, y_k \), find \( A \) and \( \alpha \), such that
\[
y = A x^\alpha
\]
Reduce by taking \( \ln \) on both sides
\[
\ln(y) = \ln(A x^\alpha) = \ln(A) + \ln(x^\alpha) = \ln(A) + \alpha \ln(x)
\]
Use linear least squares method to find \( A \) and \( \alpha \), by treating
\[
b = \ln(A) \quad = m \quad b = \ln(A)
\]
Problem is reduced to form for
\[
f(x) = mx + b, \quad \text{solve for} \quad m \quad \text{and} \quad b.
\]
\( m = \alpha, \quad b = \ln(A) \), so
\[
A = \exp(b).
\]
This problem is important because you want to approximate the growth of either the cloud resources, or the need for those resources. This can be achieved by observing the size of a cloud resource over a set number of years & mapping a model to its growth. Ideally, you wish to find a function that maps to the data, which can help you estimate the growth over time.

5) \( p = 3 \), \( q = 5 \), \( e = 5 \)

\[ n = 15 \quad , \quad y(n) = \frac{(3-1)(5-1)}{2 \cdot 4} = 8 \]

Find \( d \), such that:

\[ d \cdot e = 1 \mod y(n) \]

\[ d \cdot e = k \cdot y(n) + 1 \]

8 \% 5 = 3 \quad \Rightarrow \quad 8 = 1.5 + 3 \quad , \quad 3 = 1.8 - 1.5

5 \% 3 = 2 \quad \Rightarrow \quad 5 = 1.3 + 2 \quad , \quad 2 = 1.5 - 1.3

3 \% 2 = 1 \quad \Rightarrow \quad 3 = 1.2 + 1 \quad , \quad 1 = 1.3 - 1.2

2 \% 1 = 0 \quad / \quad \text{Plug in } \frac{8}{2} = 1.5 - 1.(1.8 - 1.5)

\[ 2 = 1.5 - 1.8 + 1.5 \]

\[ 2 = 2.5 - 1.8 \]

\[ \frac{3.42}{1.3 - 1.2} \]

\[ 1 = 1 \cdot (1.8 - 1.5) + 1 \cdot 1.2 \cdot 3 - 1.5 - 2.5 + 1.8 \]

\[ 1 = 2.8 - 3.5 \]

\[ (-2.8) + 1 = -3.5 \quad -3 + 8 = 5 \]

\[ d = 5 \]
Encoding:
\[ c = m^e \mod n \]

\[ m = 3, \ e = 5, \ n = 15 \]

\[ e = 101_2 = 2^2 \cdot 2^2 \cdot 2 \]
\[ 3^5 = 3^4 \cdot 3 \]
\[ 3^4 \cdot 3^1 = 6 \cdot 3 = 18 \mod 15 = 3 \]
\[ c = 3 \]

Decoding:
\[ m = c^d \mod n \]
\[ = 3^5 \mod 15, \text{ process is the same as encoding.} \]
\[ \& \text{ the message will be 3. The process is the same, since } m = 3, \ e = 5, \ \& \ c = 3, \ \& \ d = 5. \]

Security is especially important for cloud computing because the cloud resource can be working on sensitive \& confidential data so, to ensure that this data is not stolen, everything sent to \& from the cloud must be encrypted.
Cloud computing encourages parallelization because it costs the same to use 100 computers to retrieve a result in 1 hour as using only 1 computer to retrieve a result in 100 hours. Through the use of parallelization, the same result can be obtained faster at the same cost.

9) With map Reduce, find a and b, then replace \( w = \max(a, b) \).

For example:

\[
\begin{align*}
\text{x}_1 & \quad \text{x}_2 & \quad \text{x}_3 & \quad \text{x}_4 \\
\text{x}_5 & \quad \text{x}_6 & \quad & \\
\end{align*}
\]

\[
\begin{align*}
\max(\text{x}_1, \text{x}_2) & \quad \max(\text{x}_5, \text{x}_6) \\
\max(\text{x}_3, \text{x}_4) & \quad \text{x}_4 \\
\max(\text{x}_1, \text{x}_2, \text{x}_3, \text{x}_4) & \quad \max(\text{x}_5, \text{x}_6, \text{x}_1, \text{x}_2, \text{x}_3, \text{x}_4) \\
\max(\text{x}_5, \text{x}_6) & \\
\end{align*}
\]