Module 3 Lesson 4

Try This 2 Possible Solutions

Remember fill in your P/S chart in an ORDERED fashion, dividing by 1, 2, 3…. until you have the entire set of factors.

19. a) $14y^2-13y+3$

**** Since the product is positive and the sum is negative, we will need two negative numbers for our Product and Sum numbers.**

Product 14x3 =42	Sum -13
-1 x -42	-43
-2 x -21	-23
-3 x -14	-17
-4 doesn't work	
-5 doesn't work	
-6 x -7	-13

$14y^2-13y+3 = 14y^2 - 6y - 7y + 3$

$= (14y^2 - 6y) + (-7y + 3)$

$= 2y(7y - 3) - 1(7y - 3)$

$= (7y - 3)(2y - 1)$

** Note we can put the P/S numbers in the other order and then the solution would look like this:

$14y^2-13y+3 = 14y^2 - 7y - 6y + 3$

$= (14y^2 - 7y) + (6y + 3)$

$= 7y(2y - 1) - 3(2y - 1)$

$= (2y - 1)(7y - 3)$

This is the same answer – the brackets are just in opposite order.

b) $10p^2 - 17p - 6$

Since the product is negative, we are looking for one positive and one negative factor.

Product 10x -6 = -60	Sum -17
1 x -60	-59

-1 x 60	59
2 x -30	28
-2 x 30	- 28
3 x -20	-17

We can stop filling in the P/S chart as we have found our numbers…

$10p^2 – 17p – 6 = (10p^2 – 20p) + (3p – 6)$

$= 10p(p – 2) + 3(p – 2)$

$= (p – 2)(10p + 3)$

c) $10r^2 – 33r – 7$

Since the product is negative, we are looking for one positive and one negative factor.

Product 10 x -7 = -70	Sum -33
1 x -70	--69
-1 x 70	69
2 x -35	-33

**** yeah – we can stop as we have found our numbers****

$10r^2 – 33r – 7 = 10r^2 + 2r - 35r – 7$

$= 2r (5r +1) – 7(5r + 1)$ ** note the second numbers in each bracket are 1's not 0's.

$= (5r + 1) (2r – 7)$

d) $15g^2 – g – 2$

Since the product is negative, we are looking for one positive and one negative factor.

Product 15 x -2 = -30	Sum -1
1 x -30	-29
-1 x 30	29
2 x -15	-13
-2 x 15	13

3 x -10	-7
-3 x 10	7
4 doesn't work	
5 x -6	-1

Whew – finally we found it!!

$15g^2 – g – 2 = 15g^2 + 5g - 6g – 2$

$= 5g(3g + 1) + 2 (3g – 1)$

$= (3g + 1) (5g – 2)$

e) $4x^2 + 4x – 15$

Since the product is negative, we are looking for one positive and one negative factor.

Product 4 x -15 = -60	Sum 4
1 x -60	-59
-1 x 60	59
2 x -30	-28
-2 x 30	28
3 x -20	-17
-3 x 20	17
4 x -15	-11
-4 x 15	11
5 x -12	-7
-5 x 12	7
6 x -10	4
-6 x 10	4

Wow – finally!! This takes a while but is a fool proof way of finding the P/S numbers.

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

$= (4x^2 - 6x) + (10x – 15)$

$= 2x (2x – 3) + 5(2x – 3)$

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

f) $9d^2 – 24d + 16$

**** Since the product is positive and the sum is negative, we will need two negative numbers for our Product and Sum numbers.**

Product 9x 16 =144	Sum -24
-1 x -144	-145
-2 x -72	-74
-3 x -48	-51
-4 x -36	-40
-6 x -24	-30
-8 x -18	-26
-9 x -16	-25
-12 x -12	-24

**** note – now just leave out the numbers that do not divide evenly as you work through the chart****

$9d^2 – 24d + 16 = 9d^2 – 12d – 12d + 16$

$= (9d^2 – 12d) + (– 12d + 16)$

$= 3d(3d – 4) – 4(3d – 4)$

$= (3d – 4) (3d – 4)$ or $(3d – 4)^2$

**** when the numbers in the chart turn out to be the same number, we always get a binomial squared as the answer****

g) $9t^2 + 12t + 4$

**** Since the product and sum are positive, we will need two positive numbers for our Product and Sum numbers.**

Product 9 x 4 = 36	Sum 12
1 x 36	37
2 x 18	20
3 x 12	15
4 x 9	13
6 x 6	12

$9t^2 + 12t + 4 = 9t^2 + 6t + 6t + 4$

$= (9t^2 + 6t) + (6t + 4)$

$= 3t(3t + 2) + 3(3t + 2)$

$= (3t + 2)(3t + 2)$

Same comment as above: **** when the numbers in the chart turn out to be the same number, we always get a binomial squared as the answer****

h) $40y^2 + y - 6$

Since the product is negative, we are looking for one positive and one negative factor.

**** NOW that you have had significant practice with finding the numbers, you may be able to find the numbers with just the use of your calculator. If not, always write the product/sum chart.**

Product 40 x -6 = -240	Sum 1
1 x -240	-239
-1 x 240	239
2 x -120	-117
-2 x 120	117
3 x -80	-77
-3 x 80	77

4 x -60	-56
-4 x 60	56
5 x -48	-43
-5 x 48	43
6 x -40	-34
-6 x 40	34
8 x -30	-22
-8 x 30	22
10 x -24	-12
-10 x 24	12
12 x -20	-8
-12 x 20	8
15 x -16	-1
-15 x 16	1

Of course – the last one of tons of factors….

$40y^2 + y - 6 = 40y^2 - 15y + 16y - 6$

$= (40y^2 - 15y) + (16y - 6)$

$= 5y(8y - 3) + 2(8y - 3)$

$= (8y - 3)(5y + 2)$

i) $24c^2 + 26c – 15$

Now let's get smarter about our work – since the sum is positive, the larger number is positive, so we will not write both sets of positive/ negative factors here to save time.

Product 24 x -15 = -360	Sum 26
-1 x 360	359
-2 x 180	178
-3 x 120	117
-4 x 90	86
-5 x 72	67
-6 x 60	54
-8 x 45	37
-9 x 40	33
-10 x 36	26

$24c^2 + 26c – 15 = 24c^2 + 26c - 10c – 15$

$= (24c^2 + 26c) + (- 10c – 15)$

$= 12c (2c + 3) – 5(2c + 3)$

$= (2c + 3) (12x – 5)$

j) $8x^2 + 14x – 15$

Same strategy as the last question: since the sum is positive, the larger number is positive, so we will not write both sets of positive/ negative factors here to save time.

Product 8x -15 = -120	Sum 14
-1 x 120	119
-2 x 60	58
-3 x 40	37
-4 x 30	26

-5 x 24	19
-6 x 20	14

$8x^2 + 14x - 15 = (8x^2 - 6x) + (20x - 15)$
$= 2x(4x - 3) + 5(4x - 3)$
$= (4x - 3)(2x + 5)$

20. a) $4s^2 + \_\_ s + 3$

We need to find all sets of factors of 4 x 3 = 12. Since we do not know the middle sum, there will be several answers. Also, since we have a positive product, both numbers could be positive or both numbers could be negative.

Product	Numbers	Sum
$4 \times 3 = 12$	1, 12	13
	2, 6	8
	3, 4	7
	$-1, -12$	-13
	$-2, -6$	-8
	$-3, -4$	-7

c) $6y^2 + \_\_\_ y - 9$

We need to find all sets of factors of 6 x -9 = -54. Since we have a negative product, one factor will be positive and one factor will be negative.

Product	Numbers	Sum
$6 \times (-9) = -54$	$1, -54$	-53
	$2, -27$	-25
	$3, -18$	-15
	$6, -9$	-3
	$9, -6$	3
	$18, -3$	15

	$27, -2$	25
	$54, -1$	53

e) $9z^2 +$ ___ $z + 1$

We need to find all sets of factors of 9 x 1 = 9. Since we do not know the middle sum, there will be several answers. Also, since we have a positive product, both numbers could be positive or both numbers could be negative.

Product	Numbers	Sum
$9 \times 1 = 9$	1, 9	10
	3, 3	6
	$-1, -9$	-10
	$-3, -3$	-6

f) Here, we assume that both numbers are identical. Therefore, their product will be positive. Since both numbers have the same sign, there are only two pairs of integers that will work:

1 and 1, or -1 and -1.