

APPLICATIONS OF QUADRATIC EQUATIONS

= Integer Problems

RECALL: • consecutive integers are of the form

$$x, x+1, x+2, \dots$$

consecutive odd integers AND

consecutive even integers are of the form

$$x, x+2, x+4, \dots$$

EXAMPLE 1: Find two consecutive integers whose product is 11 more than their sum.

We must translate into math terms:

"two consecutive integers" $\rightarrow x$ & $x+1$

"product" \rightarrow multiplication

"is" $\rightarrow =$

"11 more than" $\rightarrow +11$

"sum" \rightarrow addition

so our equation is

$$x(x+1) = x + (x+1) + 11$$

Now we solve for x :

• simplify each side first:

$$x^2 + x = 2x + 12$$

• set equal to zero:

$$x^2 + x = 2x + 12$$
$$\underline{-2x - 12 \quad -2x - 12}$$
$$x^2 + x - 2x - 12 = 0$$
$$x^2 - x - 12 = 0$$

• Factor:

$$a = 1$$

$$b = -1$$

$$c = -12$$

$$a \cdot c = -12$$

sum (we want -1)

$$1 \quad -12 \quad -11$$

$$2 \quad -6 \quad -4$$

$$4 \quad -3 \quad 1$$

$$-4 \quad 3 \quad -1$$

since $a=1$, we can use the short cut

$$(x-4)(x+3) = 0$$

• set each factor equal to zero

$$x-4 = 0 \quad x+3 = 0$$

• solve for x:

$$x-4 = 0 \quad x+3 = 0$$

$$+4 \quad +4 \quad -3 \quad -3$$

$$x = 4 \quad x = -3$$

We can check to see if both values
we got solve the word problem:

- $x=4$

If $x=4$, the two consecutive integers
are 4 and 5

PRODUCT: $4 \cdot 5 = 20$

SUM: $4 + 5 = 9$

IS the Product 11 more than the sum?

$$20 = 9 + 11$$

Yes! so $x=4$ is an answer.

- $x=-3$

If $x=-3$, the two consecutive integers
are -3 and -2

PRODUCT: $(-3)(-2) = 6$

SUM: $(-3) + (-2) = -5$

IS the Product 11 more than the sum?

$$6 = -5 + 11$$

Yes! so $x=-3$ is also an answer.

APPLICATIONS OF QUADRATIC EQUATIONS

= INTEGER PROBLEMS PRACTICE PROBLEM

Find two consecutive integers whose product is 1 more than their sum.