

## Base Number System Application Questions

- Convert the numbers 12, 34, and 87 into:
  - Binary (Base 2):  
 $12=1101$   
 $34=100010$   
 $87=1010111$
  - Quinary (Base 5):  
 $12=22$   
 $34=114$   
 $87=322$
  - Nonary (Base 9):  
 $12=13$   
 $34=37$   
 $87=106$
- Convert your year of birth into base number system of your choice (other than decimal).  
*Answers will vary.*
- Convert the following numbers into decimal number system
  - 643- septenary (base 7):  
 $= (6 \times 7^2) + (4 \times 7^1) + (3 \times 7^0)$   
 $= 294 + 28 + 3$   
 $= 325$
  - 10110 –binary (base 2):  
 $= (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$   
 $= 16 + 0 + 4 + 2 + 0$   
 $= 22$
  - 333- octal (base 8):  
 $= (3 \times 8^2) + (3 \times 8^1) + (3 \times 8^0)$   
 $= 192 + 24 + 3$   
 $= 219$
- Explain why it was important in the previous question that the base number system in which the number is represented is indicated.  
*Otherwise it is impossible to tell which base number system is indicated. The numbers represent very different values depending on the base number system being used.*
- What limitations are we faced with base number systems larger than the base 10 number system?  
*The base 10 number system only has digits the digits 0,1,2,3,4,5,6,7,8,9. For larger base number systems we need more digits. People often use the letter of alphabet to solve this problem.*

6. Add the numbers 14 and 18 in the ternary (base 3) number system.

*Convert the numbers to ternary number system.*

$$\begin{array}{r} 112 \\ +200 \\ \hline \end{array}$$

1012 remember that base 3 only has digit 0,1,2, thus 3 is equal to 10.

7. Subtract 17 from 56 in the heximal (base 6) number system.

*Convert the numbers to heximal number system.*

$$\begin{array}{r} 8 \\ 132 \\ -25 \\ \hline 103 \end{array}$$

*Remember borrowing in heximal number system means getting six from the column to the left.*

8. Multiply 13 by 8 in quaternary (base 4) number system.

*Convert the numbers to quaternary number system.*

$$\begin{array}{r} 31 \\ \times 20 \\ \hline 1220 \end{array}$$

*Remember that in base 4 number system 6 is written as 12.*

9. Divide 98 by 7 in the octal (base 8) number system.

*Convert the numbers to the octal number system.*

$$\begin{array}{r} 16 \\ 7 \overline{) 142} \\ \underline{-7} \phantom{0} \\ 52 \\ \underline{52} \\ 0 \end{array}$$

*Remember 14 in base 8 number system is 12.*

*52 in base 8 number system is 42.*