Name: _____

Problems on Algebra

Making Connections Project, 2006

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1. Is the expression positive, negative, or zero?

	Positive	Negative	Zero
$2 - 10 + (-8)$			
$10 - (-8) - 2$			
$8 - 10 - 2$			
$-8 - 2 - (-10)$			

For each expression, explain how you could have predicted your answer without doing the calculation, if possible.

- $2 - 10 + (-8)$

- $10 - (-8) - 2$

- $8 - 10 - 2$

- $-8 - 2 - (-10)$

2. You are simplifying $7 - 2(3 - 8x)$. Which of the expressions are possible results after the first step?

	Possible	Not possible
$5(3 - 8x)$		
$7 - 2(-5x)$		
$7 - 6 - 16x$		
$7 - 6 + 16x$		

For each expression, explain why you made the choice you did.

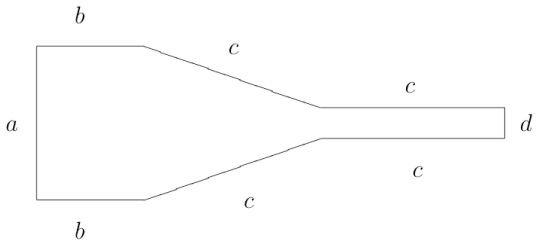
- $5(3 - 8x)$

- $7 - 2(-5x)$

- $7 - 6 - 16x$

- $7 - 6 + 16x$

3. Which expressions could represent the perimeter of the polygon below?



	Could represent the perimeter	Could not represent the perimeter
$a + b^2 + c^4 + d$		
$abbccccd$		
$a + 2b + 4c + d$		
ab^2c^4d		

For each expression, explain why you made the choice you did.

- $a + b^2 + c^4 + d$

- $abccdccb$

- $a + 2b + 4c + d$

- $a + b + c + c + d + c + c + b$

4. In the expressions below, a and x are positive numbers. For each expression explain the effect of increasing a: does the value of the expression increase, decrease, or remain unchanged?

	Increases	Decreases	Remains unchanged
$ax + 1$			
$x + a$			
$x - a$			
$a + x - (2 + a)$			

For each expression, explain why you made the choice you did.

- $ax + 1$

- $x + a$

- $x - a$

- $a + x - (2 + a)$

5. In (a)–(c),

   (i) Write an algebraic expression representing each of the given operations on a number b.

   (ii) Are the expressions equivalent? Explain what this tells you.

   (a) "Multiply by three"
   "Divide by one third"

   (b) "Multiply by one fifth"
   "Divide by five"

   (c) "Multiply by 0.4"
   "Divide by five halves"

6. Say whether each equation has a positive solution, a negative solution, a zero solution, or no solution.

		Solution is positive	Solution is negative	Solution is zero	No solutions
A	$7x = 5$				
B	$3x + 5 = 7$				
C	$5x + 3 = 7$				
D	$5 - 3x = 7$				
E	$3 - 5x = 7$				
F	$8x + 11 = 2x + 3$				
G	$11 - 2x = 8 - 4x$				
H	$8x + 3 = 8x + 11$				
I	$8x + 3x = 2x + 11x$				

Could you have predicted the answers for any of the equations without solving it? Which ones, and how?

7. You plan to drive 300 miles at 55 miles per hour, stopping for a two-hour rest. You want to know t, the number of hours the journey is going to take. Which of the following equations would you use?

(A) $55t = 190$
(B) $55 + 2t = 300$
(C) $55(t + 2) = 300$
(D) $55(t - 2) = 300$

Explain how you chose your answer.

8. To convert from miles to kilometers, Abby takes the number of miles, m, doubles it, then subtracts 20% of the result. Renato first divides the number of miles by 5, and then multiplies the result by 8.

   (a) Write an algebraic expression for each method.

   (b) Use your answer to part (a) to decide if the two methods give the same answer.

9. If the tickets for a concert cost $\$p$ each, the number of people who will attend is $2500 - 80p$. Which of the following best describes the meaning of the 80 in this expression?

   A. The price of an individual ticket.
   B. The slope of the graph of attendance against ticket price.
   C. The price at which no-one will go to the concert.
   D. The number of people who will decide not to go if the price is raised by one dollar.

   Explain how you chose your answer.

10. A peanut, dropped at time $t = 0$ from an upper floor of the Empire State Building, is at a height, h, in feet above the ground t seconds later given by

$$h(t) = -16t^2 + 1024.$$

What does the factored form

$$h(t) = -16(t - 8)(t + 8)$$

tell us about when the peanut hits the ground?

11. A street vendor of t-shirts finds that if the price of a t-shirt is set at $\$p$, the revenue from a days sales is $p(900 - 60p)$. She wants to choose the price that will yield the greatest revenue. The best form of this expression for figuring what price to set is

    A. $p(900 - 60p)$
    B. $-60(p - 7.5)^2 + 3375$
    C. $-60p(p - 15)$
    D. $900p - 60p^2$

    Explain how you chose your answer.

12. Say whether the equations have two solutions, one solution, or no solutions.

	Two solutions	One solution	No solutions	
A	$3(x-3)(x+2)=0$			
B	$(x-2)(x-2)=0$			
C	$(x+5)(x+5)=-10$			
D	$(x+2)^2=17$			
E	$(x-3)^2=0$			
F	$3(x+2)^2+5=1$			
G	$-2(x-1)^2+7=5$			

Could you have predicted the answers for any of the equations without solving it? Which ones, and how?