I know this: Base 10 and combining

Note: This packet to be completed in pencil only.

Name:	
Team:	
Block:	

During the past unit we have been learning about Base 10, the basis for our number system. We have explored other base number systems in order to help us understand our own. We have also learned how combining and adding numbers within base 10 works. This packet serves as your proof that you understand these basic precepts of our number system and are ready for more advanced concepts. You must finish this packet completely and with quality. You may use your notes, your examples, your teacher, and your classmates to assist you. Please be aware that the purpose of this packet is to ensure you understand these concepts. Being ‘finished’ does not mean you copied this from someone else. It means you can (and will be required to) explain the different concepts within this packet when asked.

When you believe you are capable of explaining (and have actually thought it out in your head how you would do so) the following concepts, initial next to it.

I understand:

	Student initials
The digits/numerals that we use in our number system (P1)	
The structure of our number system – Place value (P1)	
How exponentiation works and how it is related to base ‘n’ systems (P2)	
How to write a number in another base ‘n’ system by understanding place value (P3)	
How to make a ten with any single digit number (P4)	
How to find an equivalent number or break apart a number in order to help me add (P4)	
How to represent numbers on an abacus (P4)	
How to use strategies involving equivalent numbers to help me add on an abacus	
How to write and combine base 10 numbers using powers of ten (P5)	
The mathematical meaning of regrouping (P5)	
The mathematical meaning of the word associative (P5)	
The mathematical meaning of the word commutative (P5)	

P1 – Our base 10 system

Please list the one digit numerals that we use in our number system:

How many one digit numerals are in our number system?

How high can we count using those numerals?

If that is the case, then how do we represent larger numbers? BE SPECIFIC – check your notes and confer with others.

____
____
____
____
____
____

List some of the names of place values that we use in base 10. Some have been done as an example.

1	2	3	4	5	6	7	8	9	.	1	2	3	4	5	6	7	8
						hundreds					hundredths						

Each place value represents a number _____ times larger than the place value to its right.
Each place value represents a number _____ the size of the place value to its left.

Explain what each of these numbers is made up of. The first is done as an example.

356 3 hundreds, 300, or 3×10^2 5 tens, 50, or 5×10^1 6 ones, 6, or 6×10^0	894
6042	507
85.36	702.95

P2 – Exponentiation and its relation to place value

Label the parts: ________________ 10^4 ____________________

Exponentiation follows a simple pattern. Fill in these charts using this pattern

Powers of 10

$10^3 =$	10 * 10 * 10 =	1000	One thousand
$10^2 =$			
$10^1 =$			
$10^0 =$			
.			
$10^{-1} =$	1/10 =	1/10 or .1	One tenth (or one tenth)
$10^{-2} =$			
$10^{-3} =$			

Powers of 2

$2^3 =$			
$2^2 =$			
$2^1 =$	2 =	2	Two
$2^0 =$			
.			
$2^{-1} =$			
$2^{-2} =$	½ x ½ =	¼ or .25	One fourth (or twenty five hundredths)
$2^{-3} =$			

Powers of 3

$3^3 =$			
$3^2 =$	3 * 3 =		Nine
$3^1 =$			
$3^0 =$			
.			
$3^{-1} =$			
$3^{-2} =$			
$3^{-3} =$	1/3 * 1/3 * 1/3 =	1/27 or .037	One twenty seventh (or 37 thousandths)

Our pattern: As we move up in power, we are ________________ by our base. As we go down in power, we are ________________ by our base.

Hint: How do you go from 2^2 to 2^3? How do you go from 2^3 to 2^2?

Evaluate the following:

$5^3 =$	$4^2 =$	$6^2 =$	$7^3 =$	$3^4 =$

P3 – Writing numbers in a foreign base

Show how you would write the following number of items in a given foreign base system. The first is done for you as an example.

Number to write in different number systems: 36

In base 10, the number is written as:

__36____

		3	6
10^3 = thousands	10^2 = hundreds	10^1 = tens	10^0 = ones

Explain:

In base 10, this number is made up of 3 tens and 6 ones, for a total of 3 x 10^1 + 6 x 10^0 = 36

In base 2, the number is written as:

____

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

Explain:

In base 4, the number is written as:

____

^{5}=	^{4}=	^{3} =	^{2} =	^{1} =	^{0} =

Explain:

In base 6, the number is written as:

____

Explain:

P4 – equivalent numbers and using them to help us combine

Tell how many you would need to add to each number to make a 10:

7 + ____ = 10	5 + _____ = 10	4 + _____ = 10	8 + _____ = 10	1 + _____ = 10
3 + _____ = 10	5 + _____ = 10	6 + _____ = 10	2 + _____ = 10	9 + _____ = 10

Oftentimes we can use equivalent forms of a number in order to aid us when performing mathematical operations. For example when adding a number like 9 + 8, it might be easier to think of the 8 as 1 + 7. 1 + 7 is equal to 8. If we think of it this way, we can easily make a 10 by adding 9 + 1 first, and then add the 7 after we have made a ten. Adding with tens in a base 10 system is simple. Thus we have made our addition problem even simpler by using an equivalent number and making a ten.

With each of the following, use an equivalent form of a number in order to easily make and add with tens. The first two have been done as examples.

8 + 7 = 8 + 2 + 5 = 15	4 + 9 = 4 + 10 – 1 = 13	8 + 4 =	7 + 6 =
5 + 8 =	6 + 5 =	8 + 8 =	9 + 4 =
8 + 6 =	7 + 9 =	6 + 8 =	3 + 8 =

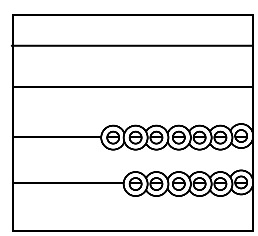
These types of strategies (using equivalent forms of a number) can aid us when performing simple addition as above, but will also aid us when performing more advanced computations later.

Working with an abacus:

Show how the following numbers would be represented on the abacus that we built. One has been done as an example.

4206

76



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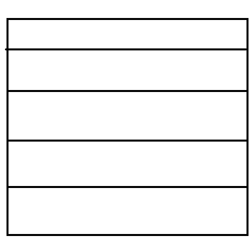

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P5 – Representing numbers in base ten using powers of ten

Evaluate the following:

$5 \times 10^2 =$	$3 \times 10^1 =$	$6 \times 10^0 =$	$8 \times 10^{-1} =$
$35 \times 10^2 =$	$43 \times 10^1 =$	$76 \times 10^0 =$	$78 \times 10^{-1} =$
$135 \times 10^2 =$	$543 \times 10^1 =$	$176 \times 10^0 =$	$978 \times 10^{-1} =$
$2135 \times 10^2 =$	$6543 \times 10^1 =$	$3176 \times 10^0 =$	$6978 \times 10^{-1} =$

Evaluate the following:

$7 \times 10^2 + 4 \times 10^1 + 8 \times 10^0 + 3 \times 10^{-1} + 6 \times 10^{-2} =$
$4 \times 10^1 + 6 \times 10^2 + 3 \times 10^{-1} + 5 \times 10^{-0} =$
$6 \times 10^0 + 8 \times 10^2 + 3 \times 10^{-2} =$
$3 \times 10^2 + 24 \times 10^1 + 8 \times 10^0 + 20 \times 10^{-1} =$
$5 \times 10^3 + 453 \times 10^0 + 7 \times 10^{-1} + 36 \times 10^{-2} =$

What does it mean to regroup? When/why would we do this? Give an example

What is the definition of associative? Give an example

What is the definition of commutative? Give an example