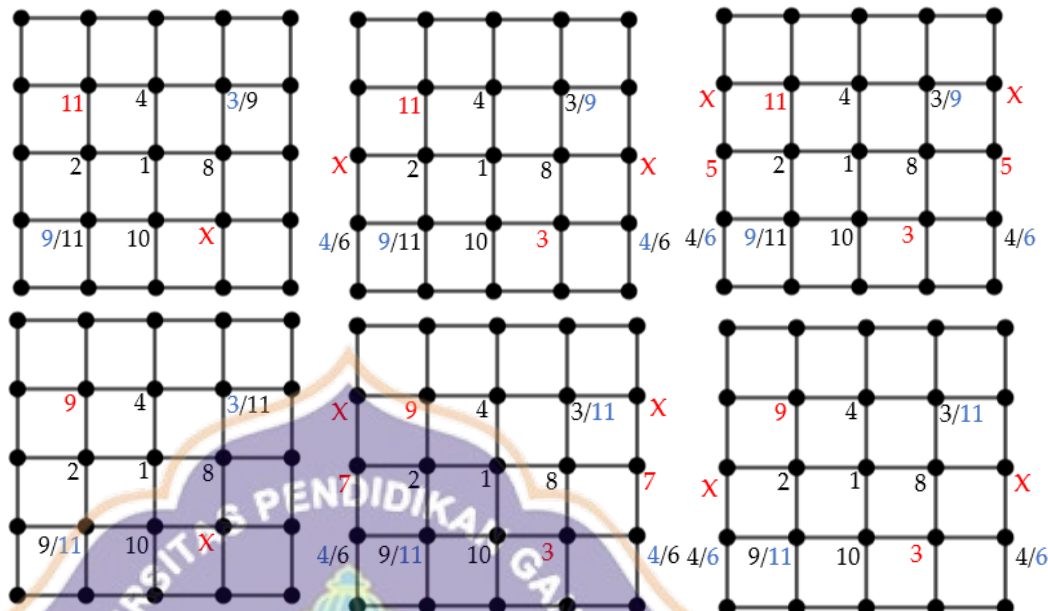


## Lampiran 1. Pewarnaan Pada Graf $L_{5,5}^*$

### 1.1. Pewarnaan Pada Graf $L_{5,5}^*$ Case 1 dengan Manual

Berikut merupakan contoh pewarnaan manual pada kombinasi pertama.



### 1.2. Pewarnaan Pada Graf $L_{5,5}^*$ Case 1 dengan Pemrograman

#### a. Menentukan titik $X_{42}$

<pre> &lt;?php //MENGINPUT NILAI YANG SUDAH DIKETAHUI \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X42 = 0;  //MEMASUKKAN PILIHAN WARNA YANG MUNGKIN \$X0 = array(1, 3, 9, 11); \$X1 = array(2, 4, 8, 10); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10);  //MEMANGGIL KEMUNGKINAN WARNA TITIK YANG AKAN DICARI foreach (\$X0 as \$value) {     \$X42 = \$value;      //MEMASUKKAN SYARAT TITIK YANG AKAN DICARI     if (\$X42 != 0 &amp;&amp; \$X42 != \$X33) {         \$T1 = abs(\$X42 - \$X43);         \$T2 = abs(\$X42 - \$X32);         \$T3 = abs(\$X32 - \$X33);         \$T4 = abs(\$X43 - \$X33);         if (\$T1 != \$T2 &amp;&amp; \$T2 != \$T3 &amp;&amp; \$T1 != \$T4) {             \$resultnya = \$X42 . " (TRUE)";             echo "Nilai X41 jika ";             echo "X : " . \$value;             echo "&lt;br/&gt;Hasil Penentuan = " . \$resultnya;             echo "&lt;hr&gt;";         }     } } ?&gt; </pre>	<p>Nilai <math>X_{42}</math> jika <math>X : 9</math>                  Hasil Penentuan = 9 (TRUE)</p> <hr/> <p>Nilai <math>X_{42}</math> jika <math>X : 11</math>                  Hasil Penentuan = 11 (TRUE)</p>
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b. Mencari Nilai  $X_{22}$

Berdasarkan Aturan poin a, maka kita ubah titik  $X_{42}$  menjadi array.

<pre>&lt;?php \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X42 = array(9, 11); \$X22 = 0;  // MEMASUKKAN PILIHAN WARNA YANG MUNGKIN \$X0 = array(1, 3, 9, 11); \$X1 = array(2, 4, 8, 10); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10);  // MEMANGGIL KEMUNGKINAN WARNA TITIK YANG AKAN DICARI foreach (\$X0 as \$value1) {     foreach (\$X42 as \$value2) {         \$X22 = \$value1;          // MEMASUKKAN SYARAT TITIK YANG AKAN DICARI         if (\$X22 != 0 &amp;&amp; \$X22 != \$X33 &amp;&amp; \$X22 != \$value2) {             \$T1 = abs(\$X22 - \$X32);             \$T2 = abs(\$X22 - \$X23);             \$T3 = abs(\$X32 - \$X33);             \$T4 = abs(\$X32 - \$value2);             if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4) {                 \$resultnya = \$X22 . " (TRUE)";                 echo "Nilai X22 jika ";                 echo "X42 : " . \$value2;                 echo "&lt;br/&gt;Maka " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } } ?&gt;</pre>	<p>Nilai X22 jika X42 : 11 Maka 9 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 9 Maka 11 (TRUE)</p> <hr/>
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c. Mencari titik  $X_{24}$

Berdasarkan Aturan poin b, maka input nilai  $X_{22}$  menjadi  $X_{22}[1] = 9$  dan  $X_{22}[2] = 11$ .

<pre> &lt;?php \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X42 = array(9, 11); \$X22[1] = 9; \$X22[2] = 11;  \$X0 = array(1, 3, 9, 11); \$X1 = array(2, 4, 8, 10); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10);  //UNTUK CABANG PERTAMA foreach (\$X0 as \$value1) {     foreach (\$X42 as \$value2) {         \$X24 = \$value1;         if (\$value1 != 0 &amp;&amp; \$value1 != \$X33 &amp;&amp; \$value2 != \$X22[1] &amp;&amp; !in_array(\$value1, array(\$X22[1]))) {             \$T1 = abs(\$value1 - \$X23);             \$T2 = abs(\$X22[1] - \$X23);             \$T3 = abs(\$X23 - \$X33);             \$T4 = abs(\$value1 - \$X34);             \$T5 = abs(\$X33 - \$X34);             if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {                 \$resultnya = \$X24 . " (TRUE)";                  echo "Untuk Cabang Pertama";                 echo "&lt;br/&gt; X42: " . \$value2;                 echo ", dan X22: " . \$X22[1];                 echo ", maka X24: " . \$resultnya;                 echo "&lt;br/&gt;";             }         }     } } </pre>	<p>Untuk Cabang Pertama X42: 11, dan X22: 9, maka X24: 3 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama X42: 11, dan X22: 9, maka X24: 11 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua X42: 9, dan X22: 11, maka X24: 3 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua X42: 9, dan X22: 11, maka X24: 9 (TRUE)</p>
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d. Mencari titik  $X_{44}$

Berdasarkan Aturan poin a dan b, karena cabang pertama dan kedua masing-masing menghasilkan dua kemungkinan warna, maka input  $X_{24}[1]$  dan  $X_{24}[2]$  menjadi "array". Untuk bahasa kodenya sama seperti sebelumnya, sehingga akan mendapatkan hasil output seperti dibawah ini.

<pre> &lt;?php \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X22[1] = 9; \$X22[2] = 11; \$X24[1] = array(3, 11); \$X24[2] = array(3, 9);  \$X0 = array(1, 3, 9, 11); \$X1 = array(2, 4, 8, 10); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10);  //UNTUK CABANG PERTAMA \$X42[1] = 11; foreach (\$X0 as \$value1) {     foreach (\$X24[1] as \$value2) {         \$X44 = \$value1;          if (\$X44 != 0 &amp;&amp; \$X44 != \$X33 &amp;&amp; \$X44 != \$value2 &amp;&amp; \$X44 != \$X42[1]) {             \$T1 = abs(\$X44 - \$X34);             \$T2 = abs(\$X34 - \$value2);             \$T3 = abs(\$X34 - \$X33);             \$T4 = abs(\$X43 - \$X44);             \$T5 = abs(\$X43 - \$X42[1]);             \$T6 = abs(\$X43 - \$X33);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5 &amp;&amp; \$T4 != \$T6) {                 \$resultnya = \$X44 . " (TRUE)";                 echo "Untuk Cabang Pertama, jika:";                 echo "&lt;br/&gt;X42: " . \$X42[1];                 echo ", X22: " . \$X22[1];                 echo ", X24: " . \$value2;                 echo "&lt;br/&gt;Maka nilai X44 = " . \$resultnya;                 echo "&lt;hr/&gt;";             }         }     } }  //UNTUK CABANG KEDUA \$X42[2] = 9; foreach (\$X0 as \$value1) {     foreach (\$X24[2] as \$value3) {         \$X44 = \$value1;          if (\$X44 != 0 &amp;&amp; \$X44 != \$X33 &amp;&amp; \$X44 != \$value2 &amp;&amp; \$X44 != \$X42[2]) {             \$T1 = abs(\$X44 - \$X34);             \$T2 = abs(\$X34 - \$value3);             \$T3 = abs(\$X34 - \$X33);             \$T4 = abs(\$X43 - \$X44);             \$T5 = abs(\$X43 - \$X42[2]);             \$T6 = abs(\$X43 - \$X33);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5 &amp;&amp; \$T4 != \$T6) {                 \$resultnya = \$X44 . " (TRUE)";                 echo "Untuk Cabang Kedua, jika:";                 echo "&lt;br/&gt;X42: " . \$X42[2];                 echo ", X22: " . \$X22[2];                 echo ", X24: " . \$value3;                 echo "&lt;br/&gt;Maka nilai X44 = " . \$resultnya;                 echo "&lt;hr/&gt;";             }         }     } } ?&gt; </pre>	<p>Untuk Cabang Pertama, jika: X42: 11, X22: 9, X24: 11 Maka nilai X44 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika: X42: 9, X22: 11, X24: 9 Maka nilai X44 = 3 (TRUE)</p>
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e. Mencari titik X<sub>41</sub> dan X<sub>45</sub>

<pre> &lt;?php \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X44 = 3;  \$X0 = array(1, 3, 9, 11); \$X1 = array(2, 4, 8, 10); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10);  // Menentukan Cabang Pertama Untuk X41 \$X42[1] = 11; \$X22[1] = 9; \$X24[1] = 11; foreach (\$X3 as \$value1) {     \$X41 = \$value1;     if (\$X41 != 0 &amp;&amp; \$X41 != \$X32 &amp;&amp; \$X41 != \$X43) {         \$T1 = abs(\$X41 - \$X42[1]);         \$T2 = abs(\$X42[1] - \$X32);         \$T3 = abs(\$X42[1] - \$X43);         if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3) {             \$resultnya = \$X41 . " (TRUE)";             echo "Untuk Cabang Pertama, jika";             echo "&lt;br/&gt;X42: " . \$X42[1];             echo ", X22: " . \$X22[1];             echo ", X24: " . \$X24[1];             echo ", X44: " . \$X44[1];             echo "&lt;br/&gt;Maka nilai X41 = " . \$resultnya;             echo "&lt;hr&gt;";         }     } }  // Menentukan Cabang Pertama Untuk X45 foreach (\$X3 as \$value1) {     \$X45 = \$value1;     if (\$X45 != 0 &amp;&amp; \$X45 != \$X34 &amp;&amp; \$X45 != \$X43) {         \$T1 = abs(\$X45 - \$X44[1]);         \$T2 = abs(\$X44[1] - \$X34);         \$T3 = abs(\$X44[1] - \$X43);         if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3) {             \$resultnya = \$X45 . " (TRUE)";             echo "Untuk Cabang Pertama, jika";             echo "&lt;br/&gt;X42: " . \$X42[1];             echo ", X22: " . \$X22[1];             echo ", X24: " . \$X24[1];             echo ", X44: " . \$X44[1];             echo "&lt;br/&gt;Maka nilai X45 = " . \$resultnya;             echo "&lt;hr&gt;";         }     } } ?&gt; </pre>	<p>Untuk Cabang Pertama, jika X42: 11, X22: 9, X24: 11, X44: Maka nilai X41 = 4 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 11, X22: 9, X24: 11, X44: Maka nilai X41 = 6 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 11, X22: 9, X24: 11, X44: Maka nilai X41 = 8 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 11, X22: 9, X24: 11, X44: Maka nilai X45 = 2 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 11, X22: 9, X24: 11, X44: Maka nilai X45 = 4 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 11, X22: 9, X24: 11, X44: Maka nilai X45 = 6 (TRUE)</p>
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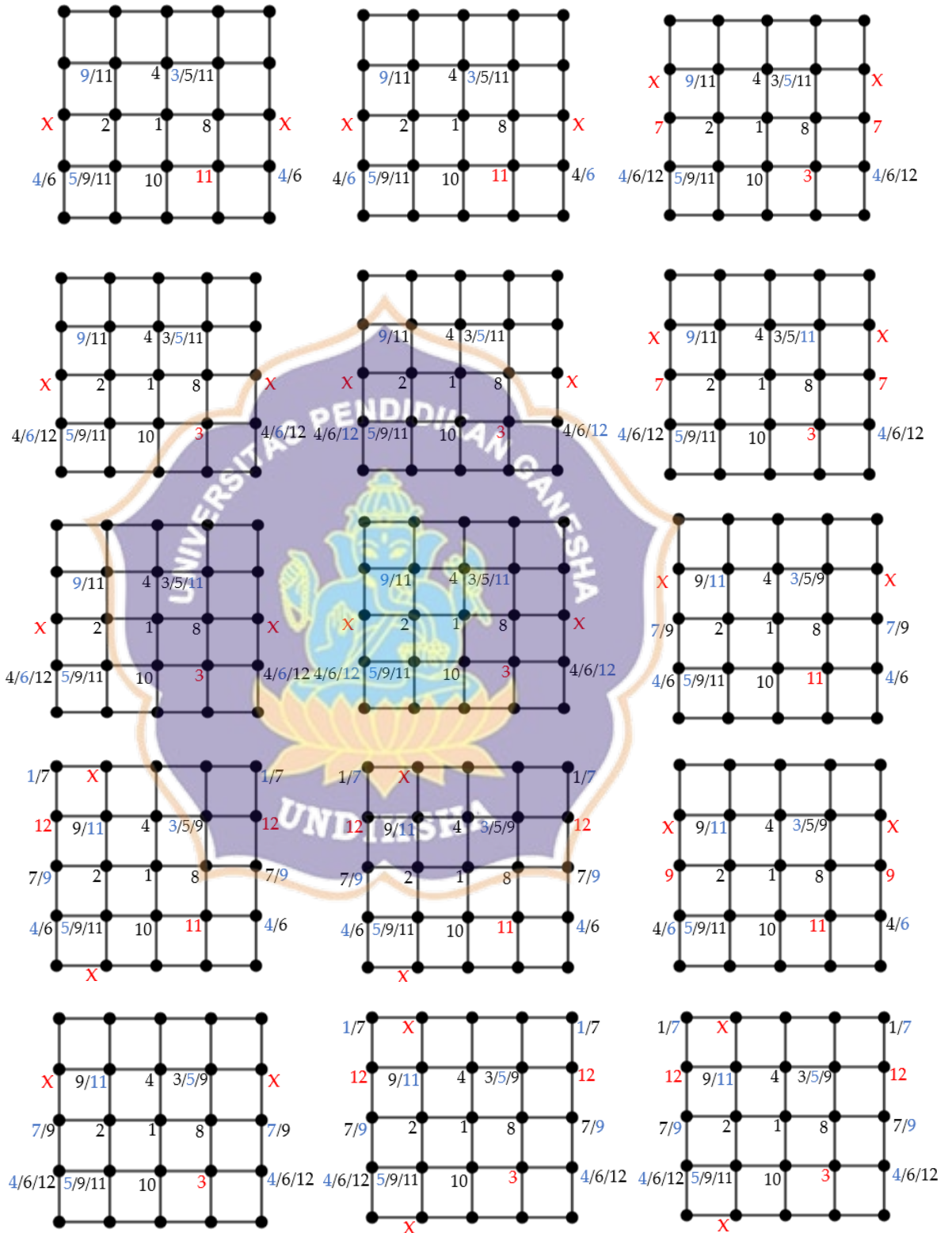
<pre>// Menentukan Cabang Kedua Untuk X41 \$X42[2] = 9; \$X22[2] = 11; \$X24[2] = 9; foreach (\$X3 as \$value1) {     \$X41 = \$value1;     if (\$X41 != 0 &amp;&amp; \$X41 != \$X32 &amp;&amp; \$X41 != \$X43) {         \$T1 = abs(\$X41 - \$X42[2]);         \$T2 = abs(\$X42[2] - \$X32);         \$T3 = abs(\$X42[2] - \$X43);         if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3) {             \$resultnya = \$X41 . " (TRUE)";             echo "Untuk Cabang Kedua, jika";             echo "&lt;br/&gt;X42: " . \$X42[2];             echo ", X22: " . \$X22[2];             echo ", X24: " . \$X24[2];             echo ", X44: " . \$X44[2];             echo "&lt;br/&gt; Maka nilai X41 = " . \$resultnya;             echo "&lt;hr&gt;";         }     } } // Menentukan Cabang Kedua Untuk X45 foreach (\$X3 as \$value1) {     \$X45 = \$value1;     if (\$X45 != 0 &amp;&amp; \$X45 != \$X34 &amp;&amp; \$X45 != \$X43) {         \$T1 = abs(\$X45 - \$X44[2]);         \$T2 = abs(\$X44[2] - \$X34);         \$T3 = abs(\$X44[2] - \$X43);         if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3) {             \$resultnya = \$X45 . " (TRUE)";             echo "Untuk Cabang Kedua, jika";             echo "&lt;br/&gt;X42: " . \$X42[2];             echo ", X22: " . \$X22[2];             echo ", X24: " . \$X24[2];             echo ", X44: " . \$X44[2];             echo "&lt;br/&gt; Maka nilai X45 = " . \$resultnya;             echo "&lt;hr&gt;";         }     } } ?&gt;</pre>	<p>Untuk Cabang Kedua, jika X42: 9, X22: 11, X24: 9, X44: Maka nilai X41 = 4 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 11, X24: 9, X44: Maka nilai X41 = 6 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 11, X24: 9, X44: Maka nilai X45 = 2 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 11, X24: 9, X44: Maka nilai X45 = 4 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 11, X24: 9, X44: Maka nilai X45 = 6 (TRUE)</p>
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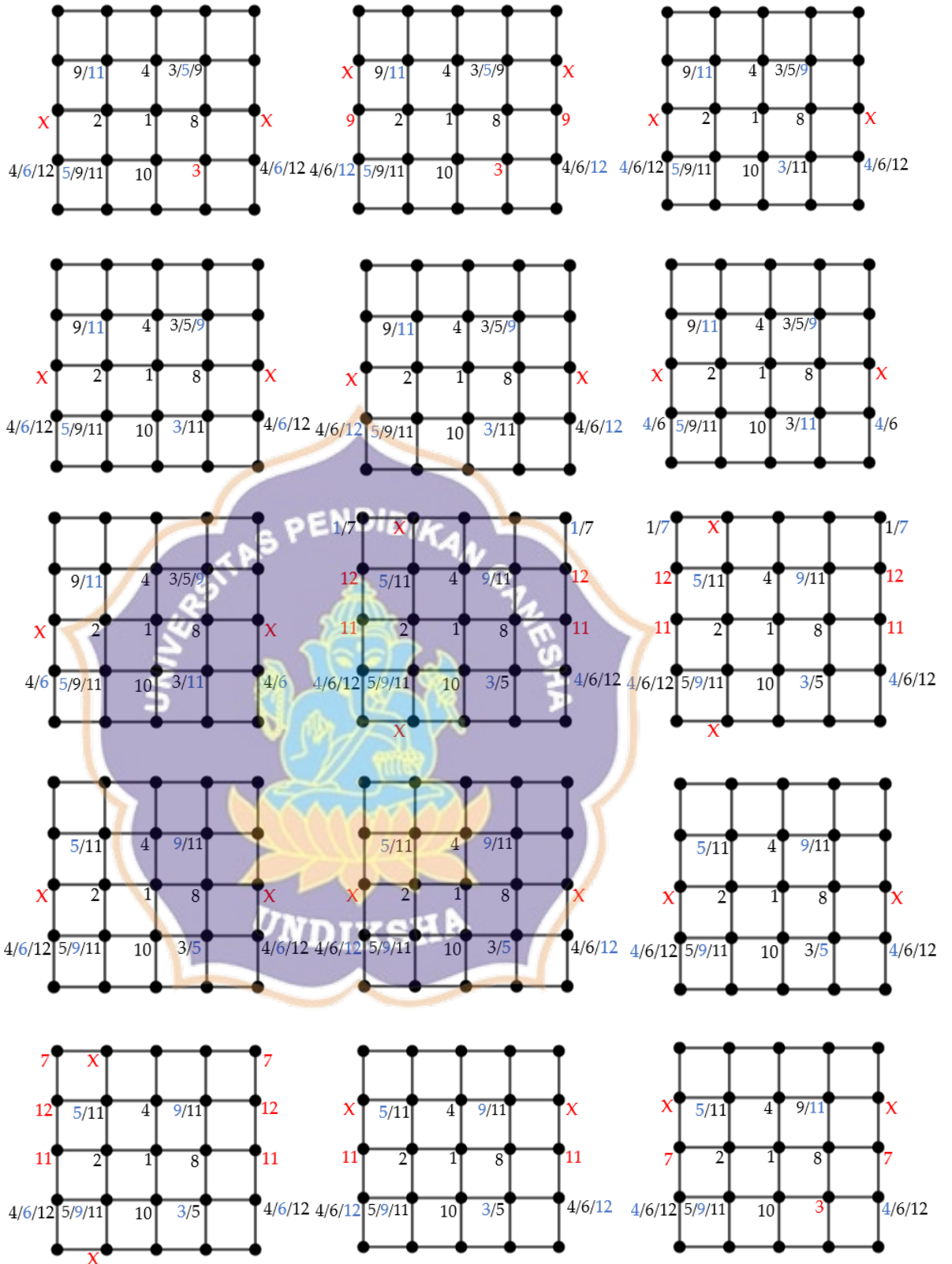
Berdasarkan Aturan poin c, maka untuk cabang pertama dan kedua mendapatkan hasil titik  $X_{41}$  dan  $X_{45}$  memiliki nilai 4 dan 6.

- f. Lakukan langkah tersebut untuk mencari warna titik yang lainnya, hingga mendapatkannilai yang tidak sesuai dengan syarat pada titik.

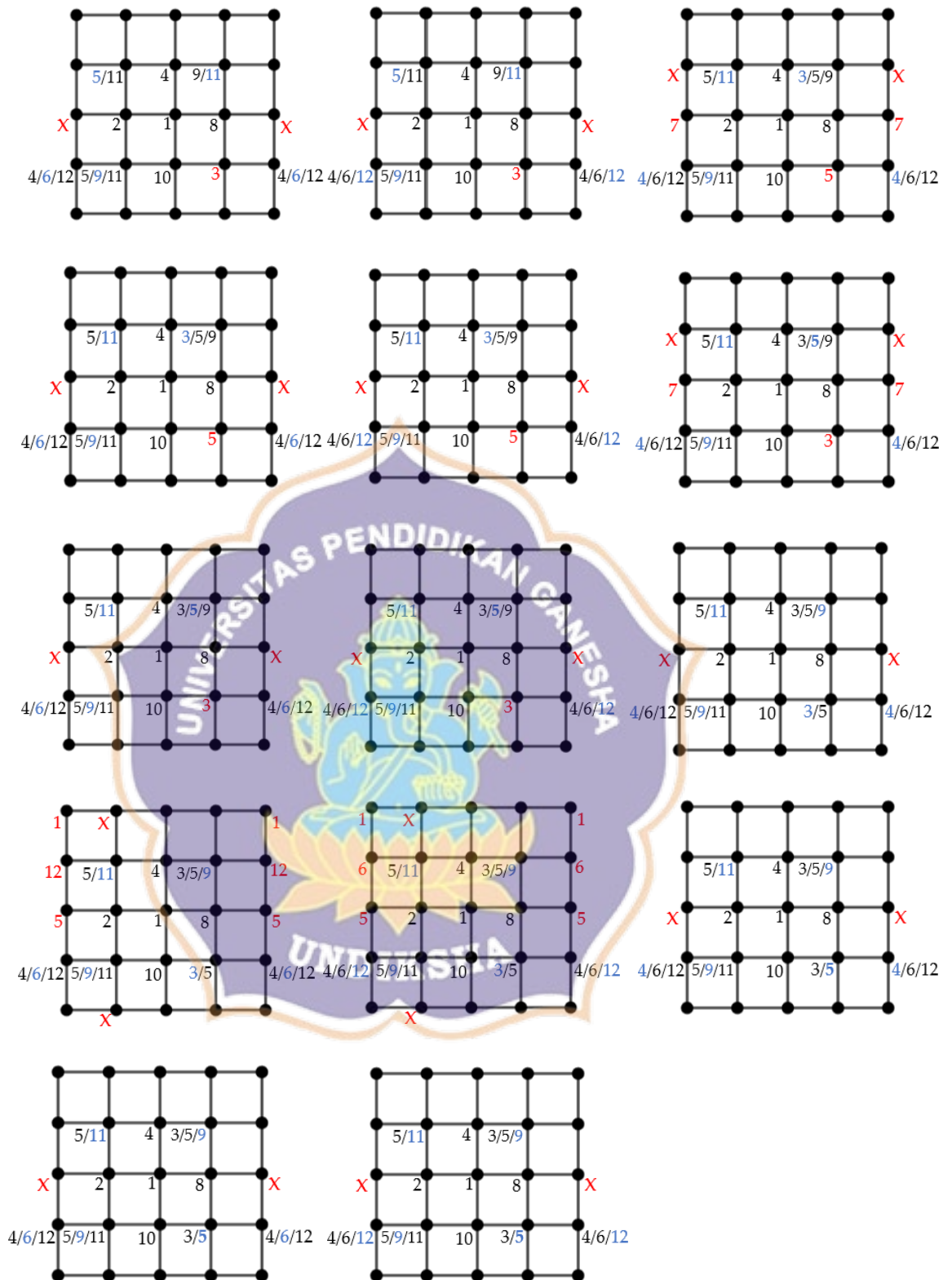
### 1.3. Pewarnaan Pada Graf $L_{5,5}$ \* Case 2 dengan Manual

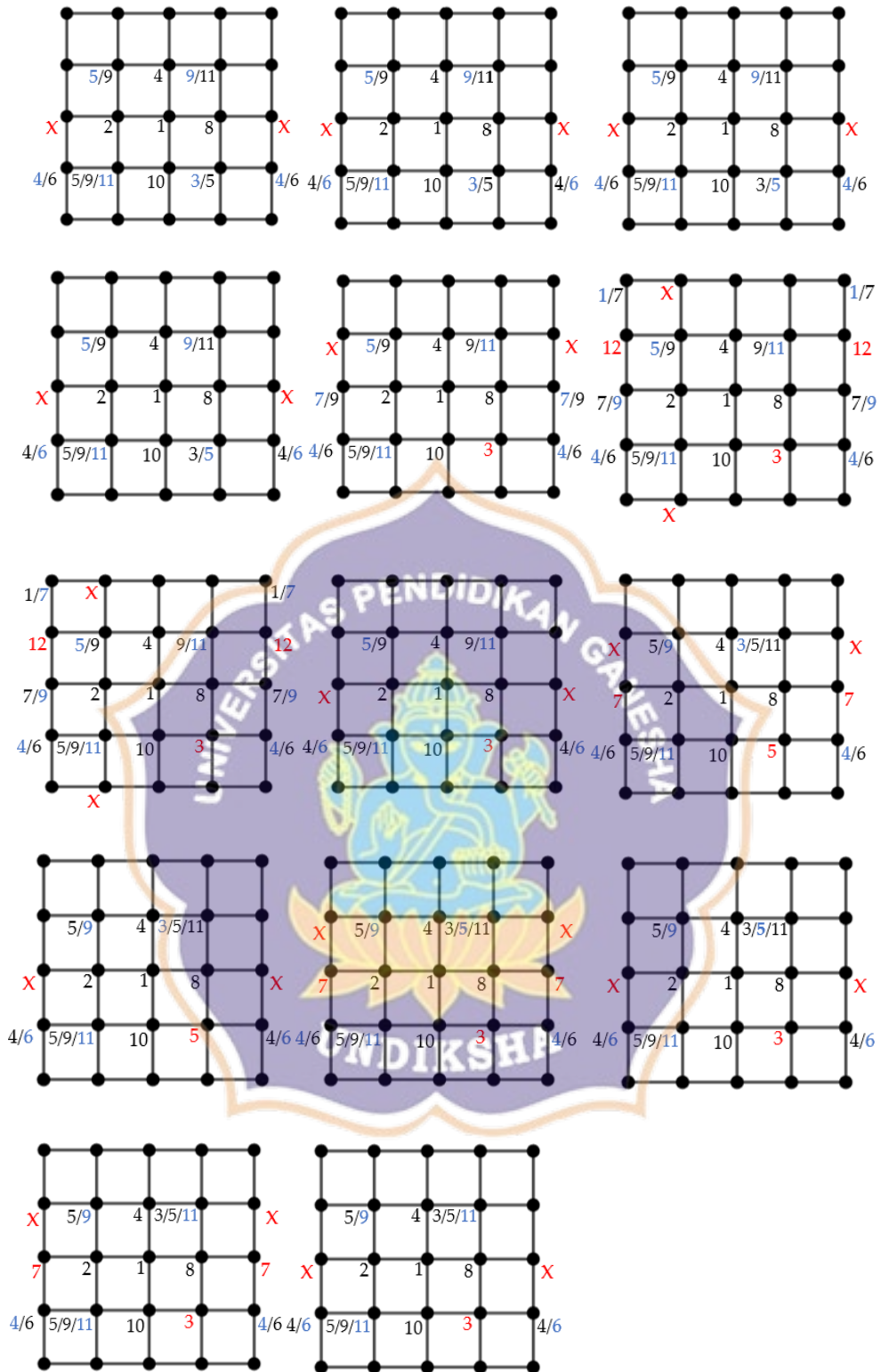
Berikut merupakan contoh pewarnaan manual pada kombinasi pertama.











#### 1.4. Pewarnaan Pada Graf $L_{5,5}$ \* Case 2 dengan Pemograman

##### a. Mencari nilai $X_{42}$

<pre>&lt;?php //MENGINPUT NILAI YANG SUDAH DIKETAHUI \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X42 = 0;  //MEMASUKKAN PILIHAN WARNA YANG MUNGKIN \$X0 = array(1, 3, 5, 9, 11); \$X1 = array(2, 4, 8, 10); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10, 12);  //MEMANGGIL KEMUNGKINAN WARNA TITIK YANG AKAN DICARI foreach (\$X0 as \$value) {     \$X42 = \$value;     //MEMASUKKAN SYARAT TITIK YANG AKAN DICARI     if (\$X42 != 0 &amp;&amp; \$X42 != \$X33) {         \$T1 = abs(\$X42 - \$X43);         \$T2 = abs(\$X42 - \$X32);         \$T3 = abs(\$X32 - \$X33);         \$T4 = abs(\$X43 - \$X33);         if (\$T1 != \$T2 &amp;&amp; \$T2 != \$T3 &amp;&amp; \$T1 != \$T4) {             \$resultnya = \$X42 . "(TRUE)";             echo "Nilai X42 yaitu " . \$resultnya;             echo "&lt;hr&gt;";         }     } } ?&gt;</pre>	<p>Nilai <math>X_{42}</math> yaitu 5(TRUE)</p> <hr/> <p>Nilai <math>X_{42}</math> yaitu 9(TRUE)</p> <hr/> <p>Nilai <math>X_{42}</math> yaitu 11(TRUE)</p> <hr/>
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##### b. Mencari nilai $X_{22}$ .

<pre>&lt;?php // MENGINPUT NILAI YANG SUDAH DIKETAHUI \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X42 = array(5, 9, 11); \$X22 = 0;  // MEMASUKKAN PILIHAN WARNA YANG MUNGKIN \$X0 = array(1, 3, 5, 9, 11); \$X1 = array(2, 4, 8, 10); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10);  // MEMANGGIL KEMUNGKINAN WARNA TITIK YANG AKAN DICARI foreach (\$X0 as \$value1) {     foreach (\$X42 as \$value2) {         \$X22 = \$value1;          if (\$X22 != 0 &amp;&amp; \$X22 != \$X33 &amp;&amp; \$X22 != \$value2) {             \$T1 = abs(\$X22 - \$X32);             \$T2 = abs(\$X22 - \$X23);             \$T3 = abs(\$X32 - \$X33);             \$T4 = abs(\$X32 - \$value2);</pre>	<p>Jika <math>X_{42} : 9</math> maka nilai <math>X_{22} : 5</math> (TRUE)</p> <hr/> <p>Jika <math>X_{42} : 11</math> maka nilai <math>X_{22} : 5</math> (TRUE)</p> <hr/> <p>Jika <math>X_{42} : 5</math> maka nilai <math>X_{22} : 9</math> (TRUE)</p> <hr/> <p>Jika <math>X_{42} : 11</math> maka nilai <math>X_{22} : 9</math> (TRUE)</p> <hr/> <p>Jika <math>X_{42} : 5</math> maka nilai <math>X_{22} : 11</math> (TRUE)</p> <hr/> <p>Jika <math>X_{42} : 9</math> maka nilai <math>X_{22} : 11</math> (TRUE)</p> <hr/>
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<pre> if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4) {     \$resultnya = \$X22 . " (TRUE)";     echo " Jika X42 : " . \$value2;     echo "&lt;br/&gt; maka nilai X22 : " . \$resultnya;     echo "&lt;hr&gt;"; } } } } ?&gt; </pre>	
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c. Mencari nilai X<sub>24</sub>

<pre> &lt;?php \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X24 = 0;  \$X0 = array(1, 3, 5, 9, 11); \$X1 = array(2, 4, 8, 10, 12); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10, 12);  //MENENTUKAN CABANG PERTAMA \$X42[1] = 5; \$X22[1] = array(9, 11); foreach (\$X0 as \$value1) {     foreach (\$X22[1] as \$value2) {         \$X24 = \$value1;          if (\$X24 != 0 &amp;&amp; \$X24 != \$X33 &amp;&amp; \$X24 != \$value2) {             \$T1 = abs(\$X24 - \$X23);             \$T2 = abs(\$value2 - \$X23);             \$T3 = abs(\$X23 - \$X33);             \$T4 = abs(\$X24 - \$X34);             \$T5 = abs(\$X33 - \$X34);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {                 \$resultnya = \$X24 . " (TRUE)";                 echo "Untuk Cabang Pertama, jika";                 echo "&lt;br/&gt; X42: " . \$X42[1];                 echo ", X22: " . \$value2;                 echo "&lt;br/&gt; Maka nilai X24 = " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } } } } </pre>	<p>Untuk Cabang Pertama, jika X42: 5, X22: 9 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 11 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 9 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 11 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 11 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 9 Maka nilai X24 = 11 (TRUE)</p>
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<pre>//MENENTUKAN CABANG KEDUA \$X42[2] = 9; \$X22[2] = array(5, 11); \$X24 = 0;  foreach (\$X0 as \$value1) {     foreach (\$X22[2] as \$value2) {         \$X24 = \$value1;          if (\$X24 != 0 &amp;&amp; \$X24 != \$X33 &amp;&amp; \$X24 != \$value2) {             \$T1 = abs(\$X24 - \$X23);             \$T2 = abs(\$value2 - \$X23);             \$T3 = abs(\$X23 - \$X33);             \$T4 = abs(\$X24 - \$X34);             \$T5 = abs(\$X33 - \$X34);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {                 \$resultnya = \$X24 . " (TRUE)";                 echo "Untuk Cabang Kedua, jika";                 echo "&lt;br/&gt;X42: " . \$X42[2];                 echo ", X22: " . \$value2;                 echo "&lt;br/&gt; Maka nilai X24 = " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } }</pre>	<p>Untuk Cabang Kedua, jika X42: 9, X22: 11 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 11 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 5 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 11 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika X42: 9, X22: 5 Maka nilai X24 = 11 (TRUE)</p>
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<pre>//MENENTUKAN CABANG KETIGA \$X42[3] = 11; \$X22[3] = array(5, 9); \$X24 = 0;  foreach (\$X0 as \$value1) {     foreach (\$X22[3] as \$value2) {         \$X24 = \$value1;          if (\$X24 != 0 &amp;&amp; \$X24 != \$X33 &amp;&amp; \$X24 != \$value2) {             \$T1 = abs(\$X24 - \$X23);             \$T2 = abs(\$value2 - \$X23);             \$T3 = abs(\$X23 - \$X33);             \$T4 = abs(\$X24 - \$X34);             \$T5 = abs(\$X33 - \$X34);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {                 \$resultnya = \$X24 . " (TRUE)";                 echo "Untuk Cabang Ketiga, jika";                 echo "&lt;br/&gt;X42: " . \$X42[3];                 echo ", X22: " . \$value2;                 echo "&lt;br/&gt; Maka nilai X24 = " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } }</pre>	<p>Untuk Cabang Ketiga, jika X42: 11, X22: 9 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika X42: 11, X22: 9 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika X42: 11, X22: 5 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika X42: 11, X22: 5 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika X42: 11, X22: 9 Maka nilai X24 = 11 (TRUE)</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



#### d. Mencari Nilai X<sub>44</sub>

```
<?php
```

```
$X33 = 1;
$X32 = 2;
$X23 = 4;
$X34 = 8;
$X43 = 10;
```

```
$X0 = array(1, 3, 5, 9, 11);
$X1 = array(2, 4, 8, 10, 12);
$X2 = array(1, 3, 5, 7, 9, 11);
$X3 = array(2, 4, 6, 8, 10, 12);
```

```
// MENENTUKAN CABANG PERTAMA
```

```
$X42[1] = 5;
$X22[1.1] = 9;
$X24[1.1] = array(3, 5, 11);
foreach($X0 as $value1) {
    foreach($X24[1.1] as $value2) {
        $X44 = $value1;
```

```
        if ($X44 != 0 && $X44 != $X33 && $X44 != $value2 && $X44 != $X42[1]) {
            $T1 = abs($X44 - $X34);
            $T2 = abs($X34 - $value2);
            $T3 = abs($X34 - $X33);
            $T4 = abs($X43 - $X44);
            $T5 = abs($X43 - $X42[1]);
            $T6 = abs($X43 - $X33);
```

```
            if ($T1 != $T2 && $T1 != $T3 && $T1 != $T4 && $T4 != $T5 && $T4 != $T6) {
                $resultnya = $X44 . " (TRUE)";
                echo "Untuk Cabang Pertama, jika";
                echo "<br/>X42: " . $X42[1];
                echo ", X22: " . $X22[1.1];
                echo ", X24: " . $value2;
                echo "<br/>Maka nilai X44 = " . $resultnya;
                echo "<br/>";
            }
        }
    }
}
```

```
$X42[1] = 5;
$X22[1.2] = 11;
$X24[1.2] = array(3, 5, 9);
```

```
foreach($X0 as $value1) {
    foreach($X24[1.2] as $value3) {
        $X44 = $value1;
        if ($X44 != 0 && $X44 != $X33 && $X44 != $value3 && $X44 != $X42[1]) {
            $T1 = abs($X44 - $X34);
            $T2 = abs($X34 - $value3);
            $T3 = abs($X34 - $X33);
            $T4 = abs($X43 - $X44);
            $T5 = abs($X43 - $X42[1]);
            $T6 = abs($X43 - $X33);
```

```
            if ($T1 != $T2 && $T1 != $T3 && $T1 != $T4 && $T4 != $T5 && $T4 != $T6) {
                $resultnya = $X44 . " (TRUE)";
                echo "Untuk Cabang Pertama, jika";
                echo "<br/>X42: " . $X42[1];
                echo ", X22: " . $X22[1.2];
                echo ", X24: " . $value3;
                echo "<br/>Maka nilai X44 = " . $resultnya;
                echo "<br/>";
            }
        }
    }
}
```

```
}
```

Untuk Cabang Pertama, jika  
X42: 5, X22: 9, X24: 5  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Pertama, jika  
X42: 5, X22: 9, X24: 11  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Pertama, jika  
X42: 5, X22: 9, X24: 3  
Maka nilai X44 = 11 (TRUE)

Untuk Cabang Pertama, jika  
X42: 5, X22: 11, X24: 5  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Pertama, jika  
X42: 5, X22: 11, X24: 9  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Pertama, jika  
X42: 5, X22: 11, X24: 3  
Maka nilai X44 = 11 (TRUE)

Untuk Cabang Pertama, jika  
X42: 5, X22: 11, X24: 9  
Maka nilai X44 = 11 (TRUE)

```

// MENENTUKAN CABANG KEDUA
$X42[2] = 9;
$X22[2.1] = 5;
$X24[2.1] = array(9, 11);

foreach ($X0 as $value1) {
    foreach($X24[2.1] as $value4) {
        $X44 = $value1;

        if ($X44 != 0 && $X44 != $X33 && $X44 != $value4 && $X44 != $X42[2]) {
            $T1 = abs($X44 - $X34);
            $T2 = abs($X34 - $value4);
            $T3 = abs($X34 - $X33);
            $T4 = abs($X43 - $X44);
            $T5 = abs($X43 - $X42[2]);
            $T6 = abs($X43 - $X33);

            if ($T1 != $T2 && $T1 != $T3 && $T1 != $T4 && $T4 != $T5 && $T4 != $T6) {
                $resultnya = $X44 . " (TRUE)";
                echo "Untuk Cabang Kedua, jika";
                echo "<br/>X42: " . $X42[2];
                echo ", X22: " . $X22[2.1];
                echo ", X24: " . $value4;
                echo "<br/> Maka nilai X44 = " . $resultnya;
                echo "<hr>";
            }
        }
    }
}

$X42[2] = 9;
$X22[2.2] = 11;
$X24[2.2] = array(3, 5, 9);

foreach ($X0 as $value1) {
    foreach($X24[2.2] as $value5) {
        $X44 = $value1;
        if ($X44 != 0 && $X44 != $X33 && $X44 != $value5 && $X44 != $X42[2]) {
            $T1 = abs($X44 - $X34);
            $T2 = abs($X34 - $value3);
            $T3 = abs($X34 - $X33);
            $T4 = abs($X43 - $X44);
            $T5 = abs($X43 - $X42[2]);
            $T6 = abs($X43 - $X33);

            if ($T1 != $T2 && $T1 != $T3 && $T1 != $T4 && $T4 != $T5 && $T4 != $T6) {
                $resultnya = $X44 . " (TRUE)";
                echo "Untuk Cabang Kedua, jika";
                echo "<br/>X42: " . $X42[2];
                echo ", X22: " . $X22[2.2];
                echo ", X24: " . $value5;
                echo "<br/> Maka nilai X44 = " . $resultnya;
                echo "<hr>";
            }
        }
    }
}
}

```

Untuk Cabang Kedua, jika  
X42: 9, X22: 5, X24: 9  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Kedua, jika  
X42: 9, X22: 5, X24: 11  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Kedua, jika  
X42: 9, X22: 5, X24: 9  
Maka nilai X44 = 5 (TRUE)

Untuk Cabang Kedua, jika  
X42: 9, X22: 11, X24: 5  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Kedua, jika  
X42: 9, X22: 11, X24: 9  
Maka nilai X44 = 3 (TRUE)

Untuk Cabang Kedua, jika  
X42: 9, X22: 11, X24: 3  
Maka nilai X44 = 5 (TRUE)

Untuk Cabang Kedua, jika  
X42: 9, X22: 11, X24: 9  
Maka nilai X44 = 5 (TRUE)

```

// MENENTUKAN CABANG KETIGA
$X42[3] = 11;
$X22[3.1] = 5;
$X24[3.1] = array(9, 11);
foreach ($X0 as $value1) {
    foreach($X24[3.1] as $value6) {
        $X44 = $value1;

        if ($X44 != 0 && $X44 != $X33 && $X44 != $value6 && $X44 != $X42[3]) {
            $T1 = abs($X44 - $X34);
            $T2 = abs($X34 - $value6);
            $T3 = abs($X34 - $X33);
            $T4 = abs($X43 - $X44);
            $T5 = abs($X43 - $X42[3]);
            $T6 = abs($X43 - $X33);

            if ($T1 != $T2 && $T1 != $T3 && $T1 != $T4 && $T4 != $T5 && $T4 != $T6) {
                $resultnya = $X44 . " (TRUE)";
                echo "Untuk Cabang Ketiga, jika";
                echo "<br/>X42: " . $X42[3];
                echo ", X22: " . $X22[3.1];
                echo ", X24: " . $value6;
                echo "<br/> Maka nilai X44 = " . $resultnya;
                echo "<hr>";
            }
        }
    }
}

$X42[3] = 11;
$X22[3.2] = 9;
$X24[3.2] = array(3, 5, 11);

foreach ($X0 as $value1) {
    foreach($X24[3.2] as $value7) {
        $X44 = $value1;
        if ($X44 != 0 && $X44 != $X33 && $X44 != $value7 && $X44 != $X42[3]) {
            $T1 = abs($X44 - $X34);
            $T2 = abs($X34 - $value7);
            $T3 = abs($X34 - $X33);
            $T4 = abs($X43 - $X44);
            $T5 = abs($X43 - $X42[3]);
            $T6 = abs($X43 - $X33);

            if ($T1 != $T2 && $T1 != $T3 && $T1 != $T4 && $T4 != $T5 && $T4 != $T6) {
                $resultnya = $X44 . " (TRUE)";
                echo "Untuk Cabang Ketiga, jika";
                echo "<br/>X42: " . $X42[3];
                echo ", X22: " . $X22[3.2];
                echo ", X24: " . $value7;
                echo "<br/> Maka nilai X44 = " . $resultnya;
                echo "<hr>";
            }
        }
    }
}
}

```

Untuk Cabang Ketiga, jika  
X42: 11, X22: 5, X24: 9  
Maka nilai X44 = 3 (TRUE)

---

Untuk Cabang Ketiga, jika  
X42: 11, X22: 5, X24: 11  
Maka nilai X44 = 3 (TRUE)

---

Untuk Cabang Ketiga, jika  
X42: 11, X22: 5, X24: 9  
Maka nilai X44 = 5 (TRUE)

---

Untuk Cabang Ketiga, jika  
X42: 11, X22: 9, X24: 5  
Maka nilai X44 = 3 (TRUE)

---

Untuk Cabang Ketiga, jika  
X42: 11, X22: 9, X24: 11  
Maka nilai X44 = 3 (TRUE)

---

Untuk Cabang Ketiga, jika  
X42: 11, X22: 9, X24: 3  
Maka nilai X44 = 5 (TRUE)

---

e. Titik  $X_{41}$  dan  $X_{45}$

<pre> &lt;?php \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10;  \$X0 = array(1, 3, 5, 9, 11); \$X1 = array(2, 4, 8, 10, 12); \$X2 = array(1, 3, 5, 7, 9, 11); \$X3 = array(2, 4, 6, 8, 10, 12);  // Menentukan Cabang Pertama Untuk X41 \$X42[1] = 5; \$X22[1.1] = 9; \$X24[1.1] = 3; \$X44[1.1] = 11; \$X41 = 0; foreach (\$X3 as \$value1) {     \$X41 = \$value1;      if (\$X41 != 0 &amp;&amp; \$X41 != \$X32 &amp;&amp; \$X41 != \$X43) {         \$T1 = abs(\$X41 - \$X42[1]);         \$T2 = abs(\$X42[1] - \$X32);         \$T3 = abs(\$X42[1] - \$X43);         if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3) {             \$resultnya = \$X41 . " (TRUE)";             echo "Untuk Cabang Pertama, jika";             echo "&lt;br/&gt;X42: " . \$X42[1];             echo ", X22: " . \$X22[1.1];             echo ", X24: " . \$X24[1.1];             echo ", X44: " . \$X44[1.1];             echo "&lt;br/&gt; Maka nilai X41 = " . \$resultnya;             echo "&lt;hr&gt;";         }     } }  // Menentukan Cabang Pertama Untuk X45 foreach (\$X3 as \$value1) {     \$X45 = \$value1;     if (\$X45 != 0 &amp;&amp; \$X45 != \$X34 &amp;&amp; \$X45 != \$X43) {         \$T1 = abs(\$X45 - \$X44[1]);         \$T2 = abs(\$X44[1] - \$X34);         \$T3 = abs(\$X44[1] - \$X43);         if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3) {             \$resultnya = \$X45 . " (TRUE)";             echo "Untuk Cabang Pertama, jika";             echo "&lt;br/&gt;X42: " . \$X42[1];             echo ", X22: " . \$X22[1.1];             echo ", X24: " . \$X24[1.1];             echo ", X44: " . \$X44[1.1];             echo "&lt;br/&gt; Maka nilai X45 = " . \$resultnya;             echo "&lt;hr&gt;";         }     } } </pre>	<p>Untuk Cabang Pertama, jika X42: 5, X22: 9, X24: 3, X44: 11 Maka nilai X41 = 4 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 9, X24: 3, X44: 11 Maka nilai X41 = 6 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 9, X24: 3, X44: 11 Maka nilai X41 = 12 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 9, X24: 3, X44: 11 Maka nilai X45 = 2 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 9, X24: 3, X44: 11 Maka nilai X45 = 4 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika X42: 5, X22: 9, X24: 3, X44: 11 Maka nilai X45 = 6 (TRUE)</p>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

```

$X22[1.1] = 9;
$X24[1.2] = array(5, 11);
$X44[1.2] = 3;
$X41 = 0;
// Menentukan Cabang Pertama Untuk X41
foreach ($X3 as $value1) {
    foreach ($X24[1.2] as $value2) {
        $X41 = $value1;

        if ($X41 != 0 && $X41 != $X32 && $X41 != $X43) {
            $T1 = abs($X41 - $X42[1]);
            $T2 = abs($X42[1] - $X32);
            $T3 = abs($X42[1] - $X43);
            if ($T1 != $T2 && $T1 != $T3) {
                $resultnya = $X41 . " (TRUE)";
                echo "Untuk Cabang Pertama, jika";
                echo "<br/>X42: " . $X42[1];
                echo ", X22: " . $X22[1.1];
                echo ", X24: " . $value2;
                echo ", X44: " . $X44[1.2];
                echo "<br/> Maka nilai X41 = " . $resultnya;
                echo "<hr>";
            }
        }
    }
}

// Menentukan Cabang Pertama Untuk X45
foreach ($X3 as $value1) {
    foreach ($X24[1.2] as $value2) {
        $X45 = $value1;
        if ($X45 != 0 && $X45 != $X34 && $X45 != $X43) {
            $T1 = abs($X45 - $X44[1.2]);
            $T2 = abs($X44[1.2] - $X34);
            $T3 = abs($X44[1] - $X43);
            if ($T1 != $T2 && $T1 != $T3) {
                $resultnya = $X45 . " (TRUE)";
                echo "Untuk Cabang Pertama, jika";
                echo "<br/>X42: " . $X42[1];
                echo ", X22: " . $X22[1.1];
                echo ", X24: " . $value2;
                echo ", X44: " . $X44[1.2];
                echo "<br/> Maka nilai X45 = " . $resultnya;
                echo "<hr>";
            }
        }
    }
}

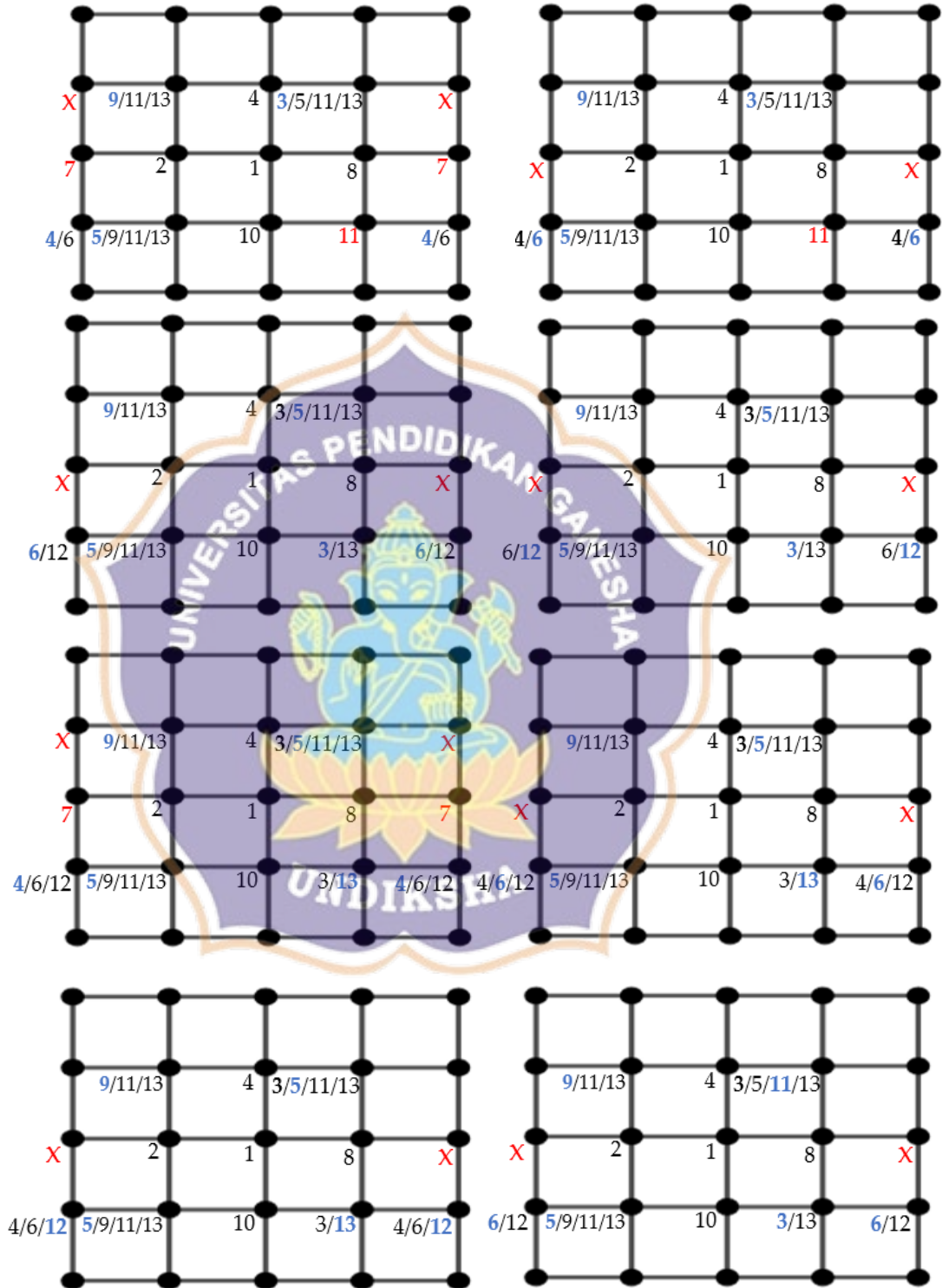
```

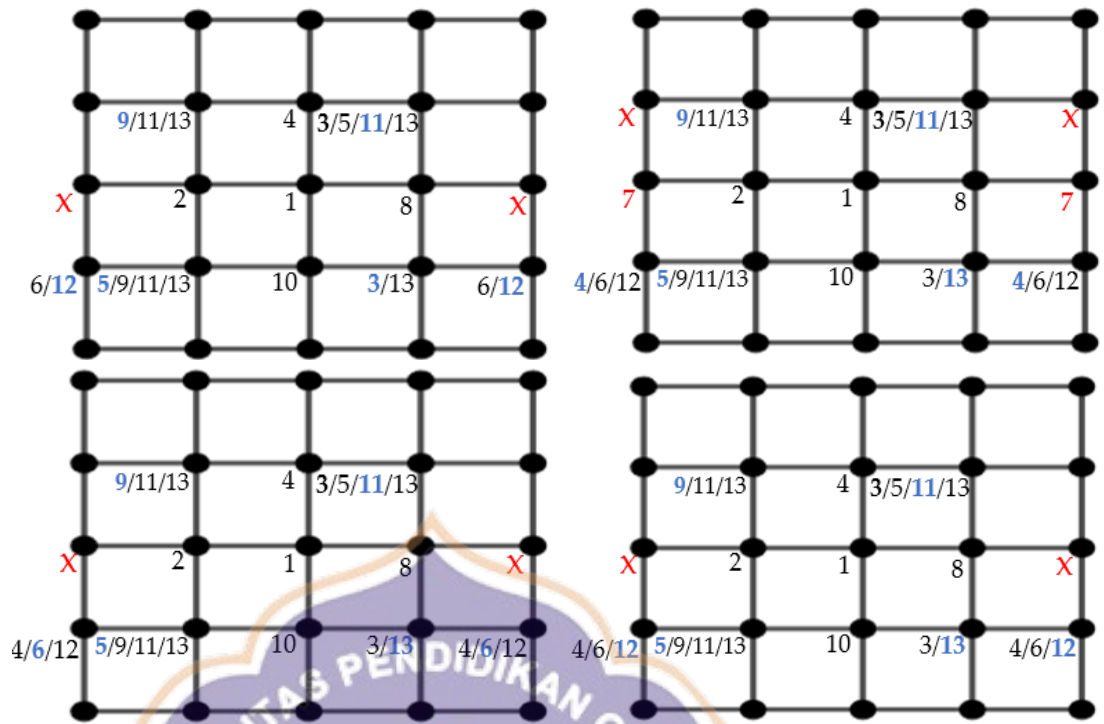
f. Untuk mencari cabang dan titik selanjutnya dapat dilakukan dengan cara yang sama, hingga mendapatkan hasil yang tidak memenuhi syarat titik. Untuk semua kombinasi akan menghasilkan error pada salah satu titik, sehingga tidak dapat diwarnai dengan 12 warna.



### 1.5 Pewarnaan Pada Graf $L_{5,5}^*$ Case 3 dengan Manual

Berikut merupakan beberapa contoh pewarnaan manual pada kombinasi pertama.





### 1.6 Pewarnaan Pada Graf $L_{5,5}^*$ Case 3 dengan Pemograman

#### a. Menentukan Nilai $X_{42}$

```

<?php
//MENGINPUT NILAI YANG SUDAH DIKETAHUI
$X33 = 1;
$X32 = 2;
$X23 = 4;
$X34 = 8;
$X43 = 10;
$X42 = 0;

//MEMASUKKAN PILIHAN WARNA YANG MUNGKIN
$X0 = array(1, 3, 5, 9, 11,13);
$X1 = array(2, 4, 8, 10,12);
$X2 = array(1, 3, 5, 7, 9, 11,13);
$X3 = array(2, 4, 6, 8, 10, 12);

//MEMANGGIL KEMUNGKINAN WARNA TITIK YANG AKAN DICARI
foreach ($X0 as $value) {
    $X42 = $value;
//MEMASUKKAN SYARAT TITIK YANG AKAN DICARI
    if ($X42 != 0 && $X42 != $X33) {
        $T1 = abs($X42 - $X43);
        $T2 = abs($X42 - $X32);
        $T3 = abs($X32 - $X33);
        $T4 = abs($X43 - $X33);
        if ($T1 != $T2 && $T2 != $T3 && $T1 != $T4) {
            $resultnya = $X42 . "(TRUE)";
            echo "Nilai X42 yaitu " . $resultnya;
            echo "<hr>";
        }
    }
}
?>

```

Nilai  $X_{42}$  yaitu 5(TRUE)

---

Nilai  $X_{42}$  yaitu 9(TRUE)

---

Nilai  $X_{42}$  yaitu 11(TRUE)

---

Nilai  $X_{42}$  yaitu 13(TRUE)

b. Menentukan Nilai  $X_{22}$

<pre> &lt;?php // MENGINPUT NILAI YANG SUDAH DIKETAHUI \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X42 = array(5, 9, 11,13); \$X22 = 0;  // MEMASUKKAN PILIHAN WARNA YANG MUNGKIN \$X0 = array(1, 3, 5, 9, 11, 13,); \$X1 = array(2, 4, 8, 10, 12); \$X2 = array(1, 3, 5, 7, 9, 11, 13); \$X3 = array(2, 4, 6, 8, 10, 12);  // MEMANGGIL KEMUNGKINAN WARNA TITIK YANG AKAN DICARI foreach (\$X0 as \$value1) {     foreach (\$X42 as \$value2) {         \$X22 = \$value1;          if (\$X22 != 0 &amp;&amp; \$X22 != \$X33 &amp;&amp; \$X22 != \$value2) {             \$T1 = abs(\$X22 - \$X32);             \$T2 = abs(\$X22 - \$X23);             \$T3 = abs(\$X32 - \$X33);             \$T4 = abs(\$X32 - \$value2);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4) {                 \$resultnya = \$X22 . " (TRUE)";                 echo "Nilai X22 jika ";                 echo "X42 : " . \$value2;                 echo " maka : " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } } ?&gt; </pre>	<p>Nilai X22 jika X42 : 9 maka : 5 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 11 maka : 5 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 13 maka : 5 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 5 maka : 9 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 11 maka : 9 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 13 maka : 9 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 5 maka : 11 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 9 maka : 11 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 13 maka : 11 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 5 maka : 13 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 9 maka : 13 (TRUE)</p> <hr/> <p>Nilai X22 jika X42 : 11 maka : 13 (TRUE)</p>
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c. Menentukan Nilai  $X_{24}$

<pre> &lt;?php  \$X33 = 1; \$X32 = 2; \$X23 = 4; \$X34 = 8; \$X43 = 10; \$X24 = 0; \$X0 = array(1, 3, 5, 9, 11, 13); \$X1 = array(2, 4, 8, 10, 12); \$X2 = array(1, 3, 5, 7, 9, 11, 13); \$X3 = array(2, 4, 6, 8, 10, 12); </pre>	<p>Untuk Cabang Pertama, jika, X42: 5, X22: 9 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 11 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 13 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 9 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 11 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 13 Maka nilai X24 = 5 (TRUE)</p>
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<pre>//Menentukan Cabang Pertama \$X42[1] = 5; \$X22[1] = array(9, 11, 13); foreach (\$X0 as \$value1) {     foreach (\$X22[1] as \$value2) {         \$X24 = \$value1;          if (\$X24 != 0 &amp;&amp; \$X24 != \$X33 &amp;&amp; \$X24 != \$value2) {             \$T1 = abs(\$X24 - \$X23);             \$T2 = abs(\$value2 - \$X23);             \$T3 = abs(\$X23 - \$X33);             \$T4 = abs(\$X24 - \$X34);             \$T5 = abs(\$X33 - \$X34);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {                 \$resultnya = \$X24 . " (TRUE)";                 echo "Untuk Cabang Pertama, jika";                 echo ", X42: " . \$X42[1];                 echo ", X22: " . \$value2;                 echo "&lt;br/&gt;Maka nilai X24 = " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } }</pre>	<p>Untuk Cabang Pertama, jika, X42: 5, X22: 11 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 13 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 9 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 13 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 9 Maka nilai X24 = 13 (TRUE)</p> <hr/> <p>Untuk Cabang Pertama, jika, X42: 5, X22: 11 Maka nilai X24 = 13 (TRUE)</p>
<pre>//MENENTUKAN CABANG KEDUA \$X42[2] = 9; \$X22[2] = array(5, 11, 13); foreach (\$X0 as \$value1) {     foreach (\$X22[2] as \$value2) {         \$X24 = \$value1;          if (\$X24 != 0 &amp;&amp; \$X24 != \$X33 &amp;&amp; \$X24 != \$value2) {             \$T1 = abs(\$X24 - \$X23);             \$T2 = abs(\$value2 - \$X23);             \$T3 = abs(\$X23 - \$X33);             \$T4 = abs(\$X24 - \$X34);             \$T5 = abs(\$X33 - \$X34);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {                 \$resultnya = \$X24 . " (TRUE)";                 echo "Untuk Cabang Kedua, jika";                 echo ", X42: " . \$X42[2];                 echo ", X22: " . \$value2;                 echo "&lt;br/&gt;Maka nilai X24 = " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } }</pre>	<p>Untuk Cabang Kedua, jika, X42: 9, X22: 11 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 13 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 11 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 13 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 5 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 11 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 13 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 5 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 13 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 5 Maka nilai X24 = 13 (TRUE)</p> <hr/> <p>Untuk Cabang Kedua, jika, X42: 9, X22: 5 Maka nilai X24 = 13 (TRUE)</p>
<pre>//MENENTUKAN CABANG KETIGA \$X42[3] = 11; \$X22[3] = array(5, 9, 13); foreach (\$X0 as \$value1) {     foreach (\$X22[3] as \$value2) {         \$X24 = \$value1;</pre>	<p>Untuk Cabang Ketiga, jika, X42: 11, X22: 9 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 13 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 9 Maka nilai X24 = 5 (TRUE)</p>



<pre> if (\$X24 != 0 &amp;&amp; \$X24 != \$X33 &amp;&amp; \$X24 != \$value2) {     \$T1 = abs(\$X24 - \$X23);     \$T2 = abs(\$value2 - \$X23);     \$T3 = abs(\$X23 - \$X33);     \$T4 = abs(\$X24 - \$X34);     \$T5 = abs(\$X33 - \$X34);      if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {         \$resultnya = \$X24 . " (TRUE)";         echo "Untuk Cabang Ketiga, jika";         echo ", X42: " . \$X42[3];         echo ", X22: " . \$value2;         echo "&lt;br/&gt;Maka nilai X24 = " . \$resultnya;         echo "&lt;hr&gt;";     } } } } </pre>	<p>Untuk Cabang Ketiga, jika, X42: 11, X22: 13 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 5 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 13 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 5 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 9 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 13 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 5 Maka nilai X24 = 13 (TRUE)</p> <hr/> <p>Untuk Cabang Ketiga, jika, X42: 11, X22: 9 Maka nilai X24 = 13 (TRUE)</p>
<pre> //MENENTUKAN CABANG KEEMPAT \$X42[4] = 13; \$X22[4] = array(5, 9, 11); foreach (\$X0 as \$value1) {     foreach (\$X22[4] as \$value2) {         \$X24 = \$value1;          if (\$X24 != 0 &amp;&amp; \$X24 != \$X33 &amp;&amp; \$X24 != \$value2) {             \$T1 = abs(\$X24 - \$X23);             \$T2 = abs(\$value2 - \$X23);             \$T3 = abs(\$X23 - \$X33);             \$T4 = abs(\$X24 - \$X34);             \$T5 = abs(\$X33 - \$X34);              if (\$T1 != \$T2 &amp;&amp; \$T1 != \$T3 &amp;&amp; \$T1 != \$T4 &amp;&amp; \$T4 != \$T5) {                 \$resultnya = \$X24 . " (TRUE)";                 echo "Untuk Cabang Keempat, jika";                 echo ", X42: " . \$X42[4];                 echo ", X22: " . \$value2;                 echo "&lt;br/&gt;Maka nilai X24 = " . \$resultnya;                 echo "&lt;hr&gt;";             }         }     } } } </pre>	<p>Untuk Cabang Keempat, jika, X42: 13, X22: 9 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 11 Maka nilai X24 = 3 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 9 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 11 Maka nilai X24 = 5 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 5 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 11 Maka nilai X24 = 9 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 5 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 9 Maka nilai X24 = 11 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 5 Maka nilai X24 = 13 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 9 Maka nilai X24 = 13 (TRUE)</p> <hr/> <p>Untuk Cabang Keempat, jika, X42: 13, X22: 11 Maka nilai X24 = 13 (TRUE)</p>

- d. Untuk mencari cabang dan titik selanjutnya dapat dilakukan dengan cara yang sama, hingga mendapatkan hasil yang tidak memenuhi syarat titik.

Untuk semua kombinasi akan menghasilkan error pada salah satu titik, sehingga tidak dapat diwarnai dengan 13 warna.



## Lampiran 2. Riwayat Hidup

### RIWAYAT HIDUP



Kadek Ria Andriani adalah seorang anak perempuan yang lahir di Singaraja tepatnya di Desa Panji pada tanggal 20 Juni 2002. Penulis lahir dari pasangan suami istri yang bernama Made Putra dan Ketut Putrining. Penulis berkebangsaan Indonesia dan beragama Hindu. Kini penulis bertempat di Banjar Dinas Dauh Pura, Desa Panji, Kecamatan Sukasada, Kabupaten Buleleng, Bali.

Penulis menyelesaikan pendidikan taman kanak-kanak di TK Tunas Mekar pada tahun 2007. Kemudian penulis melanjutkan pendidikan dasar di SD Negeri 2 Panji dari tahun 2008 hingga 2014. Selanjutnya, penulis melanjutkan pendidikan sekolah menengah di SMP N 4 Singaraja selama tiga tahun dan lulus pada tahun 2017. Pada tahun 2020, penulis lulus dari SMA Negeri 2 Singaraja dan melanjutkan ke Strata 1 Jurusan Matematika di Universitas Pendidikan Ganesha. Pada semester akhir, tahun 2024 penulis menyelesaikan Tugas Akhir yang berjudul “Bilangan Kromatik Graceful Ganjil Pada Graf Hasil Kali Cartesius  $C_m \times G$ ”. Mulai dari tahun 2020 sampai dengan penulisan skripsi ini, penulis masih terdaftar sebagai mahasiswa Program Studi S1 Matematika di Universitas Pendidikan Ganesha.

### Lampiran 3. Pernyataan Keaslian Tulisan

#### PERNYATAAN

Dengan ini saya menyatakan bahwa karya tulis yang berjudul “Bilangan Kromatik Graceful Ganjil Pada Graf Hasil Kali Cartesius  $C_m \times G$ ” beserta seluruh isinya adalah benar-benar karya sendiri dan saya tidak melakukan penjiplakan dan pengutipan dengan cara-cara yang tidak sesuai dengan etika yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi yang dijatuhkan kepada saya apabila kemudian ditemukan adanya pelanggaran atas etika keilmuan dalam karya saya ini atau ada klaim terhadap keaslian karya saya ini.



Singaraja, 12 Juni 2024

Yang membuat pernyataan,

Kadek Ria Andriani