

Name: Kelly

Date: _____

Day 1: Quadratic Functions

I can find the roots of a quadratic function by factoring.

Do Now: Factor the following trinomials.

1) $x^2 + 14x + 48$

$(x+6)(x+8)$

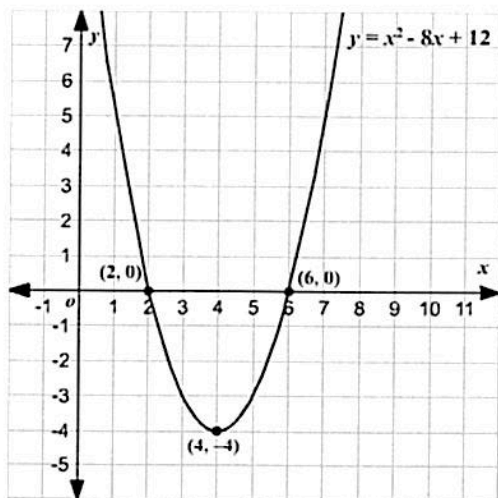
$$\begin{array}{r} 48 \\ 148 \\ 224 \\ 412 \\ 316 \\ 68 \end{array}$$

2) $x^2 - 8x + 7$

$(x-1)(x-8)$

$$\frac{7}{17}$$

Remember that a quadratic equation is an equation whose highest power of the variable is a 2, and every quadratic equation can be written in *standard form* as $ax^2 + bx + c = 0$, where a , b , and c are numbers.



When solving a quadratic equation, we are trying to find the x -values where the function crosses over the x -axis. For example, in the graph shown below, the roots would be $x=2$ and $x=6$.

Steps to solve a quadratic equation:

- Step 1: Set the equation equal to zero. Make every effort to make the squared term positive in sign.
- Step 2: Factor completely.
- Step 3: Apply the zero product property and set each factor equal to zero.
(set factors equal to 0)
- Step 4: Solve each resulting equation for the variable. You will get two equations. Note that it is possible to get two duplicate answers.
- Step 5: Check your answers (if necessary) by substituting into the original equation and checking for a true sentence.

Practice. Solve for the variable.

<p>1. $(y+5)(y+6)=0$</p> $\begin{array}{l l} y+5=0 & y+6=0 \\ \hline y=-5 & y=-6 \end{array}$	<p>2. $(4y-1)(y+2)=0$</p> $\begin{array}{l l} 4y-1=0 & y+2=0 \\ \hline y=\frac{1}{4} & y=-2 \end{array}$	<p>3. $m^2-100=0$</p> $\begin{array}{l l} (m-10)(m+10)=0 \\ \hline m-10=0 & m+10=0 \\ \hline m=10 & m=-10 \end{array}$
<p>4. $x(x+7)=0$</p> $\begin{array}{l l} x=0 & x+7=0 \\ \hline & x=-7 \end{array}$	<p>5. $b^2-144=0$</p> $\begin{array}{l l} (b-12)(b+12)=0 \\ \hline b-12=0 & b+12=0 \\ \hline b=12 & b=-12 \end{array}$	<p>6. $y^2-8y+12=0$</p> $\begin{array}{l l} (y-6)(y-2)=0 \\ \hline y-6=0 & y-2=0 \\ \hline y=6 & y=2 \end{array}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r} 12 \\ 12 \\ 26 \\ 34 \end{array}$ </div>
<p>7. $x^2-5x+6=0$</p> $\begin{array}{l l} (x-6)(x+1)=0 \\ \hline x-6=0 & x+1=0 \\ \hline x=6 & x=-1 \end{array}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r} 6 \\ 16 \\ 23 \end{array}$ </div>	<p>8. $8t^2-32=0$</p> $\begin{array}{l l} 8(t^2-4)=0 \\ \hline 8(t-2)(t+2)=0 \\ \hline t-2=0 & t+2=0 \\ \hline t=2 & t=-2 \end{array}$ <p>reject</p>	<p>9. $10x^2-10x=0$</p> $\begin{array}{l l} 10x(x-1)=0 \\ \hline 10x=0 & x-1=0 \\ \hline x=0 & x=1 \end{array}$
<p>10. $x^2+9x=36$</p> $\begin{array}{l l} x^2+9x-36=0 \\ (x+12)(x-3)=0 \\ \hline x+12=0 & x-3=0 \\ \hline x=-12 & x=3 \end{array}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r} 36 \\ 18 \\ 12 \end{array}$ </div>	<p>11. $x^2-3x=10$</p> $\begin{array}{l l} x^2-3x-10=0 \\ (x+2)(x-5)=0 \\ \hline x+2=0 & x-5=0 \\ \hline x=-2 & x=5 \end{array}$	<p>12. $x^2-3=-2x$</p> $\begin{array}{l l} x^2+2x-3=0 \\ (x+3)(x-1)=0 \\ \hline x+3=0 & x-1=0 \\ \hline x=-3 & x=1 \end{array}$
<p>13. $2x^2-50=0$</p> $\begin{array}{l l} 2(x^2-25)=0 \\ 2(x+5)(x-5)=0 \\ \hline x+5=0 & x-5=0 \\ \hline x=-5 & x=5 \end{array}$	<p>14. $3x^2=12x$</p> $\begin{array}{l l} 3x^2-12x=0 \\ 3x(x-4)=0 \\ \hline 3x=0 & x-4=0 \\ \hline x=0 & x=4 \end{array}$	<p>15. $x^2=8x+48$</p> $\begin{array}{l l} x^2-8x-48=0 \\ (x-12)(x+4)=0 \\ \hline x-12=0 & x+4=0 \\ \hline x=12 & x=-4 \end{array}$ <div style="text-align: right; margin-right: 20px;"> $\begin{array}{r} 48 \\ 48 \\ 224 \\ 412 \end{array}$ </div>

<p>16. $m^2 - 56 = m$</p> $m^2 - m - 56 = 0$ $(m-8)(m+7) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$m-8=0$</td> <td>$m+7=0$</td> </tr> <tr> <td>$m=8$</td> <td>$m=-7$</td> </tr> </table>	$m-8=0$	$m+7=0$	$m=8$	$m=-7$	<p>17. $15x^2 - 5x = 0$</p> $5(3x-1) = 0$ $5 \neq 0 \quad \quad 3x-1=0$ $ \quad x = \frac{1}{3} $	<p>18. $6x^2 = 54x$</p> $6x^2 - 54x = 0$ $6x(x-9) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$6x=0$</td> <td>$x-9=0$</td> </tr> <tr> <td>$x=0$</td> <td>$x=9$</td> </tr> </table>	$6x=0$	$x-9=0$	$x=0$	$x=9$								
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<p>19. $4t^2 - 36 = 0$</p> $4(t^2 - 9) = 0$ $4(t-3)(t+3) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$4 \neq 0$</td> <td>$t-3=0$</td> <td>$t+3=0$</td> </tr> <tr> <td></td> <td>$t=3$</td> <td>$t=-3$</td> </tr> </table>	$4 \neq 0$	$t-3=0$	$t+3=0$		$t=3$	$t=-3$	<p>20. $z^2 - 12z = 13$</p> $z^2 - 12z - 13 = 0$ $(z-13)(z+1) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$z-13=0$</td> <td>$z+1=0$</td> </tr> <tr> <td>$z=13$</td> <td>$z=-1$</td> </tr> </table>	$z-13=0$	$z+1=0$	$z=13$	$z=-1$	<p>21. $x^2 - 5x = x - 8$</p> $-x+8 \quad -x+8$ $x^2 - 6x + 8 = 0$ $(x-2)(x-4) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$x-2=0$</td> <td>$x-4=0$</td> </tr> <tr> <td>$+2+2$</td> <td>$+4+4$</td> </tr> <tr> <td>$x=2$</td> <td>$x=4$</td> </tr> </table>	$x-2=0$	$x-4=0$	$+2+2$	$+4+4$	$x=2$	$x=4$
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<p>22. $5x^2 = x$</p> $5x^2 - x = 0$ $x(5x-1) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$x=0$</td> <td>$5x-1=0$</td> </tr> <tr> <td></td> <td>$x = \frac{1}{5}$</td> </tr> </table>	$x=0$	$5x-1=0$		$x = \frac{1}{5}$	<p>23. $x^2 = 10x - 25$</p> $x^2 - 10x + 25 = 0$ $(x-5)(x-5) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$x-5=0$</td> <td>$x-5=0$</td> </tr> <tr> <td>$x=5$</td> <td>$x=5$</td> </tr> </table>	$x-5=0$	$x-5=0$	$x=5$	$x=5$	<p>24. $x^2 + 3x = -12 - 4x$</p> $x^2 + 3x + 4x + 12 = 0$ $x^2 + 7x + 12 = 0$ $(x+3)(x+4) = 0$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>$x+3=0$</td> <td>$x+4=0$</td> </tr> <tr> <td>$x=-3$</td> <td>$x=-4$</td> </tr> </table>	$x+3=0$	$x+4=0$	$x=-3$	$x=-4$				
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$$\frac{12}{1 \ 12}$$

$$2 \ 6$$

$$3 \ 4$$

$$25. \begin{array}{r} 6x^2 - 3x = 9x \\ -9x \quad -9x \\ \hline 6x^2 - 12x = 0 \\ 6x(x-2) = 0 \\ \hline \begin{array}{|l} 6x=0 \\ \hline x=0 \end{array} \quad \begin{array}{|l} x-2=0 \\ \hline x=2 \end{array} \end{array}$$

$$26. x(x+2) = 25 + 2x \\ x^2 + 2x - 25 - 2x = 0 \\ x^2 - 25 = 0 \\ (x+5)(x-5) \\ \hline \begin{array}{|l} x = -5 \\ \hline \end{array} \quad \begin{array}{|l} x = 5 \\ \hline \end{array}$$

$$27. \frac{x}{4} = \frac{16}{x} \\ x^2 = 64 \\ x^2 - 64 = 0 \\ (x+8)(x-8) = 0 \\ \hline \begin{array}{|l} x = -8 \\ \hline \end{array} \quad \begin{array}{|l} x = 8 \\ \hline \end{array}$$

$$28. \frac{x}{9} = \frac{4}{x} \\ x^2 = 36 \\ x^2 - 36 = 0 \\ (x+6)(x-6) = 0 \\ \hline \begin{array}{|l} x = -6 \\ \hline \end{array} \quad \begin{array}{|l} x = 6 \\ \hline \end{array}$$

$$29. \frac{4x}{25} = \frac{4}{x} \\ 4x^2 = 100 \\ 4x^2 - 100 = 0 \\ 4(x^2 - 25) = 0 \\ 4(x-5)(x+5) = 0 \\ \hline \begin{array}{|l} 4 \neq 0 \\ \hline \end{array} \quad \begin{array}{|l} x-5=0 \\ \hline x=5 \end{array} \quad \begin{array}{|l} x+5=0 \\ \hline x=-5 \end{array}$$

$$30. x(x+7) = 18 \quad \begin{array}{r} 18 \\ 18 \\ 29 \\ 36 \end{array} \\ x^2 + 7x - 18 = 0 \\ (x+9)(x-2) = 0 \\ \hline \begin{array}{|l} x+9=0 \\ \hline x=-9 \end{array} \quad \begin{array}{|l} x-2=0 \\ \hline x=2 \end{array}$$

$$31. \frac{t-1}{3} = \frac{4}{t} \quad \begin{array}{r} 12 \\ 12 \\ 26 \\ 34 \end{array} \\ t^2 - t = 12 \\ t^2 - t - 12 = 0 \\ (t-4)(t+3) = 0 \\ \hline \begin{array}{|l} x = 4 \\ \hline \end{array} \quad \begin{array}{|l} x = -3 \\ \hline \end{array}$$

$$32. \frac{4x-7}{x-2} = \frac{x+2}{1} \quad (x+2)(x+2) \\ 4x-7 = x^2 + 2x + 2x + 4 \\ 4x-7 = x^2 + 4x + 4 \\ \hline \begin{array}{r} -4x+7 \\ -4x+7 \\ \hline x^2 - 11 = 0 \\ \sqrt{x^2} = \sqrt{11} \\ x = \pm \sqrt{11} \end{array}$$

$$33. \frac{1}{x} = \frac{x+1}{6} \\ 6 = x^2 + x \\ x^2 + x - 6 = 0 \\ (x+3)(x-2) = 0 \\ \hline \begin{array}{|l} x+3=0 \\ \hline x=-3 \end{array} \quad \begin{array}{|l} x-2=0 \\ \hline x=2 \end{array}$$