

There is handout on the course webpage for this unit. Make sure you have looked at it before attempting these problems.

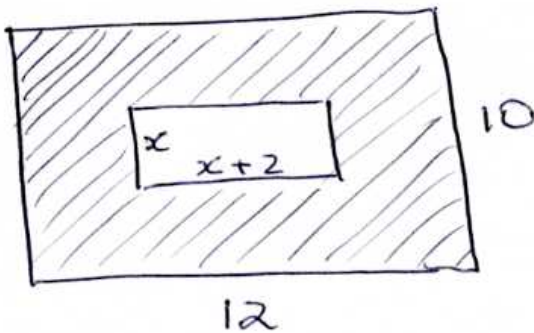
$$x^2 + bx + c = (x + m)(x + n) \text{ where } m \text{ and } n \text{ are two numbers whose product is } c \text{ and sum is } b.$$

So factoring  $x^2 + bx + c$  is reduced to finding two numbers whose product is  $c$  and sum is  $b$ . These types of problems are cooked up so that you can find these two numbers (when you can't, you have to use the quadratic formula).

Remember, you can check your answers by multiplying out.

### Questions

1. Factor  $x^2 + 11x + 30$ .
2. Factor  $x^2 - 6x + 8$ .
3. Factor  $x^2 + 18x + 72$ .
4. Factor  $x^2 + 9x + 20$ .
5. Factor  $a^2 - 13a + 30$ .
6. Factor  $x^2 + 9x - 36$ .
7. Factor  $x^2 - 16xy + 63y^2$ .
8. Factor  $4x^2 + 28x + 40$ .
9. Factor  $3x^2 - 12x - 63$ .
10. Factor  $3x^2 - 33x + 54$ .
11. Find a polynomial in factored form for the shaded area in the following rectangular region:



### Solutions

1. Two numbers whose product is 30 and sum is 11: 5, 6.

$$x^2 + 11x + 30 = (x + 5)(x + 6)$$

2. Two numbers whose product is 8 and sum is  $-6$ :  $-2$ ,  $-4$ .

$$x^2 - 6x + 8 = (x - 2)(x - 4)$$

3. Two numbers whose product is 72 and sum is 18: 12, 6.

$$x^2 + 18x + 72 = (x + 12)(x + 6)$$

4. Two numbers whose product is 20 and sum is 9: 5, 4.

$$x^2 + 9x + 20 = (x + 5)(x + 4)$$

5. Two numbers whose product is 30 and sum is  $-13$ :  $-3$ ,  $-10$ .

$$a^2 - 13a + 30 = (a - 3)(a - 10)$$

6. Two numbers whose product is  $-36$  and sum is 9: 12,  $-3$ .

$$x^2 + 9x - 36 = (x + 12)(x - 3)$$

7. Just let  $y$  carry along. Two numbers whose product is  $63y^2$  and sum is  $-16y$ :  $-7y$ ,  $-9y$ .

$$x^2 - 16xy + 63y^2 = (x - 7y)(x - 9y)$$

8. Factor first to get  $a = 1$ . Two numbers whose product is 10 and sum is 7: 5, 2.

$$\begin{aligned} 4x^2 + 28x + 40 &= 4(x^2 + 7x + 10) \\ &= 4(x + 5)(x + 2) \end{aligned}$$

9. Factor first to get  $a = 1$ . Two numbers whose product is  $-21$  and sum is  $-4$ :  $-7$ , 3.

$$\begin{aligned} 3x^2 - 12x - 63 &= 3(x^2 - 4x - 21) \\ &= 3(x - 7)(x + 3) \end{aligned}$$

10. Factor first to get  $a = 1$ . Two numbers whose product is 18 and sum is  $-11$ :  $-2$ ,  $-9$ .

$$\begin{aligned} 3x^2 - 33x + 54 &= 3(x^2 - 11x + 18) \\ &= 3(x - 2)(x - 9) \end{aligned}$$

- 11.

$$\begin{aligned} \text{shaded area} &= (12)(10) - x(x + 2) \\ &= 120 - x^2 - 2x \\ &= -x^2 - 2x + 120 \\ &= -1(x^2 + 2x - 120) \text{ find two numbers product is } -120 \text{ sum is } 2: 12, -10 \\ &= -1(x + 12)(x - 10) = (x + 12)(10 - x) \end{aligned}$$