Name_____ Block_____ Date _____

Factoring Polynomials Study Guide **(HONORS)**

Factor each polynomial completely. You must show ALL work to earn ALL credit.

1. $\frac{4x^2}{2x} - \frac{10x}{2x}$

$2x(2x-5)$

2. $\frac{3x^5}{3x^3} - \frac{39x^4}{3x^3} + \frac{90x^3}{3x^3}$

$3x^3(x^2-13x+30)$

$3x^3(x-3)(x-10)$

3. $\frac{14a^2b^2}{7ab} + \frac{35ab}{7ab} - \frac{21a^4b^3}{7ab}$

$7ab(2ab+5-3a^3b^2)$

4. $\frac{3xy}{3x} + \frac{3x}{3x} - \frac{5y}{-5} - \frac{5}{-5}$

$3x(y+1)-5(y+1)$

$(3x-5)(y+1)$

5. $\frac{2a^2}{2a} - \frac{4a}{2a} + \frac{a}{1} - \frac{2}{1}$

$2a(a-2)+1(a-2)$

$(2a+1)(a-2)$

6. $z^2 + 8z + 16$

$\frac{z^2}{z} + \frac{4z}{z} + \frac{4z}{4} + \frac{16}{4}$

$z(z+4)+4(z+4)$

$(z+4)(z+4)=(z+4)^2$

AC=16	
1	16
2	8
4	4

7. $\frac{5x^2}{5} + \frac{45x}{5} + \frac{40}{5}$

$5(x^2+9x+8)$

$5\left(\frac{x^2}{x} + \frac{8x}{x} + \frac{x}{1} + \frac{8}{1}\right)$

$5(x+8)(x+1)$

AC=8	
1	8
2	4

8. $x^2 - 14x + 13$

$\frac{x^2}{x} - \frac{x}{x} - \frac{13x}{-13} + \frac{13}{-13}$

$x(x-1)-13(x-1)$

$(x-13)(x-1)$

AC=13	
1	13
-1	-13

9. $\frac{4a^2}{4} - \frac{12a}{4} - \frac{16}{4}$

$4(a^2-3a-4)$

$4\left(\frac{a^2}{a} + \frac{a}{a} - \frac{4a}{-4} - \frac{4}{-4}\right)$

$4a(a+1)-4(a+1)$

$4(a-4)(a+1)$

AC=-4	
-1	4
-2	2

10. $2x^2 + 7x + 5$

$\frac{2x^2}{2x} + \frac{2x}{2x} + \frac{5x}{5} + \frac{5}{5}$

$2x(x+1)+5(x+1)$

$(2x+5)(x+1)$

AC=10	
1	10
2	5

Factor each polynomial completely.

11. $25x^2 - 121$

$(5x+11)(5x-11)$

12. If $4x^2 - 13x + 3$ is factored completely, one of the factors is?

A. $2x - 3$

B. $2x - 1$

C. $4x - 3$

D. $4x - 1$

$\frac{(4x^2}{x} \frac{-x)}{x}\frac{(-12x}{-3} \frac{+3)}{-3}$

$x(4x-1)-3(4x-1)$

$(x-3)(4x-1)$

13. Given the area, find the dimensions of each rectangle.

$Area = 3x^2 + 22x - 16$

Square feet

$ac = -48$

-1	48
-2	24
-3	16
-4	12
-6	8

$\frac{(3x^2}{x} \frac{-2x)}{x}\frac{(+24x}{8} \frac{-16)}{8}$

$x(3x-2)+8(3x-2)$

$(x+8)(3x-2)$

$L=x+8 \quad W=3x-2$

14. The length of a rectangular courtyard is the expression $3x - 2$. If the area is given by, $3x^2 + 4x - 4$, find the width of the room.

$ac = -12$

-1	12
-2	6
-3	4

$\frac{(3x^2}{x} \frac{-2x)}{x}\frac{(+6x}{2} \frac{-4)}{2}$

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

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

$W=x+2$

15. Which polynomial is prime?

A. $8x^2 - 2x$

B. $5x^2 + 6x + 1$

C. $x^2 + 1$

D. $9x^2 - 81$

16. Which expression is equivalent to $t^2 - 144$?

A. $(t + 12)(t - 12)$

B. $(t - 12)(t - 12)$

C. $(t - 36)(t - 4)$

D. $(t - 36)(t + 4)$

17. Select the two factors of $4x^3 - 17x^2 - 15$

$ac = -60$

-1	60
-2	30
-3	20
-4	15
-6	10

☐ $x^2 + 5$ ☐ $4x + 3$

☐ $x^2 - 5$ ☐ $4x - 3$

$\frac{(4x^3}{4x^2} \frac{-20x^2)}{4x^2}\frac{(+3x^2}{3} \frac{-15)}{3}$

$4x^2(x-5)+3(x-5)$

$(4x^2+3)(x-5)$

18. Factor the expression completely ;

$$\frac{4x^3}{4x^2} + \frac{12x^2}{4x^2} - \frac{25x}{25} - \frac{75}{25}$$

$$4x^2(x+3) - 25(x+3)$$

$$(4x^2-25)(x+3)$$

$$(2x+5)(2x-5)(x+3)$$

19. Simplify the expression below, then factor.

$$(2y-4)^2 - y(2y-2) + y^2 - 8$$

$$4y^2 - 16y + 16 - 2y^2 + 2y + y^2 - 8$$

$$3y^2 - 14y + 8$$

$$\frac{3y^2}{3y} - \frac{12y}{3y} - \frac{2y}{-2} + \frac{8}{-2}$$

$$3y(y-4) - 2(y-4)$$

$$(3y-2)(y-4)$$

$$4y^2 - 16y + 16$$

$$(2y-4)(2y-4)$$

20. A line $y = mx + b$, passes through the point $(6, 1)$ and is parallel to $2x - y = 6$. What is the value of b?

$2x - y = 6$

$-2x \quad -2x$

$\frac{-y}{-1} = \frac{-2x}{-1} + \frac{6}{-1}$

$y = 2x - 6$

$m = 2 \quad (6, 1)$

$y - 1 = 2(x - 6)$

$y - 1 = 2x - 12$

$+1 \quad +1$

$y = 2x - 11$

same slope

$b = -11$

21. Principal Legrand has 21 coins totaling \$3.45. If he only has dimes, d, and quarters, q, write and solve a system of equations to determine the number of coins Principal Legrand has.

d = dimes

q = quarters

$d + q = 21$

$-q \quad -q$

$d = 21$

$d + q = 21 \longrightarrow .10d + .10q = 2.10$

$.10d + .25q = 3.45 \quad (-) \quad .10d + .25q = 3.45$

$\frac{-.15q}{-.15} = \frac{-1.35}{-.15}$

$q = 9$

21 dimes

9 quarters

22. Sally scored a 73, 87, 81, and 97 on her first four tests. If her goal is to have an 86 test average, what must she score on her fifth test?

$$\frac{73 + 87 + 81 + 97 + n}{5} = 86$$

$$\frac{338 + n}{5} = 86$$

$338 + n = 430$

$n = 92$

23. What is the midpoint of the shortest side of the triangle with vertices $(0,0)$, $(-4,4)$, *and* $(2,8)$?

A B C

AC is shortest side.

mdpt: $(1, 4)$

	AB	BC	AC
length	$(0,0)(-4,4)$	$(-4,4)(2,8)$	$(0,0)(2,8)$
	$d=\sqrt{(-4-0)^2+(4-0)^2}$	$d=\sqrt{(2+4)^2+(8-4)^2}$	$d=\sqrt{(2-0)^2+(8-0)^2}$
	$d=\sqrt{(-4)^2+(4)^2}$	$d=\sqrt{(6)^2+(4)^2}$	$d=\sqrt{(2)^2+(8)^2}$
	$d=\sqrt{32}$	$d=\sqrt{40}$	$d=\sqrt{20}$

24. The local park needs to replace an existing fence that is **6** feet high. The function $f(x) = 200x + 7000$ models the cost for Fence Company A, where x represents the height of the fence. The table below shows the cost of building a fence with Fence Company B.

A → \$8200
B → 1500

	Input (length of fence in feet)	Output (cost of bill in dollars)	
	100	26,000	5200
+20	120	31,200	15600
+60	180	46,800	18200
+70	250	65,000	

slope

$m=260$

Which fence company charges more per foot? Company B

Which company is a better deal for the local park? Company B

25. Water is being pumped into a 12-foot cylindrical tank at a constant rate.

- The depth of the water is increasing linearly.
- At 2:00pm, the water depth was 4.3 feet.
- At 4:30pm, the water depth was 7.8 feet.

$(2, 4.3)(4.5, 7.8)$

$m=\frac{7.8-4.3}{4.5-2}=\frac{3.5}{2.5}=1.4$ ft per hour

What will the depth of the water be at 6:00 pm?

4:30pm → 6:00pm

$=1.5$ hours $\cdot$ 1.4 ft per hour

$=2.1$ feet

$7.8+2.1=9.9$ feet