CATEGORY 1
NUMBER THEORY
APRIL, 1991

1. _____ (four)
2. _____
3. _____ (five)

1. EXPRESS THE NUMBER $11100_{(two)}$ AS A BASE FOUR NUMERAL.

2. FIND THE SUM:

$10+11+12 \ldots 98+99+100$ ← Abep

3. MULTIPLY:

$$\begin{array}{r} 220_{(five)} \\ \times\ 22_{(five)} \\ \hline \\ (five) \end{array}$$

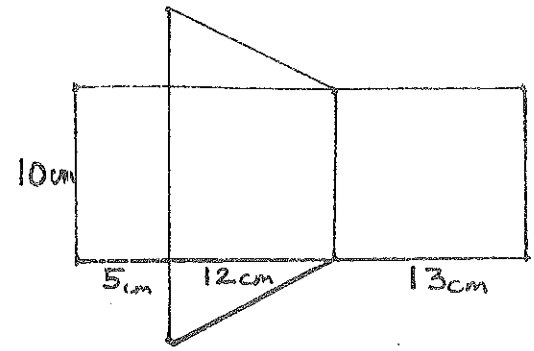
CATEGORY 2
GEOMETRY
APRIL, 1991

1. _____ cm^3

2. _____ in^2

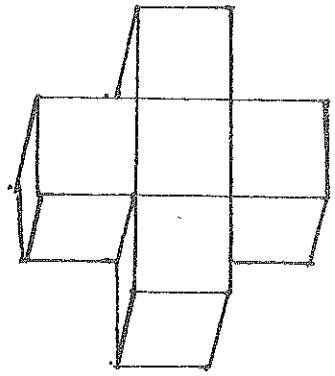
3. _____ m

1.



IF THE PATTERN IS FOLDED, WHAT IS THE VOLUME OF THE PRISM?

2.



WHAT IS THE SURFACE AREA OF THIS SHAPE IF THE EDGES OF ALL OF THE CUBES ARE 12 IN?

3. BOTH THE BASE AND THE VOLUME OF A CYLINDER AND A CONE ARE THE SAME.

IF THE HEIGHT OF THE CONE IS 1.32m. WHAT IS THE HEIGHT OF THE CYLINDER?

CATEGORY 3
MYSTERY
APRIL, 1991

1. _____ SQ. UNITS
2. _____
3. _____ MILES

1. THE AREA OF A SQUARE IS 3 SQUARE UNITS. IF THE LENGTH OF EACH SIDE IS DOUBLED, WHAT IS THE AREA OF THE NEW SQUARE?

2. EXPRESS $\sqrt{2\frac{1}{4}}$ AS A DECIMAL.

3. TWO CARS ARE TRAVELLING IN THE SAME DIRECTION. THE LEAD CAR IS GOING AT A RATE OF 48 mph. THE SECOND CAR IS GOING 60 mph. HOW FAR APART ARE THE TWO CARS 45 MINUTES BEFORE THE FASTER CAR REACHES THE SLOWER CAR?

CATEGORY 4
ARITHMETIC
APRIL, 1991

1. _____
2. _____
3. _____

1. THE MEDIAN OF SEVEN CONSECUTIVE ODD INTEGERS IS 81. WHAT IS THE SMALLEST OF THE SEVEN NUMBERS?

2. WHEN A DIE IS ROLLED, WHAT IS THE PROBABILITY THAT THE TOP FACE WILL BE A FACTOR OF SIX? (EXPRESS AS A LOWEST TERM FRACTION)

3. AL SHOOTS 80% AND BERT SHOOTS 75% FROM THE FOUL LINE. IN THEIR LAST GAME THEY EACH SCORED TWELVE FOUL SHOTS. HOW MANY TOTAL SHOTS DID THEY TAKE?

CATEGORY 5
ALGEBRA
APRIL, 1991

1. D = _____
2. x = _____
3. _____

1. IF $25a^2+Da+64$ IS A PERFECT SQUARE WHAT IS THE VALUE OF D?

2. SOLVE FOR x:

$$(x+2)^2 = x^2+8$$

3. SOLVE FOR x:

$$\frac{x^4-13x^2+36}{x^2+5x+6} = 2$$

Apr 9

CATEGORY 1 - NUMBER THEORY

1. $130_{(four)}$
2. $5005 = (110 \times 45) + 55$
3. $10340_{(five)}$ $220_{(5)} = 60_{(10)}$ $22_{(5)} = 12_{(10)}$ $60 \times 12 = 720_{(10)} = 10340_{(5)}$

CATEGORY 2 - GEOMETRY

1. $300\ cm^3$ $V = (.5)(5)(12)(10)$
2. $3168\ in^2$ $SS = (12)(12)(22\ faces)$
3. $.44\ m$ $1.32 \div 3$

CATEGORY 3 - MYSTERY

1. 12 sq.un.
2. 1.5 $\sqrt{2\frac{1}{4}} = \sqrt{\frac{9}{4}} = \frac{3}{2} = 1.5$
3. 9 mi $60mph - 48mph = 12mph$; $(12mph)\ 3/4\ hr = 9\ mi$

CATEGORY 4 - ARITHMETIC

1. 75 75 77 79 [81] 83 85 87
2. 2/3 1, 2, 3, 6 $4/6 = 2/3$
3. 31 $\frac{4}{5}A = 12$ $\frac{3}{4}B = 12$ $A = 15$ $B = 16$

CATEGORY 5 - ALGEBRA

1. 80 $(5a+8)^2 = 25a^2 + 80a + 64$
2. 1 $x^2 + 4x + 4 = x^2 + 8 \Rightarrow 4x = 4 \Rightarrow x = 1$
3. {4, 1} $\frac{(x^2-9)(x^2-4)}{(x+3)(x+2)} = 2 \Rightarrow \frac{(x-3)(x+3)(x-2)(x+2)}{(x+3)(x+2)} = 2 \Rightarrow x^2 - 5x + 6 = 2 \Rightarrow$

$x^2 - 5x + 4 = 0 \Rightarrow (x-4)(x-1) = 0 \Rightarrow x = 4$ or $x = 1$

CATEGORY 6 - TEAM QUESTIONS

1. 4 $V_1 = 1\pi L$ $V_2 = 4\pi L$
2. 36 $8 + 7 + 6 + 5 + 4 + 3 + 2 + 1$
3. 22

# CHORDS	1	2	3	4	5	6
# REGIONS	2	4	7	11	16	22

4. 20 several solutions: eg. 41 jelly beans is mean and median. April has 30 days; thus, median is average of 15th & 16th day. Therefore, 15th day must be 40 and 16th day 42 jelly beans. Working backwards 10 days to the 5th day is 20 jelly beans.
5. 10 All same number (3) all different (1) 2 same - 1 different (6)
6. -1 $10F^2 + 20F + 36 = 22 + 4 \Rightarrow 10F^2 + 20F + 10 = 0 \Rightarrow F^2 + 2F + 1 \Rightarrow$

$(F+1)^2 = 0 \Rightarrow F = -1$