Math 20 Unit #4 7.4 to 7.6; 8.1 to 8.5 Mathematician: _____

To the Test–be sure to bring:

(1) your personally-prepared 8 ½" by 11" study guide for this test
(2) your simple, non-graphing calculator and
(3) your pencils
(4) your BluGold ID

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1. Factor completely. Special case

Factor out negative and GCF

$-20x^2+20x-5$

$-5(4x^2-4x+1)$

square square

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

$5p^2+40p+80$

$5(p^2+8p+16)$

square square

$5(p+4)^2$

2. Factor completely. Special case

$64p^2-81$

square square

$(8p-9)(8p+9)$

$3p^2-75$

$3(p^2-25)$

$3(p-5)(p+5)$

3. Solve the equations: $(j+6)(j-7)=0$

$j+6=0$ or $j-7=0$

$-6=-6$ $+7=+7$

$j=-6$ $j=7$

$\{-6,7\}$

$(2g-9)(3g+7)=0$

$2g-9=0$ or $3g+7=0$

$+9=+9$ $-7=-7$

$\frac{2}{2}g=\frac{9}{2}$ $\frac{3}{3}g=\frac{-7}{3}$

$g=9/2$ $g=-7/3$

$\{-7/3, 9/2\}$

4. Solve the equation: $12s^2+36s=0$

$12s(s+3)=0$

$\frac{12}{12}s=\frac{0}{12}$ or $s+3=0$

$-3=-3$

$s=0$ $s=-3$

$\{-3,0\}$

$11d^2=-99d$

$11d^2+99d=0$

$11d(d+9)=0$

$\frac{11}{11}d=\frac{0}{11}$ or $d+9=0$

$-9=-9$

$d=0$ $d=-9$

$\{-9,0\}$

5. Solve the equation: $-70w - 280 = -35w^2$

$35w^2 - 70w - 280 = 0$

$35(w^2 - 2w - 8) = 0$

$\frac{35}{35}(w-4)(w+2) = \frac{0}{35}$

$(w-4)(w+2) = 0$

$w - 4 = 0$ or $w + 2 = 0$

$+4 = +4$ $\quad -2 = -2$

$w = 4$ or $w = -2$

$m \cdot n = -8$
$m + n = -2$ $\quad -4, 2$

* eliminate the constant factor

$\{-2, 4\}$

6. Develop the equation you need to solve this problem, list it, and solve the problem.
The product of two consecutive integers is 71 more than their sum. Find the integers.

$x, x+1$

$x(x+1) = x + (x+1) + 71$

$x^2 + x = 2x + 72$

$-2x - 72 = -2x - 72$

$x^2 - x - 72 = 0$

$(x-9)(x+8) = 0$

$x - 9 = 0$ or $x + 8 = 0$

$+9 = +9$ $\quad -8 = -8$

$x = 9$ $\quad x = -8$

$m \cdot n = 72$
$m + n = -1$
$8, -9$

$x = -8$
$x+1 = -7$
OR
$x = 9$
$x+1 = 10$

The product of two consecutive integers is 419 more than their sum. Find the integers.

$x, x+1$

$x(x+1) = x + (x+1) + 419$

$x^2 + x = 2x + 420$

$-2x - 420 = -2x - 420$

$x^2 - x - 420 = 0$

$m \cdot n = -420$
$m + n = -1$
$20, -21$

$(x+20)(x-21) = 0$

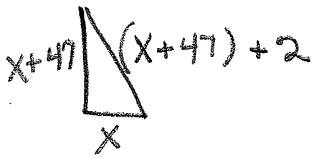
$x + 20 = 0$ or $x - 21 = 0$

$-20 = -20$ $\quad +21 = +21$

$x = -20$ $\quad x = 21$

$x = 21$
$x+1 = 22$
OR
$x = -20$
$x+1 = -19$

7. Develop the equation you need to solve this problem, list it, label the diagram, and then solve the problem.
The length of the longer leg of a right triangle is 47 cm longer than the shorter leg. The hypotenuse is 2 cm longer than the longer leg of the triangle. What are the lengths of the three sides of the triangle?



$a^2+b^2=c^2$

$x^2+(x+47)^2=(x+47+2)^2$

$x^2+(x+47)^2=(x+49)^2$

$x^2+x^2+94x+2209=x^2+98x+2401$

$-x^2-98x-2401=-x^2-98x-2401$

$x^2-4x-192=0$

$m \cdot n = -192$

$m+n=-4$

$-16, 12$

$(x-16)(x+12)=0$

$x-16=0$ or $x+12=0$

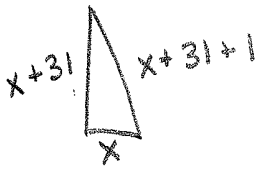
$x=16$ $x=-12$ ← makes no sense

$x=16\text{cm}$

$x+47=63\text{cm}$

$x+49=65\text{cm}$

The length of the longer leg of a right triangle is 31 inches longer than the shorter leg. The hypotenuse is 1 inch longer than the longer leg of the triangle. What are the lengths of the three sides of the triangle?



$x^2+(x+31)^2=(x+32)^2$

$x^2+x^2+62x+961=x^2+64x+1024$

$-x^2-64x-1024=-x^2-64x-1024$

$x^2-2x-63=0$

$m \cdot n = -63$

$m+n=-2$

$7, -9$

$(x-9)(x+7)=0$

$x-9=0$ or $x+7=0$

$+9=+9$ $-7=-7$

$x=9$ $x=-7$ makes no sense

$x=9''$

$x+31=40''$

$x+32=41''$

8. Write the following rational expression in its lowest terms.

$$\frac{8d-4}{28d-14}=\frac{4(2d-1)}{14(2d-1)}=\frac{4}{14}\div\frac{2}{2}=\frac{2}{7}$$

$$\frac{10d-15}{32d-48}=\frac{5(2d-3)}{16(2d-3)}=\frac{5}{16}$$

9. Write the following rational expressions in lowest terms.

$\frac{(n+3)(n+9)}{n^2+12n+27}$ / $n+3$

$= n+9$

$\frac{(n+3)(3n-2)}{6n^2+11n-10}$

$(2n-5)(3n-2)$

$= \frac{n+3}{2n-5}$

$3n^2+7n-6$

$m \cdot n = 3 \cdot -6 = -18$

$m+n = 7$ $\quad 9, -2$

$3n^2+9n-2n-6$

$3n(n+3)-2(n+3)$

$(n+3)(3n-2)$

$6n^2+11n-10$ $\quad m \cdot n = 6 \cdot -10 = -60$

$m+n = 11$ $\quad 15, -4$

$6n^2+15n-4n-10$

$3n(2n-5)-2(2n-5)$

$(2n-5)(3n-2)$

10. Multiply. Be sure to simplify your answer.

$\frac{(n+3)(n+9)}{n^2+12n+27} \cdot \frac{3}{n+9}$ / $n+3$

$= 3$

$\frac{(n+6)(n+1)}{n^2+7n+6} \cdot \frac{6}{n+6}$ / $n+1$

$= 6$

11. Divide. Be sure to simplify your answer.

$\frac{\frac{64x^2-9}{x^7}}{\frac{72x-27}{12x^3}} = \frac{64x^2-9}{x^7} \div \frac{72x-27}{12x^3}$

$= \frac{64x^2-9}{x^7} \cdot \frac{12x^3}{72x-27}$

$= \frac{(8x-3)(8x+3)}{x^{7-4}} \cdot \frac{12x^3}{9(8x-3)}$ (4, 3)

$= \frac{4(8x+3)}{3x^4}$

$\frac{\frac{4x^2-9}{x^7}}{\frac{50x-75}{20x^3}} = \frac{4x^2-9}{x^7} \div \frac{50x-75}{20x^3}$

$= \frac{4x^2-9}{x^7} \cdot \frac{20x^3}{50x-75}$

$= \frac{(2x-3)(2x+3)}{x^{7-4}} \cdot \frac{20x^3}{25(2x-3)}$ (4, 5)

$= \frac{4(2x+3)}{5x^4}$

12. Add and simplify if possible.

$$\frac{8N}{N+2}+\frac{16}{N+2} = \frac{8N+16}{N+2} = \frac{8(N+2)}{N+2} = 8$$

Do NOT Add Denominators

$$\frac{19}{N+3}+\frac{5N}{N+3}-\frac{4}{N+3} = \frac{5N+15}{N+3} = \frac{5(N+3)}{N+3} = 5$$

13. Combine and simplify if possible.

$$\frac{d^2+6}{(d+5)(d+3)}+\frac{3+6d}{(d+5)(d+3)} = \frac{(d+3)(d+3)}{(d+5)(d+3)} = \frac{d^2+6d+9}{(d+5)(d+3)} = \frac{d+3}{d+5}$$

must have common denominators

don't multiply until you are sure you can't reduce

$$\frac{d^2+67}{(d-4)(d-9)}-\frac{17d-5}{(d-4)(d-9)} = \frac{d^2-17d+67+5}{(d-4)(d-9)} = \frac{d^2-17d+72}{(d-4)(d-9)} = \frac{(d+8)(d-9)}{(d-4)(d-9)} = \frac{d+8}{d-4}$$

cannot reduce the 8 & 4 They are NOT factors.

14. Combine and simplify if possible. Leave the denominator in factored form.

must find common denominator

$$\frac{k+9}{8k-32}-\frac{2k+3}{k^2-13k+36}$$

$8(k-4)$ $(k-4)(k-9)$

LCD $= 8(k-4)(k-9)$

$$\frac{(k+9)(k-9)}{8(k-4)(k-9)}-\frac{8(2k+3)}{8(k-4)(k-9)}=\frac{k^2-81-16k-24}{(k+9)(k-9)-8(2k+3)\over 8(k-4)(k-9)}$$

$$=\frac{k^2-16k-105}{8(k-4)(k-9)}$$

check to see if any denominator factor goes into numerator

$$\frac{k+9}{8k-56}+\frac{2k+3}{k^2-9k+14}$$

$8(k-7)$ $(k-7)(k-2)$

$$\frac{(k+9)(k-2)}{8(k-7)(k-2)}+\frac{8(2k+3)}{8(k-7)(k-2)}=\frac{k^2+7k-18+16k+24}{8(k-7)(k-2)}$$

$$=\frac{k^2+23k+6}{8(k-7)(k-2)}$$

15. Divide and simplify if possible.

$$\frac{x+\frac{10}{x}}{\frac{x^2+10}{6}}=\frac{\frac{x^2+10}{x}}{\frac{x^2+10}{6}}=\frac{x^2+10}{x}\cdot\frac{6}{x^2+10}=\frac{6}{x}$$

$x+\frac{10}{x}$

$\frac{x^2+10}{x}$