

A.P. Leto Comprehensive High School
 Mu Alpha Theta Invitational Competition
 Saturday, February 2, 1991

Team Round Answers

Algebra I	Geometry	Algebra II	Pre-Calculus	Calculus
1) Quadrant I	1) 84	1) 121	1) $\{-3, 1\}$	1) -6
2) 864	2) 118	2) $14\sqrt{2}$	2) 8 ft	2) 3
3) 47	3) $\frac{21\pi}{4}$	3) 14	3) $\frac{-3}{2}$	3) $\frac{9}{4}$
4) 370.5	4) 12	4) $\{-2, 3, \frac{-1+i\sqrt{3}}{2}\}$	4) 1	4) 6
5) $\frac{6}{5}$	5) 60 meters	5) 12	5) $\frac{2\sqrt[3]{4} + 6}{31}$	5) $\frac{-3\sqrt{3}}{4}$
6) 2	6) $\frac{16}{3}$	6) $-3 \leq x < -1$	6) 4	6)
7) 2	7) $2a^2$	7) 1,489	7) $\frac{14}{3} + 2\sqrt{5}$	$4x+48y+47\pi-384=0$
8) 29	8) $\sqrt{97}$	8) 480	8) 6	7) $\frac{-80e^9}{7}$
9) $x + y - 9 = 0$	9) $\frac{8}{7}$	9) 30	9) 135	8) $\frac{1}{16}$
10) $\{2, 0, -1\}$	10) 112	10) $\{-3 \leq x \leq 2 \text{ or } x \geq 4\}$	10) $4 + 4\sqrt{13}$	9) $x - y - 1 = 0$
11) $\frac{47}{36}$ or $1\frac{11}{36}$	11) 72	11) $\frac{16\pi}{3}$	11) $\frac{-15}{4}$	10) $\frac{-\sqrt{3}}{3e}$
12) 21	12) 12	12) 20	12) 6,479	11) $2x+3y+2\sqrt{5}=0$
13) 45,369	13) 8 feet	13) 20	13) 17,550	$2x + 3y - 2\sqrt{5} = 0$
14) $\frac{7}{2}$	14) $\frac{4}{5}$	14) 644	14) $\frac{37\sqrt{7}}{4}$	12) 50
15) -12	15) $100\pi - 128$	15) 16	15) -14	13) $3 + 4\ln 2$ or $3 + 2\ln 4$
				14) $a = 2; b = -1$
				15) $2 \times 2 \times \frac{5}{2}$

Q2

Team

Solutions

1) $4 * [(6 \# 8) \# (3 * 5)]$

$[(6+8) \# (3 \cdot 5+1)]$

$4 * [14 \# 16]$

$4 * 30 = 120 + 1 = \boxed{121}$

2) $6\sqrt{2} + \frac{16\sqrt{2}}{2} - \left(\frac{9}{2}\right)^{-\frac{1}{2}} + \sqrt[4]{\frac{4}{81}}$

$6\sqrt{2} + 8\sqrt{2} - \frac{\sqrt{2}}{3} + \frac{\sqrt{2}}{3} = \boxed{14\sqrt{2}}$

3) A: $3x+6=51$
 $-6 \quad -6$

$3x=45$ largest is 19

$x=15$

B: $9x=180$ Smallest is 40

$x=20$

C: 45

$(19+40) - 45 = \boxed{14}$

4) $x(x-1)(x^2+x+1) - 6(x^2+x+1) = 0$

$(x^2+x+1)[x^2-x-6] = 0$

$(x^2+x+1)(x-3)(x+2) = 0$

$x = \frac{-1 \pm \sqrt{1-4(1)(1)}}{2} \text{ or } 3, \text{ or } -2$

$x \in \left\{ \frac{-1 \pm i\sqrt{3}}{2}, 3, -2 \right\}$

5) 2100

$2 \cdot 2 \cdot 1 \cdot 3 = \boxed{12}$

$\begin{matrix} 21 & 100 \\ 3 \cdot 7 & 2^2 \cdot 5^2 \end{matrix}$

Don't want any factors of 2' or 2',
 but 2⁰ is okay.

6) A: $\log(x^2-3x-4)$

$x^2-3x-4 > 0$

B: $-5 \leq 2x+1 \leq 5$

$(x-4)(x+1) > 0$

$-6 \leq 2x \leq 4$

$-3 \leq x \leq 2$

$A \cap B = -3 \leq x < -1$

$x > -1 \text{ or } x < 4$

$[-3, -1)$



7) A: $(-1)^8 = 1$

B: $\frac{7 \cdot 5 (x)^4 (-2y)^4}{1 \cdot 7 \cdot 5} = 70x^4(16y^4) = 1120x^4y^4$

C: $(-2y)^8 = 256y^8$

D: $\frac{7 \cdot 7 (x)^6 (-2y)^2}{1 \cdot 7} = 28x^6 \cdot 4y^2 = 112x^6y^2$

$(1,489)$

$1,489$

8) $\frac{\sqrt{(3x)^2 + (4y)^2 + (5z)^2}}{\sqrt{9x^2 + 16y^2 + 25z^2}} = 200\sqrt{z}$

$5x\sqrt{z} = 200\sqrt{z}$

$120 + 160 + 200 = 480$

$x = 40$

9) $9(x^2 - 4x + 4) + 4(y^2 + 2y + 1) = -x + 36 + y$
 $\frac{(x-2)^2}{4} + \frac{(y+1)^2}{9} = 1$

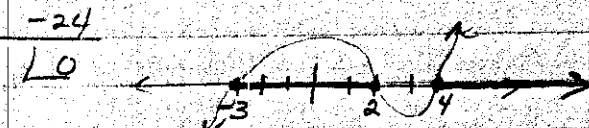
$M = 6 ; J = 4 \quad (2, -1)$

$(10)(3) = 30$

10) $\begin{array}{r|rrrr} 2 & 1 & -3 & -10 & 24 \\ & & 2 & -2 & -24 \\ \hline & 1 & -1 & -12 & 0 \end{array}$

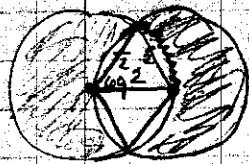
$x^2 - x - 12$

$(x-4)(x+3)$



$\{-3 \leq x \leq 2 \text{ or } x \geq 4\}$

11)



$4 \left[\frac{60}{360} \cdot 4\pi \right] = 4 \cdot \frac{2}{3}\pi = \frac{8\pi}{3}$

Total circumference is

$2(4\pi) = 8\pi$

Outer perimeter is $8\pi - \frac{8\pi}{3} = \frac{16\pi}{3}$

12) A: $\frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$

B: $2^4 = 16$

A: 15

$ABC = \frac{1}{12} \cdot \frac{16}{4} \cdot \frac{15}{1} = 20$

$$13) \sqrt{10+2\sqrt{21}} = A+B=10 \quad B=10-A$$

$$\sqrt{AB} = \sqrt{21}$$

$$\sqrt{A(10-A)} = \sqrt{21}$$

$$10A - A^2 = 21$$

$$A^2 - 10A + 21 = 0$$

$$(A-3)(A-7) = 0$$

$$A+B: 3, 7$$

$$c: \sqrt{(1+\sqrt{2})^2} - \sqrt{(\sqrt{2}-1)^2} = 1+\sqrt{2} - \sqrt{2}+1 = 2$$

$$(A+B)c = (10) \cdot 2 = \boxed{20}$$

$$14) 10111011_2 = \frac{2523}{4} + \frac{1231}{4} = \frac{10220}{4} = 2555$$

$$102110_3 = 243 + 54 + 9 + 3 = 309$$

$$124_5 = 25 + 10 + 4 = 39$$

$$2555 + 309 + 39 = \boxed{644}$$

$$15. A = f(2) = 4$$

$$B = g(2) = \log_2 2 = \frac{1}{2}$$

$$C = h(-1) = (8(-1)+4) = 16$$

$$D = f(g(h(0))) = 4$$

$$(ACD)^B = (4 \cdot 16 \cdot 4)^{\frac{1}{2}} = (256)^{\frac{1}{2}} = \boxed{16}$$