CATEGORY 1

NUMBER THEORY

DECEMBER, 1989

1) 9

2) {4, 5, 7, 8, 10, 11}

3. 2

1) $1000^3 = 10^{\square}$

2) $A = \{3, 4, 5, 6, 7, 8, 9\}$

$B = \{1, 2, 4, 5, 7, 8, 10, 11\}$

$C = \{6, 9, 10, 11, 12\}$

FIND $(A \cap B) \cup (B \cap C)$

3) IN A RECENT SURVEY BY MIDDLE SCHOOL CAFETERIA WORKERS IT WAS DISCOVER THAT OUT OF A TOTAL OF 540 STUDENTS

410 LIKED PIZZA
372 LIKED HAMBURGERS

244 LIKED PIZZA AND HAMBURGERS
12 LIKED HAMBURGERS AND LIVER AND ONIONS
10 LIKED PIZZA AND LIVER AND ONIONS
4 LIKED ALL THREE MEALS

HOW MANY LIKED ONLY LIVER AND ONIONS?
(HINT: TRY USING A VENN DIAGRAM)

CATEGORY 2

GEOMETRY

DECEMBER, 1989.

1.) length = 8 cm

width = 6 cm

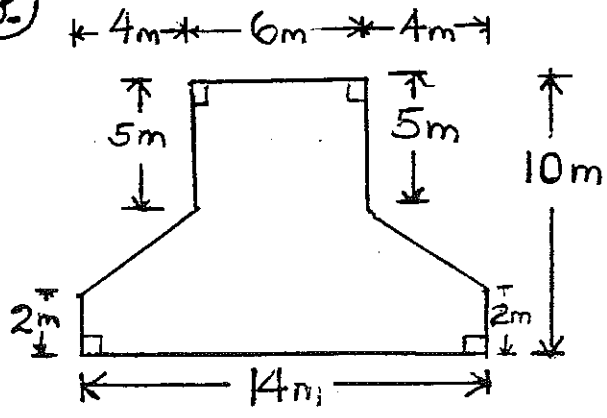
2) 144 $in.^2$

3) 88 m^2

1.) A RECTANGLE HAS AN AREA OF $48cm^2$ AND A PERIMETER OF 28 cm. WHAT IS ITS LENGTH AND WIDTH?

2.) THE LENGTH OF THE SIDES OF A SQUARE AND A REGULAR HEXAGON ARE THE SAME. THE PERIMETER OF THE HEXAGON IS 72 IN. WHAT IS THE AREA OF THE SQUARE?

3.)



FIND THE AREA.

CATEGORY 3

MYSTERY

DECEMBER, 1989

1) $\frac{25}{111}, .304, \frac{1}{3}, 34\%$

2) 35

3) $\frac{2}{15}$

1.) ARRANGE IN ORDER FROM SMALLEST TO LARGEST.

$$34\% \quad \frac{1}{3} \quad .304 \quad \frac{25}{111}$$

2) THERE ARE THREE TIMES AS MANY ONE-HUMPED CAMELS AS TWO-HUMPED CAMELS IN THE DESERT CARAVAN. THERE ARE A TOTAL OF 140 CAMELS IN THE CARAVAN. HOW MANY HAVE TWO HUMPS.

3) JONES, SMITH, AND BARNES ARE BUSINESS PARTNERS. JONES OWNS $\frac{3}{5}$ OF THE BUSINESS. SMITH OWNS TWICE AS MUCH AS BARNES. WHAT FRACTION OF THE BUSINESS DOES BARNES OWN.

CATEGORY 4
ARITHMETIC
DECEMBER, 1989

1) 1
2) 93%
3) 1

1. $\dfrac{\frac{1}{2}+\frac{1}{3}}{\frac{5}{6}} =$

2. IN A SCHOOL OF 600 STUDENTS 42 WERE ABSENT. WHAT PERCENT WERE PRESENT?

3. $\dfrac{2\frac{2}{3} \times .25}{66\frac{2}{3}\%} - \dfrac{37.5\%}{.6} + \dfrac{5}{8} =$

CATEGORY 5

ALGEBRA

DECEMBER, 1989

1) * = 8

2) 20

3) 35 °C

1.) SOLVE FOR *

$$\frac{*}{2} + \frac{*}{4} = 6$$

2.) ONE NUMBER IS TWO LESS THAN ANOTHER. IF FOUR TIMES THE LARGER IS ADDED TO FIVE TIMES THE SMALLER, THE RESULT IS 170. FIND THE LARGER NUMBER.

3.) $F = \frac{9}{5}C + 32$ IS THE FORMULA FOR CONVERTING THE TEMPERATURE IN CELSIUS (C) TO FAHRENHEIT (F). IF THE TEMPERATURE IS 95° F, HOW MANY DEGREES CELSIUS IS IT?

CATEGORY 6
TEAM QUESTIONS
DECEMBER, 1989

1) A = 500,000
2) B = 1
3) C = 2
4) D = 75
5) E = 2310
6) F = .693

1.) $2^5 \times 5^6 =$

2.) IF $a = \frac{1}{a}$ THEN $a^2 = \square$

3.) WHAT IS THE VALUE OF C IF 314,C6C IS DIVISIBLE BY NINE?

4.) FIND THE NUMBER WHICH IS 50% LARGER THAN 50.

5.) ARRANGE THE DIGITS 0,1,2,3 TO FORM A FOUR DIGIT NUMBER THAT IS DIVISIBLE BY 2, 3, 5 AND 7.

6.) USING THE ANSWERS FOR QUESTIONS 1-5, SOLVE FOR F. WRITE YOUR ANSWER IN <u>DECIMAL FORM</u>.

$$\left(\frac{CD}{A}\right)\left(\frac{E}{B}\right) = F$$

SOLUTION KEY: MEET 2 DECEMBER, 1989

CATEGORY 1:

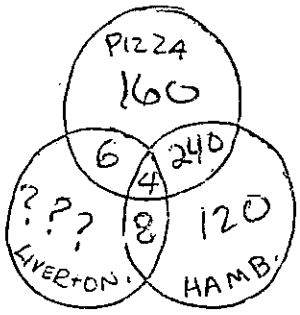
1. $1000^3 = 1000 \cdot 1000 \cdot 1000 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10^{9}$

2. $A \cap B = \{4, 5, 7, 8\}$ $B \cap C = \{10, 11\}$

$(A \cap B) \cup (B \cap C) = \{4, 5, 7, 8, 10, 11\}$

ORDER OF ELEMENTS DOES NOT MATTER

3.



160
240
120
6
4
\+ 8
538

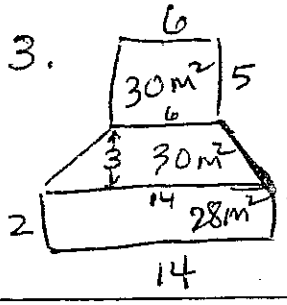
$540 - 538 = 2$

CATEGORY 2:

1. WHILE WE COULD WORK THIS ALGEBRAICALLY, I AM CERTAIN THAT MOST STUDENTS WILL PLAY WITH THE FACTORS OF 48 UNTIL THEY FIND TWO THAT HAVE A SUM OF 14.

2. $72 \div 6 = 12$ ∴ 12 in. IS THE LENGTH OF EACH SIDE OF BOTH THE HEXAGON AND SQUARE. $12_{in} \times 12_{in} = 144 in^2$ (AREA OF THE SQUARE)

3.



$A = \frac{(6+14)}{2}(3) = 30m^2$

$30m^2 + 30m^2 + 28m^2 = 88m^2$

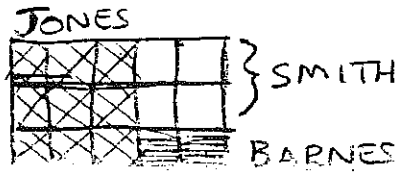
CATEGORY 3:

1. CHANGE TO DECIMAL NOTATION TO COMPARE

$.34$ $.\overline{3}$ $.304$ $.\overline{225}$

2. $3x + x = 140$ OR DIVIDE 140 INTO 4 EQUAL PARTS OF 35 EACH. 3 PARTS REPRESENTING 1-HUMPED AND 1 PART REPRESENTING 2-HUMPS.

3.



OR BARNES AND SMITH OWN $\frac{2}{5}$ OR $\frac{6}{15}$ ∴ SMITH OWNS $\frac{4}{15}$ AND BARNES $\frac{2}{15}$

CATEGORY 4

1. $\dfrac{\frac{1}{2}+\frac{1}{3}}{\frac{5}{6}} = \dfrac{\frac{3}{6}+\frac{2}{6}}{\frac{5}{6}} = \dfrac{\frac{5}{6}}{\frac{5}{6}} = 1$

2. $\frac{42}{600} = \frac{7}{100} = 7\%$ absent $\quad 100\% - 7\% = 93\%$ present

3. $\dfrac{2\frac{2}{3} \times .25}{66\frac{2}{3}\%} - \dfrac{37.5\%}{.6} + \frac{5}{8} = \dfrac{\frac{\cancel{8}^{2}}{3} \times \frac{1}{\cancel{4}_{1}}}{\frac{2}{3}} - \dfrac{\frac{3}{8}}{\frac{3}{5}} + \frac{5}{8} =$

$$\frac{\frac{2}{3}}{\frac{2}{3}} - \left(\frac{\cancel{3}^{1}}{8} \times \frac{5}{\cancel{3}_{1}}\right) + \frac{5}{8} = 1 - \frac{5}{8} + \frac{5}{8} = 1$$

CATEGORY 5

1. BEST SOLVE INTUITIVELY OR

$$\frac{2*}{4} + \frac{*}{4} = 6 \qquad \frac{3*}{4} = 6 \qquad * = \frac{4}{\cancel{3}_{1}}(\cancel{6}^{2}) \qquad * = 8$$

2. $4x + 5(x-2) = 170$

3. $F = \frac{9}{5}C + 32 \qquad 95 = \frac{9}{5}C + 32 \qquad 63 = \frac{9}{5}C \qquad C = 35$

CATEGORY 6

1. $2^5 \times 5^6 = (2\cdot5)\cdot(2\cdot5)\cdot(2\cdot5)\cdot(2\cdot5)\cdot(2\cdot5)\cdot 5 = 10\cdot10\cdot10\cdot10\cdot10\cdot5 = 500{,}000$
2. $a = \frac{1}{a}$ HAS 2 POSSIBLE SOLUTIONS $\{-1, 1\}$ HOWEVER $a^2 = 1$
3. $3+1+4+6 = 14$ – SUM OF DIGITS MUST BE MULTIPLE OF 9
   $3+1+4+C+6+C$ must be 18 $\quad C+C = 4 \quad C = 2$
   sum of digits cannot be 27 $\quad C+C \neq 13$ must be whole no.
   sum of digits cannot be 36 $\quad C+C \neq 22$ must be one digit
4. 50% of 50 is 25 $\quad 50+25 = 75$ OR 150% of 50 = 75
5. Divisble by 2 ∴ must end in 2 or 0
   Divisible by 5 ∴ must end in 0
   Divisible by 3 ∴ sum of digits is 6 regardless of order
   Divisible by 7 ⇝ six possibilities for 1ST 3 digits ~~1230~~, ~~1320~~; ~~3120~~; ~~3210~~; ~~2130~~; **2310**
6. $\left(\frac{CD}{A}\right)\left(\frac{E}{R}\right) = F \quad \left(\frac{2.75}{\text{cancel}}\right)\left(\frac{231\,e}{1}\right) = \left(\frac{3}{1000}\right)\left(\frac{231}{1}\right) = \frac{693}{1000} = .693$