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 $j-7=0$

$-6=-6$ $\quad +7=+7$

$j=-6$ $\quad j=7$

$\{-6,7\}$

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

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

$+9=+9$ $\quad -7=-7$

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

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

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

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

$12s(s+3)=0$

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

$-3=-3$

$s=-3$

$s=0$

$\{-3,0\}$

$11d^2=-99d$

$11d^2+99d=0$

$11d(d+9)=0$

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

$-9=-9$

$d=-9$

$d=0$

$\{-9,0\}$

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

$$35w^2 - 70w - 280 = 0$$
$$35(w^2 - 2w - 8) = 0$$
$$\frac{35(w-4)(w+2)}{35} = \frac{0}{35}$$
$$(w-4)(w+2) = 0$$
$$w - 4 = 0 \quad \text{or} \quad w + 2 = 0$$
$$+4 = +4 \qquad -2 = -2$$
$$w = 4 \quad \text{OR} \quad w = -2$$

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

* 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.

$x, x+1$

$$x(x+1) = x + (x+1) + 71$$
$$x^2 + x = 2x + 72$$
$$-2x - 72 = -2x - 72$$
$$x^2 - x - 72 = 0$$
$$(x-9)(x+8) = 0$$
$$x - 9 = 0 \quad \text{or} \quad x + 8 = 0$$
$$+9 = +9 \qquad -8 = -8$$
$$x = 9 \qquad x = -8$$

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

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

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

$x, x+1$

$$x(x+1) = x + (x+1) + 419$$
$$x^2 + x = 2x + 420$$
$$-2x - 420 = -2x - 420$$
$$x^2 - x - 420 = 0$$

$m \cdot n = -420$
$m + n = -1$

$20, -21$

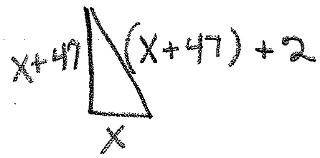
$$(x+20)(x-21) = 0$$
$$x + 20 = 0 \quad \text{or} \quad x - 21 = 0$$
$$-20 = -20 \qquad +21 = +21$$
$$x = -20 \qquad x = 21$$

$x = 21$
$x + 1 = 22$
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 $x+12=0$ ← makes no sense

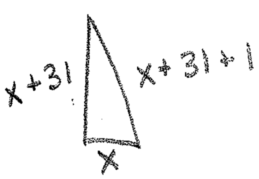
$x=16$ $x=-12$

$x=16\text{cm}$

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

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

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.

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

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

9. Write the following rational expressions in lowest terms.

$$\frac{\overbrace{n^2+12n+27}^{\cancel{(n+3)}(n+9)}}{\cancel{n+3}} = n+9$$

$$\frac{\overbrace{3n^2+7n-6}^{(n+3)(\cancel{3n-2})}}{\underbrace{6n^2+11n-10}_{(2n-5)(\cancel{3n-2})}} = \frac{n+3}{2n-5}$$

$3n^2+7n-6$

$m \cdot n = 3 \cdot {}^{-}6 = {}^{-}18$

$m+n = 7$

$9, -2$

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

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

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

$6n^2+11n-10$

$m \cdot n = 6 \cdot {}^{-}10 = {}^{-}60$

$m+n = 11$

$15, -4$

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

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

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

10. Multiply. Be sure to simplify your answer.

$$\frac{\overbrace{n^2+12n+27}^{\cancel{(n+3)}\cancel{(n+9)}}}{\cancel{n+3}} \bullet \frac{3}{\cancel{n+9}} = 3$$

$$\frac{\overbrace{n^2+7n+6}^{\cancel{(n+6)}\cancel{(n+1)}}}{\cancel{n+1}} \bullet \frac{6}{\cancel{n+6}} = 6$$

11. Divide. Be sure to simplify your answer.

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

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

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

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

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

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

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

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

12. Add and simplify if possible.

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

Do NOT Add Denominators

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

13. Combine and simplify if possible.

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

must have common denominators

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

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

$$d^2-17d+67+5$$

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

$$= \frac{d-8}{d-4}$$

cannot Reduce the 8 & 4 They are NOT factors.

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

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

must find common denominators

$8(K-4)$ $(K-4)(K-9)$

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

$$\frac{(K+9)(K-9)}{8(K-4)(K-9)}-\frac{8\,(2K+3)}{8\,(K-4)(K-9)} = \frac{\overbrace{(K+9)(K-9)-8(2K+3)}^{K^2-81-16K-24}}{8(K-4)(K-9)}$$

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

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.

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

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

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