Project 5 - CT Scans
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Variable Values

In[420]:=
```
b1 = {4, 1, 2, 2, 0, 1, 2, 2, 2, 0, 0, 0, 2 √2 , 2 √2 , √2 ,
    2 √2 , √2 , √2 , 2 √2 , 0, 2 √2 , √10 / 3, √10 , 2 √10 / 3, √10 / 3};
b2 = {0, 5, 2, 2, 0, 1, 3, 1, 2, 0, 0, √2 , 2 √2 , √2 , 3 √2 , √2 ,
    √2 , √2 , 2 √2 , 2 √2 , 2 √2 , 2 √10 / 3, 2 √10 / 3, √10 / 3, √10 };
b3 = {1, 2, 5, 2, 1, 3, 1, 5, 1, 0, √2 , 2 √2 , 3 √2 , √2 , 2 √2 , 2 √2 ,
    √2 , 2 √2 , 3 √2 , √2 , 2 √2 , 2 √10 / 3, √10 , √10 , √10 / 3};
mat = Table[0, {m, 25}, {n, 25}];
For[i = 1, i ≤ 5 , i++, mat[[i, 5 i - 4 ;; 5 i]] = 1];
For[i = 1, i ≤ 4 , i++, For[j = 1, j ≤ 5, j++, mat[[i + 5, 5 j - 5 + i]] = 1]];
mat[[10, 21]] = √2 ;
mat[[11, {16, 22}]] = √2 ;
mat[[12, {11, 17, 23}]] = √2 ;
mat[[13, {6, 12, 18, 24}]] = √2 ;
mat[[14, {1, 7, 13, 19, 25}]] = √2 ;
mat[[15, {2, 8, 14, 20}]] = √2 ;
mat[[16, {3, 9, 15}]] = √2 ;
mat[[17, {2, 6}]] = √2 ;
mat[[18, {3, 7, 11}]] = √2 ;
mat[[19, {4, 8, 12, 16}]] = √2 ;
mat[[20, {5, 9, 13, 17, 21}]] = √2 ;
mat[[21, {10, 14, 18, 22}]] = √2 ;
For[i = 0, i < 4, i++, mat[[22 + i, {1 + i, 6 + i, 11 + i, 17 + i, 22 + i}]] = √10 / 3];
mat // MatrixForm

bvars1 = LinearSolve[mat, b1]
bvars2 = LinearSolve[mat, b2]
bvars3 = LinearSolve[mat, b3]
```

Out[439]//MatrixForm=

$$\begin{pmatrix}
1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} \\
0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 \\
\sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 \\
0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 \\
0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 \\
0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 \\
0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 & \sqrt{2} & 0 & 0 & 0 \\
\frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} \\
0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0 & 0 & \frac{\sqrt{10}}{3} & 0 & 0 & 0
\end{pmatrix}$$

Out[440]= {1, 1, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0}

Out[441]= {0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0}

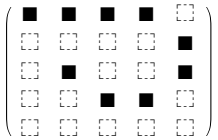
Out[442]= {0, 0, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0}

Graphical Representation

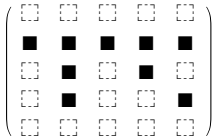
Images for b1, b2, and b3 Respectively

In[356]:=
```
bimage1 = Table[0, {m, 5}, {n, 5}];
bimage2 = Table[0, {m, 5}, {n, 5}];
bimage3 = Table[0, {m, 5}, {n, 5}];
bimage1 = Table[If[bvars1[[n + 5 m - 5]] > 0, "■", "⬚"], {m, 5}, {n, 5}];
bimage2 = Table[If[bvars2[[n + 5 m - 5]] > 0, "■", "⬚"], {m, 5}, {n, 5}];
bimage3 = Table[If[bvars3[[n + 5 m - 5]] > 0, "■", "⬚"], {m, 5}, {n, 5}];
bimage1 // MatrixForm
bimage2 // MatrixForm
bimage3 // MatrixForm
```

Out[362]//MatrixForm=



Out[363]//MatrixForm=



Out[364]//MatrixForm=