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Date: Dec 8, 2021

Course: 101 College MATH

Nyack College

College Mathematics

Final Exam

A. Directions: Find all natural number factors of each number and also represent each as a product of its prime factors (i.e. prime factorization). Make sure to SHOW ALL WORK.

(1) 144 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72 and 144

2	144
2	72
2	36
2	18
2	9
3	3

prime factors

$$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

(2) 1024

1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024

Prime factor

$$1024 = 2 \times 2$$

2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8

(3) 1,560

1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 15, 20, 24, 26, 30, 39, 40, 52, 60, 65, 78, 104, 120, 130, 156, 195, 260, 312, 390, 520, 780, 1560

2	1560
2	780
2	390
3	130
5	26
13	2

prime factor

$$1560 = 2 \times 2 \times 2 \times 3 \times 5 \times 13$$

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1, 2, 3, 11, 12, 13, 33, 52, 66, 132, 156, 286, 429, 572

(4) 1,716 858 and 1716

2	1716
2	858
2	429
3	143
11	13

prime factors  
 $1,716 = 2 \times 2 \times 2 \times 3 \times 11 \times 13$

B. Directions: Find the LCM and GCF using the prime factorization method. Make sure to SHOW ALL WORK.

(5) 10 and 15

LCM  
 10, 20, 30, 40, 50  
 15, 30, 45, 60

LCM = 30  
 $2 \times 3 \times 5 = 30$   
 GCF = 5

GCF 2 | 5 3 | 5  
 $2 \times 5 = 10$   
 $3 \times 5 = 15$   
 GCF = 5

LCM 24 and 112  
 $2 \times 2 \times 2 \times 3 = 24$   
 $2 \times 2 \times 2 \times 2 \times 7 = 112$

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 7 = 336$   
 LCM = 336

(6) 24 and 112

GCF

2	24
2	12
2	6
2	3

2	112
2	56
2	28
2	14
2	7

$2 \cdot 2 \cdot 2 = 8$   
 GCF = 8

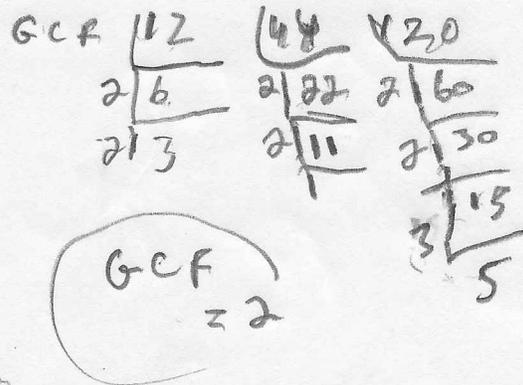
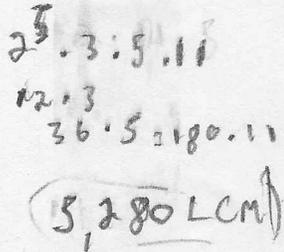
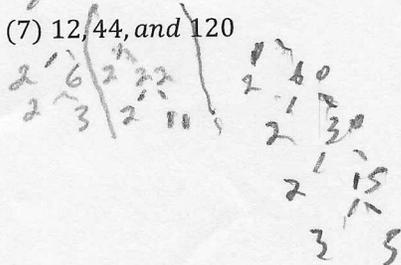
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LCM ↓

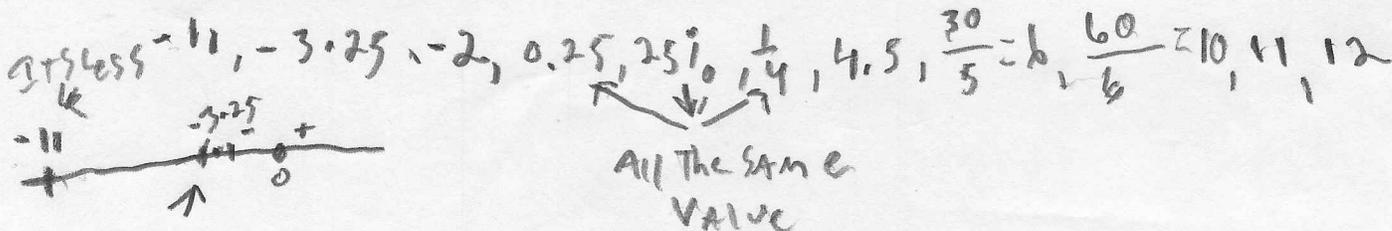
(7) 12, 44, and 120



C. Directions: List the following numbers from least and to greatest. SHOW ALL WORK.

(8)  $\{2, 3, -8, -\frac{30}{4}, 4.5, \frac{30}{5}, 205\%$   $-7.5 = 8 - \frac{30}{4} = -7.5$   $\frac{30}{5} = 6$   
 $-8, -\frac{30}{4} = -7.5, 205\%, 2, 3, 4.5, \frac{30}{5} = 6$

(9)  $\{0.25, 12, -3.25, -2, \frac{1}{4}, 4.5, \frac{30}{5}, 25\%, \frac{60}{6}, 11, -11\}$



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$$105\% = 1.05$$

(10)  $\{1.02, 3.75, 3\frac{3}{4}, \frac{30}{8}, 0.5, \frac{30}{5}, 105\%\}$

$0.5, 1.02, 1.05, \frac{30}{8} = 3\frac{6}{8}, 3.75, 3\frac{3}{4}, \frac{30}{5} = 6$

THE SAME VALUE

D. Directions: Perform the indicated operations, using the order of operations as necessary.  
SHOW ALL WORK.

(11)  $-2 - 15 = -17$

(12)  $19 - (-121) = 140$

~~1121~~

(13)  $(-6) - 12 = -18$

stays neg.

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(14)

$$(-3) + (-12) + 9$$

$$-3 - 12 + 9$$
$$-9 + 9 = 0$$

Just in case the signs weren't right  
I did it again  $\rightarrow (-3) + (-12) + 9 =$

$$-15 + 9 = -6$$

(15)

$$2[4 + (12 - 9)] \div 7$$

$$[4 + 3]$$
$$2(7)$$
$$14 \div 7 = 2$$

(16)

$$\frac{(-9) - (-(-12)) + 6}{6 \div 3} \quad (-9 - (+12)) + 6$$

$$-9 - 12$$
$$-21 + 6 = -15$$

$$\frac{27}{6 \div 3 = 2}$$

$$\frac{27}{2} = 13\frac{1}{2}$$
$$13.5$$

$$\frac{-15}{2} = -7\frac{1}{2} = -7.5$$

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E. Directions: Complete the following table. Fill in the missing blanks by converting decimals, fractions, and percentages. All fractions must be proper fractions and reduced in order to get full credit.

Percents	Decimals	Fractions
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35%  $\longrightarrow$  17. .35  $\longrightarrow$  18.  $\frac{7}{20}$

19. 40%  $\longrightarrow$  20. 0.4  $\longrightarrow$   $\frac{2}{5}$

21. 115%  $\longrightarrow$  1.15  $\longrightarrow$  22.  $\frac{115}{100}$   $\xrightarrow{\text{Reduce}}$   $\frac{23}{20}$   $\xrightarrow{\text{GCF } 5}$   $\frac{23}{4}$

$1.15 \times 100 = 115\%$

F. Directions: Solve each equation. Make sure to SHOW ALL WORK.

(23)  $3x + 12 - x = -2x - 16$

$$2x + 12 = -2x - 16$$

$2x$	$-12$	$+2x$	$-12$
$4x$	$=$	$-28$	
$4$		$4$	

$x = -7$

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(24)  $5(x + 15) = 10(x - 25)$

$$\begin{aligned} 5x + 75 &= 10x - 250 \\ -10x - 75 & \quad -10x - 75 \\ \hline -5x &= -325 \\ \frac{-5x}{-5} &= \frac{-325}{-5} \rightarrow x = 65 \end{aligned}$$

(25)  $8(x - 2) + 2(x - 3) = 18$

$$\begin{aligned} 8x - 16 + 2x - 6 &= 18 \\ 10x - 22 &= 18 \\ +22 &= 22 \\ \hline 10x &= 40 \\ \frac{10x}{10} &= \frac{40}{10} \quad x = 4 \end{aligned}$$

(26)  $-[4x - (5x + 2)] = 8(1 - x)$

distribute  $-(4x - 5x - 2) = 8(1 - x)$   
 $(-x + 2) = 8(1 - x)$   
 $x + 2 = 8(1 - x)$  rearrange  
 distribute  $x + 2 = 8(-x + 1)$   
 $x + 2 = -8x + 8$   
 $x + 2 = -8x + 8$   
 $x + 8x = 8 - 2$   
 $9x = 6$

$$\begin{aligned} x &= -8x + 2 \\ 8x &= -8x + 2 \\ 9x &= 2 \\ \frac{9x}{9} &= \frac{2}{9} \quad \text{simplify} \\ x &= \frac{2}{9} \end{aligned}$$

(27)  $\frac{3x}{4} + \frac{5x}{2} = 52$

$$\begin{aligned} 3x + 5x &= 52 \\ 4 \quad 2 \quad \text{common denominator} \\ 3x + 2 \cdot 5x &= 52 \\ 3x + 10x &= 52 \\ 13x &= 52 \end{aligned}$$

$$\begin{aligned} 13x &= 52 \\ \frac{13x}{13} &= \frac{52}{13} \\ x &= 4 \end{aligned}$$

Eliminate fraction multiply by 4

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G. Directions: Find each sum or difference. Make sure to SHOW ALL WORK.

(28)  $(4x^2 - 2x + 10) + (-2x^2 + 4x - 2)$

$$\begin{array}{r} 4x^2 - 2x + 10 \\ + (-2x^2 + 4x - 2) \\ \hline 2x^2 + 2x + 8 \end{array}$$

(29)  $(12 - 6x + 7) - (-2x^2 + 3x - 2)$

$$\begin{array}{r} 12 - 6x + 7 \\ - (-2x^2 + 3x - 2) \\ \hline 2x^2 - 9x + 21 \end{array}$$

(30)  $(12x^2 - 8x + 6) - (3x^2 - 2x + 4)$

$$\begin{array}{r} 12x^2 - 8x + 6 \\ - (3x^2 - 2x + 4) \\ \hline 9x^2 - 6x + 2 \end{array}$$

(31)  $5(3x^2 - 3x + 11) - 5(6x^2 - x + 10)$

$$\begin{array}{r} 15x^2 - 15x + 55 \\ - 30x^2 + 5x - 50 \\ \hline -15x^2 - 10x + 5 \end{array}$$

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H. Directions: C. Find each product. SHOW ALL WORK.

(32)  $(x - 4)(x + 4)$

$$x^2 - 4x + 4 - 16 = x^2 - 16$$

(33)  $(x + 4)(12x^3 - 3x^2 + x + 1)$

$$\begin{array}{r} 12x^4 - 3x^3 + x^2 + x \\ 48x^3 - 12x^2 + 4x + 4 \\ \hline 12x^4 + 45x^3 - 11x^2 + 5x + 4 \end{array}$$

(34)  $(x + 3)^2(y + 7)^2$

$$x^2y^2 + 14x^2y + 49y^2$$

$$(x+3)(x+3)$$

$$x^2 + 3x + 9$$

$$+ 3x$$
$$(x^2 + 6x + 9)$$

$$(y+7)(y+7)$$

$$y^2 + 7y + 49$$

$$+ 7y$$

$$(y^2 + 14y + 49)$$

$$x^2y^2 + 14x^2y + 49y^2 + 6xy^2 + 84xy + 294x + 9y^2 + 126y + 441$$

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I. Directions: Write the equation for line (in slope-y-intercept and standard forms) for the following points (SHOW ALL WORK):

(35)  $x_1, y_1$   $x_2, y_2$   
 $(10, 4)$  and  $(-3, 1)$

$$y - y_1 = m(x - x_1)$$

$$y - 4 = \frac{3}{13}(x - 10)$$

$$13y - 52 = 3x - 30$$

-3x	13y	-52	=	3x	-30
		+52		-3x	+30
				22	

$$-3x + 13y = 22$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 4}{-3 - 10} = \frac{-3}{-13} = \frac{3}{13}$$

$$m = \frac{3}{13}$$

$Ax + By = C$   
 $-3x + 13y = 22$   
 $Ax + By = C$

$$y = \frac{3x}{13} + \frac{22}{13}$$

(36)  $x_1, y_1$   $x_2, y_2$   
 $(-12, 4)$  and  $(1, -9)$

$$y - y_1 = m(x - x_1)$$

$$y - 4 = -1(x - (-12))$$

$$y - 4 = -1(x + 12)$$

$$y - 4 = -x - 12$$

+4	-1x	-4	=	-x	-16
		+4		+x	+16
				12	

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-9 - 4}{1 - (-12)} = \frac{-13}{13} = -1$$

$$m = -1$$

$$-1x + y = -16$$

or

$$y = -x - 16$$

$$y = -x - 16$$

$$y = -x - 16$$

$$-x + y = -16$$

$$y = -x - 16$$

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J. Directions: Factor each polynomial. SHOW ALL WORK.

(37)  $x^2 + 15x - 54$

$(x - 3)(x + 18)$   
 $x^2 + 18x - 54$   
 $-3x$   
-54  
-3 18

(38)  $x^2 - 12x + 27$

$(x - 9)(x - 3)$   
 $x^2 - 3x - 9x + 27$   
 $-9x$   
27  
-9 -3

(39)  $x^2 - 256$

$(x + 16)(x - 16)$   
REWRITE 256  
as  $16^2$   
 $x^2 - 16^2$

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K. Directions: Solve each system by elimination. SHOW ALL WORK.

(40)

$$\begin{array}{r} -6x + 15y = -33 \\ 6x + 14y = 16 \end{array}$$

$$\frac{21y = -17}{29}$$

$$\boxed{y = -0.586}$$

$$\begin{array}{r} -3(2x - 5y = 11) \\ 2(3x + 7y = 8) \end{array}$$

$$3x + 7\left(\frac{-17}{29}\right) = 8$$

$$\begin{array}{r} 3x - 4.103 = 8 \\ +4.103 \quad +4.103 \end{array}$$

$$3x = 12.103$$

$$\boxed{x = 4.03433}$$

(41)

$$\begin{array}{r} -15x - 20y = 30 \\ 15x + 9y = 3 \end{array}$$

$$\frac{-11y = 33}{-11}$$

$$\boxed{y = -3}$$

$$\begin{array}{r} -5(3x + 4y = -6) \\ 3(5x + 3y = 1) \end{array}$$

$$3x + 4(-3) = -6$$

$$\begin{array}{r} 3x - 12 = -6 \\ +12 \quad +12 \end{array}$$

$$\frac{3x = 6}{3}$$

$$\boxed{x = 2}$$

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L. Directions: Solve each system by substitution. SHOW ALL WORK.

(42)

$$\{(1, 3)\}$$

$$4x + y = 6$$

$$y = 2x$$

$$y = 2(1) = 2 = 2$$

$$4x + (2x) = 6$$

$$6x = 6 \quad | \div 6$$

$$x = 1$$

(43)

$$3x - 4y = -22$$

$$-3x + y = 0$$

$$+3x \quad +3x$$

$$y = 3x$$

$$3x - 4(3x) = -22$$

$$3x - 12x = -22$$

$$-9x = -22$$

$$x = \frac{22}{9}$$

$$x = 2.44$$

$$-3(2.44) + 3(2.44) = 0$$

$$-7.33 + 7.33 = 0$$

$$0 = 0$$

$$\left\{ \left( \frac{22}{9}, \frac{22}{9} \right) \right\}$$