

Name Answer Key  
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Date \_\_\_\_\_  
Pre-Calculus

Solving Quadratics by Factoring and the Square Root Principle

Identify 3 types of factoring.

- 1) GCF
- 2) DOTS
- 3) Trinomials (master product)

Solving Quadratics by Factoring Steps:

- 1) set equation = 0
  - 2) make sure its in standard form
  - 3) GCF
  - 4) DOTS
  - 5) Trinomials
  - 6) set each factor = zero
  - 7) Solve!
- } in this order!

Ex1:  $4x^2 - 9 = 0$  DOTS!  
 $(2x-3)(2x+3) = 0$   
 $2x-3=0$     $2x+3=0$   
 $x = 3/2$     $x = -3/2$

Ex3:  $x^2 - 4x = 12$   
 $x^2 - 4x - 12 = 0$   
 $x^2 - 6x + 2x - 12 = 0$   
 $x(x-6) + 2(x-6)$   
 $(x-6) = 0$     $(x+2) = 0$   
 $x = 6$     $x = -2$

Ex2:  $2x^2 - 10x = 0$  GCF  
 $2x(x-5) = 0$   
 $2x = 0$     $x-5 = 0$   
 $x = 0$     $x = 5$

Ex3:  $18 + 2x^2 = -15x$   
 $2x^2 + 15x + 18 = 0$   
 $2x^2 + 12x + 3x + 18 = 0$   
 $2x(x+6) + 3(x+6)$   
 $(2x+3) = 0$     $x+6 = 0$   
 $x = -3/2$     $x = -6$

Solve by using the Square Root Principle

- 1) Isolate  $x^2$  or  $( )^2$
- 2) Square root both sides
- 3) Don't forget  $\pm$
- 4) Solve for  $x$
- 5) Express in simplest form or round
- 6) If you have  $( )^2 = ( )^2$  double distribute + solve

Ex1:  $x^2 = 13$   
 $x^2 = \pm \sqrt{13}$   
 $x = \pm 3.61$

Ex2:  $4x^2 = 25$   
 $x^2 = \frac{25}{4}$   
 $x = \pm \sqrt{\frac{25}{4}} = \pm \frac{\sqrt{25}}{\sqrt{4}} = \pm \frac{5}{2}$

Ex3:  $(3x+5)^2 = 14$   
 $3x+5 = \pm \sqrt{14}$   
 $\frac{3x+5}{5-5} = \frac{\pm \sqrt{14}}{5-5}$   
 $\frac{3x}{3} = \frac{-5 \pm \sqrt{14}}{3}$   
 $x = \frac{-5 \pm \sqrt{14}}{3}$

Ex4:  $(x+3)^2 = (x+13)^2$   
 $x^2 + 3x + 3x + 9 = x^2 + 13x + 13x + 169$   
 $x^2 + 6x + 9 = x^2 + 26x + 169$   
 $\frac{6x+9}{-6x} = \frac{26x+169}{-6x}$   
 $\frac{-9}{-6x} = \frac{20x+169}{-6x}$   
 $\frac{-169}{-6x} = \frac{20x}{-6x}$   
 $\frac{-169}{20} = \frac{20x}{20}$   
 $-8 = x$

Practice: Solve each of the following:  
 $\sqrt{\quad}$  principle

1)  $169x^2 - 36 = 0$   
 $169x^2 = 36$   
 $\frac{169x^2}{169} = \frac{36}{169}$   
 $x^2 = \frac{36}{169} = \pm \sqrt{\frac{36}{169}} = \pm \frac{6}{13}$

2)  $25r^2 - 1 = 0$   
 $25r^2 = 1$   
 $\frac{25r^2}{25} = \frac{1}{25}$   
 $r^2 = \frac{1}{25} = \pm \sqrt{\frac{1}{25}} = \pm \frac{1}{5}$

3)  $x^2 - 9 = 0$  Dots  
 $(x-3)(x+3) = 0$   
 $x-3=0 \quad x+3=0$   
 $x=3 \quad x=-3$

4)  $9a^2 - 441 = 0$   
 $9a^2 = 441$   
 $\frac{9a^2}{9} = \frac{441}{9}$   
 $a^2 = 49$   
 $a = \pm 7$

$$5) 42n^3 - 330n^2 - 432n = 0$$

$$6n(7n^2 - 55n - 72) = 0$$

$$6n(7n^2 - 63n + 8n - 72) = 0$$

$$6n(7n(n-9) + 8(n-9)) = 0$$

$$6n(7n+8)(n-9) = 0$$

$$6n=0 \quad 7n+8=0 \quad n-9=0$$

$$n=0 \quad n=-8/7 \quad n=9$$

$$6) 25v^2 + 80v = -60$$

$$25v^2 + 80v + 60 = 0$$

$$5(5v^2 + 16v + 12) = 0$$

$$5(5v^2 + 10v + 6v + 12) = 0$$

$$5(5v(v+2) + 6(v+2)) = 0$$

$$5(5v+6)(v+2) = 0$$

$$5 \neq 0 \quad 5v+6=0 \quad v+2=0$$

$$v = -6/5 \quad v = -2$$

$$7) 3b^2 - 11b = -6$$

$$3b^2 - 11b + 6 = 0$$

$$3b^2 - 9b - 2b + 6 = 0$$

$$3b(b-3) - 2(b-3) = 0$$

$$(3b-2)(b-3) = 0$$

$$3b-2=0 \quad b-3=0$$

$$\star \quad b = 2/3 \quad b = 3$$

$$8) (28mn - 49m^2 - 12xn + 21x) = 0$$

just factor!

$$7m(4n-7) - 3x(4n-7) = 0$$

$$9) (15n^3 - 24n^2) + (40n - 64) = 0$$

$$3n^2(5n-8) + 8(5n-8) = 0$$

$$(3n^2-8)(5n-8) = 0$$

$$3n^2-8=0 \quad 5n-8=0$$

$$n = \pm \sqrt{8/3} \quad n = 8/5$$

$$10) 35v^2 + 15v = 0$$

$$5v(7v+3) = 0$$

$$5v=0 \quad 7v+3=0$$

$$v=0 \quad v = -3/7$$

$$11) 2n^2 = -144$$

$$\frac{2n^2}{2} = \frac{-144}{2}$$

$$\sqrt{n^2} = \sqrt{-72}$$

no solution

(can't have a negative  $\sqrt{\quad}$ !)

$$12) x^2 + 8 = 28$$

$$\frac{x^2 + 8 - 8}{-8 - 8}$$

$$\sqrt{x^2} = \sqrt{20}$$

$$x = \pm 2\sqrt{5}$$

or

$$x = \pm 4.47$$

$$13) -6m^2 = -486$$

$$\frac{-6m^2}{-6} = \frac{-486}{-6}$$

$$\sqrt{m^2} = \sqrt{81}$$

$$m = \pm 9$$

$$14) 7v^2 + 1 = 29$$

$$\frac{7v^2 + 1 - 1}{-1 - 1}$$

$$7v^2 = 28$$

$$\sqrt{v^2} = \sqrt{4}$$

$$v = \pm 2$$

$$\star 15) 25p^2 + 150 = -175p$$

$$25p^2 + 175p + 150 = 0$$

$$5(5p^2 + 35p + 30) = 0$$

$$5(5p^2 + 25p + 10p + 30) = 0$$

$$5(5p(p+5) + 10(p+5)) = 0$$

$$5(5p+10)(p+5) = 0$$

$$5 \neq 0 \quad 5p+10=0 \quad p+5=0$$

$$16) x^2 + 2x = 8 \quad p=2 \quad p=-5$$

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

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

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

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

$$x-2=0 \quad x+4=0$$

$$x=2 \quad x=-4$$

$$17) 10n^2 + 2 = 292$$

$$\frac{10n^2}{10} = \frac{290}{10}$$

$$\sqrt{n^2} = \sqrt{29}$$

$$n = \pm\sqrt{29}$$

$$18) \sqrt{(2k-1)^2} = \sqrt{9}$$

$$2k-1 = \pm 3$$

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

$$+1 \quad +1 \quad 2k = -2$$

$$2k=4 \quad k=-1$$

$$k=2$$

$$19) 9(2m-3)^2 + 8 = 449$$

$$\frac{-8 \quad -8}{9(2m-3)^2} = \frac{441}{9}$$

$$9(2m-3)^2 = 441$$

$$\sqrt{(2m-3)^2} = \sqrt{49}$$

$$2m-3 = \pm 7$$

$$2m-3=7$$

$$m=5$$

$$2m-3=-7$$

$$m=-2$$

$$20) (x+5)^2 = (x+10)^2$$

$$x^2 + 5x + 5x + 25 = x^2 + 10x + 10x + 100$$

$$x^2 + 10x + 25 = x^2 + 20x + 100$$

$$\frac{-10x + 25}{-10x} = \frac{20x + 100}{-10x}$$

$$\frac{25}{-10} = \frac{10x + 100}{-10}$$

$$\frac{-75}{10} = \frac{10x}{10}$$

$$-7.5 = x$$

$$\star 21) n^2 + 7n = 0$$

$$n(n+7) = 0$$

$$n=0 \quad n+7=0$$

$$n=-7$$

$$22) x^2 = -11x - 28$$

$$x^2 + 11x + 28 = 0$$

$$(x+7)(x+4) = 0$$

$$x+7=0 \quad x+4=0$$

$$x=-7 \quad x=-4$$

$$23) 10x^3 - 47x^2 + 42x = 0$$

$$x(10x^2 - 47x + 42) = 0$$

$$x(10x^2 - 35x - 12x + 42) = 0$$

$$x(5x(2x-7) - 6(2x-7)) = 0$$

$$x(5x-6)(2x-7) = 0$$

$$x=0 \quad 5x-6=0 \quad 2x-7=0$$

$$x=6/5 \quad x=7/2$$

$$24) 28n^2 - 60 = 128n$$

$$28n^2 - 128n - 60 = 0$$

$$4(7n^2 - 32n - 15) = 0$$

$$4(7n^2 - 35n + 3n - 15) = 0$$

$$4(7n(n-5) + 3(n-5)) = 0$$

$$4 \neq 0 \quad 7n+3=0 \quad n-5=0$$

$$n=-3/7$$

$$n=5$$