1 Linear Algebra

Just like the example given in the assignment we will multiple each row of matrix 1 with each column of matrix 2.

$$\begin{pmatrix} 3 & 4 & 1 \\ 2 & -1 & 2 \\ 0 & -2 & 5 \end{pmatrix} \cdot \begin{pmatrix} 2 & 2 & 4 \\ -3 & 1 & 6 \\ 1 & 3 & 5 \end{pmatrix} =$$

$$\begin{pmatrix} 3 \cdot 2 + 4 \cdot -3 + 1 \cdot 1 & 3 \cdot 2 + 4 \cdot 1 + 1 \cdot 3 & 3 \cdot 4 + 4 \cdot 6 + 1 \cdot 5 \\ 2 \cdot 2 + -1 \cdot -3 + 2 \cdot 1 & 2 \cdot 2 + -1 \cdot 1 + 2 \cdot 3 & 2 \cdot 4 + -1 \cdot 6 + 2 \cdot 5 \\ 0 \cdot 2 + -2 \cdot -3 + 5 \cdot 1 & 0 \cdot 2 + -2 \cdot 1 + 5 \cdot 3 & 0 \cdot 4 + -2 \cdot 6 + 5 \cdot 5 \end{pmatrix} =$$

$$\begin{pmatrix} -5 & 13 & 41 \\ 9 & 9 & 12 \\ 11 & 13 & 13 \end{pmatrix}$$

2 Assert and prove

The gold can be found in suitcase 1 and the true expression in suitcase 4.

- If the gold is in suitcase 2, then expression 1, 2, and 4 are true.
- If the gold is in suitcase 3, both expression 3 and 4 are true.
- If the gold is in suitcase 4, no expression is true.
- So finally if the gold is in suitcase 1, only expression 4 is true making this the solution.

3 Programming

```
public class PC {

  public static void main(String[] args) {
    int x = 7;
    int y = 0;

    if(x < 3){
      y = 2*4-x;
    } else {
      y = 2*4+x;
    }

    System.out.println(y);
  }
```

```
}
```

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1. The number that will be printed is 15, since $y = 2 \cdot 4 + 7 = 15$.
2. If x is changed to 3, the number that will be printed is 11.
3. When x is equal to -2, y will be equal to 10 ($y = 2 \cdot 4 - (-2)$).

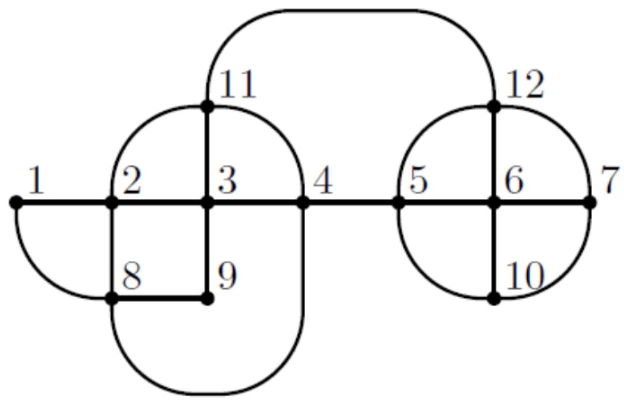
```java
public class PC2 {

  public static void main(String[] args) {
    int x = 7;
    int y = 0;

    for(int i = 0; i < x; i++){
      y += 2;
      System.out.println(y);
    }

    System.out.println("End of output");
  }

}
```

---

1. *'y'* will be printed 7 times.
2. The final output will be 'End of output'.

4 Formal reasoning

1. $(\neg R \wedge \neg S) \vee RB$ means 'It is not raining and the sun is not shining, or there is a rainbow'.
2. The propositional logic for "If it rains and I'm outside then I get wet" is $(R \wedge O) \rightarrow W$.



1. It is possible to walk a route which contains each street exactly once, an example route would be: $7 \to 12 \to 5 \to 10 \to 7 \to 6 \to 12 \to 11 \to 4 \to 8 \to 1 \to 2 \to 11 \to 3 \to 9 \to 8 \to 2 \to 3 \to 4 \to 5 \to 6 \to 10$. We can check easily if there should be a possible route by checking if there is an Eulerian path. To be able to answer this we need to decide on the degree of each bar:

bar	degree	bar	degree	bar	degree	bar	degree
1	2	4	4	7	3	10	3
2	4	5	4	8	4	11	4
3	4	6	4	9	2	12	4

Only bar 7 & 10 have an odd degree, so there does indeed exist an Eulerian path.

2. To answer this question if it is possible to walk a route which contains each street exactly once and begins and ends at bar 3 we need to find out if there exists an Eulerian circuit. An Eulerian circuit only exists when there are no vertices (bars) with an odd degree. It is thus not possible to walk a route which contains each street exactly once and begins and ends at bar 3.

3. There exist a route which contains each bar exactly once, this is also known as a Hamiltonian path, an example of a route is: $1 \to 2 \to 11 \to 12 \to 7 \to 6 \to 10 \to 5 \to 4 \to 3 \to 9 \to 8$