CATEGORY 1 – NUMBER THEORY – APRIL 1993

1. WHAT IS THE VALUE OF x: $.00000086 = 8.6 \times 10^{x}$

2. $23_{six} + 23_{five} =$ _____ $_{seven}$

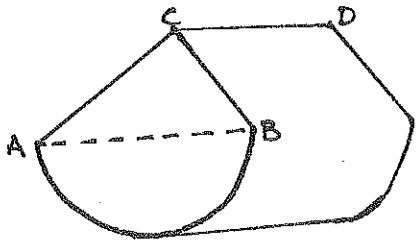
3. SIMPLIFY: $3\left(-\frac{1}{3}\right)^{-2} + 3\left(-\frac{1}{3}\right)^{-1} + 3\left(-\frac{1}{3}\right)^{0} + 3\left(-\frac{1}{3}\right)^{1}$

Answers
1.
2. seven
3.

CATEGORY 2 ~ GEOMETRY ~ APRIL, 1993

1. IF THE LENGTH OF EACH EDGE OF A CUBE IS DOUBLED THE VOLUME IS INCREASED _____ TIMES.

2. A RECTANGULAR SOLID HAS SURFACE AREAS OF $15\ cm^2$, $18\ cm^2$, AND $30\ cm^2$. WHAT IS THE LENGTH OF THE LONGEST EDGE?

3. 

FIND THE VOLUME IF $AC = 16\ cm$, DIAMETER $AB = 20\ cm$, AND $m\angle ACB = 90°$ (USE 3.14 FOR π). $CD = 50\ cm$

ANSWERS	
1.	
2.	cm
3.	cm^3

CATEGORY 3 – MYSTERY – APRIL 1993

1. HOW MANY WAYS CAN THE LETTERS M,A,T,H BE ARRANGED?

2. THE PRODUCT OF TWO NUMBERS IS 48. THE DIFFERENCE IS 13. WHAT IS THE SUM?

3. IF SAM IS $33\frac{1}{3}\%$ TALLER THAN LOUIE, THEN LOUIE IS WHAT PERCENT SHORTER THAN SAM?

– ANSWERS –
1.
2.
3. %

CATEGORY 4 ~ ARITHMETIC ~ APRIL, 1993

1. WHAT IS THE MEDIAN OF THE FOLLOWING SET OF NUMBERS?

   32, 64, 48, 15, 15, 36, 28, 14

2. IF A PAIR OF ORDINARY 6-SIDED DICE ARE ROLLED WHAT IS THE PROBABILITY OF ROLLING DOUBLES (EXPRESS AS A FRACTION)

3. 400 FAMILIES IN PODUNK, MA HAVE THREE CHILDREN. HOW MANY OF THESE FAMILIES WOULD YOU PREDICT HAVE THREE BOYS?

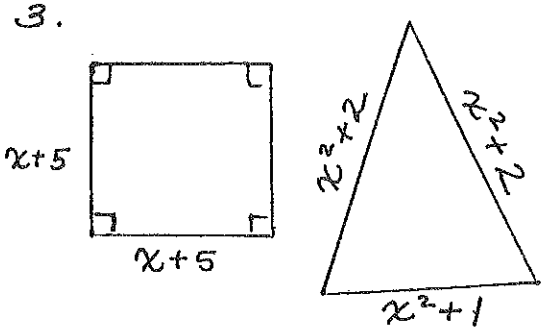
~ANSWERS~
1.
2.
3

CATEGORY 5 ~ ALGEBRA ~ APRIL, 1993

1. FACTOR: $5x^3 + 30x^2 + 40x$

2. FIND THE SOLUTION SET: $2x^2 + 14x = -24$

3.



IF THE PERIMETERS OF THESE TWO FIGURES ARE EQUAL WHAT IS THE VALUE OF x?

~ANSWERS~
1.
2. { , }
3. $x =$

CATEGORY 6 – TEAM QUESTIONS – APRIL 1993

1. THE PERSON SPENT $\frac{2}{3}$ AND THEN LOST $\frac{2}{3}$ OF WHAT WAS LEFT. HOW MUCH DID SHE START WITH IF SHE HAS #4 LEFT?

2. FIND 8.4% OF $5.\overline{3}$ TIMES $3\frac{1}{7}$ (EXPRESS AS A DECIMAL)

3. HOW MANY DIFFERENT 5-LETTER WORDS CAN BE FORMED FROM THE LETTERS P,E,N,T,A,G,O,N IF THE 1ST LETTER MUST BE P AND NO LETTER MAY BE USED MORE THAN ONCE IN EACH WORD.

4. A SPHERE WITH A RADIUS OF 4 HAS THE SAME VOLUME AS A CONE WITH A RADIUS OF 4. WHAT IS THE HEIGHT OF THE CONE?

5. IF A RANDOM 2-DIGIT NUMBER IS CHOSEN, WHAT IS THE PROBABILITY THAT THE NUMBER IS A PERFECT SQUARE? (EXPRESS AS A FRACTION IN SIMPLEST FORM)

6. $$\frac{(C+10D)B}{D} - F = \frac{1}{E} + A$$

-ANSWERS-
1) A=
2) B=
3) C=
4) D=
5) E=
6) F=

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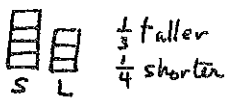
Cat. 1 ~ Number Theory ~ Answers ~

1. -7
2. 40_{seven} $(15_{ten} + 13_{ten} = 28 = 40_{seven})$
3. 20 $[3(9) + 3(-3) + 3(1) + 3(-\frac{1}{3})]$

Cat 2 ~ Geometry

1. 8
2. 6 $(3\times5;\ 3\times6;\ 5\times6)$
3. 12,650 cm³ $(\frac{1}{2}\pi r^2 + \frac{1}{2}bh)\cdot 50$
   $(\frac{1}{2}\,3.14\,(100) + \frac{1}{2}\,16\cdot12)\,50$
   $(157 + 96)\,50$

Cat 3 ~ Mystery

1. 24 $(4\cdot3\cdot2\cdot1)$
2. 19 $(16+3)$
3. 25% 

Cat 4 ~ Arithmetic

1. 30 $(14, 15, 15, 28 / 32, 36, 48, 64)$
2. $\frac{1}{6}$
3. 50 (Prob. 3 boys is 1/8 BBB BBG BGG GGG BGB GBG GBB GGB)

Cat 5 ~ Algebra

1. $5x(x+2)(x+4)$ [any order]
2. $\{-4, -3\}$
3. $x = 3$ $[3x^2 + 5 = 4x + 20 \Rightarrow 3x^2 - 4x - 15 = 0 \Rightarrow (3x+5)(x-3) = 0$, $x = 3$]

Cat 6 ~ Team

1. A = 36 $[(x - \frac{2}{3}x) - \frac{2}{3}(\frac{1}{3}x) = 4]$
2. B = 1.408 $[\frac{88}{1000}\cdot\frac{4}{1}\cdot\frac{16}{1}\cdot\frac{22}{11} = \frac{1408}{1000} = 1.408]$
3. C = 840 $[1\cdot7\cdot6\cdot5\cdot4]$
4. D = 16 $[\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h \Rightarrow \frac{4}{3}\cdot4^3\pi = \frac{1}{3}\cdot4^2\pi h \Rightarrow h = 16\ (4^3)]$
5. E = 1/15 $[16, 25, 36, 49, 64, 81;\ 6/90 = 1/15]$
6. F = 37