

Solving Quadratic Equations By Completing the Square Date _____ Period _____

Solve each equation by completing the square.

1) $p^2 + 14p - 38 = 0$

	$p+7$		
p	p^2	$7p$	-38
$+7$	$7p$	49	-49

$(p+7)^2 = 87$
 $p+7 = \pm\sqrt{87}$
 $p = \sqrt{87} - 7$
 $p = -\sqrt{87} - 7$

3) $a^2 + 14a - 51 = 0$

	$a+7$		
a	a^2	$7a$	-51
$+7$	$7a$	49	-49

$(a+7)^2 = 100$
 $a+7 = \pm 10$
 $a = 10 - 7 = 3$
 $a = -10 - 7 = -17$

5) $x^2 + 6x + 8 = 0$

	$x+3$		
x	x^2	$3x$	-1
$+3$	$3x$	9	-9

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

7) $x^2 + 14x - 15 = 0$

	$x+7$		
x	x^2	$7x$	-15
$+7$	$7x$	49	-49

$(x+7)^2 = 64$
 $x+7 = \pm 8$
 $x = 8 - 7 = 1$
 $x = -8 - 7 = -15$

9) $r^2 - 4r - 91 = 7$

$r^2 - 4r - 98 = 0$

	$r-2$		
r	r^2	$-2r$	-98
-2	$-2r$	4	-4

$(r-2)^2 = 102$
 $r-2 = \pm\sqrt{102}$
 $r = \sqrt{102} + 2$
 $r = -\sqrt{102} + 2$

11) $k^2 - 4k + 1 = -5$

$k^2 - 4k + 6 = 0$

	$k-2$		
k	k^2	$-2k$	6
-2	$-2k$	4	-4

$(k-2)^2 + 2$

$(k-2)^2 = -2$
 Can't solve because negatives don't have $\sqrt{\quad}$

2) $v^2 + 6v - 59 = 0$

	$v+3$		
v	v^2	$3v$	-59
$+3$	$3v$	9	-9

$(v+3)^2 = 68$
 $v+3 = \pm\sqrt{68}$
 $v = \sqrt{68} - 3$
 $v = -\sqrt{68} - 3$

4) $x^2 - 12x + 11 = 0$

	$x-6$		
x	x^2	$-6x$	-25
-6	$-6x$	36	-36

$(x-6)^2 = 25$
 $x-6 = \pm 5$
 $x = 5 + 6 = 11$
 $x = -5 + 6 = 1$

6) $n^2 - 2n - 3 = 0$

	$n-1$		
n	n^2	$-n$	-3
-1	$-n$	1	-1

$(n-1)^2 = 4$
 $n-1 = \pm 2$
 $n = 2 + 1 = 3$
 $n = -2 + 1 = -1$

8) $k^2 - 12k + 23 = 0$

	$k-6$		
k	k^2	$-6k$	-13
-6	$-6k$	36	-36

$(k-6)^2 = 13$
 $k-6 = \pm\sqrt{13}$
 $k = \sqrt{13} + 6$
 $k = -\sqrt{13} + 6$

10) $x^2 - 10x + 26 = 8$

$x^2 - 10x + 18 = 0$

	$x-5$		
x	x^2	$-5x$	18
-5	$-5x$	25	-25

$(x-5)^2 = 7$
 $x-5 = \pm\sqrt{7}$
 $x = \sqrt{7} + 5$
 $x = -\sqrt{7} + 5$

12) $b^2 + 2b = -20$

$b^2 + 2b + 20 = 0$

	$b+1$		
b	b^2	b	20
$+1$	b	1	-1

$(b+1)^2 + 19 = 0$

Can't be solved because vertex of $(-1, 19)$ is above $y=0$.

13) $v^2 - 6v = -91 \rightarrow v^2 - 6v + 91 = 0$

v	-3	
v^2	$-3v$	91
-3	$-3v$	9
		-9

No solution.
Vertex of
(3, 82) is above
 $y=0$

$(v-3)^2 + 82 = 0$

15) $5k^2 = 60 - 20k \rightarrow k^2 = 12 - 4k$
 $k^2 + 4k - 12 = 0$

k	2	
k^2	$2k$	-12
2	$2k$	4
		-4

$(k+2)^2 = 16$

$k+2 = 4$

$k = 2$

$k+2 = -4$

$k = -6$

$(k+2)^2 - 16 = 0$

17) $8x^2 + 16x = 42$

x	1	
x^2	$1x$	-5.25
1	$1x$	1
		-1

$(x+1)^2 = 6.25$

$x+1 = 2.5$

$x = 1.5$

$x+1 = -2.5$

$x = -3.5$

$(x+1)^2 - 6.25 = 0$

19) $2a^2 = -6 + 8a$

$a^2 = -3 + 4a$
 $a^2 - 4a + 3 = 0$

a	-2	
a^2	$-2a$	3
-2	$-2a$	4
		-4

$(a-2)^2 = 1$

$a-2 = 1$

$a = 3$

$a-2 = -1$

$a = 1$

$(a-2)^2 - 1 = 0$

21) $4n^2 + 4n + 36 = 0$

$n^2 + n + 9 = 0$

n	3	
n^2	$3n$	9
3	$3n$	25
		-25

No solution

$(n+3)^2 + 8.75 = 0$

23) $10p^2 + 4p + 77 = 9 \rightarrow 10p^2 + 4p + 68 = 0$

$p^2 + 0.4p + 6.8 = 0$

p	2	
p^2	$2p$	6.8
2	$2p$	0.4
		-0.4

No solution

$(p+2)^2 + 6.76 = 0$

14) $n^2 = 18n + 40 \rightarrow n^2 - 18n - 40 = 0$

n	-9	
n^2	$-9n$	-40
-9	$-9n$	81
		-81

$(n-9)^2 = 121$

$n-9 = \pm 11$

$n-9 = 11$

$n = 20$

$n-9 = -11$

$n = -2$

16) $6x^2 - 48 = -12x$
 $x^2 - 8 = -2x$
 $x^2 + 2x - 8 = 0$

x	1	
x^2	$1x$	-8
1	$1x$	-1
		-1

$(x+1)^2 - 9 = 0$

$(x+1)^2 = 9$

$x+1 = 3$

$x = 2$

$x+1 = -3$

$x = -4$

18) $9n^2 + 79 = -18n$

$9n^2 + 18n + 79 = 0$

$n^2 + 2n + \frac{79}{9} = 0$ $(n+1)^2 = -\frac{70}{9}$

n	1	
n^2	$1n$	$\frac{79}{9}$
1	$1n$	1
		-1

No solution

$(n+1)^2 + \frac{70}{9} = 0$

20) $2x^2 - 5x + 67 = 0$

$x^2 - 2.5x + 33.5 = 0$

x	-1.25	
x^2	$-1.25x$	33.5
-1.25	$-1.25x$	1.5625
		-1.5625

No solution

$(x-1.25)^2 + 31.9375 = 0$

22) $7k^2 - 16k + 100 = 0$

$k^2 - \frac{16}{7}k + \frac{100}{7} = 0$

k	$-\frac{8}{7}$	
k^2	$-\frac{8}{7}k$	$\frac{100}{7}$
$-\frac{8}{7}$	$-\frac{8}{7}k$	$\frac{64}{49}$
		$-\frac{64}{49}$

No solution

$(k-\frac{8}{7})^2 + \frac{636}{49} = 0$

24) $3x^2 = -4 + 8x$

$3x^2 - 8x + 4 = 0$

$x^2 - \frac{8}{3}x + \frac{4}{3} = 0$

x	$-\frac{4}{3}$	
x^2	$-\frac{4}{3}x$	$\frac{16}{9}$
$-\frac{4}{3}$	$-\frac{4}{3}x$	$\frac{16}{9}$
		$-\frac{16}{9}$

$(x-\frac{4}{3})^2 = \frac{4}{9}$

$x-\frac{4}{3} = \frac{2}{3}$

$x = \frac{4}{3} + \frac{2}{3} = 2$

$x-\frac{4}{3} = -\frac{2}{3}$

$x = \frac{4}{3} - \frac{2}{3} = \frac{2}{3}$

$(x-\frac{4}{3})^2 - \frac{4}{9} = 0$