Scoring Rubric for Unit #8 Test Solving Methods for Polynomial Equations: Factoring, Completing the Square, and Quadratic Equation

Name: _____

Take Home Test:

#1 Student must have clear definitions that demonstrate full understanding of the definitions of the words to receive full points.

1. +2 +1 +0 Factor=A number or algebraic expression that divides another number or expression evenly

2. +2 +1 +0 Prime Factorization=A way of expressing a number as a product of its Prime factors (Prime means only evenly divisible by 1 and itself)

3. +2 +1 +0 GCF=The greatest number that is a factor of two or more other numbers

4. +2 +1 +0 Difference of Squares=A squared number subtracted from another squared number

5. +2 +1 +0 Perfect Square Trinomial=Can be written as a square of a binomial

6. +2 +1 +0 Prime polynomial=A polynomial with integer coefficients that cannot be factored into polynomials of lower degrees.

7. +2 +1 +0 Factored form=Written as a product of the factors for the polynomial

8. +2 +1 +0 Standard form=The term with the highest degree is placed first and then decreases in descending order based on the power of the term

9. +3 +2 +1 +0 Quadratic Equation= $\frac{(-b\pm\sqrt{b^2-4ac})}{2a}$. Use when trying to factor and there isn't a way to make the numbers come out evenly (additional point is for correct explanation of usage)

10. +3 +2 +1 +0 Completing the Square=A method used to solve a quadratic equation by changing the form of the equation so the left side is a perfect square trinomial. Use when trying to factor and there isn't an easy way to make the numbers come out evenly (additional point is for correct explanation of usage)

Multiply Total Number of Points for #1 by 10/22= / 10 Points

#2 Student must have clear explanations that demonstrate full understanding to receive full points.

+2 +1 +0	Student defines the difference of squares (saying something about two square numbers with a "-" sign between them)
+1 +0	Student correctly creates a difference of squares polynomial
+1 +0	Student correctly factors this polynomial

Multiply Total Number of Points for #2 by 11/4= / 11 Points

#3 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0	Student recalls that the area of a triangle=1/2 b*h
+1 +0	Student sets up equation $\frac{1}{2}(x+8)(2x+4)=91$
+1 +0	Student solves and gets $\frac{1}{2}(2x^2+20x+32)=91$
+2 +1 +0	Student simplifies to $x^2+10x-75=0$
+3 +0	Student factors to $(x-5)(x+15)=0$
+1 +0	Student gets x=5 or x=-15
+2 +0	Student realized that you can't have a negative distance and explains that x=-15 cannot be a solution.

Multiply Total Number of Points for #3 by 16/11= / 16 Points

#4 Student must have clear explanations that demonstrate full understanding to receive full points.

1.	+1 +0	Student puts (x-2)(x-2)=0
	+1 +0	Student recognizes solutions as x=2 and x=2
	+3 +0	Student explains that it is easiest to look at factoring normally first since The coefficient in front of the leading term is 1, so it's easy to factor
2.	+1 +0	Student moves the 11 over to the other side and adds 9 to both sides
	+1 +0	Student factors polynomial (x+3)^2=20
	+1 +0	Student gets $x=-3\pm 2\sqrt{5}$
	+3 +2 +1 +0	Student explains that the normal factoring method didn't work because

there wasn't anything that multiplied to 11 and that added to 6. Student explains that because the leading term was 1 and because 6 was even, it was an easier problem to solve using the completing the square method

3. +1 +0 Student writes down the quadratic equation and sets a, b, c equal to the appropriate values. a=2 b=-1 c=5

   +1 +0 Student substitutes values in and simplifies to: $x = \frac{1 \pm \sqrt{39}}{4}$

   +3 +2 +1 +0 Student explains that the quadratic formula is easiest to use because there is a coefficient on the leading term, the left side of the equation is not a perfect square, and the coefficients of the x^2 and x terms will not make completing the square convenient.

Multiply Total Number of Points for #4 by 8/16= / 8 Points

Section Score:_____/ 53 Points

In-Class Part 1:

#1 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0	Student makes factor trees for 25 and 100 to find appropriate common factors (5*5 and 5*5*2*2). Students may also use an alternative way of factoring
+1 +0	Student finds common factor=25
+1 +0	Student writes correct notation like 25(x-4y)

Multiply Total Number of Points for #1 by 7/3= / 7 Points

#2 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0	Student correctly uses the order of operations to consolidate 2+4 first
+1 +0	Student properly multiplies the 5 by 6, resulting in 30
+1 +0	Student shows work for the foiling method correctly
+1 +0	Student accurately compares the two methods, noticing the same answer (answer=30 for both)

Multiply Total Number of Points for #2 by 9/4= / 9 Points

#3 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0	Student correctly factors (a+b)(a+b)
+1 +0	Student notes that these factors are the same
+1 +0	Students show that $(a + b)(a + b) = (a + b)^2$

Multiply Total Number of Points for #3 by 5/3= / 5 Points

#4 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0	Student factors the first one as (x+2)(x+2)

+1 +0 Student explains that factoring the 2nd one is not possible

+1 +0 Student explains that there are no factors that multiply to 8 that add to -3

+2 +0 Student explains that solving yields imaginary numbers, so they're not rational numbers

+2 +1 +0 Student show the following work:

$$\frac{-4\pm\sqrt{4^2-4(1)(4)}}{(2)(1)} = \frac{-4\pm\sqrt{16-16}}{2} = -2$$

+2 +1 +0 Student show the following work:

$$\frac{-3 \pm \sqrt{(-3)^2 - 4(1)(5)}}{(2)(1)} = \frac{-3 \pm \sqrt{9-20}}{2} = \frac{3 \pm \sqrt{-19}}{2}$$

Multiply Total Number of Points for #4 by 7/9= / 7 Points

#5 Student must have clear explanations that demonstrate full understanding to receive full points.

1. +2 +1 +0 Student factors 56=5*8 and gets (r-8)(r-7). Student gets +2 only if both factors and signs are correct.

2. +2 +1 +0 Student factors 10=5*2 and gets (m-5)(m+2). Student gets +2 only if both factors and signs are correct.

3. +1 +0 Student factors out a 4 correctly
   +3 +2 +1 +0 Student factors 81=9*9 and gets 4(1+9m)(1-9m). +3 only if student gets correct factors and signs and remembers to include the 4 in front.

Multiply Total Number of Points for #5 by 12/8= / 12 Points

Section Score:_____/ 40 Points

In-Class Part 2:

#1 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0 Student correctly selects A

+2 +1 +0 Student factors polynomial (x-3)(x+2)=0. Student only gets +2 if they switch the signs correctly

+1 +0 Student sets each factor equal to zero individually

+1 +0 Student provides an explanation for why the roots are -2 or 3 (by solving the factors set equal to zero)

+1 +0 Student gives a valid explanation for why there are two x values. They should explain something to the effect that it is a polynomial with degree 2 or that each root is a valid solution

Multiply Total Number of Points for #1 by 11/6= / 11 Points

#2 Student must have clear explanations that demonstrate full understanding to receive full points.

+2 +0 Student must get the equation entirely correctly for full points. No partial points May be given. Quadratic Equation= $\frac{(-b\pm\sqrt{b^2-4ac})}{2a}$.

+1 +0 Student knows to combine 4x+3x=7x

+1 +0 Student explains that a=2 b=7 and c=5 correctly

Multiply Total Number of Points for #2 by 5/4= / 5 Points

#3 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0 Student explains that +9 was added to both sides of the equation

+1 +0 Student explains that this was done to get the left-hand side of the equation in a factorable form

+1 +0 Student recognizes this tactic as completing the square

Multiply Total Number of Points for #3 by 2/3= / 2 Points

#4 Student must have clear explanations that demonstrate full understanding to receive full points.

+1 +0 Student adds 2 to the right side of the equation

+1 +0 Student divides every term by 3 to get the leading coefficient to be 1. This results in $x^2 - \frac{7}{3}x + \quad = \frac{2}{3} +$

+3 +0 Student computes necessary term to make it a perfect square trinomial by doing:

$\left(\frac{1}{2} * -\frac{7}{3}\right)^2 = \left(-\frac{7}{6}\right)^2 = \frac{49}{36}$

+1 +0 Student adds this number to both sides of the equation, yielding:

$x^2 - \frac{7}{3}x + \frac{49}{36} = \frac{2}{3} + \frac{49}{36}$ (Student gets +1 even if they add the wrong number to both sides)

+2 +0 Student factors correctly, yielding $\left(x - \frac{7}{6}\right)\left(x - \frac{7}{6}\right)$

+1 +0 Student simplifies the right side to $\frac{24}{36} + \frac{49}{36} = \frac{73}{36}$

+2 +0 Student simplifies this to:

$\left(x - \frac{7}{6}\right)^2 = \frac{73}{36} => \sqrt{\left(x - \frac{7}{6}\right)^2} = \sqrt{\frac{73}{36}} => x = \frac{7}{6} \pm \frac{\sqrt{73}}{6}$

Multiply Total Number of Points for #4 by 7/11= / 7 Points

#5 Student must have clear explanations that demonstrate full understanding to receive full points.

+2 +0 Student finds x intercepts by setting equation equal to zero $\frac{x^2}{400} + \frac{x}{10} = 0$

+4 +0 Student solves by completing the square or using the quadratic equation, yielding x=0 and x=40

+4 +0 Student explains that x=40 means the ball took 40 seconds to drop to the floor (height 0) again. And x=0 means the ball was at rest at time 0.

Multiply Total Number of Points for #5 by 5/10= / 5 Points

Section Score:_____/ 30 Points

Test Total Score:_____/123 Points

Grade: A A- B+ B B- C+ C C- D+ D F

Grader should use the Compromise method with approximate midpoints for grade intervals as follows:

116=>A, 105=>B, 93=>C, 80=>D, 68=>F