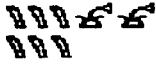


Name SOLUTIONS

Each of the 16 questions is worth 6 points plus 1 points for each of 4 homework problems for a total of 100


Convert the numeral to Hindu-Arabic form.

1)   $6 \times 10\,000 = 60,000$   
 $2 \times 1000 = 2,000$   


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62,000

Write the Babylonian numeral as a Hindu-Arabic numeral.

2)   $3 \times 10 = 30$   
 $4 \times 1 = 4$   


---

34

Convert the numeral to Hindu-Arabic form.

3) LXXI  $1 \times 50 = 50$   
 $2 \times 10 = 20$   
 $1 \times 1 = 1$   


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71

Write the numeral as a Mayan numeral.

4) 3048

$$\frac{3048}{360} = 8 \text{ r } 168$$

$$\frac{168}{20} = 8 \text{ r } 8$$



Convert the numeral to a numeral in base 10.

5)  $322_7$

$$3 \times 49 = 147$$

$$2 \times 7 = 14$$

$$2 \times 1 = 2$$

$$\boxed{163}$$

Convert the base 10 numeral to a numeral in the base indicated.

6) 13,562 to base 8

$$\frac{13562}{4096} = 3 \text{ r } 1274$$

$$\frac{1274}{512} = 2 \text{ r } 250$$

$$\frac{250}{64} = 3 \text{ r } 58$$

$$\frac{58}{8} = 7 \text{ r } 2$$

$$\boxed{32372_8}$$

Add in the indicated base.

7)

$$\begin{array}{r} 333_5 \\ + 30_5 \\ \hline \end{array}$$

$$\begin{array}{r} 333_5 \\ + 30_5 \\ \hline 413_5 \end{array}$$

$$\boxed{413_5}$$

Subtract in the indicated base.

8)

$$\begin{array}{r} 1001_4 \\ - 32_4 \\ \hline \end{array}$$

$$\begin{array}{r} 3311 \\ \cancel{100} \times 4 \\ - 32_4 \\ \hline 303_4 \end{array}$$

$$\boxed{303_4}$$

Multiply in the indicated base.

9)

$$\begin{array}{r} 63_7 \\ \times 67 \\ \hline \end{array}$$

$$\begin{array}{r} 63_7 \\ \times 67 \\ \hline 24 \\ 51 \\ \hline \boxed{534_7} \end{array}$$

Decide whether the given set of numbers is a group under the given operation. If not, why?

10) Even integers; multiplication

$\boxed{\text{No ; NO INVERSE}}$

Decide whether the given set of numbers is a commutative group under the given operation. If not, why?

11) Whole numbers; multiplication

$\boxed{\text{No ; NO INVERSE}}$

Determine the sum or difference in clock 12 arithmetic.

12)  $(8 + 3) + 10$

$$\begin{aligned} 8 + 3 + 10 &= 21 \\ 21 \bmod 12 &= \boxed{9} \end{aligned}$$

Decide which of the 5 properties of a commutative group (closure, identity, inverse, associative, commutative) hold for the given system.

13)

$\parallel$	3	8	14	17
3	8	14	17	3
8	14	17	3	8
14	17	3	8	14
17	3	17	14	8

CLOSURE	YES
IDENTITY	NO
INVERSE	NO
ASSOCIATIVE	NO
COMMUTATIVE	NO

$$(8 \parallel 14) \parallel 17 = 3 \parallel 17 = 3$$

$$8 \parallel (14 \parallel 17) = 8 \parallel 8 = 17$$

$$8 \parallel 17 = 17$$

$$17 \parallel 8 = 8$$

Solve the problem.

14) If February is your starting month, what month will it be 5 years and 5 months from February?

$$\text{FEB} = \text{MONTH } 2$$

$$5 \text{ YRS} + 5 \text{ MO.} = 65 \text{ MONTHS}$$

$$2 + 65 = 67$$

$$67 \pmod{12} = 7$$

$$\text{MONTH } 7 = \boxed{\text{JULY}}$$

Perform the modular arithmetic operation.

15)  $41 - 27 \pmod{5}$

$$\begin{array}{r} 41 \\ -27 \\ \hline 14 \end{array}$$

$$14 \pmod{5} = \boxed{4}$$

Find all replacements (less than the modulus) for the question mark that make the statement true.

16)  $3 \cdot 4 \equiv ? \pmod{7}$

$$\begin{array}{r} 3 \\ \times 4 \\ \hline 12 \end{array}$$

$$12 \pmod{7} = \boxed{5}$$