

# LOOKING

for the

# Top



# Quark



## A Graphing Game

Thomas Jefferson National Accelerator Facility - Office of Science Education

<http://education.jlab.org/>

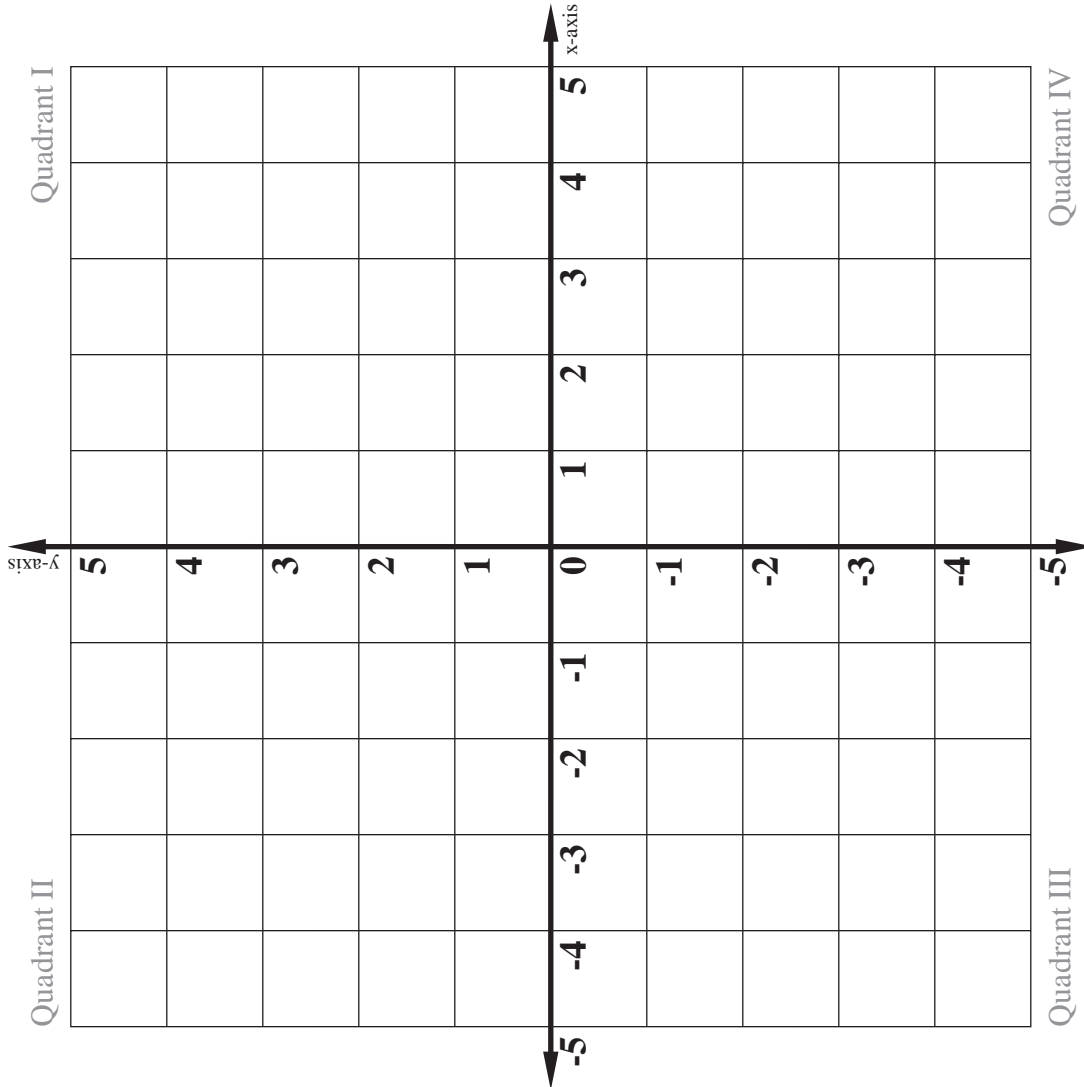
# My Quarks

## Directions

There are six kinds of quarks:

<b>Top</b>	<b>Charm</b>	<b>Up</b>
<b>Bottom</b>	<b>Strange</b>	<b>Down</b>

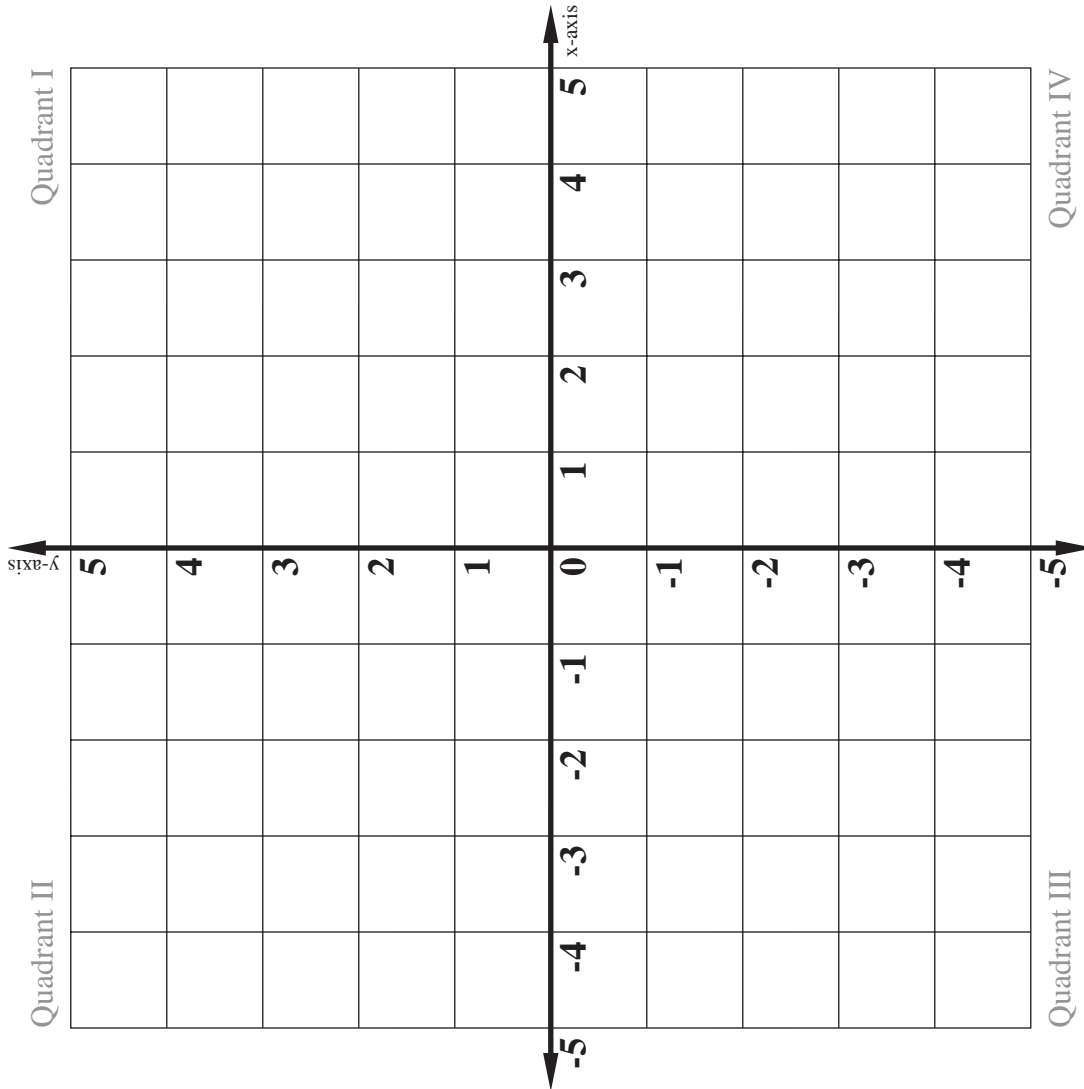
- Hide one of each kind of quark on your grid.  
Make sure that you place the quarks where the lines intersect, like at (5,8).
- Remember: The coordinate **(5,8)** means that you go **across to 5** and then **up to 8**
- Your partner will try to find your quarks by guessing coordinates. Check the **My Quarks** grid to see if they found one of your quarks.
- Take turns guessing coordinates until someone finds all of the hidden quarks.



## QUARK KEY

<input type="checkbox"/>	= Top	<input type="checkbox"/>	= Charm	<input type="checkbox"/>	= Up
<input type="checkbox"/>	= Bottom	<input type="checkbox"/>	= Strange	<input type="checkbox"/>	= Down

# My Guesses



4. Try to find your partner's hidden quarks by guessing coordinates.  
**Remember: The coordinate (5,8) means that you go across to 5 and then up to 8**
5. Keep track of **your guesses** on the **My Guesses** grid.

**Did you find one of their quarks?**

Mark that coordinate as a hit!

**Did you miss them this time?**

Mark that coordinate as a miss.

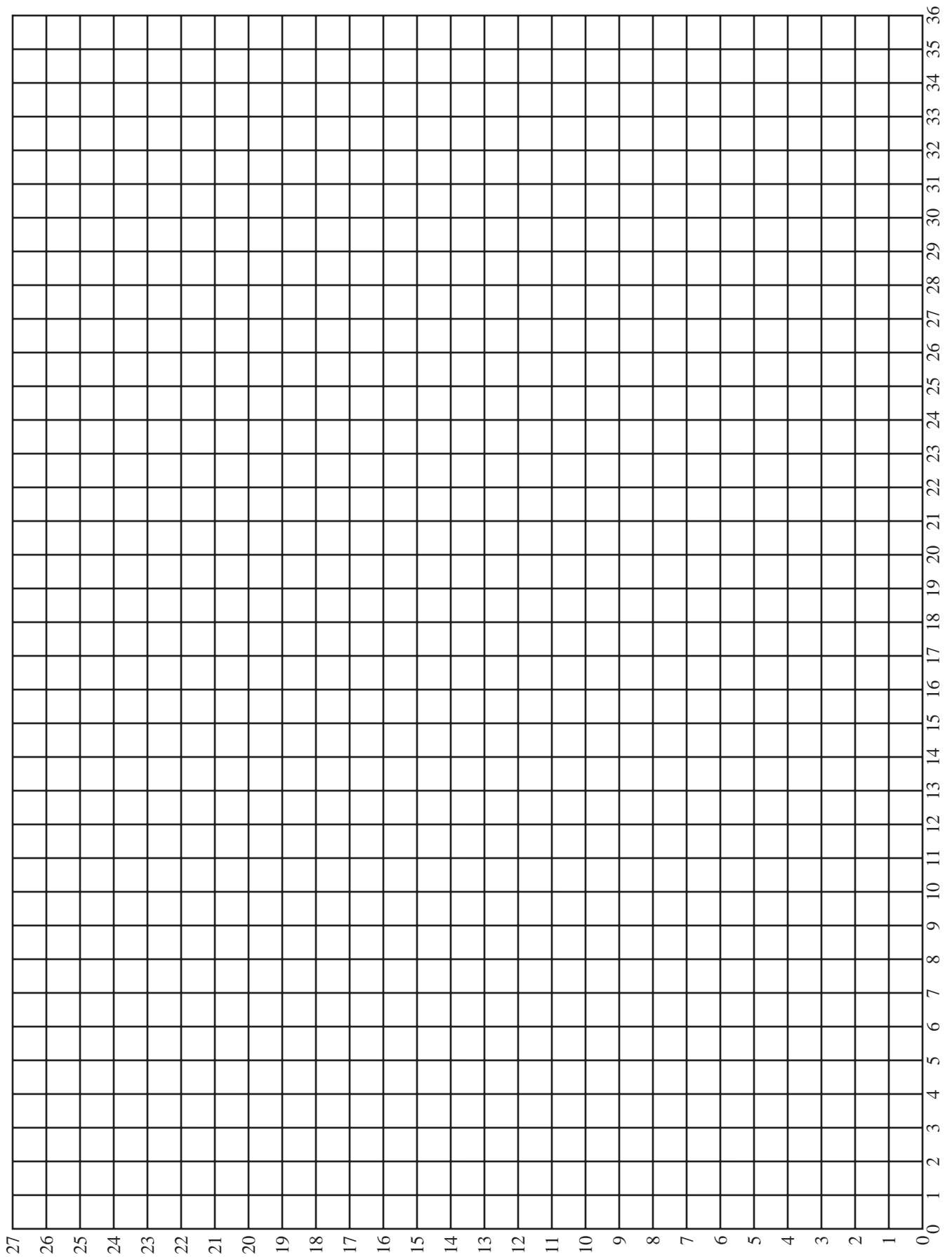
6. Take turns guessing coordinates until someone finds all of the hidden quarks.

<b>KEY</b>	
<input type="checkbox"/>	= Hits!!!
<input type="checkbox"/>	= Misses

## Mystery Picture

**Directions:** Plot the coordinates to find the mystery picture.

(4,20)	(1,1)	(20,20)	(26,24)	(10,23)	(2,11)	(22,21)
(13,19)	(12,16)	(22,24)	(30,25)	(16,22)	(22,5)	(1,10)
(4,21)	(32,14)	(20,21)	(12,5)	(7,19)	(1,8)	(22,23)
(14,25)	(8,24)	(17,25)	(5,2)	(12,19)	(4,7)	(2,0)
(11,6)	(34,10)	(19,25)	(26,22)	(10,21)	(9,13)	(2,3)
(5,19)	(2,7)	(3,7)	(29,19)	(4,5)	(8,6)	(32,21)
(10,19)	(1,2)	(23,24)	(31,22)	(16,24)	(13,25)	(8,11)
(4,19)	(34,11)	(10,22)	(26,23)	(22,20)	(3,11)	(26,21)
(7,22)	(4,11)	(22,25)	(31,19)	(16,23)	(24,5)	(10,14)
(4,24)	(4,23)	(9,5)	(1,9)	(12,25)	(6,9)	(24,16)
(8,10)	(31,6)	(18,22)	(26,19)	(6,3)	(5,8)	(3,0)
(5,22)	(11,25)	(22,19)	(6,5)	(11,22)	(28,20)	(30,5)
(10,24)	(18,16)	(2,5)	(28,23)	(4,2)	(16,5)	(3,6)
(11,19)	(10,16)	(11,15)	(24,23)	(31,25)	(17,22)	(28,5)
(33,13)	(9,8)	(32,7)	(18,25)	(26,20)	(14,19)	(5,9)
(30,16)	(10,7)	(33,8)	(19,22)	(6,16)	(3,4)	(10,20)
(5,10)	(7,25)	(5,25)	(20,16)	(4,1)	(29,22)	(28,16)
(14,5)	(16,19)	(6,22)	(16,16)	(22,22)	(30,19)	(7,4)
(18,5)	(5,5)	(4,22)	(3,3)	(20,22)	(32,20)	(10,25)
(12,22)	(16,20)	(8,16)	(8,23)	(8,21)	(26,5)	(31,15)
(26,16)	(8,20)	(22,16)	(25,24)	(26,25)	(20,23)	(6,19)
(7,5)	(20,24)	(11,5)	(6,25)	(7,7)	(14,16)	(30,22)
(16,21)	(20,5)	(20,19)	(4,25)	(29,25)	(32,24)	(28,24)





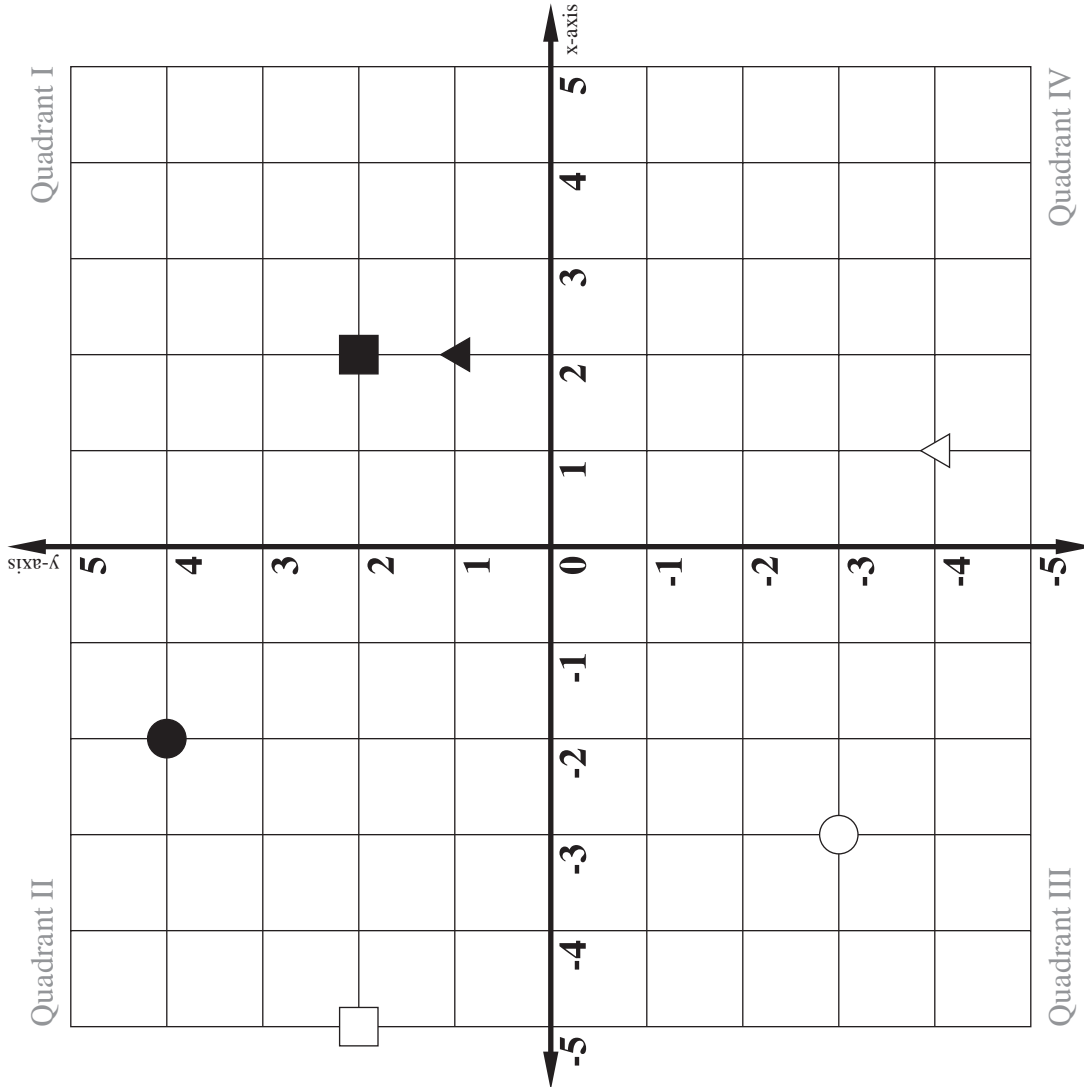
# My Quarks

## Directions

There are six kinds of quarks:

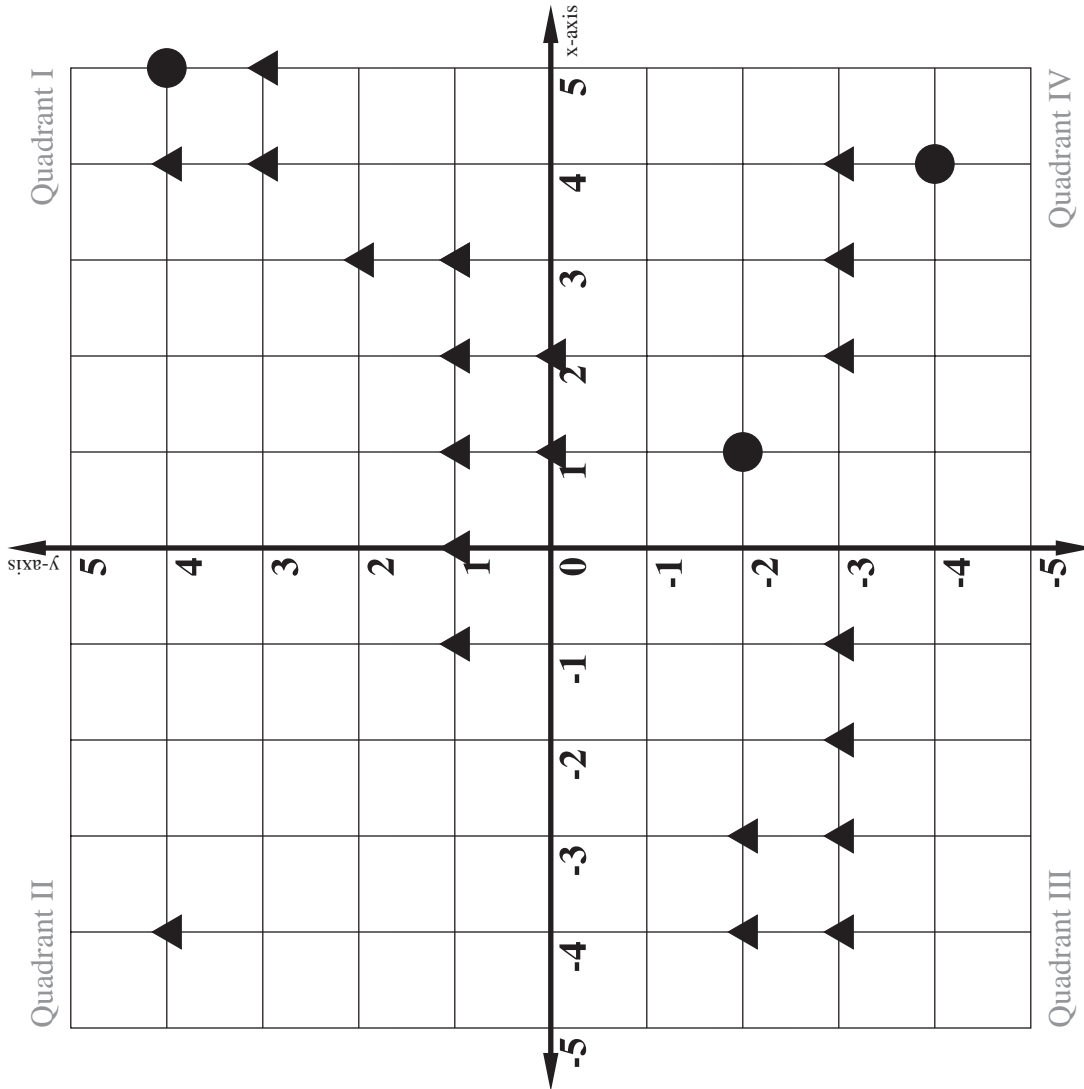
<b>Top</b>	<b>Charm</b>	<b>Up</b>
<b>Bottom</b>	<b>Strange</b>	<b>Down</b>

- Hide one of each kind of quark on your grid.  
Make sure that you place the quarks where the lines intersect, like at (5,8).
- Remember: The coordinate **(5,8)** means that you go **across to 5** and then **up to 8**
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QUARK KEY					
	= Top		= Charm		= Up
	= Bottom		= Strange		= Down

# My Guesses



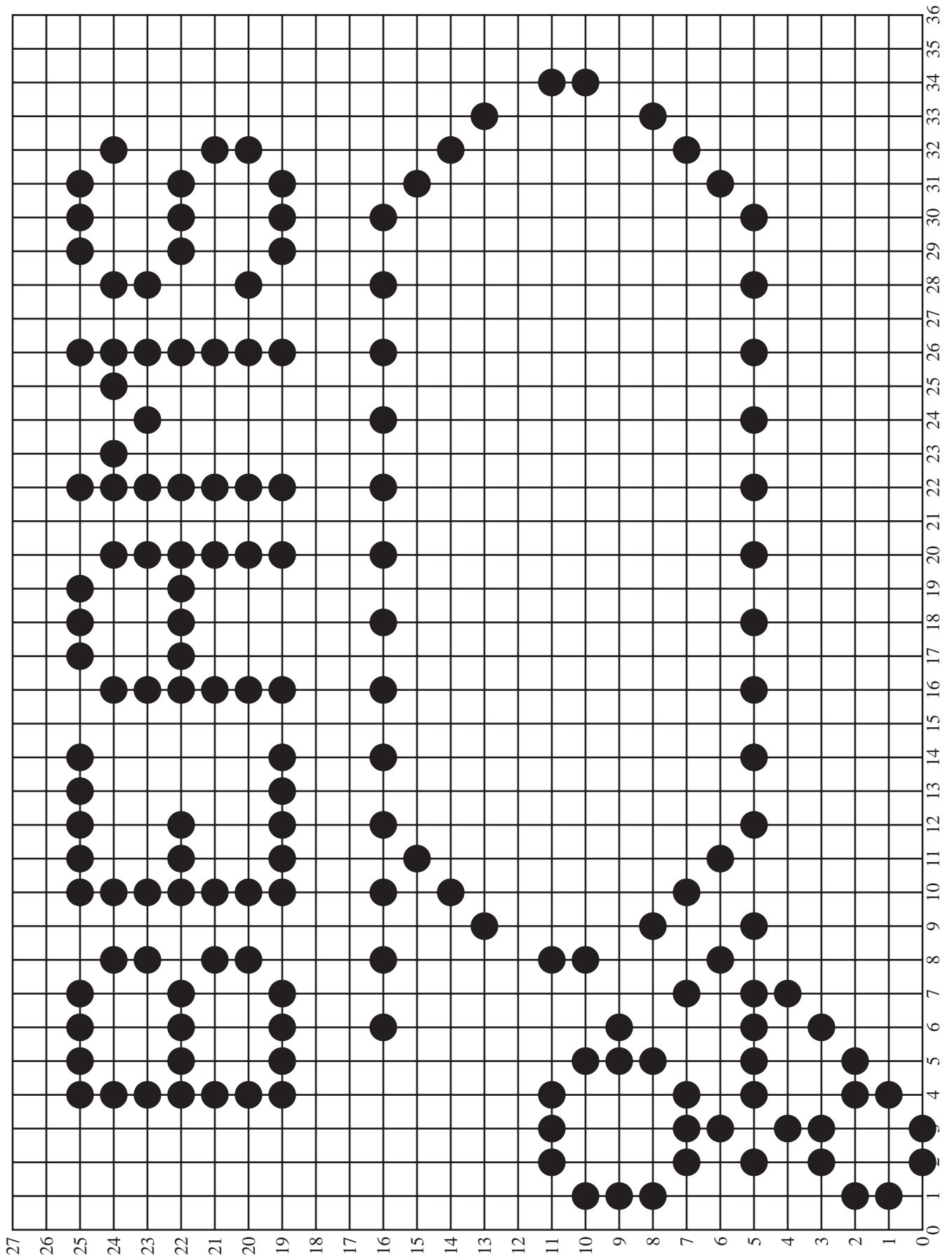
**KEY**

● = Hits!!!

▲ = Misses

4. Try to find your partner's hidden quarks by guessing coordinates.  
Remember: The coordinate **(5,8)** means that you go **across to 5** and then **up to 8**
5. Keep track of **your guesses** on the **My Guesses** grid.  
**Did you find one of their quarks?**  
Mark that coordinate as a hit!  
**Did you miss them this time?**  
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# Looking for the Top Quark

This is an activity in which students practice locating coordinates on a grid.

## Objectives:

In this activity students will:

- work in groups
- learn the names of the six quarks
- pick a coordinate on a grid and call out the corresponding ordered pair
- hear an ordered pair and find the corresponding point on a grid

## Questions to Ask:

1. Why is the order of a coordinate pair important?
2. How would you plot the coordinate (3,2,6)?
3. How many different types of graphs are there?

## Travel Book Activities:

- Mystery Picture
- Writing About a Loss

## Virginia State Standards of Learning

### Math 6.5 Number and Number Sense

- by identifying and representing integers on a number line

### 7.26 Patterns, Functions and Algebra

- by identifying and graphing ordered pairs in the four quadrants of a coordinate plane

# Looking for the Top Quark

## Teacher Overview and Materials List

### Background:

Scientists are involved in a wide range of experiments and activities and often need a convenient way to represent the data they collect. Graphs provide a visual way of presenting information. Reading and interpreting graphs is a necessary skill in the sciences. This activity gives students the opportunity to practice their graphing skills while playing a game.

### Minimum Materials Needed for Each Student Group:

'My Quarks' grid

'My Guesses' grid

### Notes:

- Current atomic theory predicts the existence of three pairs of quarks: Up and Down; Strange and Charm; Top and Bottom. Scientists had evidence for the existence of all of the quarks except for the Top quark. If the Top quark couldn't be found, atomic theory would have to be drastically revised. After years of experimentation, scientists working at another Department of Energy research laboratory called Fermi Lab finally observed evidence for the existence of the Top quark.