Task1 clauses:

Following steps that I followed while making the assignment 3:

1> First I assign some numeric code to all 8 colors (Red, Green, Blue, Yellow, Orange, Purple, Violet, Silver)

| Colors | Red | Green | Blue | Yellow | Orange | Purple | Violet | Silver |
|--------|-----|--|------|--------|--------|--------|--------|--------|
| Code | | The second secon | | | | | | |

2. I gave some numeric code for different position hold by different colors.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----|----|----|----|----------------|-----------|----------------|-----|
| R1 | R2 | R3 | R4 | G11 | G12 | G 3 | G14 |
| 9 | 01 | 11 | 12 | 13 | 14 | 15 | 16 |
| B1 | B2 | B3 | B4 | y 1 | Y2 | <u> 73</u> | 74 |
| 17 | 81 | 19 | 20 | 21 | 22 | 23 | 24 |
| 01 | 02 | 03 | 04 | P1 | P2 | P3 | P4 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
| V1 | V2 | V3 | V4 | SI | <u>S2</u> | 53 | 54. |

It means that -

"2" specifies that Red is in 2nd position.

" specifies that Green is in 3rd position.

6627" specifies that Violet is in 3rd position.

3.> I add three initial clauses to SAT solver. (constraints)

Constraint 1: " No repeatation of color"

If red is in first position, then it should not present in any other position.

 $1 \rightarrow 72 \wedge 73 \wedge 74$ REDMI 9 PRIME $1 \rightarrow 72 \wedge 73 \wedge 74$

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Similarly- 2 > 71 173 174

= 72 V 71 A 73 A 74

 $= (72 \vee 71) \wedge (72 \vee 73) \wedge (72 \vee 74)$

Similarly-

 $3 \rightarrow 71 \wedge 72 \wedge 74$

= 73 V 71 A72 A74

 $= (73 \vee 71) \wedge (73 \vee 72) \wedge (73 \vee 74)$

Similarly-

4 -> 71 172 173

 $= 74 V 71 \Lambda 72 \Lambda 73.$

 $= (74 \vee 71) \wedge (74 \vee 72) \wedge (74 \vee 73)$

As same way, we can do for other colors Like Green, Blue, Yellow, Orange etc.

Constraint 2: "No two color will present at same place"

If Red is in 1st position, then no other color should. be present in that position.

 $1 \rightarrow 75 \land 79 \land 713 \land 717 \land 721 \land 725 \land 729$.

- = $71 V 75 \Lambda 79 \Lambda 713 \Lambda 717 \Lambda 721 \Lambda 725 \Lambda 729.$
- $(71V75) \wedge (71V79) \wedge (71V713) \wedge (71V717) \wedge (71V721)$ (71V725) A (71 V729)

Similarly

2 > 76 A 710 A 714 A 718 A 722 A 726 A 730.

- = 72 V 76 A 710 A 714 A 718 A 722 A 726 A 730.
- = $(72 \sqrt{16}) \wedge (72 \sqrt{10}) \wedge (72 \sqrt{14}) \wedge (72 \sqrt{18}) \wedge (72 \sqrt{122})$

REDMI 9 PRIME²⁶) A (72 V 730)

Similarly -

 $3 \rightarrow 77 \land 711 \land 715 \land 719 \land 723 \land 727 \land 731$

- = 73 V 77 A 711 A 715 A 719 A 723 A 727 A 731.
- = (73 V 77) \(\) (73 V 711) \(\) (73 V 715) \(\) (73 V 719) \(\) (73 V 723) \(\) \(\) (73 V 727) \(\) (73 V 731)

Similarly -

4 -> 78 \ \ 712 \ \ \ 716 \ \ 720 \ \ 724 \ \ \ 728 \ \ 732

- = 74 V 78 A 712 A 716 A 720 A 724 A 728 A 732
- $= (74 \vee 78) \wedge (74 \vee 712) \wedge (74 \vee 716) \wedge (74 \vee 720) \wedge (74 \vee 724)$ $\wedge (74 \vee 728) \wedge (74 \vee 732)$

As same way, we can do for other color's position.

Constraint 3: "There should be exactly one color in each.

position "

For position 1 - an month anothing to

1 V 5 V 9 V 13 V 17 V 21 V 25 V 29

For position 2-

2 V 6 V 10 V 14 V 18 V 22 V 26 V 30.

For position 3 -

3 V 7 VII V 15 V 19 V 23 V 27 V 31.

For position 4 -

4 V 8 V 12 V 16 V 20 V 24 V 28 V 32

- 4.) Random selection of 4 distinct color by Code Maker.

 OS Hidden code

 ie R B G Y
- 5.) Some random guess made by Code Breaker. ie-ABCD.
- 6.) Now code Make take the code maker guess code and compare it with its hidden code. Based on this, he return "white" and "black" pegs.

Now I make different cases based on Black.

pegs. for eg-

If Black = 0 (No color matched).

TATIBATEATD ---- we add this clouse.

STARTY OFVOR

If Black = 1. (one color matched).

A > 7BATCATD. VET) A (OTVETVAT)

- = TAVTBATCATD.
- = (TAVTB) A (TAVTC) A (TAVTD).

Similarly-

B > TANTCATD. 80 A (CIVOLVAI)

- = 7BVTAATCATD.
- = (7BV7A) \((7BV7C) \((7BV7D)).

Similarly - (UTV STVAT) A (BTV STVAT

C → JAN JBN JD.

= TCVTANTBATD.

REDMI 9 PRIMEVTA) N (TCVTB) N (TCVTD).

Similarly-

D > TANTCATB.

- = JDVJANJCNJB.
- = (TDV7A) A (TDV7C) A (TDV7B).

We add one more clause that is one of the position. is true.

AVBVCVD.

If black == 2 (Two color matched).

We make following clauses -

(ANB) > 7CATD. (means two color are correct while other two are incorrect).

- = TAVIBV TCATD.
- = (TAVTBVTC) A (TAVTBVTD),

Similarty -

(BNC) → TANTD.

- = TBV7CV7AN7D.
- = (7AV7BV7C) A (7AV7C V 7D)

Similarly-

(CND) - TANTB.

- = TCV7D V7A N7B.
- = (TAVICVID) A (TBVICV ID)

Similarly -

(AAC) → TBATD.

= (7AV7CV7B) A (7AV7CV7D)

Similarly -

(AND) → TCN7B.

REDMI 9 PRIMAVIDVIC) A (TAVIDVIB)

Similarly -(BAD) - TAATC. = (TBVTDVTA) A (TBVTDVTC), We add one more clause that is two of the position. (ANB) V (ANC) V (AND) V (BNC) V (BND) V (CND) is true. convert it into CNF-(AVBVD) A (AVBVC) A (AVGVD) A (BVCVD). If Black = 3. (Three colors matched). we make following clauses .-(ANBNC) → TD. (A,B,C are correct implies D is not correct) = TAVTBVTCVTD. and prolegions - 11982 .. Similarly-(BACAD) - TA. IA - ZUDOR 20 = TAVTBVTCVTD We add one more clause that is three of the. position ès true. (AMBAC) V (BACAD) V (AMBAD) V (AMCAD). Convert it into CNF-(AVB) A (AVC) A (AVD) A (BVC) A (BVD) A (CVD) If black = = 4 then exit from loop. else.

REDMI 9 PRIMED step 5 and repeat

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Task 2 clauses:

In Task 2, I bollow these steps -

- I remove constraint 1: "No repeatation of color".

 I add only two constraints as my initial clause
 cons 1: "No two color will be in same position"

 Cons 2: "Exactly one color will be present in each

 position"
- (2). I modified the code for the Codemaker so that it can.

 generate repeated combination of color.

 Like-

RGRY YYGY OOOR. OPPG.

I just make two changes in Task 1 to acheive. the Task 2: