2005 Palm Harbor February Invitational
Algebra I Answer Key

Individual

1. B
2. A
3. E
4. A
5. D
6. C
7. B
8. C
9. C
10. A
11. B
12. D
13. B
14. A
15. D
16. B
17. E
18. E
19. B
20. C
21. B
22. C
23. A
24. A
25. D
26. C
27. B
28. D
29. C
30. A

Team

1. -90
2. 3
3. 48
4. 56.25 (%)
5. $x \in \{5, 401\}$
6. $\frac{7}{27}$
7. 2011015
8. 3.75
9. $\sqrt{185}$
10. $-\frac{1}{5}$ or -0.2
11. 55
12. 504
13. $18 or 18
14. 105
15. 27.5

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1) Distance from (55,16) to (81,30)
Distance formula: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
$\sqrt{(81-55)^2 + (30-16)^2}$
$= \sqrt{(26)^2 + (14)^2}$
$= \sqrt{872} \approx 29.5.$ **B**

2) $(7x + 2y)^2 = ?$
$= (7x + 2y)(7x + 2y)$
FOIL the binomials -
$= 49x^2 + 28xy + 4y^2$ **A**

3) x ? y $= \frac{x^2}{y} + \frac{y^2}{x}$
4 ? 2 $= \frac{4^2}{2} + \frac{2^2}{4}$
$= \frac{16}{2} + \frac{4}{4}$
$= 8 + 1 = 9$ **E**

4) Smallest subset of the real numbers?
$\frac{\sqrt{25}}{\sqrt{9}} = \frac{5}{3}$, Not a natural number, whole number,
or integer, smallest subset is rational. **A**

5) y-intercept of the following equation.
$y = 2x^2 + 5x - 10$
There is a y-intercept of a graph when $x = 0$.
$y = 2(0)^2 + 5(0) - 10$, therefore $y = -10$
is the y-intercept. **D**

6) Solve for x, $|3x - 8| \le 20$,
$3x - 8 \le 20$ and $3x - 8 \ge -20$
$3x \le 28$ and $3x \ge -12$
$x \le \frac{28}{3}$ and $x \ge -4$
Therefore $-4 \le x \le \frac{28}{3}$ **C**

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7) Simplify - $\left(\dfrac{x^2y^{-5}}{x^3x^{-2}y^{10}}\right)^{-2}$

$= \left(\dfrac{x}{y^{15}}\right)^{-2}$

$= \dfrac{y^{30}}{x^2}$

$= x^{-2}y^{30}$

A = -2, B = 30

$\dfrac{A+B}{2} = \dfrac{-2+30}{2} = \dfrac{28}{2} = 14$ **B**

8) How many not parallel to $y = 3x + 5$?
Slope = 3, answers can't have a slope of 3.
i. $y + 3x = 5$, slope = -3, not parallel
ii. $6x = 2y - 1$, slope = 3, parallel
iii. $21x + 7y - 35 = 0$, slope = -3, not parallel
iv. $-y = 3x$, slope = -3, not parallel
i, iii, and iv are not parallel so answer is 3 are not parallel. **C**

9) i. If both f and g are negative numbers then their sum cannot be a natural number.
ii. As long as f>g then f-g must be in the set of whole numbers. For example - $(-5)-(-6)=1$, in reality the smallest value that f-g can have is 1.
iii. $f \times g$ must always be an integer as long as f and g are integers. It is closed under multiplication.
iv. $|f \times g|$ must not always be an element of N since if any of the numbers is 0 then the answer will be 0, and 0 is not in the set of natural numbers.
so ii and iii are true. **C**

10) $y = x^3 - 3x^2 - 45x - 81$
$x \in \{9, -3, -3\}$
The distinct roots are
9 and -3, so 9×-3 = -27 **A**

11) $D = Q - P$ and $4D - P = 2$
and $Q - 4D = 0$
$Q = 4D$, then $Q - P = 2$
and $Q - P = D$, so $D = 2$.
Then P = 6 and Q = 8
$17 = 6 + 8 + 2 + N$, so N=1
$8(.25) + 6(.01) + 2(.10) + 1(.05) = \$2.31$ **B**

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12) $y = \frac{kw}{\sqrt{xz}}$, $10a + 4a + a = 30$, $a = 2$
$w = 10a = 20, x = 4a = 8, z = a = 2$
$15 = \frac{20k}{\sqrt{2 \times 8}} = 5k, k = 3$ **D**

13) If g<30 then g=12, $g+1=13$ and $g-1=11$
$11+13=24$, $24-1=23$, which also is prime.
$f-g=24-1=23$. **B**

14) You want 7s to be as great as it can be so $7(3)=21$ is used, and since you are subtracting t you want 2t to be as small as possible. $2(-5)=-10$.
$7s-2t=7(3)-2(-5)=31$. **A**

15) (sum of first 5 tests)/5 = 84
(sum of last n tests)/n = 97
(sum of n+5 tests)/(n+5) = 89.5
$(n+5)(89.5) =$ (sum of n+5 tests)
(n+5)(89.5) = (97n)+(84)(5)
$n=4$ **D**

16) $\frac{1}{5}+\frac{-3}{2}+7=5.7$ $S_n = n\left(\frac{t_1+t_n}{2}\right)$, $t_n = t_1 + ((n-1)d)$
$t_n = 2+((21-1)2)=42$,
$21\left(\frac{42+2}{2}\right)=21(22)=462$ **B**

17) $P(x)=10x^3-57x^2-94x+21$
7 is one factor
$\frac{10x^3-57x^2-94x+21}{x-7} = 10x^2+13x-3$
Use the quadratic formula to get the other two roots.
$x \in \{\frac{1}{5}, \frac{-3}{2}, 7\}$, therefore the sum of the roots is $\frac{1}{5}+\frac{-3}{2}+7=5.7$ **E**

18) y = 3x+4 and y=x^2+6x+6
To find point of intersection set the equations equal to each other.
3x+4 = x^2+6x+6
0 = x^2+3x+2
roots of equation = -2 and –1
Get points from these x-values.
(-2,-2) and (-1, 1) **E**

19) x$y = 3y + x
32$15 = 3(15) + 32 = 77 **B**

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20) $6=3+2+1$ $6^2=36>30$
$(6)^3-(6)^2 = 180$ **C**

21) $20/.45 = x/.88$
$.45x = 17.6$
$x = 39.111$
x rounds up to 40 **B**

22) 3x + 20 = 10x – (sqrt(36))
$7x = 14$
$x = 2$ **C**

23) $A=3B=5C$
$A+C = 3B+(3/5)B$
$(18/5)B$ **A**

24) (R+R+20)/2 = average speed=48
2R+20=96, R=38 **A**

25) $A=3x+24$
$B=5x+10$
$3x+24=5x+10$
$2x=14$, $x=7$ **D**

26) $107/2 = 53.5$
so 53 and 54 are the integers
(5*3)+(5*4) = 15+20 = 35 **C**

27) $(x^3-x^2)/2 = 792$,
$(1728-144)/2 = 792$ **B**

28) I+11=2R
I-7=R
I+11=2(I-7)
25=I
25=R+7
R=18, I+R = 25+18 = 43 **D**

29) $24.20 = 2.2C + 3.3L
C=5, L=4
5+4=9 **C**

30) $$\frac{7\sqrt{48}-3\sqrt{27}+5\sqrt{125}}{\sqrt{8}} = \frac{7\sqrt{16\times 3}-3\sqrt{9\times 3}+5\sqrt{25\times 5}}{\sqrt{4\times 2}} = \frac{28\sqrt{3}-9\sqrt{3}+25\sqrt{5}}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$
$$= \frac{19\sqrt{6}+25\sqrt{10}}{4}$$ **A**