

1. Prove that:

$$\sum_{i=1}^n (4i - 7) = 2n^2 - 5n$$

2. Prove that:

$$\sum_{i=1}^n (i^2 + i + 1) = \frac{n^3 + 3n^2 + 5n}{3}$$

3. Prove that:

$$n^3 > 2n^2 + 1 \text{ whenever } n > 2$$

4. Multiply the following

$$(1 \ 2 \ 1 \ 3) \begin{pmatrix} 2 \\ 1 \\ 1 \\ 2 \end{pmatrix}$$

5. Multiply the following:

$$\begin{pmatrix} 2 \\ 1 \\ 1 \\ 2 \end{pmatrix} (1 \ 2 \ 1 \ 3)$$

6. Multiply the following:

$$\begin{pmatrix} 1 & 3 & 1 \\ 2 & 2 & 1 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 2 & 1 \\ 3 & 2 \end{pmatrix}$$

7. Multiply the following:

$$\begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 2 & 1 \end{pmatrix} \begin{pmatrix} 3 & 3 & 1 \\ 2 & 1 & 1 \\ 3 & 1 & 2 \end{pmatrix}$$

8. Combine the following permutations as indicated:

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 2 & 4 \end{pmatrix} \circ \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \end{pmatrix}$$

9. Combine the following:

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 2 & 1 \end{pmatrix} \oplus \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 1 & 2 & 3 \end{pmatrix}$$

10. Combine the following:

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 4 & 2 \end{pmatrix} \oplus \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 3 & 4 \end{pmatrix}$$

11. Combine the following:

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 1 & 3 & 2 \end{pmatrix} \oplus \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{pmatrix}$$

12. Convert from decimal to binary 2's complement notation. All results will be 8 bits long.

10, -12, 37, -14, -100, 97

13. Convert from decimal to binary signed magnitude notation. All results will be 8 bits long.

10, -12, 37, -14, -100, 97

14. Convert from Hexadecimal to binary

1A3F FF 401 AA55 1011

15. Convert from binary into hexadecimal.

11101011101001 1001011101110 101010011 1000000100001

16. Give addition and multiplication tables for Modulo 3 arithmetic.

17. Give addition and multiplication tables for Modulo 4 arithmetic.

18. Give addition and multiplication tables for Modulo 5 arithmetic.

19. Does the inverse law hold for Modulo 6 arithmetic? Modulo 7? Modulo 9?

20. Convert the following to prefix notation.

$$a * b + c * d$$

$$a * (b + c) * d$$

$$((a * b) + c) * d$$

21. Convert the following to suffix notation.

$$a * b + c * d$$

$$a * (b + c) * d$$

$$((a * b) + c) * d$$