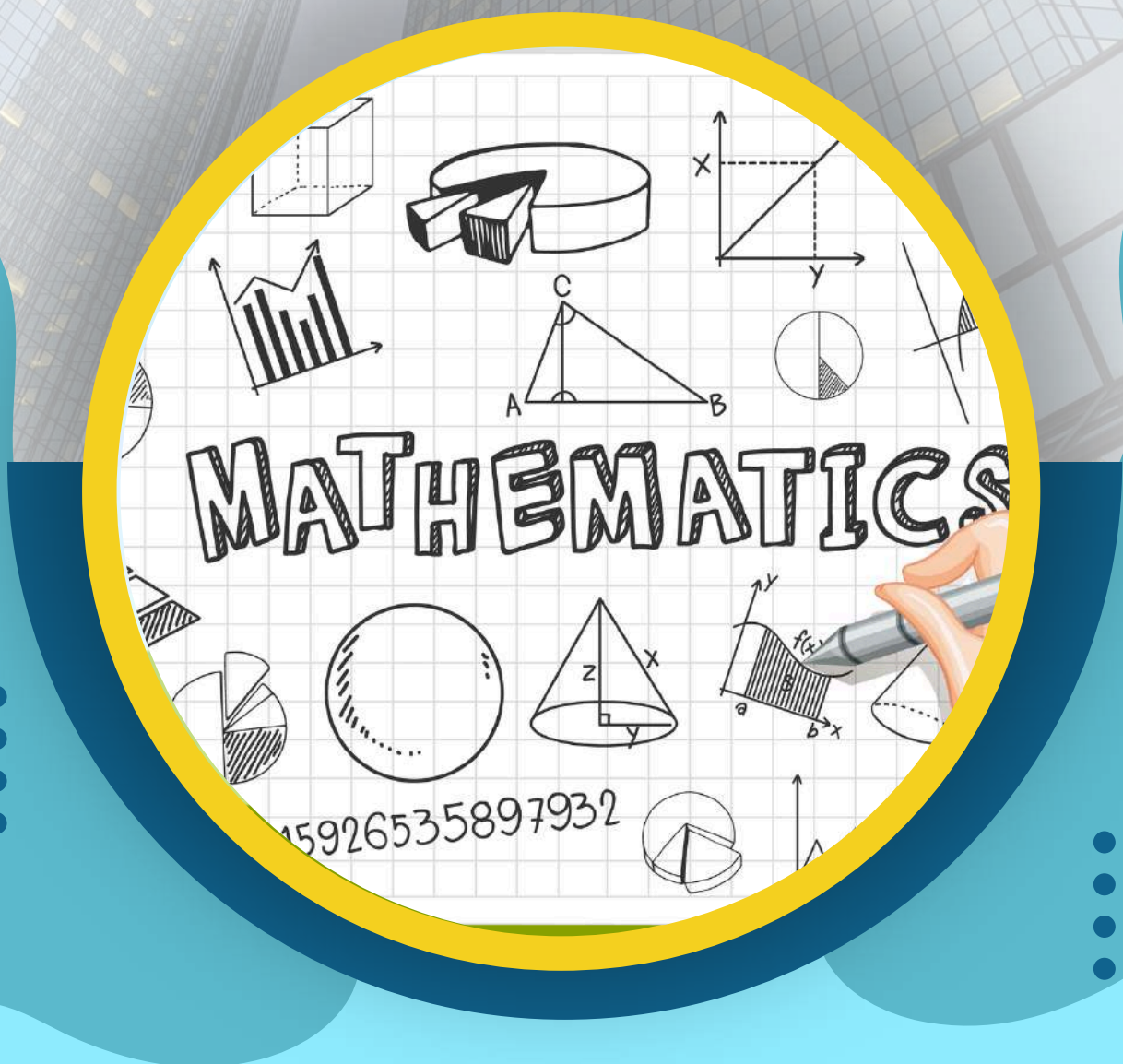


CALCULUS & ALGEBRA



NUMBERING SYSTEM VOLUME 1

AUTHOR / ILLUSTRATOR
NOR LIAN MOHD NORDIN

EDITOR
NITHYA PERIASAMY

CALCULUS & ALGEBRA

NUMBERING SYSTEM

VOLUME 1

BY:

NOR LIAN BINTI MOHD NORDIN
LECTURER

POLITEKNIK UNGKU OMAR

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CALCULUS & ALGEBRA

NUMBERING SYSTEM

VOLUME 1

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About me

Nor Lian Mohd Nordin has 21 years teaching experience in Politeknik Ungku Omar (PUO) since year 2002.

Nor Lian graduated with Bachelor Degree in Electrical Engineering from University Technology Malaysia (UTM) in 1997 and completed her Masters in Education (Technical) from University Technology Malaysia (UTM) in 2002. She was Head of Computer Unit from 2019 to 2021, before moving up the grade.



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PREFACE

The book is about Calculus & Algebra Volume 1 on Chapter 1 Numbering Systems. This topic introduces the basic rules of numbering systems. It also covers on finding the values and converting numbering numbers. This book contains the rules, examples, exercises and quizzes for each of the sub topic.

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1.0 - NUMBERING SYSTEM

1.1 - CONCEPTS OF NUMBERING SYSTEM

TYPES OF NUMBERING SYSTEM

BINARY

- Base 2
- Consist of two values, 0 and 1

EXAMPLE

1100011
1100.101

DECIMAL

- Base 10
- Consist of ten values, 0,1,2,3,4,5,6,7,8,9

EXAMPLE

tens units
13.95
hundredths (1/100)
tenths (1/10)
decimal point

OCTAL

- Base 8
- Consist of eight values, 0,1,2,3,4,5,6,7

EXAMPLE

Octal number: 653
 6×8^2 5×8^1 3×8^0

HEXADECIMAL

- Base 16
- Consist of sixteen values, 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

EXAMPLE

3 A0E 62F
 3×16^6 $A \times 16^5$ 0×16^4 $E \times 16^3$ 6×16^2 2×16^1 $F \times 16^0$
15 ones

1.2 - DATA ORGANIZATION

A group of 8 bits together is called a byte

10101110

A group of 4 bits together is called a nibble

1010

BIT
A bit is a single 0 or 1 on its own

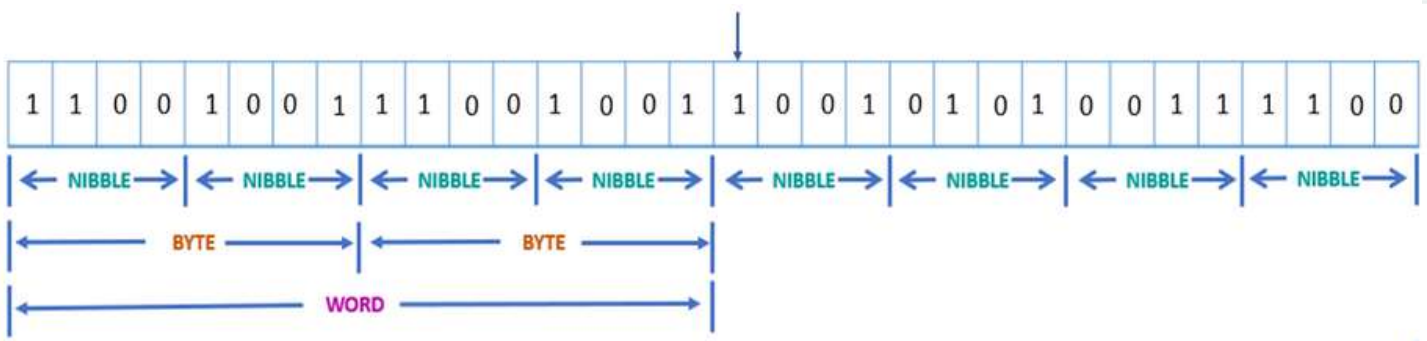
1

A group of 16 bits together is called a word

1010111010110011

A group of 32 bits together is called a doubleword

11110100010011100110100000011111





TRY THIS!

1

• Define data organization of the following:

- 1) bit
- 2) nibble
- 3) byte
- 4) word



Every new day
is another
chance to
change your life



2

• Change the following:

- 1) 3 words in nibbles
- 2) 16 nibbles in bytes
- 3) 8 bytes in nibbles
- 4) 24 bits in nibbles
- 5) 5 words in bits
- 6) 128 bytes in double words
- 7) 3 nibbles to bit
- 8) 1 double words to word
- 9) 12 bytes to nibbles



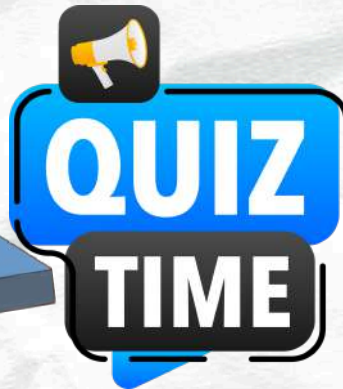
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Check answers:

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<https://www.proprofs.com/quiz-school/ugc/story.php?title=mzc4ntmynauamx>



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OR



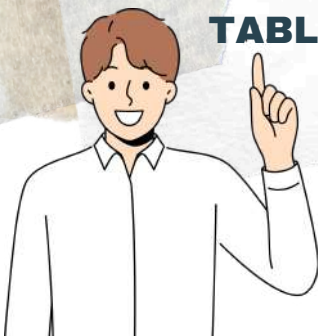
ProProfs
Quiz Maker

« BACK

1.3 - BINARY SYSTEM

DECIMAL	BINARY					OCTAL	HEXADECIMAL
0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1
2	0	0	0	1	0	2	2
3	0	0	0	1	1	3	3
4	0	0	1	0	0	4	4
5	0	0	1	0	1	5	5
6	0	0	1	1	0	6	6
7	0	0	1	1	1	7	7
8	0	1	0	0	0	10	8
9	0	1	0	0	1	11	9
10	0	1	0	1	0	12	A
11	0	1	0	1	1	13	B
12	0	1	1	0	0	14	C
13	0	1	1	0	1	15	D
14	0	1	1	1	0	16	E
15	0	1	1	1	1	17	F
16	1	0	0	0	0	20	10
17	1	0	0	0	1	21	11
18	1	0	0	1	0	22	12

TABLE 1: NUMBERING SYSTEM



A

1.3.1 - ADDITION & SUBTRACTION IN BINARY

BINARY NUMBER - ADDITION



Rules of Binary Addition

- $0 + 0 = 0$
- $0 + 1 = 1$
- $1 + 0 = 1$
- $1 + 1 = 2$ (BUT IN BINARY, IT BECOMES 1 AND 0)



EXAMPLE 1:

Solve the following Binary numbers:

$$11010 + 1100 =$$

SOLUTION:

$1 + 1 = 2$, but in binary 2 is equal to 1 and 0 (refer to the table).

So, 0 remain below, 1 is carried up

$$\begin{array}{r}
 \text{Carry } 1 \\
 1 \quad 1 \quad 0 \quad 1 \quad 0 \\
 + \quad 1 \quad 1 \quad 0 \quad 0 \\
 \hline
 1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 0_2
 \end{array}$$

Step 1: $0 + 0 = 0$
Step 2: $1 + 0 = 1$
Step 3: $0 + 1 = 1$
Step 4: $1 + 1 = 10$ (from table), so carry 1 and 0 stay below
Step 5: $1 + 1 + 0 = 10$ (from table), so carry 1 and 0 stay below

DECIMAL	BINARY					OCTAL	HEXADECIMAL
0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1
2	0	0	0	1	0	2	2
3	0	0	0	1	1	3	3

step 1:
 $0 + 0 = 0$

step 2:
 $1 + 0 = 1$

step 3:
 $0 + 1 = 1$

step 4:
 $1 + 1 = 10$ (from table)
so, carry 1 and 0 stay below

step 5:
 $1 + 1 + 0 = 10$ (from table)
so, carry 1 and 0 stay below

The answer is
100110 (base 2)

1.3.1 - ADDITION & SUBTRACTION IN BINARY

BINARY NUMBER - ADDITION

EXAMPLES :

Solve the following Binary numbers:



2) $0111 + 0110 =$

SOLUTION:

1 + 1 = 2, but in binary, 2 is equal to 1 and 0 (refer to the table).
So, 0 remain below, 1 is carried up

Carry 1

DECIMAL	BINARY	OCTAL	HEXADECIMAL
0	0 0 0 0 0	0	0
1	0 0 0 0 1	1	1
2	0 0 0 1 0	2	2
3	0 0 0 1 1	3	3

1 + 1 + 1 = 3, but in binary, 3 is equal to 1 and 1 (refer to the table).
So, 1 remain below, the other 1 is carried up

Carry 1

1	1	1	
1	1	0	
1	0	1	2

Answer = 1101 (base 2)



3) $01101011 + 101000111 =$

SOLUTION:

1 + 1 = 2, but in binary, 2 is equal to 1 and 0 (refer to the table).
So, 0 remain below, 1 is carried up

Carry 1

DECIMAL	BINARY	OCTAL	HEXADECIMAL
0	0 0 0 0 0 0	0	0
1	0 0 0 0 0 1	1	1
2	0 0 0 0 1 0	2	2
3	0 0 0 0 1 1	3	3

1 + 1 + 1 = 3, but in binary, 3 is equal to 1 and 1 (refer to the table).
So, 1 remain below, the other 1 is carried up

Carry 1

1	1	0	1	1	
1	0	1	0	0	1
1	0	0	0	1	0

Answer = 100010010 (base 2)



<https://www.proprofs.com/quiz-school/ugc/story.php?title=mzc4otc5mg3rng>



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OR



ProProfs
Quiz Maker



1.3.1 - ADDITION & SUBTRACTION IN BINARY

BINARY NUMBER - SUBTRACTION



Rules of Binary Subtraction

- $0 - 0 = 0$
- $1 - 0 = 1$
- $1 - 1 = 0$
- $0 - 1 =$ (WITH A BORROW OF 1)

EXAMPLES:

Solve the following Binary numbers:

1) $101 - 11 =$

SOLUTION:



IMPORTANT

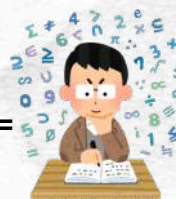
$0 - 1 = \text{X}$, so, you must borrow. When you borrow, you will get 2 (because the base is 2).

So, $2 - 1 = 1$

$$\begin{array}{r} \text{borrow } 2 \\ \begin{array}{r} 0 \\ 1 \end{array} \begin{array}{r} 1 \\ 1 \end{array} \\ - \quad \begin{array}{r} 1 \\ 1 \end{array} \\ \hline 0 \quad \begin{array}{r} 1 \\ 1 \end{array} \quad 0_2 \end{array}$$

Answer = 10 (base 2)

2) $11100111 - 10101101 =$



SOLUTION:

$$\begin{array}{r} \text{borrow } 0 \quad \text{borrow } 2 \quad \text{borrow } 1 \quad \text{borrow } 2 \\ \begin{array}{r} 1 \\ 1 \end{array} \begin{array}{r} 1 \\ 0 \end{array} \begin{array}{r} 1 \\ 1 \end{array} \begin{array}{r} 0 \\ 0 \end{array} \begin{array}{r} 0 \\ 1 \end{array} \begin{array}{r} 1 \\ 1 \end{array} \begin{array}{r} 1 \\ 0 \end{array} \begin{array}{r} 1 \\ 1 \end{array} \\ - \quad \begin{array}{r} 1 \\ 1 \end{array} \begin{array}{r} 0 \\ 0 \end{array} \begin{array}{r} 1 \\ 1 \end{array} \begin{array}{r} 0 \\ 1 \end{array} \begin{array}{r} 1 \\ 1 \end{array} \begin{array}{r} 1 \\ 0 \end{array} \begin{array}{r} 1 \\ 1 \end{array} \begin{array}{r} 1 \\ 0 \end{array} \\ \hline 0 \quad 0 \quad 1 \quad 1 \quad 1 \quad 0 \quad 1 \quad 0_2 \end{array}$$

Answer = 111010 (base 2)



TRY THIS!

1

• Solve the following Binary numbers

a) $1010 + 1110$

b) $1110 + 1001$

c) $10111 + 1111$

d) $1001.011 + 0100.110$

e) $101 - 011$

f) $1110 - 0011$

g) $1100 - 0111$

h) $10000 - 01111$

“Never lost hope, because it is the key to achieve all your dreams”



SCAN ME!

OR



Check answers:

https://drive.google.com/file/d/1naBcVgfb4RMO6iwDfm4-cYRkK9wm_KS/view?usp=drive_link

BINARY NUMBER - MULTIPLICATION



Rules of Binary Multiplication

- $0 \times 0 = 0$
- $0 \times 1 = 0$
- $1 \times 0 = 0$
- $1 \times 1 = 1$, AND NO CARRY OR BORROW BITS



EXAMPLES :

Solve the following Binary numbers:

1) $110 \times 11 =$



SOLUTION:

$$\begin{array}{r}
 110 \\
 \times 11 \\
 \hline
 110 \\
 + 110 \\
 \hline
 10010
 \end{array}$$

110 must multiple with 1 by referring to the rules of multiplication

Then, add the 2 rows

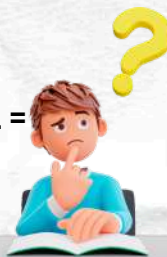
$1 + 1 = 2$, but in binary, 2 is equal to 1 and 0 (refer to the table).

So, 0 remain below and 1 is carried up

DECIMAL	BINARY	OCTAL	HEXADECIMAL
0	0 0 0 0 0 0	0	0
1	0 0 0 0 0 1	1	1
2	0 0 0 0 1 0	2	2
3	0 0 0 0 1 1	3	3

Answer = 10010 (base 2)

2) $00010111 \times 00000011 =$



SOLUTION:

$$\begin{array}{r}
 00010111 \\
 \times 00000011 \\
 \hline
 00010111 \\
 + 00010111 \\
 \hline
 001000101_2
 \end{array}$$

$1 + 1 = 2$

DECIMAL	BINARY	OCTAL	HEXADECIMAL
0	0 0 0 0 0 0	0	0
1	0 0 0 0 0 1	1	1
2	0 0 0 0 1 0	2	2
3	0 0 0 0 1 1	3	3
4	0 0 0 1 0 0	4	4
5	0 0 0 1 0 1	5	5
6	0 0 0 1 1 0	6	6
7	0 0 0 1 1 1	7	7
8	0 0 1 0 0 0	10	8
9	0 0 1 0 0 1	11	9

Answer = 1000101 (base 2)



TRY THIS!

1

• Solve the following binary numbers

a) 110×101

b) 1011×10

c) 101×11

d) 1011×111

e) 101010×11

f) 101001×111

g) 111101×1011

h) 111111×1011

“

Never give up!
Great things
take time

”



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ME!

OR



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1.3.2 - ADDITION & SUBTRACTION IN OCTAL NUMBER

EXAMPLES :

Solve the following Octal numbers:

1) $237 + 157 =$



SOLUTION:

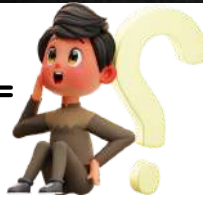
$$\begin{array}{r} 237_8 \\ + 157_8 \\ \hline 416_8 \end{array}$$

7 + 7 = 14 $\rightarrow$ (1 $\times$ 8)
9 = (1 $\times$ 8)

carry: 6, 1

Answer = 416 (base 8)

2) $6773 + 4620 =$



SOLUTION:

$$\begin{array}{r} 6773_8 \\ + 4620_8 \\ \hline 13613_8 \end{array}$$

7 + 2 = 9 $\rightarrow$ (1 $\times$ 8)
1 + 7 + 6 = 14 $\rightarrow$ (1 $\times$ 8)
1 + 6 + 4 = 11 $\rightarrow$ (1 $\times$ 8)

carry: 1, 6, 3

Answer = 13613 (base 8)

TIPS:

ADDED VALUE MUST < 8 (BECAUSE THE BASE IS 8),
IF ADDED VALUE > 8 , THE VALUE MUST CARRY OUT





TRY THIS!

1

• Solve the following Octal numbers

a) $263+115$

b) $266+331$

c) $125+520$

d) $777+123$

e) $3451+222$

“ A little progress
each day adds
up to a big
results ”



SCAN
ME!

OR



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[https://drive.google.com/file/d/1ewG-pY77jM2svgjsOl0R1BifpOiHGJBG/view?usp=drive link](https://drive.google.com/file/d/1ewG-pY77jM2svgjsOl0R1BifpOiHGJBG/view?usp=drive_link)

SUBTRACTION IN OCTAL NUMBER

EXAMPLE : Solve the following Octal numbers:

1) $321_8 - 15_8 =$



SOLUTION:

A chalkboard showing the octal subtraction $321_8 - 15_8 = 304_8$. The digits 3, 2, and 1 are in the top row, with a small '8' to the right of each. The digits 1, 5, and 8 are in the bottom row, with a small '8' to the right of each. A red diagonal line is drawn through the '2' in the top row. A red arrow points from the '2' in the top row to the '1' in the bottom row. The result '304' is written below the bottom row, with a small '8' to the right of each digit. The result is underlined with a yellow line.

1

- $(1 - 5)$ is not enough to subtract.
- Had to borrow from number 2
- Because the base is 8, so, $8 + 1 = 9$, then $9 - 5 = 4$

2

- Second step, $(1 - 1) = 0$

3

- Third step, $(3 - 0) = 3$

so, the answer is.....

304



SUBTRACTION IN OCTAL NUMBER



EXAMPLES:

Solve the following Octal numbers:

$$701 - 220 =$$



SOLUTION:

$$\begin{array}{r} \overset{6}{\cancel{7}} \overset{8+}{0} 1_8 \\ - 220_8 \\ \hline 461_8 \end{array}$$

Answer = 461 (base 8)

$$3503 - 1153 =$$



SOLUTION:

$$\begin{array}{r} \overset{4}{\cancel{3}} \overset{8+}{5} 0 3_8 \\ - 1153_8 \\ \hline 2330_8 \end{array}$$

Answer = 2330 (base 8)

$$3503 - 1153 =$$



SOLUTION:

$$\begin{array}{r} \overset{6}{\cancel{6}} \overset{8+}{\cancel{7}} \overset{8+}{\cancel{2}} \overset{8+}{5}_8 \\ - 1326_8 \\ \hline 5377_8 \end{array}$$

Answer = 5377 (base 8)



TRY THIS!

1

• Solve the following Octal numbers

a) $443 - 25$

b) $765 - 276$

c) $370 - 135$

d) $2117 - 352$

e) $505 - 46$

“ Today is a great day to be amazing ”



SCAN ME!

OR



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1.3.3 - ADDITION & SUBTRACTION IN HEXADECIMAL NUMBER

EXAMPLES:

Solve the following Hexadecimal numbers:

1) $258 + 517 =$???

SOLUTION:

DECIMAL	HEXADECIMAL
10	A
11	B
12	C
13	D
14	E
15	F

2) $ABBA + D38 =$???

SOLUTION:

DECIMAL	HEXADECIMAL
10	A
11	B
12	C
13	D
14	E
15	F

3) $FACE + 125 =$???

SOLUTION:

DECIMAL	HEXADECIMAL
10	A
11	B
12	C
13	D
14	E
15	F



TRY THIS!

1 • Solve the following Hexadecimal numbers

a) $2A + F9$

b) $BA + 15$

c) $C5 + FB$

d) $2D11 + 30A1$

e) $CAD0 + EA6F$

“ Struggle that you do today is the single way to build a better future ”



SCAN ME!

OR



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https://drive.google.com/file/d/1NPA8RN1N7tRfYfNVwJmjoWf1VV-9P5wH/view?usp=drive_link

SUBTRACTION IN HEXADECIMAL NUMBER

EXAMPLES

Solve the following Hexadecimal numbers:

1) $FE - 2B =$



SOLUTION:

Answer = D3 (base 16)

$\begin{array}{r} FE \\ - 2B \\ \hline D3 \end{array}$	$\begin{array}{l} E - B = 14 - 11 = 3 \\ F - 2 = 15 - 2 = 13 = D \end{array}$	<table border="1"> <thead> <tr> <th>DECIMAL</th> <th>HEXADECIMAL</th> </tr> </thead> <tbody> <tr><td>10</td><td>A</td></tr> <tr><td>11</td><td>B</td></tr> <tr><td>12</td><td>C</td></tr> <tr><td>13</td><td>D</td></tr> <tr><td>14</td><td>E</td></tr> <tr><td>15</td><td>F</td></tr> </tbody> </table>	DECIMAL	HEXADECIMAL	10	A	11	B	12	C	13	D	14	E	15	F
DECIMAL	HEXADECIMAL															
10	A															
11	B															
12	C															
13	D															
14	E															
15	F															

2) $EEC5 - AB3 =$



SOLUTION:

Answer = E412 (base 16)

$\begin{array}{r} EEC5 \\ - AB3 \\ \hline E412 \end{array}$	$\begin{array}{l} C - B = 12 - 11 = 1 \\ E - A = 14 - 10 = 4 \end{array}$	<table border="1"> <thead> <tr> <th>DECIMAL</th> <th>HEXADECIMAL</th> </tr> </thead> <tbody> <tr><td>10</td><td>A</td></tr> <tr><td>11</td><td>B</td></tr> <tr><td>12</td><td>C</td></tr> <tr><td>13</td><td>D</td></tr> <tr><td>14</td><td>E</td></tr> <tr><td>15</td><td>F</td></tr> </tbody> </table>	DECIMAL	HEXADECIMAL	10	A	11	B	12	C	13	D	14	E	15	F
DECIMAL	HEXADECIMAL															
10	A															
11	B															
12	C															
13	D															
14	E															
15	F															

3) $9432 - 52EC =$



SOLUTION:

Answer = 4146 (base 16)

$\begin{array}{r} 9432 \\ - 52EC \\ \hline 4146 \end{array}$	$\begin{array}{l} 16 + 2 = 18 - C = 18 - 12 = 6 \\ 16 + 2 = 18 - E = 18 - 14 = 4 \end{array}$	<table border="1"> <thead> <tr> <th>DECIMAL</th> <th>HEXADECIMAL</th> </tr> </thead> <tbody> <tr><td>10</td><td>A</td></tr> <tr><td>11</td><td>B</td></tr> <tr><td>12</td><td>C</td></tr> <tr><td>13</td><td>D</td></tr> <tr><td>14</td><td>E</td></tr> <tr><td>15</td><td>F</td></tr> </tbody> </table>	DECIMAL	HEXADECIMAL	10	A	11	B	12	C	13	D	14	E	15	F
DECIMAL	HEXADECIMAL															
10	A															
11	B															
12	C															
13	D															
14	E															
15	F															



TRY THIS!

1

• Solve the following Hexadecimal numbers

a) CB - 72

b) 93F - 45F

c) F521 - 600

d) DDF8 - EC9

e) FAEF - 1DE

“ Dreams don't work unless you do ”



SCAN ME!

OR



Check answers:

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1.3.4 CONVERTING NUMBER SYSTEM BINARY TO DECIMAL

EXAMPLES

CONVERT BINARY TO DECIMAL NUMBERS:

1) 1110 (base 2) = _____(decimal)

SOLUTION:

1	1	1	0
2^3	2^2	2^1	2^0

$$= (1 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$$

$$= 8 + 4 + 2 + 0$$

$$= \underline{14}_{10}$$

2) 111010 (base 2) = _____(decimal)

SOLUTION:

1	1	1	0	1	0
2^5	2^4	2^3	2^2	2^1	2^0

$$= (1 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$$

$$= 32 + 16 + 8 + 2$$

$$= 58$$



TRY THIS!

1 • Convert Binary to Decimal Number

a) 11001

b) 1010111

c) 1011100

d) 1110011

e) 10001111

“ Make your dream as aim. Don't make your aim as dream ”



SCAN ME!

OR



Check answers:

https://drive.google.com/file/d/1cMFIJ9Na0up-nPfnvJnNvTrNgmU5RxpF/view?usp=drive_link



1.3.5 CONVERTING NUMBER SYSTEM OCTAL TO DECIMAL

EXAMPLES

CONVERT OCTAL TO DECIMAL NUMBERS:

1) 11230 (base 8) =  (decimal)

SOLUTION:

1	2	3	0
8^3	8^2	8^1	8^0

$$= (1 \times 8^3) + (2 \times 8^2) + (3 \times 8^1) + (0 \times 8^0)$$

$$= 512 + 128 + 24 + 0$$

$$= \underline{664}_{10}$$

2) 5217 (base 8) =  (decimal)

SOLUTION:

5	2	1	7
8^3	8^2	8^1	8^0

$$= (5 \times 8^3) + (2 \times 8^2) + (1 \times 8^1) + (7 \times 8^0)$$

$$= 2560 + 128 + 8 + 7$$

$$= \underline{2703}_{10}$$





TRY THIS!

1

• Convert Octal to Decimal Number

- a) 225
- b) 635
- c) 6733
- d) 5015
- e) 1141

“ Set your goals
and don't stop
till you get
there ”



SCAN
ME!

OR



Check answers:

https://drive.google.com/file/d/1qOaN7Wxaun81yGG7A4INDu93b63dpwal/view?usp=drive_link

« BACK

1.3.6 CONVERTING NUMBER SYSTEM HEXADECIMAL TO DECIMAL

EXAMPLES

CONVERT HEXADECIMAL TO DECIMAL NUMBERS:

1) E9 (base 16) =  (decimal)

SOLUTION:

E	9
16^1	16^0

$$= (E \times 16^1) + (9 \times 16^0)$$

$$= 224 + 9$$

$$= \underline{233}_{10}$$

2) 5217 (base 16) =  (decimal)

SOLUTION:

5	2	1	7
8^3	8^2	8^1	8^0

$$= (5 \times 8^3) + (2 \times 8^2) + (1 \times 8^1) + (7 \times 8^0)$$

$$= 2560 + 128 + 8 + 7$$

$$= \underline{2703}_{10}$$





TRY THIS!

1 • Convert Hexadecimal to Decimal Number

a) 1EF

b) 55DC

c) A2F

d) 11C

e) 39B

“ Believe in your self ”



SCAN ME!

OR



Check answers:

https://drive.google.com/file/d/1R7eKzNrXMS0Y_cj-EgWSG0sfwDAUYsM5/view?usp=drive_link



1.3.7 CONVERTING NUMBER SYSTEM DECIMAL TO BINARY

EXAMPLES

CONVERT DECIMAL TO BINARY NUMBERS:

1) $25 \text{ (base 10)} = \text{-----} \text{ (base 2)}$

SOLUTION:

2	25_{10}		
2	12_{10}	$0.5 \times 2 = 1$	
2	6_{10}	$= 0$	
2	3_{10}	$= 0$	
2	1_{10}	$0.5 \times 2 = 1$	
	0_{10}	$0.5 \times 2 = 1$	

$25_{10} = 11001_2$

2) $512 \text{ (base 10)} = \text{-----} \text{ (base 2)}$

SOLUTION:

2	512_{10}		
2	256_{10}	$= 0$	
2	128_{10}	$= 0$	
2	64_{10}	$= 0$	
2	32_{10}	$= 0$	
2	16_{10}	$= 0$	
2	8_{10}	$= 0$	
2	4_{10}	$= 0$	
2	2_{10}	$= 0$	
2	1_{10}	$= 0$	
	0_{10}	$0.5 \times 2 = 1$	

$512_{10} = 100000000_2$



TRY THIS!

1

- Convert Decimal to Binary Number

- a) 13
- b) 69
- c) 55
- d) 113
- e) 765

Today's goal:
Be Awesome



SCAN
ME!

OR



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https://drive.google.com/file/d/1sethQR7sQ_wU3RHJmOImF8Y5v4ieuADJ/view?usp=drive_link

« BACK

1.3.8 CONVERTING NUMBER SYSTEM DECIMAL TO OCTAL

EXAMPLES

CONVERT DECIMAL TO OCTAL NUMBERS:

1) $121 \text{ (base 10)} = \text{?} \text{ (base 8)}$

SOLUTION:

8	121_{10}		
8	15_{10}	$0.125 \times 8 = 1$	
8	1_{10}	$0.875 \times 8 = 7$	
	0_{10}	$0.125 \times 8 = 1$	

$121_{10} = 171_8$

2) $1151 \text{ (base 10)} = \text{?} \text{ (base 8)}$

SOLUTION:

8	1151_{10}		
8	143_{10}	$0.875 \times 8 = 7$	
8	17_{10}	$0.875 \times 8 = 7$	
8	2_{10}	$0.125 \times 8 = 1$	
8	0_{10}	$0.25 \times 8 = 2$	

$1151 = 2177_8$



TRY THIS!

1

• Convert Decimal to Octal Number

- a) 27
- b) 89
- c) 987
- d) 521
- e) 4135

“ Dreams don't work unless you do ”



SCAN ME!

OR



Check answers:

[https://drive.google.com/file/d/1Tj8Qk4XtdX4s9UGsqmHB7h74eOsBFTAP/view?usp=drive link](https://drive.google.com/file/d/1Tj8Qk4XtdX4s9UGsqmHB7h74eOsBFTAP/view?usp=drive_link)



1.3.9 CONVERTING NUMBER SYSTEM DECIMAL TO HEXADECIMAL

EXAMPLES

CONVERT 28 (BASE 10) TO HEXADECIMAL NUMBER (BASE 16)

1) 28 (base 10) = _____ (base 16)

SOLUTION:

16	28 ₁₀	
16	1 ₁₀	$0.75 \times 16 = 12 = C$
	0 ₁₀	$0.0625 \times 16 = 1$

$28_{10} = 1C_{16}$

10	0	1	0	1	0	12	A
11	0	1	0	1	1	13	B
12	0	1	1	0	0	14	C
13	0	1	1	0	1	15	D
14	0	1	1	1	0	16	E
15	0	1	1	1	1	17	F

2) 911 (base 10) = _____ (base 16)

SOLUTION:

16	911 ₁₀	
16	56 ₁₀	$0.9375 \times 16 = 15 = E$
16	3 ₁₀	$0.5 \times 16 = 8$
	0 ₁₀	$0.1875 \times 16 = 3$

$911_{10} = 38E_{16}$



TRY THIS!

1 • Convert Decimal to Hexadecimal Number

- a) 60
- b) 369
- c) 485
- d) 947
- e) 1277

“ Big journeys
begin with small
steps ”



SCAN
ME!

OR



Check answers:

https://drive.google.com/file/d/1r-oTSiHjeXq2593OsTbvWuPCSGel2iWF/view?usp=drive_link



1.3.10 CONVERTING NUMBER SYSTEM OCTAL TO BINARY

EXAMPLES

1) 54 (base 8) = _____ (base 2)

SOLUTION:

Refer to the Table
to get the answer

5	4
101	100

So, $54_8 = 101100_2$

DECIMAL	BINARY						OCTAL
0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1
2	0	0	0	1	0	2	2
3	0	0	0	1	1	3	3
4	0	0	1	0	0	4	4
5	0	0	1	0	1	5	5
6	0	0	1	1	0	6	6
7	0	0	1	1	1	7	7

2) 721 (base 8) = _____ (base 2)

SOLUTION:

Refer to the Table
to get the answer

7	2	1
111	010	001

So, $721_8 = 111010001_2$

DECIMAL	BINARY						OCTAL
0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1
2	0	0	0	1	0	2	2
3	0	0	0	1	1	3	3
4	0	0	1	0	0	4	4
5	0	0	1	0	1	5	5
6	0	0	1	1	0	6	6
7	0	0	1	1	1	7	7



TRY THIS!

1

- Convert Octal to Binary Number

- a) 36
- b) 261
- c) 105
- d) 1133
- e) 3470

When fear becomes motivation, SUCCESS will soon follow



SCAN ME!

OR



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https://drive.google.com/file/d/1ErInLZ9Z4PScB8LjpWHyYQWKmriS80Le/view?usp=drive_link

« BACK

1.3.11 CONVERTING NUMBER SYSTEM HEXADECIMAL TO BINARY

EXAMPLES

1) 5F (base 16) = _____ (base 2)

SOLUTION:

Refer to the Table
to get the answer

5	F
0101	1111

So, $5F_{16} = \underline{1011111_2}$

DECIMAL	BINARY				HEXADECIMAL
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6
7	0	1	1	1	7
8	1	0	0	0	8
9	1	0	0	1	9
10	1	0	1	0	A
11	1	0	1	1	B
12	1	1	0	0	C
13	1	1	0	1	D
14	1	1	1	0	E
15	1	1	1	1	F

2) 3C2 (base 16) = _____ (base 2)

SOLUTION:

Refer to the Table
to get the answer

3	C	2
0011	1100	0010

So, $3C2_{16} = \underline{1111000010_2}$

DECIMAL	BINARY				HEXADECIMAL
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6
7	0	1	1	1	7
8	1	0	0	0	8
9	1	0	0	1	9
10	1	0	1	0	A
11	1	0	1	1	B
12	1	1	0	0	C



TRY THIS!

1

• Convert Hexadecimal to Binary Number

- a) 2B
- b) 51A
- c) CCA
- d) BAC1
- e) 20FE

Take every
CHANCE
Drop every
FEAR



SCAN
ME!

OR



Check answers:

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1.3.12 CONVERTING NUMBER SYSTEM BINARY TO OCTAL

EXAMPLES

1) 111011 (base 2) = _____ (base 8)

SOLUTION:

Refer to the Table
to get the answer

111	011
7	3

So, $111011_2 = 73_8$

DECIMAL	BINARY						OCTAL
0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1
2	0	0	0	1	0	2	2
3	0	0	0	1	1	3	3
4	0	0	1	0	0	4	4
5	0	0	1	0	1	5	5
6	0	0	1	1	0	6	6
7	0	0	1	1	1	7	7

2) 101110101 (base 2) = _____ (base 8)

SOLUTION:

Refer to the Table
to get the answer

101	110	101
5	6	5

So, $101110101_2 = 565_8$

DECIMAL	BINARY						OCTAL
0	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1
2	0	0	0	1	0	2	2
3	0	0	0	1	1	3	3
4	0	0	1	0	0	4	4
5	0	0	1	0	1	5	5
6	0	0	1	1	0	6	6
7	0	0	1	1	1	7	7



TRY THIS!

1 • Convert Binary to Octal Number

- a) 10100
- b) 110011
- c) 1111100
- d) 1010010111
- e) 111000010101

“ Practice makes us right, repetitions make us perfect ”



SCAN ME!

OR



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https://drive.google.com/file/d/1bZCuROv6e22Pe23us2Vyk-wsM2acGut/view?usp=drive_link



1.3.13 CONVERTING NUMBER SYSTEM BINARY TO HEXADECIMAL

EXAMPLES

1) 111010 (base 2) = _____ (base 16)

SOLUTION:

Refer to the Table
to get the answer

11	1010
3	A

So, $111010_2 = 3A_{16}$

DECIMAL	BINARY					HEXADECIMAL
1	0	0	0	1		1
2	0	0	1	0		2
3	0	0	1	1		3
4	0	1	0	0		4
5	0	1	0	1		5
6	0	1	1	0		6
7	0	1	1	1		7
8	1	0	0	0		8
9	1	0	0	1		9
10	1	0	1	0		A
11	1	0	1	1		B
12	1	1	0	0		C

2) 111000000011 (base 2) = _____ (base 16)

SOLUTION:

Refer to the Table
to get the answer

1110	0000	0011
E	0	3

So, $111000000011_2 = E03_{16}$

DECIMAL	BINARY					HEXADECIMAL
1	0	0	0	1		1
2	0	0	1	0		2
3	0	0	1	1		3
4	0	1	0	0		4
5	0	1	0	1		5
6	0	1	1	0		6
7	0	1	1	1		7
8	1	0	0	0		8
9	1	0	0	1		9
10	1	0	1	0		A
11	1	0	1	1		B
12	1	1	0	0		C
13	1	1	0	1		D
14	1	1	1	0		E
15	1	1	1	1		F



TRY THIS!

1

• Convert Binary to Hexadecimal Number

a) 10100

b) 10101000

c) 110110111001

d) 10110111010111

e) 1011110000000101

Big journeys begin with
small steps



SCAN
ME!

OR



Check answers:

https://drive.google.com/file/d/1mj2r4MUT6-tc5JhjzOJnQMmaKQ5Ohj5B/view?usp=drive_link



1.3.14 CONVERTING NUMBER SYSTEM OCTAL TO HEXADECIMAL

EXAMPLES

1) 157 (base 8) = _____ (base 16)

SOLUTION:

Refer to the Table
to get the answer

5	7	OCTAL
101	111	BINARY
Tips: Hexadecimal must be in 4 bits		
10	1111	HEXADECIMAL

So, $57_8 = 2F_{16}$

DECIMAL	BINARY				HEXADECIMAL
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6
7	0	1	1	1	7
8	1	0	0	0	8
9	1	0	0	1	9
10	1	0	1	0	A
11	1	0	1	1	B
12	1	1	0	0	C
13	1	1	0	1	D
14	1	1	1	0	E
15	1	1	1	1	F

2) 20 (base 8) = _____ (base 16)

SOLUTION:

Refer to the Table
to get the answer

2	0	OCTAL
010	000	BINARY
Tips: Hexadecimal must be in 4 bits		
01	0000	HEXADECIMAL

So, $20_8 = 10_{16}$

DECIMAL	BINARY				HEXADECIMAL
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6



TRY THIS!

1

• Convert Octal to Hexadecimal Number

- a) 54
- b) 233
- c) 505
- d) 1277
- e) 3115



SCAN
ME!

OR



Check answers:

https://drive.google.com/file/d/1krxyRdvn9FMTGt1RCL12gn93b2XTD7Nj/view?usp=drive_link



1.3.15 CONVERTING NUMBER SYSTEM HEXADECIMAL TO OCTAL

EXAMPLES

1) 5E (base 16) = _____ (base 8)

SOLUTION:

Refer to the Table
to get the answer

5	E		HEXADECIMAL
0101	1110		BINARY
Tips: The bit for Octal must be in 3 bits			
01	011	110	OCTAL
1	3	6	answer

So, $5E_{16} = 136_8$

DECIMAL	BINARY				HEXADECIMAL
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6
7	0	1	1	1	7
8	1	0	0	0	8
9	1	0	0	1	9
10	1	0	1	0	A
11	1	0	1	1	B
12	1	1	0	0	C
13	1	1	0	1	D
14	1	1	1	0	E
15	1	1	1	1	F

2) 61D (base 16) = _____ (base 8)

SOLUTION:

Refer to the Table
to get the answer

	6	1	D	HEXADECIMAL
	0110	0001	1101	BINARY
Tips: The bit for Octal must be in 3 bits				
011	000	011	101	OCTAL
3	0	3	5	answer

So, $61D_{16} = 3035_8$

DECIMAL	BINARY				HEXADECIMAL
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6
7	0	1	1	1	7
8	1	0	0	0	8
9	1	0	0	1	9
10	1	0	1	0	A
11	1	0	1	1	B
12	1	1	0	0	C
13	1	1	0	1	D
14	1	1	1	0	E
15	1	1	1	1	F



TRY THIS!

1 • Convert Hexadecimal to Octal Number

- a) F3
- b) 2AB
- c) 9DE
- d) 12C
- e) 420A



SCAN
ME!

OR



Check answers:

https://drive.google.com/file/d/1hFDAhS4dSp-U3Ux2NyvRT1hoNa6jIPDg/view?usp=drive_link



REFERENCES

01

Jitin Kumar, (2019). A Multiples Method for Number System Conversions. International Journal of Scientific Research in Computer Science and Engineering, Vol.7, Issue4, pp14-17. <https://doi.org/10.26438/ijsrcse/v7i4.1417>

02

IPS Group of Colleges, Gwalior. Number system.pdf:<https://www.ipsgwalior.org/download/number%20system.pdf>

03

Ajayi Olusola Olajide. (2017). Computer Number System.
<https://www.researchgate.net/publication/320677641>

04

Number Systems Introduction-Decimal, Binary, Octal & Hexadecimal [Video]. Youtube.
<https://www.youtube.com/watch?v=FFDMzbrEXaE>

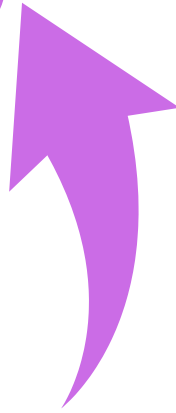
05

How To Add and Subtract Binary Numbers [Video]. Youtube.
<https://www.youtube.com/watch?v=C5EkxfNEMjE>



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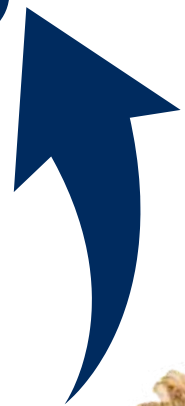
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ME!**

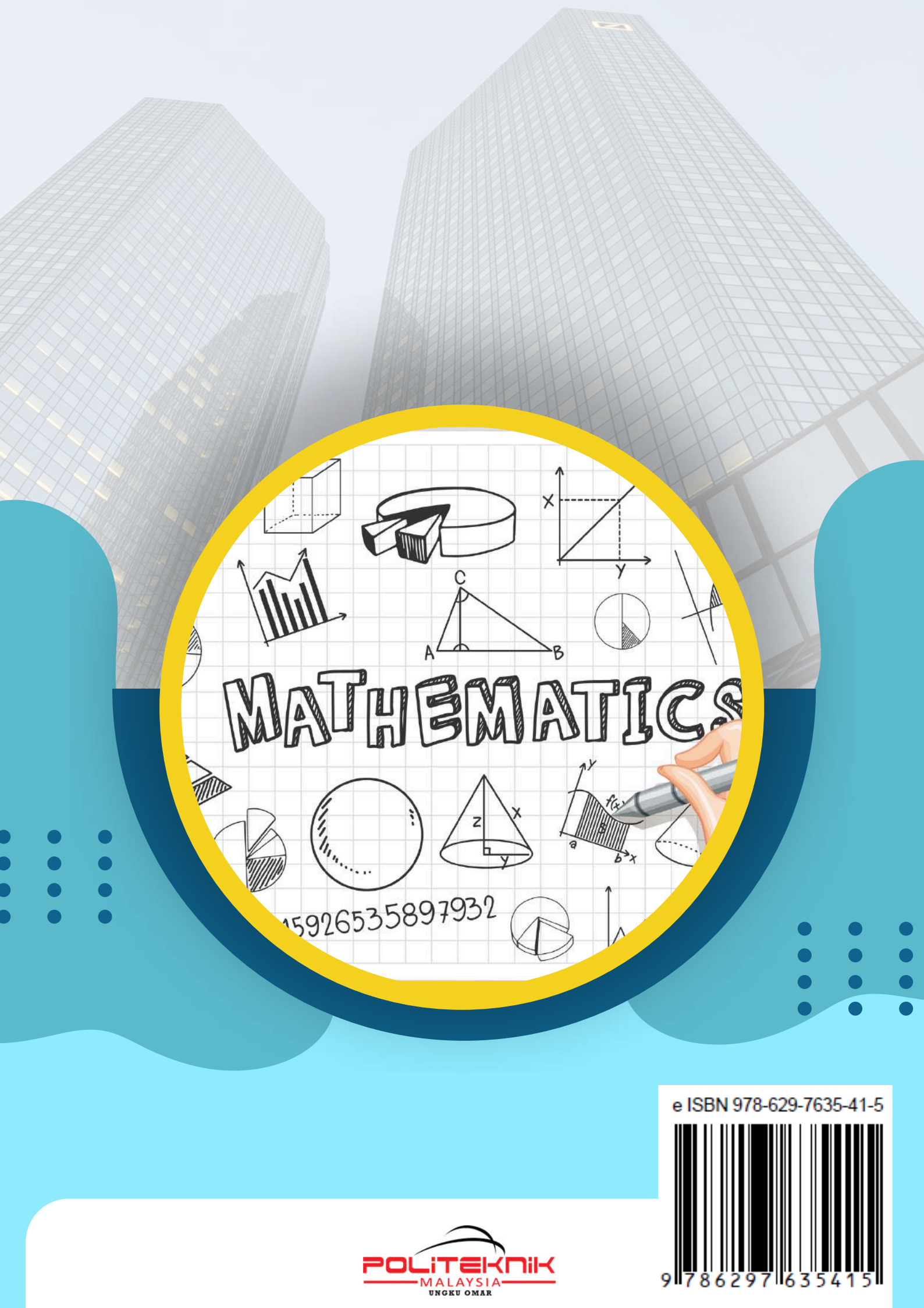


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