

**M110 SECTION 4.3 CALCULATING IN OTHER BASES
INTRODUCTION TO OTHER BASES**

BASE 5 PLACE VALUE SYSTEM

The Hindu–Arabic system is a place value system based on 10. This means that the columns are powers of 10. When moving to a different Base system, it simply means that the column are powers of a different base. It also means that the numerals used will also change.

In a Base 5 system, the base is 5. Therefore the columns are powers of 5.

5^6	5^5	5^4	5^3	5^2	5^1	5^0
					fives	ones or units

WHAT IS THE BASE? _____

WHAT NUMERALS ARE USED? _____

THE MEANING OF A DIGIT

What does the digit 4 mean in the number $3\ 241_5$? _____

What does the digit 2 mean in the number $3\ 241_5$? _____

What does the digit 3 mean in the number $3\ 241_5$? _____

WRITING A NUMBER IN EXPANDED FORM

$3\ 012_5 =$ _____

$1\ 203\ 432_5 =$ _____

WRITE AS A SINGLE NUMBER IN THE GIVEN BASE.

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

$(3 \times 5^7) + (4 \times 5^6) + (2 \times 5^4) + (4 \times 5^3) + (2 \times 5^2) + (3 \times 5^0) =$ _____

BASE 2 PLACE VALUE SYSTEM

In a Base 2 system, the base is 2. Therefore the columns are powers of 2.

2^6	2^5	2^4	2^3	2^2	2^1	2^0
					twos	ones or units

WHAT IS THE BASE? _____

WHAT NUMERALS ARE USED? *only* _____

THE MEANING OF A DIGIT

What does the first digit of 1 mean in the number 101_2 ? _____

What does the second digit of 1 mean in the number 101_2 ? _____

What does the digit of 0 mean in the number 101_2 ? _____

WRITING A NUMBER IN EXPANDED FORM

$1011_2 =$ _____

$1101111_2 =$ _____

WRITE AS A SINGLE NUMBER IN THE GIVEN BASE

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

$(1 \times 2^6) + (1 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^0) =$ _____

CONVERT THE NUMERAL TO A NUMERAL IN BASE 10.

The easiest way to convert back to a Hindu-Arabic number is to write the number in the expanded notation of the given base and then multiply and add.

$$432_5$$

$$111011_2$$

$$145_8$$

EXTENDING TO OTHER BASES

BASE 8

THE COLUMNS ARE POWERS OF _____?

WHAT NUMERALS ARE USED? _____

What does the digit 5 mean in the number 2351_8 ? _____

Convert to Base 10:

$$2351_8 = \underline{\hspace{15em}}$$
$$= \underline{\hspace{15em}}$$

BASE 12

THE COLUMNS ARE POWERS OF _____?

WHAT NUMERALS ARE USED? _____

What does the digit 5 mean in the number $25AB1_{12}$? _____

What does the digit A mean in the number $25AB1_{12}$? _____

Convert to Base 10:

$$B27_{12} = \underline{\hspace{15em}}$$
$$= \underline{\hspace{15em}}$$

BASE 16

THE COLUMNS ARE POWERS OF _____?

WHAT NUMERALS ARE USED? _____

What does the digit C mean in the number $1C3B1_{16}$? _____

Convert to Base 10:

$$92D_{16} = \underline{\hspace{15em}}$$
$$= \underline{\hspace{15em}}$$

CONVERT A NUMERAL TO ANOTHER BASE.

68 to base 8

503 to base 5

240 to base 2

567₉ to base 3

COUNT IN THE FOLLOWING BASES

Write the first ten counting numbers in Base 2

Write the first 15 counting numbers in Base 5

Write the first 20 counting numbers in Base 12