$\boxed{15}$

(1)(i) Recall that e_i has a one on the ith position and zeros elsewhere.
$\boxed{2}$ Furthermore, the i^{th} column of X is equal to $L_X(e_i)$.
Now X is upper triangular iff $\forall_{i\in\{1,\ldots,n-1\}}$ the i^{th} column of X has zeros strictly below the ith position.

So X is upper triangular iff $\forall_{i\in\{1,\ldots,n-1\}} L_X(e_i) \in V_i$ iff $\forall_{i\in\{1,\ldots,n-1\}} L_X(V_i) \subseteq V_i$.

(ii) Clearly $I \in B$. Furthermore, we have for $X, Y \in B$ and $i \in \{1,\ldots,n-1\}$,
$\boxed{2}$ $L_X(V_i) \subseteq V_i$ and $L_Y(V_i) \subseteq V_i$. So $L_{XY}(V_i) = L_X(L_Y(V_i)) \subseteq L_X(V_i) \subseteq V_i$ which means that $XY \in B$. Finally we have for $X \in B$ and $i \in \{1,\ldots,n-1\}$ $L_{X^{-1}}(V_i) = L_{X^{-1}}(L_X(V_i)) = V_i$. So $X \in B$.

(iii) $D^*D = \operatorname{diag}(\bar{z}_1 z_1, \ldots, \bar{z}_n z_n)$ and $\bar{z}_i z_i = |z_i|^2$.
$\boxed{1}$ So D is unitary iff $\forall_{i\in\{1,\ldots,n\}} |z_i| = 1$.

(2) Reflections have determinant -1, so they must occur on
$\boxed{5}$ the list $-A$, A a rotation symmetry of the cube.
Relative to a suitable basis A looks like $\begin{bmatrix} R & \begin{matrix}0\\0\end{matrix} \\ \begin{matrix}0&0\end{matrix} & 1\end{bmatrix}$, where R is a 2×2 rotation matrix. So $-A = \begin{bmatrix} -R & \begin{matrix}0\\0\end{matrix} \\ \begin{matrix}0&0\end{matrix} & -1\end{bmatrix}$. This is a reflection iff $-R = \mathrm{id}$ iff $R = -\mathrm{id}$, ie a rotation over π radians (180 degrees). Only the axes of type A_1 (4-fold, through the centres of opposite faces) and type A_2 (2-fold, through the centres of opposite edges) give such rotations. Of course we get one reflection for each of these axes: the reflection plane is the plane orthogonal to the axis. So the three axes of type A_1 produce the first three reflections and the six axes of type A_2 produce the other six.

(3)
$\boxed{5}$

	1	ρ	ρ^2	r	ρr	$\rho^2 r$
1	1	ρ	ρ^2	r	ρr	$\rho^2 r$
ρ	ρ	ρ^2	1	ρr	$\rho^2 r$	r
ρ^2	ρ^2	1	ρ	$\rho^2 r$	r	ρr
r	r	$\rho^2 r$	ρr	1	ρ^2	ρ
ρr	ρr	r	$\rho^2 r$	ρ	1	ρ^2
$\rho^2 r$	$\rho^2 r$	ρr	r	ρ^2	ρ	1

← only this row is not straightforward!