Lesson 5 Multi-step Factoring and Word Problems

Date:

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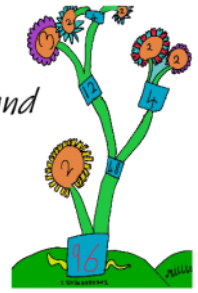
Factoring:
Multi-step Factoring and Word Problems



do the chant

common factoring

grouping

difference of squares

trinomial

Multi-Step Factoring

example:

$$2x^3 - 18x = 2x(x^2 - 9) \quad \leftarrow \text{remove the common factor}$$
$$= 2x(x+3)(x-3) \quad \leftarrow \text{difference of squares}$$

example:

$$4x(2x+3) + 4x^2 - 9 = 4x(2x+3) + (2x+3)(2x-3) \quad \leftarrow \text{difference of squares}$$
$$= (2x+3)[4x + (2x-3)] \quad \leftarrow \text{remove the common factor}$$
$$= (2x+3)(6x-3) \quad \leftarrow \text{reduce}$$
$$= (2x+3)\cdot 3(2x-1) \quad \leftarrow \text{remove the common factor}$$
$$= 3(2x+3)(2x-1)$$

Word problems

example #1

what is the perimeter of this rectangle if both dimensions can be expressed as binomials?

$P = 2(l+w)$

$A = 6x^2 + 7x - 24$

$6x^2 - 7x - 24$

$-16 + 9 = -7$

$-16 \times 9 = 144$

1	144
2	72
3	48
4	36
6	24
8	18
9	16
12	12

$6x^2 - 16x + 9x - 24$

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

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

$P = 2(5x-5)$

$= 10x - 10$ units

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

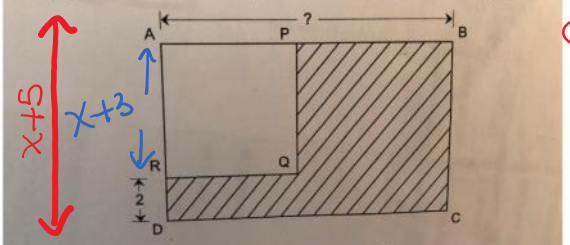
$(3x-8)(2x+3)$

$P=2((3x-8)+(2x+3))$ → $P=2(5x-5)$

$=10x-10$ units

example #2

In the following figure, segment RD is 2 units long. Quadrilateral ABCD is a rectangle. The polynomial x^2+6x+9 represents the area of square APQR. The polynomial $2x^2+8x-14$ represents the area of the shaded region.



What binomial represents the length of segment AB?

$\overline{AB} = 3x-1$

① x^2+6x+9

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

② Area ABCD

$(x^2+6x+9)+(2x^2+8x-14)$

$3x^2+14x-5$

③ $x+5 \overline{)\,3x^2+14x-5}$ → $3x-1$

$-(3x^2+15x)$

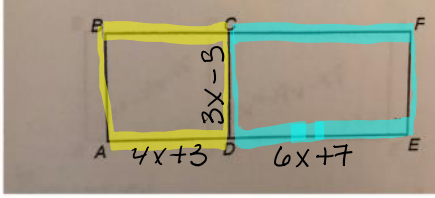
$-x-5$

$-x-5$

0

example #3

Rectangles ABCD and CDEF share a common side CD as shown below. The area of rectangle ABCD is given by the expression $(12x^2-11x-15)\,m^2$. The area of rectangle CDEF is given by the expression $(18x^2-9x-35)\,m^2$. What binomial corresponds to the length of segment AE?



① $12x^2-11x-15$

$-20+9=-11$

$-20\times 9=-180$

1	180
2	90
3	60
4	45
5	36
6	30
9	20
10	18
12	15

$12x^2-20x+9x-15$

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

$(3x-5)(4x+3)$ → has to be common side CD b/c 35 is not divisible by 3

$18x^2-9x-35$

② $6x+7 \overline{)\,18x^2-9x-35}$

$-(18x^2-30x)$

$21x-35$

$21x-35$

0

③ $(4x+3)+(6x+7)$

$10x+10$

OR

factor $18x^2-9x-35$

$18x^2+21x-30x-35$

$3x(6x+7)-5(6x+7)$

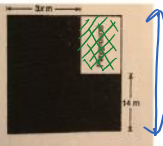
$(3x-5)(6x+7)$

shared side

+	−
1	630
2	315
3	210
5	126
6	105
7	90
9	70
14	45
15	42
18	35
21	30

example #4

A playground is built in one corner of a square-shaped park. The area of the park is given by the expression $(25x^2+10x+1)\,m^2$. **What is polynomial expression that corresponds to the area of the playground?**



5x+1

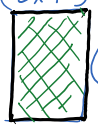
5x+1

① area of park is square ∴ PST

$25x^2+10x+1=(5x+1)(5x+1)$

$25x^2+10x+1 = (5x+1)(5x+1)$

② playground $(5x+1)-3x = 2x+1$



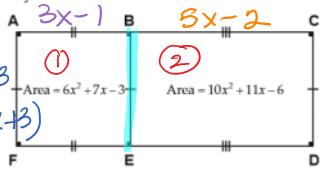
$(5x+1)-14$

$= 5x-13$

③ $A = (2x+1)(5x-13) = 10x^2-21x-13$

example #5 In the diagram below,

- The area of rectangle ABEF is represented by the trinomial $6x^2+7x-3$.
- The area of rectangle BCDE is represented by the trinomial $10x^2+11x-6$.



① $6x^2+7x-3$

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

$3x(2x+3)-1(2x+3)$

$(2x+3)(3x-1)$

② $10x^2+11x-6$

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

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

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

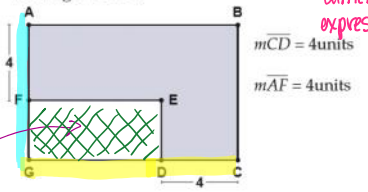
The lengths of the rectangles' bases and heights can be represented by binomials. What binomial represents the length of side AC?

③ $\overline{AC} = (3x-1)+(5x-2)$

$= 8x-3$

example #6 Given the diagram below, the polynomial $10x^2-x-2$ represents the area of the rectangle DEFG.

assume that dimensions can be expressed as binomials



$m\overline{CD} = 4$units

$m\overline{AF} = 4$units

What is the polynomial that represents the area of the shaded region?

① Factor Area

$10x^2-x-2$

$10x^2-5x+4x-2$

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

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

② $FG = (2x-1)+4$

$= 2x+3$

$GD = (5x+2)+4$

$= 5x+6$

③ Area ABCG

$(2x+3)(5x+6)$

$10x^2+12x+15x+18$

$10x^2+27x+18$

④ ABCG − DEFG

$(10x^2+27x+18)-(10x^2-x-2)$

$28x+20$ units^2

you can now do:

WB

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