## ALGEBRA PROBLEM SESSION \#12 - PRACTICE PROBLEMS

## The Square Root Property and Completing the Square

1. Tell why a cannot be 0 in the quadratic equation $\mathrm{ax}^{2}+\mathrm{bx}+\mathrm{c}=0$.
2. To solve the equation $(x+5)^{2}=36$, David says to subtract 5 from both sides of the equation to get $x^{2}=31$; then $x=$ $\pm \sqrt{31}$. Explain whether David is correct.
3. Solve $x^{2}+\sqrt{3} x-\frac{1}{4}=0$ by completing the square.
4. What number must be added to $x^{2}+\sqrt{3} x$ to make it a perfect-square trinomial?
5. Could you make the left-hand side of $4 x^{2}+4 x=-3$ a trinomial square without dividing by 4 first? If so, what number would you add? Try your method in $4 x^{2}+20 x=-5$.
6. Solve each equation by the square root property. Simplify and express solutions in the form $\boldsymbol{a}+\boldsymbol{b i}$.
a. $3 x^{2}-5=0$
b. $(x+3)^{2}=64$
c. $3(x+2)^{2}=36$
7. Determine the constant that should be added to the binomial so that it becomes a perfect square trinomial. Then write and factor the trinomial.
a. $x^{2}+4 x$
b. $x^{2}-10 x$
c. $x^{2}+\frac{4}{5} x$
8. Solve by completing the square
a. $x^{2}+6 x=7$
b. $x^{2}+8 x-5=0$
c. $9 x^{2}-6 x+5=0$

## The Quadratic Formula

1. Using the quadratic function to solve $2 \mathrm{x}^{2}=7 \mathrm{x}-3$, Ray says that $\mathrm{a}=2, \mathrm{~b}=7$, $\mathrm{c}=3$, so $\mathrm{x}=$ $\frac{-7 \pm \sqrt{49-4(2(-3)}}{2(2)}=\frac{-7 \pm \sqrt{73}}{4}$. Ask the students to explain whether Ray is correct or not.
2. Solve by using the quadratic formula:
a. $x^{2}+5 x-10=0$
b. $2 x^{2}=-4 x+5$
c. $x^{2}+6 x+13=0$
3. Compute the discriminant then determine the number and type of solutions for the given equations.
a. $x^{2}+7 x+4=0$
b. $2 x^{2}-4 x+3=0$
c. $5 x^{2}+4=0$
4. Solve. Use any method.
a. $2 x^{2}-x=1$
b. $(2 x+3)(x+4)=1$
c. $\frac{x^{2}}{3}-x-\frac{1}{6}=0$
d. $\frac{1}{x}+\frac{1}{x+3}=\frac{1}{4}$
5. Write a quadratic equation in standard form with the given solution set.
a. $\{-2,6\}$
b. $\{-8 i, 8 i\}$
c. $\{-3 \sqrt{5}, 3 \sqrt{5}\}$
6. What is the discriminant and what information does it provide about a quadratic equation?
7. If you are given a quadratic equation, how do you determine which method to use to solve it?
8. Explain how to write a quadratic equation from its solution set. Give an example with your explanation.

## Quadratic Equations and Functions

1. Find the coordinates of the vertex for the parabola.
a. $f(x)=-2(x+4)^{2}-8$
b. $f(x)=-2 x^{2}+8 x-1$
2. Use the vertex and intercepts to sketch the graph of the quadratic function. Use the graph to find the function's range.
a. $f(x)=(x-3)^{2}+2$
b. $f(x)=\frac{5}{4}-\left(x-\frac{1}{2}\right)^{2}$
c. $f(x)=x^{2}-2 x-15$
d. $f(x)=5-4 x-x^{2}$
e. $f(x)=3 x^{2}-2 x-4$
3. Without graphing, determine if the function has a minimum or maximum value, find the minimum and maximum values, and then identify the domain and range for $f(x)=2 x^{2}-\mathbf{8 x}-\mathbf{3}$.
4. A person standing close to the edge on the top of a 220 -foot building throws a baseball vertically upward. The quadratic function $\boldsymbol{s}(\boldsymbol{t})=\mathbf{- 1 6} \boldsymbol{t}^{2} \mathbf{- 6 4 t}+\mathbf{2 0 0}$ models the ball's height above the ground, $\boldsymbol{s}(\boldsymbol{t})$, in feet, $t$ seconds after it was thrown.
a. After how many seconds does the ball reach its maximum height? What is the maximum height?
b. How many seconds does it take until the ball finally hits the ground? Round to the nearest tenth of a second.
c. Find $\boldsymbol{s}(\mathbf{0})$ and describe what this means.
5. Among all pairs of numbers whose sum is 16 , find a pair whose product is a large as possible. What is the maximum product?
6. You have 200 feet of fencing to enclose a rectangular plot that borders on a river. If you do not fence the side along the river, find the length and width of the plot that will maximize the area. What is the largest area that can be enclosed?

7. Explain how to decide whether a parabola opens upward or downward.
8. Describe how to find a parabola's vertex if its equation is in the form $\boldsymbol{f}(\boldsymbol{x})=\boldsymbol{a} \boldsymbol{x}^{2}+\boldsymbol{b} \boldsymbol{x}+\boldsymbol{c}$. Use $f(x)=x^{2}-6 x+8$ as an example.
9. Below are shown graphs of quadratic equations. Write the function's equation, selecting from the following options:

$$
\begin{aligned}
& f(x)=(x+1)^{2}-1, \\
& g(x)=(x+1)^{2}+1, \\
& h(x)=(x-1)^{2}+1, \\
& j(x)=(x-1)^{2}-1, \\
& F(x)=x^{2}+2 x+1, \\
& G(x)=x^{2}-2 x+1, \\
& H(x)=x^{2}-1, \\
& J(x)=-x^{2}-1
\end{aligned}
$$




