Math 20-1 KEY

Lxx – Worksheet – 4.2 Factoring Quadratic Equations

Pg 230 #3: Factor completely.

$x^2 + x - 20$

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

$\square + \square = 1$
$\square \times \square = -20$

1, 20
2, 10
4, 5

$x^2 - 12x + 36$

$(x-6)(x-6)$

or

$(x-6)^2$

$\frac{1}{4}x^2 + 2x + 3$

$\frac{1}{4}(x^2+8x+12)$

$\frac{1}{4}(x+2)(x+6)$

$\square + \square = 8$
$\square \times \square = 12$

1, 12
2, 6
3, 4

$2x^2 + 12x + 18$

$2(x^2+6x+9)$

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

$2(x+3)^2$

Pg 230 #4ac: Factor each expression.

$4y^2 - 9x^2$

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

$\frac{1}{4}s^2 - \frac{9}{25}t^2$

$(\frac{1}{2}s - \frac{3}{5}t)(\frac{1}{2}s + \frac{3}{5}t)$

Pg 230 #5ac: Factor each expression.

$(x+2)^2 - (x+2) - 42$

Let $y = (x+2)$

$y^2 - y - 42$

$(y+6)(y-7)$

$(x+2+6)(x+2-7)$

$(x+8)(x-5)$

$\square + \square = -1$
$\square \times \square = -42$

1, 42
2, 21
3, 14
6, 7

$(4j-2)^2 - (2+4j)^2$

$[(4j-2)+(2+4j)][(4j-2)-(2+4j)]$

$[4j-2+2+4j][4j-2-2-4j]$

$[8j][-4]$

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Pg 230 #7ace: Solve each factored equation.

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

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

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

So $x=-4$ or -3

$(x+7)(x-8)=0$

$x+7=0$ $\quad x-8=0$

$x=-7$ $\quad x=8$

So $x=-7, 8$

$(3x+1)(5x-4)=0$

$3x+1=0$ $\quad 5x-4=0$

$3x=-1$ $\quad 5x=4$

$x=-1/3$ $\quad x=4/5$

Pg 230 #8ace: Solve each quadratic equation by factoring. ~~Check your answers~~.

$10n^2-40=0$

$10(n^2-4)=0$

$10(n+2)(n-2)=0$

$n+2=0$ $\quad n-2=0$

$n=-2$ $\quad n=2$

$n=-2, 2$

$3w^2+28w+9=0$

$\square+\square=28$

$\square\times\square=27$

$1, 27$

$3, 9$

$3w^2+1w+27w+9=0$

$(3w^2+1w)+(27w+9)=0$

$w(3w+1)+9(3w+1)=0$

$(3w+1)(w+9)=0$

$3w+1=0$ $\quad w+9=0$

$w=-1/3$ $\quad w=-9$

$w=-9, -1/3$

$d^2+\frac{5}{2}d+\frac{3}{2}=0$

$\frac{1}{2}(2d^2+5d+3)=0$ $\quad 2, 3$ $\quad \square+\square=5$ $\quad \square\times\square=6$

$\frac{1}{2}[2d^2+2d+3d+3]=0$

$\frac{1}{2}[(2d^2+2d)+(3d+3)]=0$

$\frac{1}{2}[2d(d+1)+3(d+1)]=0$

$\frac{1}{2}(d+1)(2d+3)=0$

$d+1=0$ $\quad 2d+3=0$

$d=-1$ $\quad 2d=-3$

$d=-3/2$

$d=-1, -3/2$

Pg 230 #10ace: Solve each equation.

$42=x^2-x$

$0=x^2-x-42$ $\quad \square+\square=-1$ $\quad \square\times\square=-42$

$0=(x-7)(x+6)$

$x-7=0$ $\quad x+6=0$

$x=7$ $\quad x=-6$

$x=-6, 7$

$y^2+4y=21$

$y^2+4y-21=0$ $\quad -3, +7$ $\quad \square+\square=4$ $\quad \square\times\square=-21$

$(y-3)(y+7)=0$

$y-3=0$ $\quad y+7=0$

$y=3$ $\quad y=-7$

$y=-7, 3$

$3x^2+9x=30$

$3x^2+9x-30=0$

$3(x^2+3x-10)=0$ $\quad -2, +5$ $\quad \square+\square=3$ $\quad \square\times\square=-10$

$3(x-2)(x+5)=0$

$x-2=0$ $\quad x+5=0$

$x=2$ $\quad x=-5$

$x=-5, 2$

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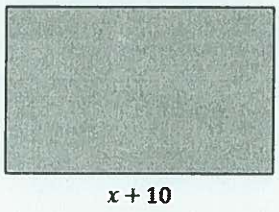
Pg 230 #11: A rectangle has dimension $x + 10$ and $2x - 3$, where x is in centimeters. The area of the rectangle is 54 cm^2.



a. What equation could you use to determine the value of x?
b. What is the value of x?

(A) Area = LW
$54 = (x+10)(2x-3)$
$54 = 2x^2 - 3x + 20x - 30$
$54 = 2x^2 + 17x - 30$
$0 = 2x^2 + 17x - 84$

(B) $\square + \square = +17$
$\square \times \square = 168$

1, 168
2, 84
4, 42
6, 28
3, 56
7, 24
8, 21

$2x^2 + 17x - 84 = 0$
$2x^2 - 7x + 24x - 84 = 0$
$(2x^2 - 7x) + (+24x - 84) = 0$
$x(2x-7) + 12(2x-7) = 0$
$(x+12)(2x-7) = 0$
$x + 12 = 0$, $x = -12$
$2x - 7 = 0$, $x = +7/2$

$x = -12$ doesn't give positive length or width.
So $x = +7/2$ cm or $x = +3.5$ cm.

Pg 230 #13: A flare is launched from a boat. The height, h, in meters, of the flare above the water is approximately modelled by the function $h(t) = 150t - 5t^2$, where t is the number of seconds after the flare is launched.

a. What equation could you use to determine the time it takes for the flare to return to the water?
b. How many seconds will it take for the flare to return to the water?

(A) $0 = 150t - 5t^2$
$5t^2 - 150t + 0 = 0$

(B) $5t(t - 30) = 0$
$5t = 0$, $t = 0$
$t - 30 = 0$, $t = 30$

So at water level when $t = 0$ (launched) and $t = 30$ (landed).
So lands after 30 sec.

As a side note, the vertex is halfway between these "zeroes" (x-intercepts), so it reaches max height at 15 seconds.

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Pg 230 #19: Solve each equation.

$$x(2x-3)-2(3+2x)=-4(x+1)$$

$2x^2-3x-6-4x = -4x-4$

$2x^2-7x-6 = -4x-4$

$+4x \quad +4 \qquad +4x \quad +4$

$2x^2-3x-2=0$

$+1 \quad -4$

$\square + \square = -3$

$\square \times \square = -4$

$2x^2+1x-4x-2=0$

$(2x^2+1x)+(-4x-2)=0$

$x(2x+1)-2(2x+1)=0$

$(2x+1)(x-2)=0$

$2x+1=0$ $\qquad$ $x-2=0$

$x=-1/2$ $\qquad$ $x=2$

So $x=+2, -1/2$

$$3(x-2)(x+1)-4=2(x-1)^2$$

$3(x^2+1x-2x-2)-4 = 2(x^2-1x-1x+1)$

$3(x^2-x-2)-4 = 2(x^2-2x+1)$

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

$3x^2-3x-10 = 2x^2-4x+2$

$-2x^2 \quad +4x \quad -2 \qquad -2x^2 \quad +4x \quad -2$

$x^2+x-12=0$

$\square + \square = 1$

$\square \times \square = -12$

1, 12
2, 6
3, 4

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

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

$x=-4$ $\qquad$ $x=3$

So $x=-4, 3$