Florida INVITATIONAL at MIDDLETON Algebra I Team Questions February 23rd, 2008

1. Find all roots of the following equations:
   A) $5x^2+9x-7=0$
   B) $3x^2+14x+15=0$
   C) $x^3-3x^2-x+3=0$
   D) $2x^2-20x=-48$
2. Find the solutions to the following systems of equations
   A) $\begin{cases} 4x+7y=9 \\ 5y+3x=-1 \end{cases}$
   B) $\begin{cases} -7x+11y=-24 \\ 2x-6y=4 \end{cases}$
   C) $\begin{cases} 5x+4y-10=0 \\ 10x+8y-15=0 \end{cases}$
   D) $\begin{cases} 4x-13y=51 \\ 78y-24x=-306 \end{cases}$
3. Turn the following repeating decimals into equivalent fractions
   A) $.\overline{51}$
   B) $.2\overline{4}$
   C) $2.\overline{1}-1.\overline{45}$
   D) $4.\overline{78}$
4. Solve for x:
   A) $x+9<13$
   B) $\sqrt{x-1}<-3$
   C) $|x+4|>5$
   D) $\left(|x-1|+4\right)^2 \geq 36$
5. Given: $f(x)=2x^2-x-15$, $g(x)=\sqrt{21-2x}-4$, $h(x)=\dfrac{4}{x+3}+x+8$
   A) What is $f(3)+g(4)+h(5)$?
   B) What is $h(g(h(1)))$?
   C) What is $g(10)$?
   D) What is $g((f(f^{-1}(-15)))+1)$?
6. True or False?
   A) The whole numbers are a subset of the natural numbers
   B) -2 is an integer
   C) $\sqrt{4}$ is a rational number
   D) The absolute value of any integer is a natural number
7. A) Andrew has $4.50 in a total of 33 quarters, dimes, and nickels, and he has 3 more nickels than dimes. How many quarters does he have?

   B) Omar can canoe up a 10 mile river in $\frac{5}{4}$ of an hour and can canoe down the same river in $\frac{5}{8}$ of an hour. If he always canoes at the same speed and the river's current is 4mph, how fast, in miles per hour, is Omar canoeing?

   C) Mahesh needs to drain his swimming pool, and so he hired Leo to drain all of the water out of his pool. Leo could completely drain the pool if it were full in 8 hours. Sadly for Leo and Mahesh, it's raining, and the rain could fill the pool in 12 hours if it were totally empty and Leo wasn't around. How long will it take to drain the pool? The pool starts out completely filled.

7. continued

D) Haafiz decided to get Joseph back for disassembling his shoes one day, so he decided to hide some high-quality laxative in his milk the morning before a math competition. If the mixture is already 400mLs, 40 of which are laxative, how much more laxative must be added to make the mixture 85% milk?

8. Simplify the following expressions in prime factored form.

A) $2^4+2^4+2^4+2^4$

B) $\dfrac{3^6}{3^3\times 3^{-2}}$

C) $(11^2)^3$

D) $5^{\frac{1}{2}}\times 125^{\frac{1}{2}}$

9. Find the slope of each of the following lines

A) $y=3x+x+1$

B) $2x+3y=-4$

C) $-6x=2y+11$

D) $y=2$

10. A) What is the 17th prime number?

B) What is the biggest 3-digit prime number?

C) How many composite numbers are less than 30?

D) What is the average of the first 10 prime numbers?

11. A) Simplify by rationalizing the denominator of $\dfrac{3}{\sqrt{7}+2}$

B) Solve for x: $\sqrt{8+2x}=x$

C) Simplify : $\sqrt{1008}+\sqrt{343}$

D) Simplify: $\dfrac{2}{\sqrt{2}}\times\dfrac{8}{\sqrt{8}}\div\dfrac{32}{\sqrt{32}}$

12. A) How many factors does 96 have?

B) What is the greatest common factor of 384 and 288?

C) What is the prime factorization of 3960?

D) What is the smallest number with 12 factors?

13. Expand:

A) $(2x+3)(4x-2)$

B) $(3x-4)(6)(2x-1)$

C) $(2x+1)^2(5x-5)$

D) $(x-1)(2x+3)(x^2+x-4)$

14.A) 40 tickets are sold to a play that severely fell short of its expectations. An adult ticket costs \$7, and adult and child tickets are sold for more than \$7. Children cannot buy tickets for themselves because the play is rated R. If 13 children see the play (none of which snuck in), and \$280 in tickets are sold in total, how much would it cost for 3 adults and 2 children to see the play?

B) What is the slope of $2x-3y=6$?

C) What degree is $4^2x^2y^2zw^9$?

D) How many subsets are there for the set $\{0,\pi,e,101,-1337\}$?

Florida Invitational at Middleton Algebra 1 TEAM

SOLUTIONS

1.

$\frac{-9\pm\sqrt{221}}{10}$ A) By quadratic equation

$\frac{-5}{3},-3$ B) By factoring, $(3x+5)(x+3)$

$1,-1,3$ C) By grouping, $x^2(x-3)-1(x-3)=(x^2-1)(x-3)=(x+1)(x-1)(x-3)$

$6,4$ D) Factor out the GCF of 2, then factor. $2(x-6)(x-4)=0$

2.

$x=-52$
$y=31$ A) By elimination. $12x+21y=27$, $12x+20y=-4$, $y=31$, $155+3x=-1$, $x=-52$

$x=5$
$y=1$ B) By substitution. $x=3y+2$, $-21y-14+11y=-24$, $-10y=-10$, $y=1$, $2x-6=4$, $x=5$

No solutions C) The lines are parallel

All reals D) The lines are the same

3.

$\frac{17}{33}$ A) $\frac{51}{99}=\frac{17}{33}$

$\frac{11}{45}$ B) $\frac{2}{10}+\frac{4}{9}\times\frac{1}{10}=\frac{22}{90}=\frac{11}{45}$

$\frac{65}{99}$ C) $\frac{19}{9}-\frac{144}{99}=\frac{209}{99}-\frac{144}{99}=\frac{65}{99}$

$\frac{158}{33}$ D) $4\frac{78}{99}=4\frac{26}{33}=\frac{158}{33}$

4.

$x<4$ A)

No solutions B) A radical can never be smaller than a negative

$x>1$ OR $x<-9$ C) $x+4>5, x>1$; $-x-4>5, -x>9, x<-9$; $|x-1|+4\geq 6, |x-1|\geq 2$

$x\geq 3$ OR $x\leq -1$ D) $x-1\geq 2, x\geq 3$; $-x+1\geq 2, -x\geq 1, x\leq -1$

5.

$\frac{19}{2}+\sqrt{13}$ A) f(3)=0 g(4)= $\sqrt{13}$ -4 h(5)=27/2

Undefined B) h(1) = 10, g(10) = -3, h(-3) has a 0 in the denominator and therefore is undefined

-3 C) $\sqrt{(21-2\cdot 10)}=\sqrt{1}-4=-3$

3 D) $f(f^{-1}(-15))=-15+1=-14, g(-14)=3$

6.

False A) The whole numbers are the natural numbers and zero.

True B)

True C) $\sqrt{4}=2$

False D) The absolute value of 0 is not a natural number

7. 12 A) $4.5=.25q+.1d+.05n$ $4.35=.25q+.15d$ $3.15=.35d$ $9+3=12$
$q+d+n=33$
$n=d+3$
$q=30-2d$ $d=9$ $q+21=33, q=12$

12 B) 10 miles in $\frac{5}{4}$ of an hour is 8 mph, 10 miles in $\frac{5}{8}$ of an hour is 16 mph.
$x+4=16$
$x-4=8$
$x=12$,where x is the speed of Omar's canoeing.

24 C) Leo can drain $\frac{1}{8}$ th of the pool in an hour, the rain can fill $\frac{1}{12}$ th of the pool in an hour.
$\frac{1}{8}-\frac{1}{12}=\frac{1}{24}$ th of the pool is drained per hour. 24 hours to totally drain the pool

$\frac{400}{17}$ D) $\frac{40+x}{400+x}=\frac{15}{100}, 4000+100x=6000+15x$
$85x=2000, x=\frac{400}{17}$

8. 2^6 A) $4(2^4)=2\times2\times2^4=2^6$

3^5 B) $\frac{3^6}{3^1}=3^5$

11^6 C) $11^{2\times3}=11^6$

5^2 D) $5^{\frac{1}{2}}\times5^{\frac{1}{2}\times3}=5^{\frac{1}{2}}\times5^{\frac{3}{2}}=5^2$

9. 4 A)

$\frac{-2}{3}$ B) $3y=-2x-4, y=\frac{-2}{3}x-\frac{4}{3}$

-3 C) $-2y=6x+11, y=-3x-\frac{11}{2}$

0 D) A horizontal line

10. 59 A) 2,3,5,7,11,13,17,19,23,29,31,37,41,43,47,53,**59**

997 B)

18 C) 4,6,8,9,10,12,14,15,16,18,20,21,22,24,25,26,27,28

$\frac{129}{10}$ D) $\frac{2+3+5+7+11+13+17+19+23+29}{10}$

11. $\sqrt{7}-2$ A) $\frac{3}{\sqrt{7}+2}\times\frac{\sqrt{7}-2}{\sqrt{7}-2}=\frac{3\sqrt{7}-6}{3}=\sqrt{7}-2$

$x=4$ B) $x^2-2x-8=0$, $(x-4)(x+2)=0$, but -2 is extraneous.

$19\sqrt{7}$ C) $\sqrt{1008}=12\sqrt{7}$, $\sqrt{343}=7\sqrt{7}$, $12\sqrt{7}+7\sqrt{7}=19\sqrt{7}$

$\frac{\sqrt{2}}{2}$ D) $\frac{2}{\sqrt{2}}\times\frac{8}{2\sqrt{2}}=4\times\frac{4\sqrt{2}}{32}=\frac{\sqrt{2}}{2}$

12.

12	A) 1,2,3,4,6,8,12,16,24,32,48,96
96	B) $384 = 2^7 \times 3$, $288 = 2^5 \times 3^2$, GCF is $2^5 \times 3 = 96$
$2^3 \times 3^2 \times 5 \times 11$	C)
60	D) 1,2,3,4,5,6,10,12,15,20,30,60

13.

$8x^2 + 8x - 6$	A)
$36x^2 - 66x + 24$	B)
$20x^3 - 15x - 5$	C)
$2x^4 + 3x^3 - 10x^2 - 7x + 12$	D)

14.

35	A) $13x + 14(7) = 280, 13x = 192, x = 14$ where x is the cost of a child and adult going. So two of those tickets plus one adult ticket equals 35.
$\frac{2}{3}$	B) $\frac{-A}{B} = \frac{-2}{-3} = \frac{2}{3}$
14	C) Adding the exponents of the variables, 2+2+1+9=14
32	D) The amount of subsets in any set is 2^x where x is the number of terms in the set