a) $x^2 + 11x + 30$

← simple

b) $x^2 + x - 56$

$$\_ \cdot \_ = -56$$
$$\_ + \_ = 1$$

c) $2x^2 - 5x - 3$

→ not simple

d) $3x^2 + 10x - 8$

e) $2x^2 + 4x - 6$
$= 2(x^2 + 2x - 3)$

f) $2x^2 + 18x - 44$
$= 2(x^2 + 9x - 22)$
$= 2(x + 11)(x - 2)$

g) $6x^2 + 7x - 5$

h) $2x^2 - 13x - 24$

3.6a Factoring Complex Trinomials: $ax^2 + bx + c$

I. Factoring a common binomial:

2 terms

a) $xA + yA$

$= A(x+y)$

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

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

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

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

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

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

II. Factoring $ax^2 + bx + c$:

ex. $6x^2 + 7x + 2$ — **One method** → represent the trinomial by an area model

	$3x$	2
$2x$	$6x^2$	$4x$
1	$3x$	2

Another method **is called decomposition**

$6x^2 + 7x + 2$

$6 \times 2 = 12$

$3 \cdot 4 = 12$

$3 + 4 = 7$

$7x$

$6x^2 + 3x + 4x + 2$

* Find the product of __ac__

* Find 2 factors of __ac__ that have a sum of __b__

* decompose the middle term with these two factors

$(6x^2 + 3x) + (4x+2)$

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

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

* group the __first__ 2 terms and __second__ 2 termes
* common factor each group

* factor the common binomial from the two parts and write the expression as the product of 2 binomials

ex. $6x^2 - 13x + 5$

30

$-10 \cdot -3 = 30$

$-10 + -3 = -13$

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

$= 2x(3x-5) - 1(3x-5)$

$= (3x-5)(2x-1)$

try: $10x^2 - 11x - 6$

$-15 \cdot \dfrac{4}{} = -60$

$-15 + \dfrac{4}{} = -11$

$= (10x^2 - 15x) + (+4x - 6)$ $= (10x^2 + 4x) + (-15x - 6)$

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

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

III. My favourite: *Factoring by inspection*

ex. $4x^2 - 4x - 15$

$10x$

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

$-6x$

$+4x$

didn't work but is very close... switch the signs!

$-10x$

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

$+6x$

$-4x$

* *write two parentheses that will eventually contain your two binomial factors*

* *place 2 possible factors of ax^2 at the beginning of each parenthesis*

* *place 2 possible factors of c at the end of each parenthesis*

* *execute a mental distribution to determine the value of the resulting middle term; if it matches the original trinomial you're finished, if not, rearrange the factors and try again*

* *Inspection works well when the dominant coeficient (a) or the constant term (c) are prime numbers*

Ex. Try these with methods II and III

a) $2x^2 - 9x - 18$ b) $9x^2 - 21x + 10$

$-15 \cdot -6 = 90$

$-15 + -6 = -21$

$= (2x + 3)(x - 6)$

$3x$

$-12x$

$= (9x^2 - 15x) + (-6x + 10)$

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

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

Check your understanding: pg. 177 #(5-23)aceg