1. Given the $n+1$ dimensional vector given $\tilde{\mathbf{x}} = \begin{bmatrix} \bar{\mathbf{x}} \\ x_{n+1} \end{bmatrix}$. The set $S = \{\tilde{\mathbf{x}} | \|\bar{\mathbf{x}}\| \leq x_{n+1}\}$ represents a Norm cone
   Ans a
2. The l_∞ norm ball for the set of two dimensional vectors $[x \quad y]^T$ is a square with sides parallel to x-axis or y-axis
   Ans b
3. The l_2 norm ball for the set of two dimensional vectors $[x \quad y]^T$ is a circle centered at origin
   Ans c
4. Given X is a real-valued random variable with $\Pr(X = a_i) = p_i,\ i = 1,2,\ldots,n$. The condition $E\{X^2\} \leq \alpha \Longrightarrow \sum_{i=1}^{n} a_i^2 p_i \leq \alpha$, which can be seen to be a halfspace
   Ans d
5. Each constraint $\|\bar{\mathbf{x}} - \bar{\mathbf{x}}_0\| \leq \|\bar{\mathbf{x}} - \bar{\mathbf{x}}_i\|$ can be represented as
   $$(\bar{\mathbf{x}}_i - \bar{\mathbf{x}}_0)^T \bar{\mathbf{x}} \leq \frac{\|\bar{x}_i\|^2 - \|\bar{x}_0\|^2}{2},$$
   which is a halfspace. The set V is the intersection of K such halfspaces. Hence, it is a polyhedron
   Ans d
6. A polyhedron is formed from the intersection of several hyperplanes and halfspaces
   Ans b
7. The l_1 norm ball for the set of two dimensional vectors $[x \quad y]^T$ is a tilted square with diagonals on x-axis or y-axis
   Ans a
8. As shown in the lectures, the set of points $S = \{[x_1 \quad x_2]^T | x_1 x_2 \geq 1, x_1, x_2 \geq 0\}$ can be represented as the intersection of the halfspaces
   $$\alpha^2 x_2 + x_1 \geq 2\alpha$$
   Ans c
9. Let X be a real-valued random variable with $\Pr(X = a_i) = p_i, i = 1,2,\ldots,n$. Consider the condition $\Pr\{X^2 \leq \alpha\} = \beta$. This can be expressed as
   $$\Pr\{X^2 \leq \alpha\} = \beta \Longrightarrow \sum_{i:a_i^2 \leq \alpha} p_i = \beta$$
   Hence, the set of all vectors $\bar{\mathbf{p}}$ that satisfy this property is a hyperplane
   Ans b
10. The given set is a norm ball, which can be seen as follows
   $$\|\bar{\mathbf{x}} - \bar{\mathbf{a}}\| \leq \theta \left\|\bar{\mathbf{x}} - \bar{\mathbf{b}}\right\| \Longrightarrow \|\bar{\mathbf{x}} - \bar{\mathbf{a}}\|^2 \leq \theta^2 \left\|\bar{\mathbf{x}} - \bar{\mathbf{b}}\right\|^2$$
   $$\Longrightarrow (1-\theta^2)\bar{\mathbf{x}}^T\bar{\mathbf{x}} - 2\left(\bar{\mathbf{a}} - \theta^2\bar{\mathbf{b}}\right)^T \bar{\mathbf{x}} + \left(\bar{\mathbf{a}}^T\bar{\mathbf{a}} - \theta^2 \bar{\mathbf{b}}^T\bar{\mathbf{b}}\right)$$
   which is a norm ball with center and radius given as
   $$\bar{\mathbf{x}}_0 = \frac{\left(\bar{\mathbf{a}} - \theta^2\bar{\mathbf{b}}\right)}{(1-\theta^2)}, \left(\frac{\theta^2\left\|\bar{\mathbf{b}}\right\|^2 - \|\bar{\mathbf{a}}\|^2}{1-\theta^2} + \|\bar{\mathbf{x}}_0\|^2\right)^{1/2}$$
   Ans a