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Chromatic Number Location of Corona Operation Result of Cycle Graph with Path Graph

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ABSTRACT

Let $G = (V, E)$ be a connected graph, and c be a vertex coloring using k colors, i.e. $1,2, \dots, k$. Let $\Pi = \{C_1, C_2, \dots, C_k\}$ be a partition of $V(G)$ that induces a coloring c. The color code of a vertex v in G, denoted by $c_{\Pi}(v)$ is a k-ordered pair $(d(v, C_1), \dots, d(v, C_k))$ with $d(v, C_i) = \min\{d(v, x) | x \in C_i\}$ for $i \in [1, k]$. If each vertex in G has a different color code, then c is called a location coloring of G. The location chromatic number of a graph G, denoted by $\chi_L(G)$ is the smallest number k such that G has a location coloring with k colors. Let G and H be graphs, the corona operation $G \odot H$ is defined as the graph obtained by taking the duplicates of the graphs G and $|G|$ duplicate of graph H, namely H_i with $i = 1,2,3.., |G|$ then connect each vertex i of G to each vertex in H_i. The chromatic number of the location of the corona operation result of the cycle graph with the path graph $C_3 \odot P_n$ is 5 for $3 \le n \le 11$ and 6 for $12 \le n \le 20$.

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INTRODUCTION

Graph theory has a unique solution concept to discuss, one of which is graph coloring. Graph coloring is a method of coloring elements in a graph divided into two parts: vertex coloring and edge coloring. Graph coloring continued to develop, so the concept of metric dimension emerged, which was introduced by Harary F and Melter [1]. The metric dimension is the minimum cardinality of all distinguishing sets in G which is denoted by $\dim(G)$. In 1998 Chartrand et al. succeeded in finding the concept of partition dimension which is a development of metric dimension [2]. The smallest integer partition dimension k such that graph G has distinguishing partitions with k partition classes. Furthermore, the partition dimension gave birth to the concept of location chromatic number, which was introduced by Chartrand et al. in 2002 [3].

The location chromatic number of a graph is a combined concept between coloring and partition dimension. The determination of the location chromatic number is based on the minimum colors used in location coloring, with different color codes for each vertex on the graph. In 2003, Chartrand et al. successfully constructed a tree graph of order $n \ge 5$ with location chromatic numbers varying from 3 to n except for $(n-1)$ [4]. Furthermore, in 2011, Asmiati et al. successfully obtained the location chromatic number of amalgamation on uniform star graphs [5]. In 2012, Asmiati et al. successfully determined the location chromatic number of firework graphs and characterized the location chromatic number of three-digit cycle graphs [6]. Furthermore, Behtoei et al. found the combined location chromatic number of path graphs, circle graphs and complete multipartite graphs [7].

Discussion of location chromatic number has been widely studied, including on two graphs that can be operated with several operations, including join operation $(G+H)$, Cartesian operation $(G\times H)$, corona operation $(G\odot H)$, tensor operation $(G\otimes H)$, composition $(G[F])$, and amalgamation. In 1970, Harary F and Frunct defined corona operation of graph G and graph H, namely the graph obtained by taking duplicate of graph G and $|G|$ duplicate of graph H, namely H_i with $i=1,2,3,\ldots,|G|$, then connecting each vertex of G to each vertex in H_i [8].

In 2012, Baskoro et al. succeeded in determining the location chromatic number on the graph resulting from the corona operation of two connected graphs $G\odot H$ and the exact value of the location chromatic number of a particular graph [9]. Based on the literature search, there has been no research on the chromatic number of the location of the corona operation result of a cycle graph with a path graph $\chi_L(C_3\odot P_n)$ for $3\le n\le 20$. So the author is motivated in this study to discuss the chromatic number of the location of the corona operation result on a cycle graph with a path graph.

METHODS

The steps taken in this study are as follows:

1. Determining the lower limit of the graph resulting from the corona operation $C_3\odot P_n$. The lower limit starts from the chromatic number of the location $C_n, \chi_L\,(C_3\odot P_n)\ge 3$. Furthermore, the addition of colors is carried out to meet the requirements of the chromatic number of the location.
2. Determining the upper limit of the chromatic number of the location of the graph resulting from the corona operation $C_3\odot P_n$. The coloring is constructed so that a minimum coloring is obtained that meets the requirements of the chromatic number of the location.
3. Formulating the results obtained from the construction process as a mathematical statement.

RESULTS AND DISCUSSION

Suppose the vertex set $V(C_3\odot P_n)=\{a_i|i=1,2,3\}\cup\{b_j^i\,;\,i=1,2,3;\ j=1,2,\ldots,n\}$, vertices $a_i\,;1,2,3$ are vertices on the cycle C_3. Vertices b_j^i with $i=1,2,3;\ \ j=1,2,\ldots,n$ are vertices located on the $j-$th path graph adjacent to the vertex a_i. Furthermore, the edge set $E(C_3\odot P_n)=\{\,a_1\,a_2,\ a_2\,a_3,\ \ a_3\,a_1\}\cup\{b_j^i\,b_{j+1}^i\,;i=1,2,3;\ j=1,2,\ldots,n-1\}$.

1. Chromatic Number of Coronal Operation Result Location $C_3\odot P_n$ for $3\le n\le 11$

First, the lower bound of the chromatic number of the corona operation results location $C_3\odot P_n$ will be determined. Since the corona operation result graph $C_3\odot P_3$ contains a cycle graph, then based on $\chi_L\,(C_3\odot P_n)\ge 3$ for odd n. Suppose c is the location coloring in $C_3\odot P_n$ $3\le n\le 11$ using three colors. Note that $d(b_k^i,v)=d(b_l^i,v)$, with $k\ne l$, and $v\notin\{b_k^i,b_l^i\}$. As a result, $c(b_k^i)\ne c(b_l^i)$ for $k\ne l$. Then, there will be the same color code at each neighboring point., which can be seen in the following table

Table 1. Color Code at each Point in $V(C_3\odot P_3)$ with 3 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$
$(a_1)=(0,1,1)$	$(a_2)=(1,0,1)$	$(a_3)=1,1,0)$
$(b_1^2)=(0,1,1)$	$(b_1^1)=(1,0,1)$	$(b_2^1)=(1,1,0)$
$(b_3^2)=(0,1,1)$	$(b_3^1)=(1,0,1)$	$(b_2^2)=(1,1,0)$
$(b_1^3)=(0,1,1)$	$(b_2^3)=(1,0,1)$	
$(b_3^3)=(0,1,1)$		

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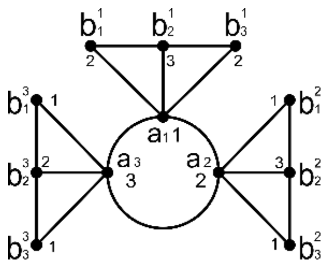

Figure 1. Location Coloring $C_3 \odot P_3$ with 3 Colors

Table 2. Color Code at each Point in $V(C_3 \odot P_3)$ with 4 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$
$(a_1) = (0,1,1,1)$	$(a_2) = (1,0,1,1)$	$(a_3) = (1,1,0,1)$	$(b_2^1) = (1,1,1,0)$
$(b_1^2) = (0,1,1,2)$	$(b_3^1) = (1,0,2,1)$	$(b_1^1) = (1,2,0,1)$	$(b_3^2) = (2,1,1,0)$
$(b_2^3) = (0,1,1,1)$	$(b_1^3) = (1,0,1,2)$	$(b_2^2) = (1,1,0,1)$	$(b_3^3) = (1,2,1,0)$

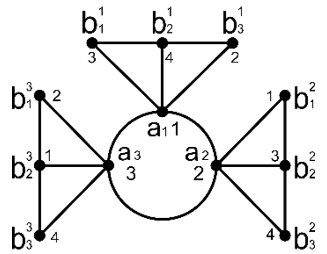

Figure 2. Location Coloring $C_3 \odot P_3$ with 4 Colors.

A contradiction with the definition of the location chromatic number is that there are the same color codes at neighboring points, so at least five colors are needed. Consequently, $\chi_L(C_3 \odot P_n) \geq 5$.

Table 3. Color Code at each Point in $V(C_3 \odot P_3)$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,2)$	$(a_2) = (1,0,1,1,2)$	$(a_3) = (1,1,0,2,1)$	$(b_2^1) = (1,1,1,0,3)$	$(b_3^3) = (1,2,1,3,0)$
$(b_1^2) = (0,1,1,2,3)$	$(b_3^1) = (1,0,2,1,3)$	$(b_1^1) = (1,2,0,1,3)$	$(b_3^2) = (2,1,1,0,3)$	
$(b_2^3) = (0,1,1,3,1)$	$(b_1^3) = (1,0,1,3,2)$	$(b_2^2) = (1,1,0,1,3)$		

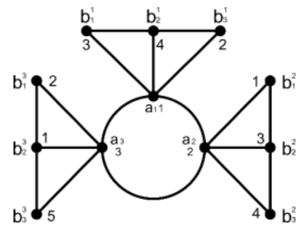

Figure 3. Location Coloring $C_3 \odot P_3$ with 5 Colors.

Table 4. Color Code at each Point in $V(C_3 \odot P_4)$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_2^1) = (1,1,1,0,2)$	$(b_4^1) = (1,1,2,2,0)$
$(b_1^2) = (0,1,1,2,2)$	$(b_3^1) = (1,0,2,1,1)$	$(b_1^1) = (1,2,0,1,2)$	$(b_3^2) = (2,1,1,0,1)$	$(b_4^2) = (2,1,2,1,0)$
$(b_2^3) = (0,1,1,2,1)$	$(b_1^3) = (1,0,1,2,2)$	$(b_2^2) = (1,1,0,1,2)$	$(b_4^3) = (2,2,1,0,1)$	$(b_3^3) = (1,2,1,1,0)$

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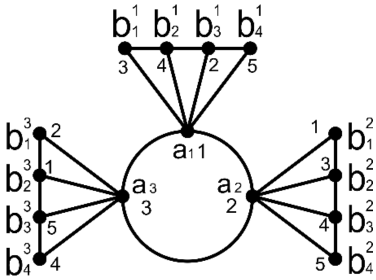

Figure 4. Location Coloring $C_3 \odot P_4$ with 5 Colors

Table 5. Color Code at each Point in $V(C_3 \odot P_5)$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_2^1) = (1,1,1,0,2)$	$(b_4^1) = (1,1,1,2,0)$
$(b_1^2) = (0,1,1,2,2)$	$(b_3^1) = (1,0,2,1,1)$	$(b_1^1) = (1,2,0,1,2)$	$(b_3^2) = (2,1,1,0,1)$	$(b_4^2) = (1,1,2,1,0)$
$(b_5^2) = (0,1,2,2,1)$	$(b_1^3) = (1,0,1,2,2)$	$(b_5^1) = (1,2,0,2,1)$	$(b_4^3) = (2,2,1,0,1)$	$(b_3^3) = (1,2,1,1,0)$
$(b_2^3) = (0,1,1,2,1)$		$(b_2^2) = (1,1,0,1,2)$		$(b_5^3) = (1,2,1,1,0)$

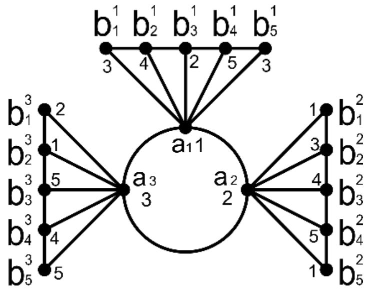

Figure 5. Location Coloring $C_3 \odot P_5$ with 5 Colors.

Table 6. Color Code at each Point in $V(C_3 \odot P_6)$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_2^1) = (1,1,1,0,2)$	$(b_4^1) = (1,1,1,2,0)$
$(b_1^2) = (0,1,1,2,2)$	$(b_3^1) = (1,0,2,1,1)$	$(b_1^1) = (1,2,0,1,2)$	$(b_6^1) = (1,2,1,0,2)$	$(b_4^2) = (1,1,2,1,0)$
$(b_5^2) = (0,1,2,1,1)$	$(b_1^3) = (1,0,1,2,2)$	$(b_5^1) = (1,2,0,2,1)$	$(b_3^2) = (2,1,1,0,1)$	$(b_3^3) = (1,2,1,1,0)$
$(b_2^3) = (0,1,1,2,1)$	$(b_6^3) = (2,0,1,2,1)$	$(b_2^2) = (1,1,0,1,2)$	$(b_6^2) = (1,1,2,0,2)$	$(b_5^3) = (1,2,1,1,0)$
			$(b_4^3) = (2,2,1,0,1)$	

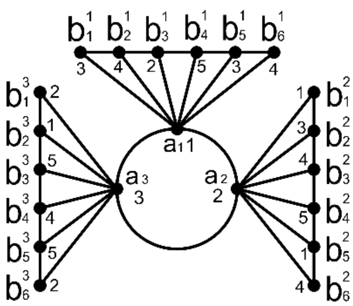

Figure 6. Location Coloring $C_3 \odot P_6$ with 5 Colors.

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Table 7. Color Code at each Point in $V(C_3 \odot P_7)$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_2^1) = (1,1,1,0,2)$	$(b_4^1) = (1,1,1,2,0)$
$(b_1^2) = (0,1,1,2,2)$	$(b_3^1) = (1,0,2,1,1)$	$(b_1^1) = (1,2,0,1,2)$	$(b_6^1) = (1,2,1,0,1)$	$(b_4^2) = (1,1,2,1,0)$
$(b_5^2) = (0,1,2,1,1)$	$(b_1^3) = (1,0,1,2,2)$	$(b_5^1) = (1,2,0,1,1)$	$(b_3^2) = (2,1,1,0,1)$	$(b_7^2) = (2,1,2,1,0)$
$(b_2^3) = (0,1,1,2,1)$	$(b_6^3) = (2,0,1,2,1)$	$(b_2^2) = (1,1,0,1,2)$	$(b_6^2) = (1,1,2,0,1)$	$(b_3^3) = (1,2,1,1,0)$
			$(b_4^3) = (2,2,1,0,1)$	$(b_5^3) = (2,1,1,1,0)$
				$(b_7^3) = (2,1,1,2,0)$

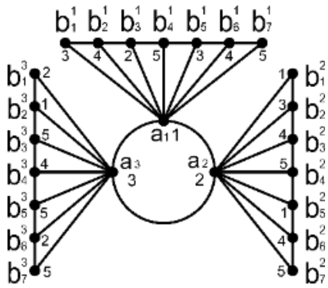

Figure 7. Location Coloring $C_3 \odot P_7$ with 5 Colors.

Table 8. Color Code at each Point in $V(C_3 \odot P_8)$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_1^1) = (1,2,1,0,2)$	$(b_5^1) = (1,1,1,2,0)$
$(b_2^2) = (0,1,1,2,2)$	$(b_4^1) = (1,0,2,1,1)$	$(b_2^1) = (1,2,0,1,2)$	$(b_3^1) = (1,1,1,0,2)$	$(b_8^1) = (1,2,2,1,0)$
$(b_6^2) = (0,1,2,1,1)$	$(b_2^3) = (1,0,1,1,2)$	$(b_6^1) = (1,2,0,1,1)$	$(b_7^1) = (1,2,1,0,1)$	$(b_5^2) = (1,1,2,1,0)$
$(b_3^3) = (0,1,1,2,1)$	$(b_7^3) = (2,0,1,2,1)$	$(b_1^2) = (1,1,0,2,2)$	$(b_4^2) = (2,1,1,0,1)$	$(b_8^2) = (2,1,2,1,0)$
		$(b_3^2) = (1,1,0,1,2)$	$(b_7^2) = (1,1,2,0,1)$	$(b_4^3) = (1,2,1,1,0)$
			$(b_1^3) = (2,1,1,0,2)$	$(b_6^3) = (2,1,1,1,0)$
			$(b_5^3) = (2,2,1,0,1)$	$(b_8^3) = (2,1,1,2,0)$

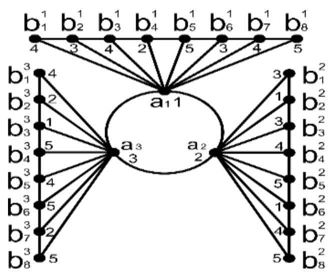

Figure 8. Location Coloring $C_3 \odot P_8$ with 5 Colors.

Table 9. Color Code at each Point in $V(C_3 \odot P_9)$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_1^1) = (1,2,1,0,2)$	$(b_5^1) = (1,1,1,2,0)$
$(b_2^2) = (0,1,1,2,2)$	$(b_4^1) = (1,0,2,1,1)$	$(b_2^1) = (1,2,0,1,2)$	$(b_3^1) = (1,1,1,0,2)$	$(b_8^1) = (1,2,2,1,0)$
$(b_6^2) = (0,1,2,1,1)$	$(b_1^3) = (2,0,1,1,2)$	$(b_6^1) = (1,2,0,1,1)$	$(b_7^1) = (1,2,1,0,1)$	$(b_5^2) = (1,1,2,1,0)$
$(b_4^3) = (0,1,1,2,1)$	$(b_3^3) = (1,0,1,1,2)$	$(b_1^2) = (1,1,0,2,2)$	$(b_9^1) = (1,2,2,0,1)$	$(b_8^2) = (2,1,2,1,0)$
	$(b_8^3) = (2,0,1,2,1)$	$(b_3^2) = (1,1,0,1,2)$	$(b_4^2) = (2,1,1,0,1)$	$(b_5^3) = (1,2,1,1,0)$
			$(b_7^2) = (1,1,2,0,1)$	$(b_7^3) = (2,1,1,1,0)$
			$(b_9^2) = (2,1,2,0,1)$	$(b_9^3) = (2,1,1,2,0)$
			$(b_2^3) = (2,1,1,0,2)$	
			$(b_6^3) = (2,2,1,0,1)$	

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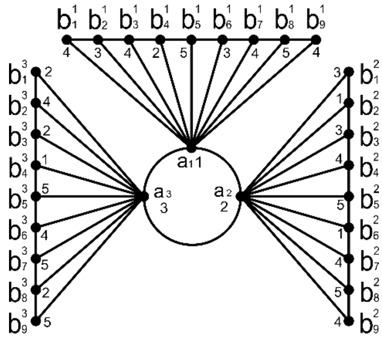

Figure 9. Location Coloring $C_3 \odot P_9$ with 5 Colors.

Table 10. Color Code at each Point in $V(C_3 \odot P_{10})$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_3^1) = (1,2,1,0,2)$	$(b_5^1) = (1, 1, 1,2,0)$
$(b_1^2) = (0,1,2,1,2)$	$(b_1^1) = (1,0,1,2,2)$	$(b_2^1) = (1,1,0,1,2)$	$(b_7^1) = (1,1,2,0,2)$	$(b_8^1) = (1,2,2,1,0)$
$(b_4^2) = (0,1,1,2,1)$	$(b_6^1) = (1,0,2,1,1)$	$(b_4^1) = (1,2,0,1,1)$	$(b_2^2) = (1,1,2,0,1)$	$(b_5^2) = (1,1,2,1,0)$
$(b_6^2) = (0,1,1,1,2)$	$(b_8^1) = (1,0,1,1,2)$	$(b_9^1) = (1,1,0,2,1)$	$(b_7^2) = (1,1,1,0,2)$	$(b_8^2) = (2,1,2,1,0)$
$(b_3^3) = (0,2,1,1,1)$	$(b_6^3) = (2,0,1,1,2)$	$(b_5^2) = (1,1,0,2,2)$	$(b_2^3) = (1,2,1,0,1)$	$(b_5^3) = (1,2,1,1,0)$
	$(b_8^3) = (2,0,1,1,1)$	$(b_8^2) = (2,1,0,1,1)$	$(b_5^3) = (2,1,1,0,1)$	$(b_7^3) = (2,1,1,1,0)$
		$(b_{10}^2) = (2,1,0,2,1)$	$(b_7^3) = (2,1,1,0,2)$	$(b_9^3) = (2,1,1,2,0)$
			$(b_{10}^3) = (2,2,1,0,1)$	
			$(b_6^3) = (2,2,1,0,1)$	

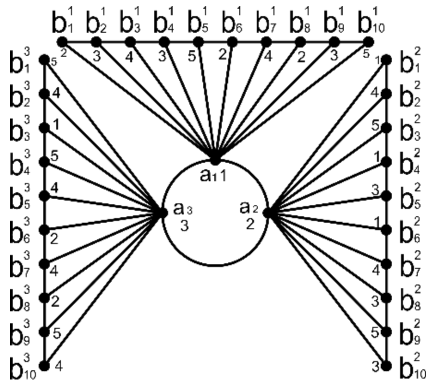

Figure 10. Location Coloring $C_3 \odot P_{10}$ with 5 Colors.

Table 11. Color Code at each Point in $V(C_3 \odot P_{11})$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_3^1) = (1,2,1,0,2)$	$(b_5^1) = (1, 1, 1,2,0)$
$(b_2^2) = (0,1,2,1,1)$	$(b_1^1) = (1,0,1,2,2)$	$(b_2^1) = (1,1,0,1,2)$	$(b_7^1) = (1,1,2,0,2)$	$(b_{10}^1) = (1,2,1,1,0)$
$(b_5^2) = (0,1,1,2,1)$	$(b_6^1) = (1,0,2,1,1)$	$(b_4^1) = (1,2,0,1,1)$	$(b_{11}^1) = (1,2,2,0,1)$	$(b_1^2) = (1,1,2,2,0)$
$(b_7^2) = (0,1,1,1,2)$	$(b_8^1) = (1,0,1,1,2)$	$(b_9^1) = (1,1,0,2,1)$	$(b_3^2) = (1,1,2,0,1)$	$(b_4^2) = (1,1,2,1,0)$
$(b_1^3) = (0,2,1,2,1)$	$(b_6^3) = (2,0,1,1,1)$	$(b_6^2) = (1,1,0,2,2)$	$(b_8^3) = (1,1,1,0,2)$	$(b_{10}^2) = (2,1,1,2,0)$
$(b_3^3) = (0,2,1,1,1)$	$(b_8^3) = (2,0,1,1,2)$	$(b_9^2) = (2,1,0,1,1)$	$(b_4^3) = (1,2,1,0,1)$	$(b_2^3) = (1,2,1,2,0)$
		$(b_{11}^2) = (2,1,0,2,1)$	$(b_7^3) = (2,1,1,0,2)$	$(b_5^3) = (2,1,1,1,0)$
			$(b_9^3) = (2,1,1,0,1)$	$(b_{10}^3) = (2,2,1,1,0)$
			$(b_{11}^3) = (2,2,1,0,1)$	

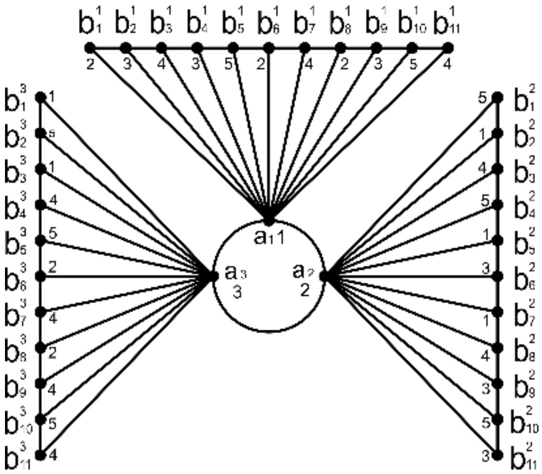

Figure 11. Location Coloring $C_3 \odot P_{11}$ with 5 Colors.

2. Chromatic Number of Coronal Operation Result Location $C_3 \odot P_n$ for $12 \leq n \leq 20$

First, we will determine the lower bound of the location chromatic number of the corona operation graph $C_3 \odot P_n$. Since the corona operation graph $C_3 \odot P_n$ contains a cycle graph, then based on Theorem 2.2, $\chi_L(C_3 \odot P_n) \geq 3$ for odd n. Suppose c is a location coloring using five colors in $C_3 \odot P_n$ $12 \leq n \leq 20$. Note that $d(b_j^i, v) = d(b_k^i, v)$, with $j \neq k$, and $v \notin \{b_j^i, b_k^i\}$. Consequently, $c(b_j^i) = c(b_k^i)$ for $j \neq k$. Consider the following table:

Table 12. Color Code at each Point in $V(C_3 \odot P_{12})$ with 5 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$
$(a_1) = (0,1,1,1,1)$	$(a_2) = (1,0,1,1,1)$	$(a_3) = (1,1,0,1,1)$	$(b_3^1) = (1,2,1,0,2)$	$(b_5^1) = (1, 1, 1,2,0)$
$(b_1^2) = (0,1,1,2,2)$	$(b_1^1) = (1,0,1,2,2)$	$(b_2^1) = (1,1,0,1,2)$	$(b_7^1) = (1,1,2,0,2)$	$(b_{10}^1) = (1,2,1,1,0)$
$(b_3^2) = (0,1,1,1,2)$	$(b_6^1) = (1,0,2,1,1)$	$(b_4^1) = (1,2,0,1,1)$	$(b_{11}^1) = (1,1,2,0,1)$	$(b_6^2) = (2,1,1,2,0)$
$(b_{11}^2) = (0,1,2,2,1)$	$(b_8^1) = (1,0,1,1,2)$	$(b_9^1) = (1,1,0,2,1)$	$(b_4^2) = (1,1,1,0,2)$	$(b_8^2) = (2,1,1,1,0)$
$(b_1^3) = (0,2,1,2,1)$	$(b_{12}^1) = (1,0,2,1,2)$	$(b_2^2) = (1,1,0,2,2)$	$(b_9^2) = (2,1,2,0,1)$	$(b_{10}^2) = (1,1,2,1,0)$
$(b_3^3) = (0,2,1,1,1)$	$(b_6^3) = (2,0,1,1,1)$	$(b_5^2) = (2,1,0,1,1)$	$(b_4^3) = (1,2,1,0,1)$	$(b_{12}^2) = (1,1,2,2,0)$
	$(b_8^3) = (2,0,1,1,2)$	$(b_7^2) = (2,1,0,2,1)$	$(b_7^3) = (2,1,1,0,2)$	$(b_2^3) = (1,2,1,2,0)$
			$(b_9^3) = (2,1,1,0,1)$	$(b_5^3) = (2,1,1,1,0)$
			$(b_{11}^3) = (2,2,1,0,1)$	$(b_{10}^3) = (2,2,1,1,0)$
				$(b_{12}^3) = (2,2,1,1,0)$

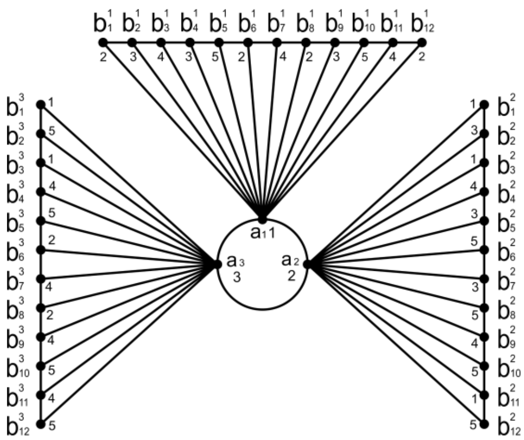

Figure 12. Location Coloring of $C_3 \odot P_{12}$ with 5 Colors.

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Table 13. Color Code of each Point in $V(C_3 \odot P_{12})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_1^1) = (1,2,1,0,2,3)$	$(b_3^1) = (1,1,2,2,0,2)$	$(b_{12}^2) = (2,1,2,2,1,0)$
$(b_2^2) = (0,1,2,1,1,2)$	$(b_4^1) = (1,0,1,2,1,3)$	$(b_2^1) = (1,2,0,1,1,3)$	$(b_6^1) = (1,1,1,0,2,3)$	$(b_{11}^1) = (2,1,2,1,0,2)$	$(b_9^3) = (1,1,1,2,2,0)$
$(b_1^3) = (0,2,1,1,2,2)$	$(b_7^1) = (1,0,2,1,2,3)$	$(b_5^1) = (1,1,0,1,2,3)$	$(b_8^1) = (1,1,2,0,2,3)$	$(b_1^2) = (2,1,1,2,0,2)$	$(b_{11}^3) = (1,2,1,2,1,0)$
$(b_4^3) = (0,1,1,2,1,2)$	$(b_9^1) = (1,0,1,1,2,3)$	$(b_{10}^1) = (1,1,0,2,1,3)$	$(b_3^2) = (1,1,2,0,1,2)$	$(b_4^2) = (2,1,1,1,0,2)$	
$(b_7^3) = (0,1,1,2,2,2)$	$(b_3^3) = (1,0,1,1,2,2)$	$(b_{12}^1) = (1,2,0,2,1,3)$	$(b_5^2) = (2,1,1,0,1,2)$	$(b_7^2) = (2,1,2,1,0,1)$	
$(b_{10}^3) = (0,2,1,2,2,1)$	$(b_6^3) = (1,0,1,2,1,2)$	$(b_6^2) = (2,1,0,1,1,2)$	$(b_{10}^2) = (2,1,2,0,1,2)$	$(b_9^2) = (1,1,1,2,0,2)$	
	$(b_8^3) = (1,0,1,2,2,1)$	$(b_8^2) = (2,1,0,2,1,2)$	$(b_2^3) = (1,1,1,0,2,2)$	$(b_{11}^2) = (2,2,1,2,0,1)$	
				$(b_5^3) = (1,1,1,2,0,3)$	
				$(b_{12}^3) = (1,2,1,2,0,3)$	

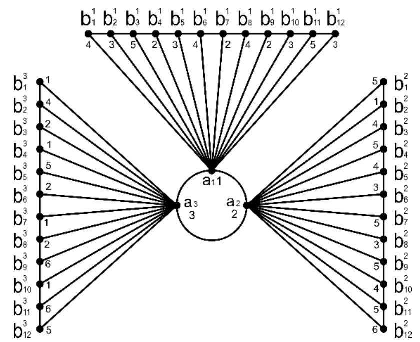

Figure 13. Location Coloring of $C_3 \odot P_{12}$ with 6 Colors.

Table 14. Color Code of each Point in $V(C_3 \odot P_{13})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_2^1) = (1,2,1,0,2,3)$	$(b_4^1) = (1,1,1,2,0,3)$	$(b_{12}^2) = (2,1,2,2,1,0)$
$(b_2^2) = (0,1,2,1,1,2)$	$(b_5^1) = (1,0,1,2,1,3)$	$(b_3^1) = (1,2,0,1,1,3)$	$(b_7^1) = (1,1,1,0,2,3)$	$(b_{12}^1) = (1,2,1,2,0,3)$	$(b_9^3) = (1,1,1,2,2,0)$
$(b_1^3) = (0,2,1,1,2,2)$	$(b_8^1) = (1,0,2,1,2,3)$	$(b_6^1) = (1,1,0,1,2,3)$	$(b_9^1) = (1,1,2,0,2,3)$	$(b_1^2) = (1,1,2,2,0,2)$	$(b_{11}^3) = (1,2,1,2,1,0)$
$(b_4^3) = (0,1,1,2,1,2)$	$(b_{10}^1) = (1,0,1,1,2,3)$	$(b_{11}^1) = (1,1,0,2,1,3)$	$(b_3^2) = (1,1,2,0,1,2)$	$(b_4^2) = (2,1,2,1,0,2)$	$(b_{12}^3) = (2,2,1,2,1,0)$
$(b_7^3) = (0,1,1,2,2,2)$	$(b_3^3) = (1,0,1,1,2,2)$	$(b_{13}^1) = (1,2,0,2,1,3)$	$(b_5^2) = (2,1,1,0,1,2)$	$(b_7^2) = (2,1,1,2,0,2)$	
$(b_{10}^3) = (0,2,1,2,2,1)$	$(b_6^3) = (1,0,1,2,1,2)$	$(b_6^2) = (2,1,0,1,1,2)$	$(b_{10}^2) = (2,1,2,0,1,2)$	$(b_9^2) = (2,1,1,1,0,2)$	
	$(b_8^3) = (1,0,1,2,2,1)$	$(b_8^2) = (2,1,0,2,1,2)$	$(b_2^3) = (1,1,1,0,2,2)$	$(b_{11}^2) = (2,1,2,1,0,1)$	
				$(b_{13}^2) = (2,1,2,2,0,1)$	
				$(b_5^3) = (1,1,1,2,0,2)$	
				$(b_{12}^3) = (2,2,1,2,0,1)$	

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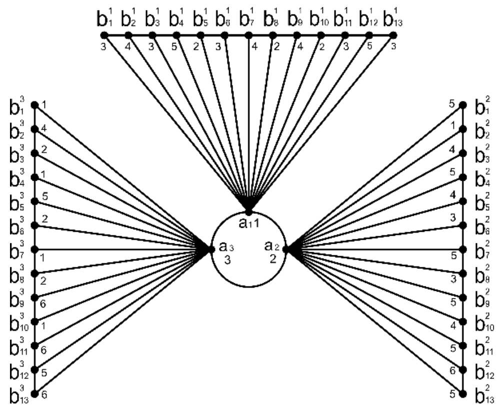

Figure 14. Location Coloring $C_3 \odot P_{13}$ with 6 Colors.

Table 15. Color Code at each Point in $V(C_3 \odot P_{14})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_1^1) = (1,2,1,0,2,3)$	$(b_3^1) = (1,1,1,2,0,3)$	$(b_{13}^2) = (2,1,2,2,1,0)$
$(b_1^2) = (0,1,2,2,1,2)$	$(b_4^1) = (1,0,1,2,1,3)$	$(b_2^1) = (1,2,0,1,1,3)$	$(b_6^1) = (1,1,1,0,2,3)$	$(b_{11}^1) = (1,2,1,2,0,3)$	$(b_{10}^3) = (1,1,1,2,2,0)$
$(b_3^2) = (0,1,2,1,1,2)$	$(b_7^1) = (1,0,2,1,2,3)$	$(b_5^1) = (1,1,0,1,2,3)$	$(b_8^1) = (1,1,2,0,2,3)$	$(b_{13}^1) = (1,2,1,1,0,3)$	$(b_{12}^3) = (1,2,1,2,1,0)$
$(b_2^3) = (0,1,1,1,2,2)$	$(b_9^1) = (1,0,1,1,2,3)$	$(b_{10}^1) = (1,1,0,2,1,3)$	$(b_{14}^1) = (1,2,2,0,1,3)$	$(b_2^2) = (1,1,2,2,0,2)$	$(b_{14}^3) = (2,2,1,2,1,0)$
$(b_5^3) = (0,1,1,2,1,2)$	$(b_1^3) = (1,0,1,2,2,2)$	$(b_{12}^1) = (1,2,0,2,1,3)$	$(b_4^2) = (1,1,2,0,1,2)$	$(b_5^2) = (2,1,2,1,0,2)$	
$(b_8^3) = (0,1,1,2,2,2)$	$(b_4^3) = (1,0,1,1,2,2)$	$(b_7^2) = (2,1,0,1,1,2)$	$(b_6^2) = (2,1,1,0,1,2)$	$(b_8^2) = (2,1,1,2,0,2)$	
$(b_{11}^3) = (0,2,1,2,2,1)$	$(b_7^3) = (1,0,1,2,1,2)$	$(b_9^2) = (2,1,0,2,1,2)$	$(b_{11}^2) = (2,1,2,0,1,2)$	$(b_{10}^2) = (2,1,1,1,0,2)$	
	$(b_9^3) = (1,0,1,2,2,1)$		$(b_3^3) = (1,1,1,0,2,2)$	$(b_{12}^2) = (2,1,2,1,0,1)$	
				$(b_{14}^2) = (2,1,2,2,0,1)$	
				$(b_6^3) = (1,1,1,2,0,2)$	
				$(b_{13}^3) = (2,2,1,2,0,1)$	

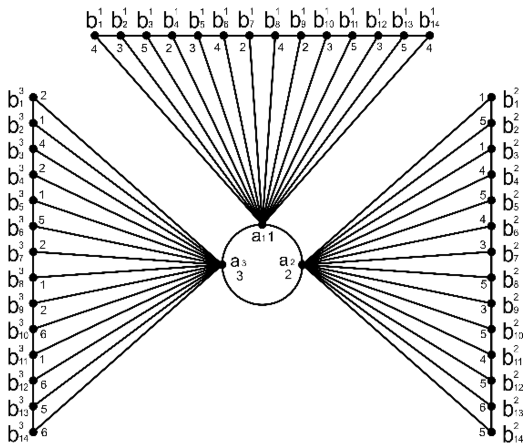

Figure 15. Location Coloring $C_3 \odot P_{14}$ with 6 Colors.

Table 16. Color Code at each Point in $V(C_3 \odot P_{15})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_1^1) = (1,2,1,0,2,3)$	$(b_3^1) = (1,1,1,2,0,3)$	$(b_{12}^2) = (2,1,2,2,1,0)$
$(b_2^2) = (0,1,2,1,1,2)$	$(b_4^1) = (1,0,1,2,1,3)$	$(b_2^1) = (1,2,0,1,1,3)$	$(b_6^1) = (1,1,1,0,2,3)$	$(b_{11}^1) = (1,2,1,2,0,3)$	$(b_{14}^2) = (1,1,2,2,1,0)$
$(b_{15}^2) = (0,1,2,2,2,1)$	$(b_7^1) = (1,0,2,1,2,3)$	$(b_5^1) = (1,1,0,1,2,3)$	$(b_8^1) = (1,1,2,0,2,3)$	$(b_{13}^1) = (1,2,1,1,0,3)$	$(b_9^3) = (1,1,1,2,2,0)$
$(b_1^3) = (0,2,1,1,2,2)$	$(b_9^1) = (1,0,1,1,2,3)$	$(b_{10}^1) = (1,1,0,2,1,3)$	$(b_{14}^1) = (1,2,2,0,1,3)$	$(b_{15}^1) = (1,2,2,1,0,3)$	$(b_{11}^3) = (1,2,1,2,1,0)$
$(b_4^3) = (0,1,1,2,1,2)$	$(b_3^3) = (1,0,1,1,2,2)$	$(b_{12}^1) = (1,2,0,2,1,3)$	$(b_3^2) = (1,1,2,0,1,2)$	$(b_1^2) = (1,1,2,2,0,2)$	$(b_{13}^3) = (2,2,1,2,1,0)$
$(b_7^3) = (0,1,1,2,2,2)$	$(b_6^3) = (1,0,1,2,1,2)$	$(b_6^2) = (2,1,0,1,1,2)$	$(b_5^2) = (2,1,1,0,1,2)$	$(b_4^2) = (2,1,2,1,0,2)$	
$(b_{10}^3) = (0,2,1,2,2,1)$	$(b_8^3) = (1,0,1,2,2,1)$	$(b_8^2) = (2,1,0,2,1,2)$	$(b_{10}^2) = (2,1,2,0,1,2)$	$(b_7^2) = (2,1,1,2,0,2)$	
	$(b_{15}^3) = (2,0,1,2,1,2)$		$(b_2^3) = (1,1,1,0,2,2)$	$(b_9^2) = (2,1,1,1,0,2)$	
				$(b_{11}^2) = (2,1,2,1,0,1)$	
				$(b_{13}^2) = (2,1,2,2,0,1)$	
				$(b_5^3) = (1,1,1,2,0,2)$	
				$(b_{12}^3) = (2,2,1,2,0,1)$	
				$(b_{14}^3) = (2,1,1,2,0,1)$	

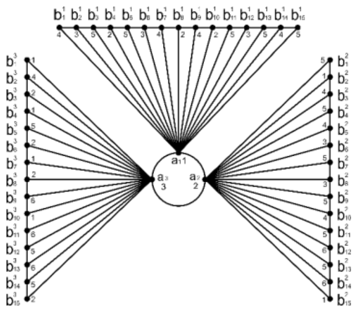

Figure 16. Location Coloring $C_3 \odot P_{15}$ with 6 Colors.

Table 17. Color Code at each Point in $V(C_3 \odot P_{16})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_1^1) = (1,2,1,0,2,3)$	$(b_3^1) = (1,1,1,2,0,3)$	$(b_{12}^2) = (2,1,2,2,1,0)$
$(b_2^2) = (0,1,2,1,1,2)$	$(b_4^1) = (1,0,1,2,1,3)$	$(b_2^1) = (1,2,0,1,1,3)$	$(b_6^1) = (1,1,1,0,2,3)$	$(b_{11}^1) = (1,2,1,2,0,3)$	$(b_{14}^2) = (1,1,2,2,1,0)$
$(b_{15}^2) = (0,1,1,2,2,1)$	$(b_7^1) = (1,0,2,1,2,3)$	$(b_5^1) = (1,1,0,1,2,3)$	$(b_8^1) = (1,1,2,0,2,3)$	$(b_{13}^1) = (1,2,1,1,0,3)$	$(b_9^3) = (1,1,1,2,2,0)$
$(b_1^3) = (0,2,1,1,2,2)$	$(b_9^1) = (1,0,1,1,2,3)$	$(b_{10}^1) = (1,1,0,2,1,3)$	$(b_{14}^1) = (1,2,2,0,1,3)$	$(b_{15}^1) = (1,1,2,1,0,3)$	$(b_{11}^3) = (1,2,1,2,1,0)$
$(b_4^3) = (0,1,1,2,1,2)$	$(b_{16}^1) = (1,0,2,2,1,3)$	$(b_{12}^1) = (1,2,0,2,1,3)$	$(b_3^2) = (1,1,2,0,1,2)$	$(b_1^2) = (1,1,2,2,0,2)$	$(b_{13}^3) = (2,2,1,2,1,0)$
$(b_7^3) = (0,1,1,2,2,2)$	$(b_3^3) = (1,0,1,1,2,2)$	$(b_6^2) = (2,1,0,1,1,2)$	$(b_5^2) = (2,1,1,0,1,2)$	$(b_4^2) = (2,1,2,1,0,2)$	
$(b_{10}^3) = (0,2,1,2,2,1)$	$(b_6^3) = (1,0,1,2,1,2)$	$(b_8^2) = (2,1,0,2,1,2)$	$(b_{10}^2) = (2,1,2,0,1,2)$	$(b_7^2) = (2,1,1,2,0,2)$	
	$(b_8^3) = (1,0,1,2,2,1)$	$(b_{16}^2) = (1,1,0,2,2,2)$	$(b_2^3) = (1,1,1,0,2,2)$	$(b_9^2) = (2,1,1,1,0,2)$	
	$(b_{15}^3) = (2,0,1,1,1,2)$		$(b_{16}^3) = (2,1,1,0,2,2)$	$(b_{11}^2) = (2,1,2,1,0,1)$	
				$(b_{13}^2) = (2,1,2,2,0,1)$	
				$(b_5^3) = (1,1,1,2,0,2)$	
				$(b_{12}^3) = (2,2,1,2,0,1)$	
				$(b_{14}^3) = (2,1,1,2,0,1)$	

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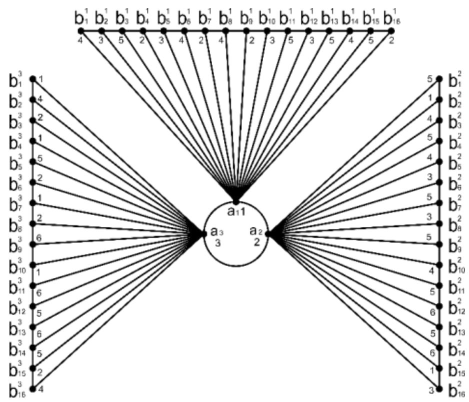

Figure 17. Location Coloring of $C_3 \odot P_{16}$ with 6 Colors.

Table 18. Color Code of each Point in $V(C_3 \odot P_{17})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_1^1) = (1,2,1,0,2,3)$	$(b_3^1) = (1,1,1,2,0,3)$	$(b_{12}^2) = (2,1,2,2,1,0)$
$(b_2^2) = (0,1,2,1,1,2)$	$(b_4^1) = (1,0,1,2,1,3)$	$(b_2^1) = (1,2,0,1,1,3)$	$(b_6^1) = (1,1,1,0,2,3)$	$(b_{11}^1) = (1,2,1,2,0,3)$	$(b_{14}^2) = (1,1,2,2,1,0)$
$(b_{15}^2) = (0,1,1,2,2,1)$	$(b_7^1) = (1,0,2,1,2,3)$	$(b_5^1) = (1,1,0,1,2,3)$	$(b_8^1) = (1,1,2,0,2,3)$	$(b_{13}^1) = (1,2,1,1,0,3)$	$(b_{17}^2) = (2,1,1,2,2,0)$
$(b_1^3) = (0,2,1,1,2,2)$	$(b_9^1) = (1,0,1,1,2,3)$	$(b_{10}^1) = (1,1,0,2,1,3)$	$(b_{14}^1) = (1,2,2,0,1,3)$	$(b_{15}^1) = (1,1,2,1,0,3)$	$(b_9^3) = (1,1,1,2,2,0)$
$(b_4^3) = (0,1,1,2,1,2)$	$(b_{16}^1) = (1,0,2,2,1,3)$	$(b_{12}^1) = (1,2,0,2,1,3)$	$(b_3^2) = (1,1,2,0,1,2)$	$(b_{17}^1) = (1,1,2,2,0,3)$	$(b_{11}^3) = (1,2,1,2,1,0)$
$(b_7^3) = (0,1,1,2,2,2)$	$(b_3^3) = (1,0,1,1,2,2)$	$(b_6^2) = (2,1,0,1,1,2)$	$(b_5^2) = (2,1,1,0,1,2)$	$(b_1^2) = (1,1,2,2,0,2)$	$(b_{13}^3) = (2,2,1,2,1,0)$
$(b_{10}^3) = (0,2,1,2,2,1)$	$(b_6^3) = (1,0,1,2,1,2)$	$(b_8^2) = (2,1,0,2,1,2)$	$(b_{10}^2) = (2,1,2,0,1,2)$	$(b_4^2) = (2,1,2,1,0,2)$	$(b_{17}^3) = (2,2,1,1,2,0)$
	$(b_8^3) = (1,0,1,2,2,1)$	$(b_{16}^2) = (1,1,0,2,2,1)$	$(b_2^3) = (1,1,1,0,2,2)$	$(b_7^2) = (2,1,1,2,0,2)$	
	$(b_{15}^3) = (2,0,1,1,1,2)$		$(b_{16}^3) = (2,1,1,0,2,1)$	$(b_9^2) = (2,1,1,1,0,2)$	
				$(b_{11}^2) = (2,1,2,1,0,1)$	
				$(b_{13}^2) = (2,1,2,2,0,1)$	
				$(b_5^3) = (1,1,1,2,0,2)$	
				$(b_{12}^3) = (2,2,1,2,0,1)$	
				$(b_{14}^3) = (2,1,1,2,0,1)$	

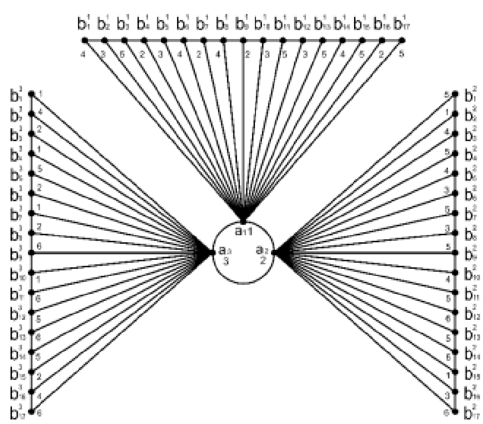

Figure 18. Location Coloring of $C_3 \odot P_{17}$ with 6 Colors.

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Table 19. Color Code of each Point in $V(C_3 \odot P_{18})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_2^1) = (1,2,1,0,2,3)$	$(b_4^1) = (1,1,1,2,0,3)$	$(b_{12}^2) = (2,1,2,2,1,0)$
$(b_2^2) = (0,1,2,1,1,2)$	$(b_5^1) = (1,0,1,2,1,3)$	$(b_1^1) = (1,2,0,1,2,3)$	$(b_7^1) = (1,1,1,0,2,3)$	$(b_{12}^1) = (1,2,1,2,0,3)$	$(b_{14}^2) = (1,1,2,2,1,0)$
$(b_{15}^2) = (0,1,1,2,2,1)$	$(b_8^1) = (1,0,2,1,2,3)$	$(b_3^1) = (1,2,0,1,1,3)$	$(b_9^1) = (1,1,2,0,2,3)$	$(b_{14}^1) = (1,2,1,1,0,3)$	$(b_{17}^2) = (2,1,1,2,2,0)$
$(b_1^3) = (0,2,1,1,2,2)$	$(b_{10}^1) = (1,0,1,1,2,3)$	$(b_6^1) = (1,1,0,1,2,3)$	$(b_{15}^1) = (1,2,2,0,1,3)$	$(b_{16}^1) = (1,1,2,1,0,3)$	$(b_9^3) = (1,1,1,2,2,0)$
$(b_4^3) = (0,1,1,2,1,2)$	$(b_{17}^1) = (1,0,2,2,1,3)$	$(b_{11}^1) = (1,1,0,2,1,3)$	$(b_3^2) = (1,1,2,0,1,2)$	$(b_{18}^1) = (1,1,2,2,0,3)$	$(b_{11}^3) = (1,2,1,2,1,0)$
$(b_7^3) = (0,1,1,2,2,2)$	$(b_3^3) = (1,0,1,1,2,2)$	$(b_{13}^1) = (1,2,0,2,1,3)$	$(b_5^2) = (2,1,1,0,1,2)$	$(b_1^2) = (1,1,2,2,0,2)$	$(b_{13}^3) = (2,2,1,2,1,0)$
$(b_{10}^3) = (0,2,1,2,2,1)$	$(b_6^3) = (1,0,1,2,1,2)$	$(b_6^2) = (2,1,0,1,1,2)$	$(b_{10}^2) = (2,1,2,0,1,2)$	$(b_4^2) = (2,1,2,1,0,2)$	$(b_{17}^3) = (2,2,1,1,2,0)$
	$(b_8^3) = (1,0,1,2,2,1)$	$(b_8^2) = (2,1,0,2,1,2)$	$(b_2^3) = (1,1,1,0,2,2)$	$(b_7^2) = (2,1,1,2,0,2)$	
	$(b_{15}^3) = (2,0,1,1,1,2)$	$(b_{16}^2) = (1,1,0,2,2,1)$	$(b_{16}^3) = (2,1,1,0,2,1)$	$(b_9^2) = (2,1,1,1,0,2)$	
		$(b_{18}^2) = (2,1,0,2,2,1)$	$(b_{18}^3) = (2,2,1,0,2,1)$	$(b_{11}^2) = (2,1,2,1,0,1)$	
				$(b_{13}^2) = (2,1,2,2,0,1)$	
				$(b_5^3) = (1,1,1,2,0,2)$	
				$(b_{12}^3) = (2,2,1,2,0,1)$	
				$(b_{14}^3) = (2,1,1,2,0,1)$	

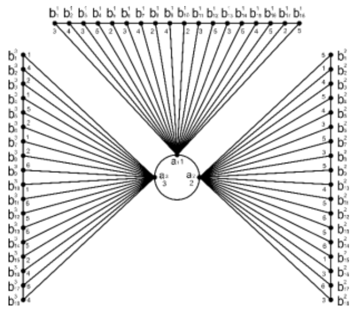

Figure 19. Location Coloring of $C_3 \odot P_{18}$ with 6 Colors.

Table 20. Color Code of each Point in $V(C_3 \odot P_{19})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,2)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_2^1) = (1,2,1,0,2,3)$	$(b_4^1) = (1,1,1,2,0,3)$	$(b_{12}^2) = (2,1,2,2,1,0)$
$(b_2^2) = (0,1,2,1,1,2)$	$(b_5^1) = (1,0,1,2,1,3)$	$(b_1^1) = (1,2,0,1,2,3)$	$(b_7^1) = (1,1,1,0,2,3)$	$(b_{12}^1) = (1,2,1,2,0,3)$	$(b_{14}^2) = (1,1,2,2,1,0)$
$(b_{15}^2) = (0,1,1,2,2,1)$	$(b_8^1) = (1,0,2,1,2,3)$	$(b_3^1) = (1,2,0,1,1,3)$	$(b_9^1) = (1,1,2,0,2,3)$	$(b_{14}^1) = (1,2,1,1,0,3)$	$(b_{17}^2) = (2,1,1,2,2,0)$
$(b_1^3) = (0,2,1,1,2,2)$	$(b_{10}^1) = (1,0,1,1,2,3)$	$(b_6^1) = (1,1,0,1,2,3)$	$(b_{15}^1) = (1,2,2,0,1,3)$	$(b_{16}^1) = (1,1,2,1,0,3)$	$(b_9^3) = (1,1,1,2,2,0)$
$(b_4^3) = (0,1,1,2,1,2)$	$(b_{17}^1) = (1,0,2,1,1,3)$	$(b_{11}^1) = (1,1,0,2,1,3)$	$(b_{18}^1) = (1,1,2,0,1,3)$	$(b_{19}^1) = (1,2,2,1,0,3)$	$(b_{11}^3) = (1,2,1,2,1,0)$
$(b_7^3) = (0,1,1,2,2,2)$	$(b_3^3) = (1,0,1,1,2,2)$	$(b_{13}^1) = (1,2,0,2,1,3)$	$(b_3^2) = (1,1,2,0,1,2)$	$(b_1^2) = (1,1,2,2,0,2)$	$(b_{13}^3) = (2,2,1,2,1,0)$
$(b_{10}^3) = (0,2,1,2,2,1)$	$(b_6^3) = (1,0,1,2,1,2)$	$(b_6^2) = (2,1,0,1,1,2)$	$(b_5^2) = (2,1,1,0,1,2)$	$(b_4^2) = (2,1,2,1,0,2)$	$(b_{17}^3) = (2,2,1,1,2,0)$
	$(b_8^3) = (1,0,1,2,2,1)$	$(b_8^2) = (2,1,0,2,1,2)$	$(b_{10}^2) = (2,1,2,0,1,2)$	$(b_7^2) = (2,1,1,2,0,2)$	
	$(b_{15}^3) = (2,0,1,1,1,2)$	$(b_{16}^2) = (1,1,0,2,2,1)$	$(b_{19}^2) = (2,1,1,0,2,2)$	$(b_9^2) = (2,1,1,1,0,2)$	
		$(b_{18}^2) = (2,1,0,1,2,1)$	$(b_2^3) = (1,1,1,0,2,2)$	$(b_{11}^2) = (2,1,2,1,0,1)$	
			$(b_{16}^3) = (2,1,1,0,2,1)$	$(b_{13}^2) = (2,1,2,2,0,1)$	
			$(b_{18}^3) = (2,2,1,0,1,1)$	$(b_5^3) = (1,1,1,2,0,2)$	
				$(b_{12}^3) = (2,2,1,2,0,1)$	
				$(b_{14}^3) = (2,1,1,2,0,1)$	
				$(b_{19}^3) = (2,2,1,1,0,2)$	

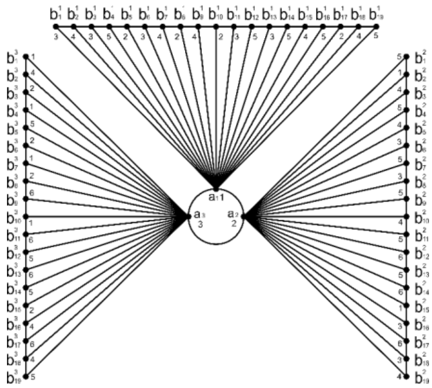

Figure 20. Location Coloring of $C_3 \odot P_{19}$ with 6 Colors.

Table 21. Color Code of each Point in $V(C_3 \odot P_{20})$ with 6 Colors

$\{c_\Pi(c_1)\}$	$\{c_\Pi(c_2)\}$	$\{c_\Pi(c_3)\}$	$\{c_\Pi(c_4)\}$	$\{c_\Pi(c_5)\}$	$\{c_\Pi(c_6)\}$
$(a_1) = (0,1,1,1,1,1)$	$(a_2) = (1,0,1,1,1,1)$	$(a_3) = (1,1,0,1,1,1)$	$(b_2^1) = (1,2,1,0,2,2)$	$(b_4^1) = (1,1,1,2,0,2)$	$(b_{20}^1) = (1,2,2,2,1,0)$
$(b_2^2) = (0,1,2,2,1,1)$	$(b_5^1) = (1,0,1,2,1,2)$	$(b_1^1) = (1,2,0,1,2,2)$	$(b_7^1) = (1,1,1,0,2,2)$	$(b_{12}^1) = (1,2,1,2,0,2)$	$(b_3^2) = (1,1,2,1,2,0)$
$(b_{16}^2) = (0,1,1,2,2,1)$	$(b_8^1) = (1,0,2,1,2,2)$	$(b_3^1) = (1,2,0,1,1,2)$	$(b_9^1) = (1,1,2,0,2,2)$	$(b_{14}^1) = (1,2,1,1,0,2)$	$(b_{13}^2) = (2,1,2,2,1,0)$
$(b_4^3) = (0,1,1,1,2,2)$	$(b_{10}^1) = (1,0,1,1,2,2)$	$(b_6^1) = (1,1,0,1,2,2)$	$(b_{15}^1) = (1,2,2,0,1,2)$	$(b_{16}^1) = (1,1,2,1,0,2)$	$(b_{15}^2) = (1,1,2,2,1,0)$
$(b_{12}^3) = (0,2,1,2,1,1)$	$(b_{17}^1) = (1,0,2,1,1,2)$	$(b_{11}^1) = (1,1,0,2,1,2)$	$(b_{18}^1) = (1,1,2,0,1,2)$	$(b_{19}^1) = (1,2,2,1,0,1)$	$(b_{18}^2) = (2,1,1,2,2,0)$
$(b_{15}^3) = (0,2,1,1,2,1)$	$(b_3^3) = (1,0,1,2,2,1)$	$(b_{13}^1) = (1,2,0,2,1,2)$	$(b_4^2) = (2,1,2,0,1,1)$	$(b_1^2) = (1,1,2,2,0,2)$	$(b_2^3) = (2,1,1,1,2,0)$
	$(b_9^3) = (2,0,1,1,2,1)$	$(b_7^2) = (2,1,0,1,1,2)$	$(b_6^2) = (2,1,1,0,1,2)$	$(b_5^2) = (2,1,2,1,0,2)$	$(b_6^3) = (2,2,1,1,1,0)$
	$(b_{20}^3) = (2,0,1,2,1,2)$	$(b_9^2) = (2,1,0,2,1,2)$	$(b_{11}^2) = (2,1,2,0,1,2)$	$(b_8^2) = (2,1,1,2,0,2)$	$(b_8^3) = (2,1,1,2,1,0)$
		$(b_{17}^2) = (1,1,0,2,2,1)$	$(b_{20}^2) = (2,1,1,0,2,2)$	$(b_{10}^2) = (2,1,1,1,0,2)$	$(b_{11}^3) = (1,2,1,1,2,0)$
		$(b_{19}^2) = (2,1,0,1,2,1)$	$(b_1^3) = (2,2,1,0,2,1)$	$(b_{12}^2) = (2,1,2,1,0,1)$	$(b_{14}^3) = (1,2,1,2,1,0)$
			$(b_5^3) = (1,2,1,0,2,1)$	$(b_{14}^2) = (2,1,2,2,0,1)$	$(b_{18}^3) = (2,2,1,2,1,0)$
			$(b_{10}^3) = (2,1,1,0,2,1)$	$(b_7^3) = (2,2,1,2,0,1)$	
			$(b_{16}^3) = (1,2,1,0,1,2)$	$(b_{13}^3) = (1,2,1,2,0,1)$	
				$(b_{17}^3) = (2,2,1,1,0,1)$	
				$(b_{19}^3) = (2,1,1,2,0,1)$	

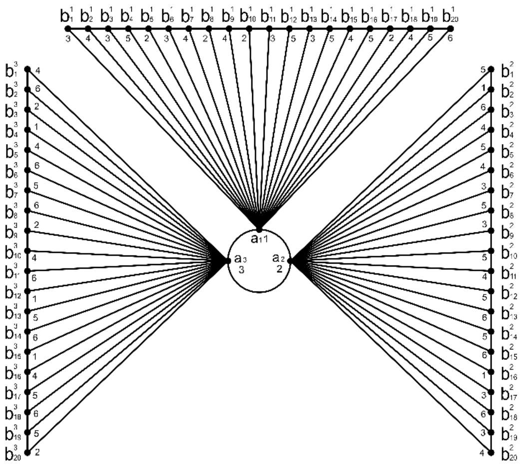

Figure 21. Location Coloring of $C_3 \odot P_{20}$ with 6 Colors.

CONCLUSSION AND SUGGESTIONS

Based on the research that has been conducted, it was concluded that the location chromatic number of $C_3 \odot P_n$ is 5 for $3 \leq n \leq 11$ and 6 for $12 \leq n \leq 20$.

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