

TOPIC: CONVERTING BETWEEN BASES

Change from Bases Below 10 to Base 10

◆ Recall: Hindu-Arabic System is base 10, but we can use *other* bases, such as base 2 (_____).

► When not in base 10, the base is given as a _____, which determines the place values & digits of that system.

Recall	Base 10	New	Other Bases → Base 10
	3987 Base: 10: Place Values: 1, 10, 10^2, 10^3, ... Expanded Form: $(3 \times 10^3) + (9 \times 10^2) + (8 \times 10) + (7 \times 1)$ Multiply: $3000 + 900 + 80 + 7$ Add: 3987		1011_{two} 1. Identify the base and place values Base: _____ Place Values: _____ 2. Write in expanded form Expanded form: $(_\times_) + (_\times_) + (_\times_) + (_\times_)$ 3. Simplify Multiply: Add:

PRACTICE

Convert the following values to base 10.

(A) 10110₂

(B) 275_{eight}

(C) 324₆

HOW TO: Convert to Base 10

- 1) Find the **base** and **place values**
- 2) Write in **expanded form**
- 3) Simplify by **multiplying** and **adding**

TOPIC: CONVERTING BETWEEN BASES

Change from Bases Above 10 to Base 10

◆ Recall: When not in base 10, the base is given as a subscript, which gives the place values & digits of that system.

► For digits greater than 9, we use _____, in alphabetical order: 10 = __, 11 = __, 12 = __, ...

EXAMPLE

Convert $2AD_{16}$ to base 10.

Base: ____ Place Values: _____

Expanded form:

$$(__ \times __) + (__ \times __) + (__ \times __)$$

Base 10: _____

HOW TO: Convert to Base 10

1) Find the **base** and **place values**

2) Write in **expanded form**

Note: Convert capital letters to base 10

3) Simplify by **multiplying** and **adding**

PRACTICE

Convert the following values to base 10.

(A) $3A_{16}$

(B) $2B_{\text{twelve}}$

(C) 716_{sixteen}

TOPIC: CONVERTING BETWEEN BASES

Change from Base 10 to Different Bases

◆ Recall: When we convert **to** base 10, we use **multiplication**. When converting **from** base 10, we use _____.

Recall	Convert to Base 10	New	Convert to Other Bases
	Convert 1101_{two} to Base 10 1. Find the base & place values we're converting FROM Base: 2 Place Values: 1, 2, 2^2, 2^3, ... 2. Write in expanded form Expanded Form: $(1 \times 2^3) + (1 \times 2^2) + (0 \times 2) + (1 \times 1)$ 3. Simplify each term Multiply & Add: $8 + 4 + 0 + 1 = 13$ Answer: 13		Convert 13 to Base 2 1. Find the base & place values we're converting TO Base: _____ Place Values: _____ 2. Identify <i>relevant</i> place values (powers _____ base 10) # Relevant Place Values: 3. For each place value from step 2, starting with _____: Divide Base 10 # by Place Value: Quotient = _____, Remainder = _____ base 10 # Answer:

PRACTICE

Convert each number from base 10 to the desired base.

(A) 45 into base 2

(B) 83 into base 8

(C) 94 into base 16

HOW TO: Convert from Base 10

- 1) Find the base & place values we're converting **TO**
- 2) Identify *relevant* place values
 - powers $\leq$ base 10 #
- 3) For **each place value** from step 2, starting with *highest*:
 - Divide** base 10 # by place value
 - **Quotient** = digit
 - **Remainder** = *new* base 10 #

TOPIC: CONVERTING BETWEEN BASES

EXAMPLE

Find the base, b , if $150_b = 84$.