Note Card:

Base 10 to Base 16

Convert $(44, 281)_{10}$ to Base 16

$\frac{44281}{16} = 2767$

Remainder:

$(2767 \cdot 16) = 44272$

$44281 - 44272 = 9$

$\frac{2767}{16} = 172$

Remainder:

$(172 \cdot 16) = 2752$

$44281 - 44272 = 15 = F$

$\frac{172}{16} = 10$

Remainder:

$(10 \cdot 16) = 160$

$172 - 160 = 12 = C$

$\frac{10}{16} = 1$

Remainder:

$(0 \cdot 16) = 0$

$10 - 0 = 10 = A$

$= ACF9_{16}$

Base 16 to Base 10

Convert $(6B)_{16}$ to Base 10

$B = 11$

$11 \cdot 16^0 = 11$

$6 \cdot 16^1 = 96$

$11 + 96 = 107$

Base 10 to Base 2

- **Using 1 or 0, indicate if there's a remainder**

Convert $(123)_{10}$ to Base 2

$\frac{123}{2} = 61.5$ 1

$\frac{61}{2} = 30.5$ 1

$\frac{30}{2} = 15$ 0

$\frac{15}{2} = 7.5$ 1

$\frac{7}{2} = 3.5$ 1

$\frac{3}{2} = 1.5$ 1

$\frac{1}{2} = 0.5$ 1

$= 1111011$

Base 16 to Base 2

Convert $(37)_{16}$ to Base 2

$\frac{3}{2} = 1.5$ 1

$\frac{1}{2} = 0.5$ 1

$(3)_{16} = (0011)_2$

$\frac{7}{2} = 3.5$ 1

$\frac{3}{2} = 1.5$ 1

$\frac{1}{2} = 0.5$ 1

$(7)_{16} = (0111)_2$

$(37)_{16} = (00110111)_2$

Base 2 to Base 10

Convert $(11111111)_2$ to Base 10

$1 \cdot 2^7 + 1 \cdot 2^6 + 1 \cdot 2^5 + 1 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 = 255$

$= (255)_{10}$

FInd Matrix Dimensions

$(m \times n) \cdot (n \times k) = (m \times k)$

product is defined

Matrix Multiplication

$$\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} \begin{bmatrix} j & k & l \\ m & n & o \\ p & q & r \end{bmatrix} = \begin{bmatrix} (aj + bm + cp) & (ak + bn + cq) & (al + bo + or) \\ (dj + em + fp) & (dk + en + fq) & (dl + eo + fr) \\ (gj + hm + ip) & (gk + hn + iq) & (gl + ho + ir) \end{bmatrix}$$

1. Define the problem
Create mathematical model
Develop computational model
Implement computational model
Test and assess solution

1.

2. 0110 1100 1110 000| 1100 1110

$4 \cdot 6 =$ 24 bits

$\frac{24}{8} =$ 4 bytes

2.

3. $-17+(9-(-17)) \cdot \text{rand}(5,2)$

3.

4. The row or column dimension must be 1.

5a. round (A) = -6

5b. floor (A) = -7

5c. fix (B) = 4

5d. ceil (B) = 5

6a. $B \mid\mid \sim A$

$f \mid\mid \sim t = f \mid\mid f \models 0$

6b. $xor(A, \sim B) \mid\mid B$

$xor(t, \sim f) \mid\mid f$

$= xor(t, t) \mid\mid f$

$= f \mid\mid f \models 0$

6c. $B \,\&\&\, A \mid\mid B$

$f \,\&\&\, t \mid\mid f$

$= f \mid\mid f \models 0$

6.

7. 0 <= -20 <= 10

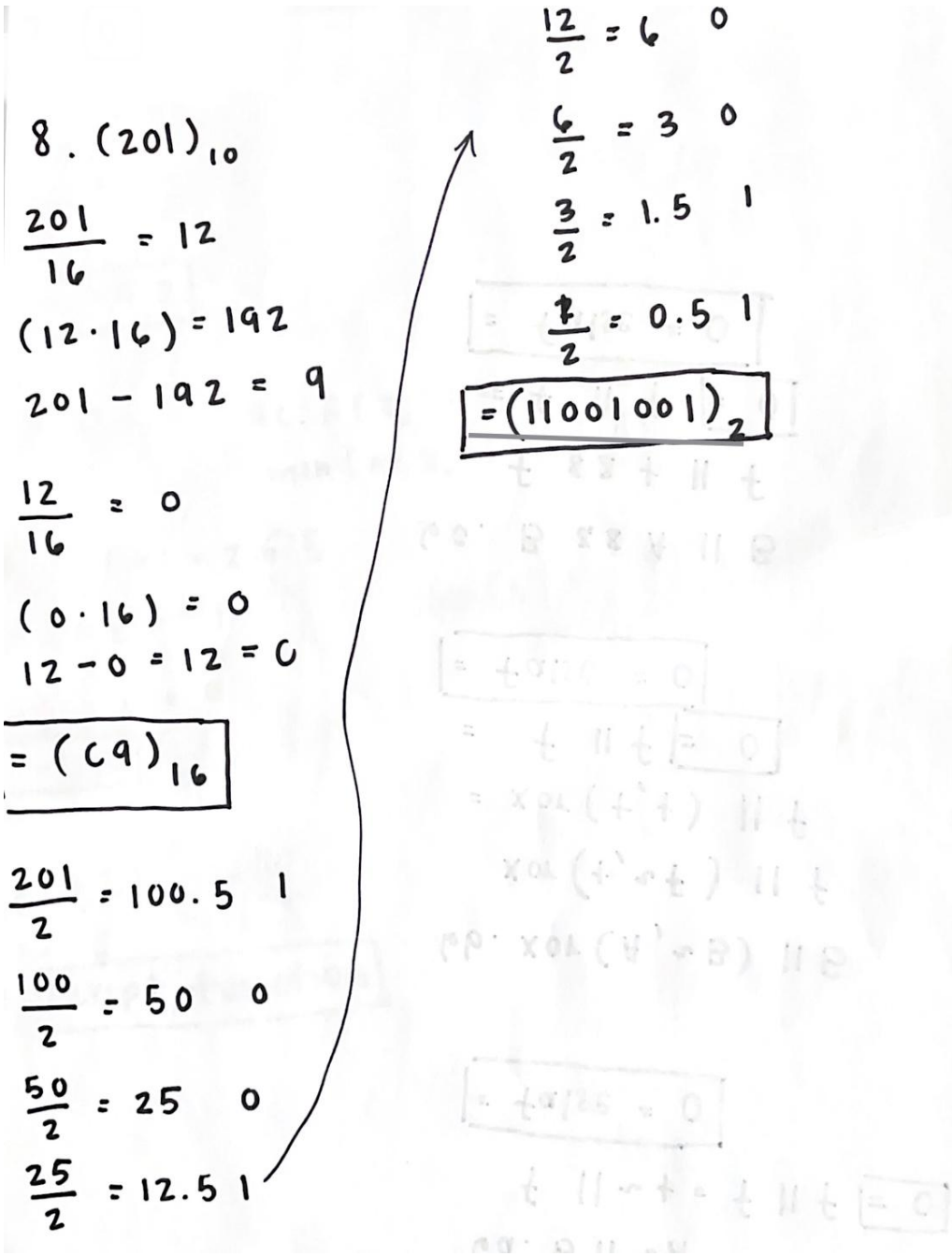
0 <= -20 → false

-20 <= 10 → true

false && true = false = 0

7.

8.


8. $(201)_{10}$
$\frac{201}{16} = 12$
$(12 \cdot 16) = 192$
$201 - 192 = 9$
$\frac{12}{16} = 0$
$(0 \cdot 16) = 0$
$12 - 0 = 12 = 0$
$= (C9)_{16}$
$\frac{201}{2} = 100.5$ 1
$\frac{100}{2} = 50$ 0
$\frac{50}{2} = 25$ 0
$\frac{25}{2} = 12.5$ 1
$\frac{12}{2} = 6$ 0
$\frac{6}{2} = 3$ 0
$\frac{3}{2} = 1.5$ 1
$\frac{1}{2} = 0.5$ 1
$= (11001001)_2$

9a.

$$\begin{bmatrix} 2 \\ 2 \\ 3 \\ 4 \end{bmatrix}$$

9b. $\boxed{1 \quad -4 \quad 2}$

9.

9c. $A(2,:) = 1 \quad -4 \quad 2$

$\min(A(2,:)) = \boxed{-4}$

9d.

$4 + 1 + 3 + 1 = 9$

$-1 - 4 - 2 - 4 = -11$

$2 + 2 + 3 + 4 = 11$

$\boxed{9 \quad -11 \quad 11}$

9e. $9 - 11 + 11 = \boxed{9}$

10.

10a.

$$[6\ 5\ 4]' = \begin{bmatrix} 6 \\ 5 \\ 4 \end{bmatrix}$$

$$[4\ 8\ -4]' = \begin{bmatrix} 4 \\ 8 \\ -4 \end{bmatrix}$$

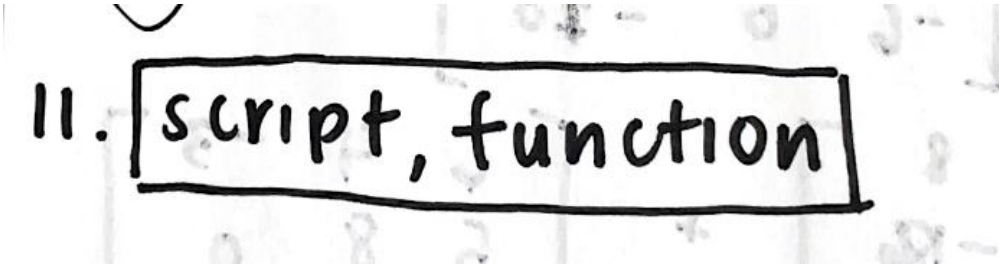
$$[-3\ 0\ -5] = \begin{bmatrix} -3 \\ 0 \\ -5 \end{bmatrix}$$

$$M' = \begin{bmatrix} 6 & 4 & -3 \\ 5 & 8 & 0 \\ 4 & -4 & -5 \end{bmatrix}$$

10b. $2 \cdot \begin{bmatrix} 6 & 5 & 4 \\ 4 & 8 & -4 \\ -3 & 0 & -5 \end{bmatrix} = \begin{bmatrix} 12 & 10 & 8 \\ 8 & 16 & -8 \\ -6 & 0 & -10 \end{bmatrix}$

$$2M + M' = \begin{bmatrix} 12 & 10 & 8 \\ 8 & 16 & -8 \\ -6 & 0 & -10 \end{bmatrix} + \begin{bmatrix} 6 & 4 & -3 \\ 5 & 8 & 0 \\ 4 & -4 & -5 \end{bmatrix}$$

$$= \begin{bmatrix} 18 & 14 & 5 \\ 13 & 24 & -8 \\ -2 & -4 & -15 \end{bmatrix}$$

11. 

12. 3 : 4 : 11 = 3 7 11

5 → 3 7 11

6 → 3 7 11

```
>> x = 5 AND y = 3
>> x = 5 AND y = 7
>> x = 5 AND y = 11
>> x = 6 AND y = 3
>> x = 6 AND y = 7
>> x = 6 AND y = 11
>> The nested for loops are complete!
```