

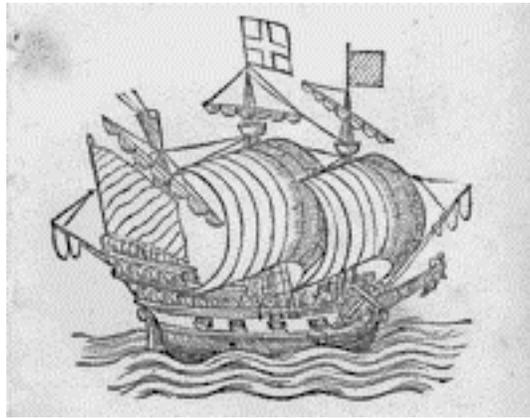
Section Two

# *Across the Atlantic*

## Navigation

### Student Packet

Name: \_\_\_\_\_



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## The Compass Rose

The compass is one of the oldest navigational devices, and is still used throughout the world today. The Chinese (or possibly the Greeks) were the first to discover that certain rocks always lined up north if they were allowed to turn freely. These rocks were called *lodestones*. The Vikings were among the first mariners to use lodestones to find North. They would lay lodestones on boards floating in a water-filled bucket.

The Western compass system has **four cardinal points**: North, South, East, and West. These are then divided into **half-winds**: northeast, northwest, southeast, and southwest. These are further divided into **quarter-winds** such as north-northwest and west-southwest. Altogether there are 32 points, or directions, to the Western compass.

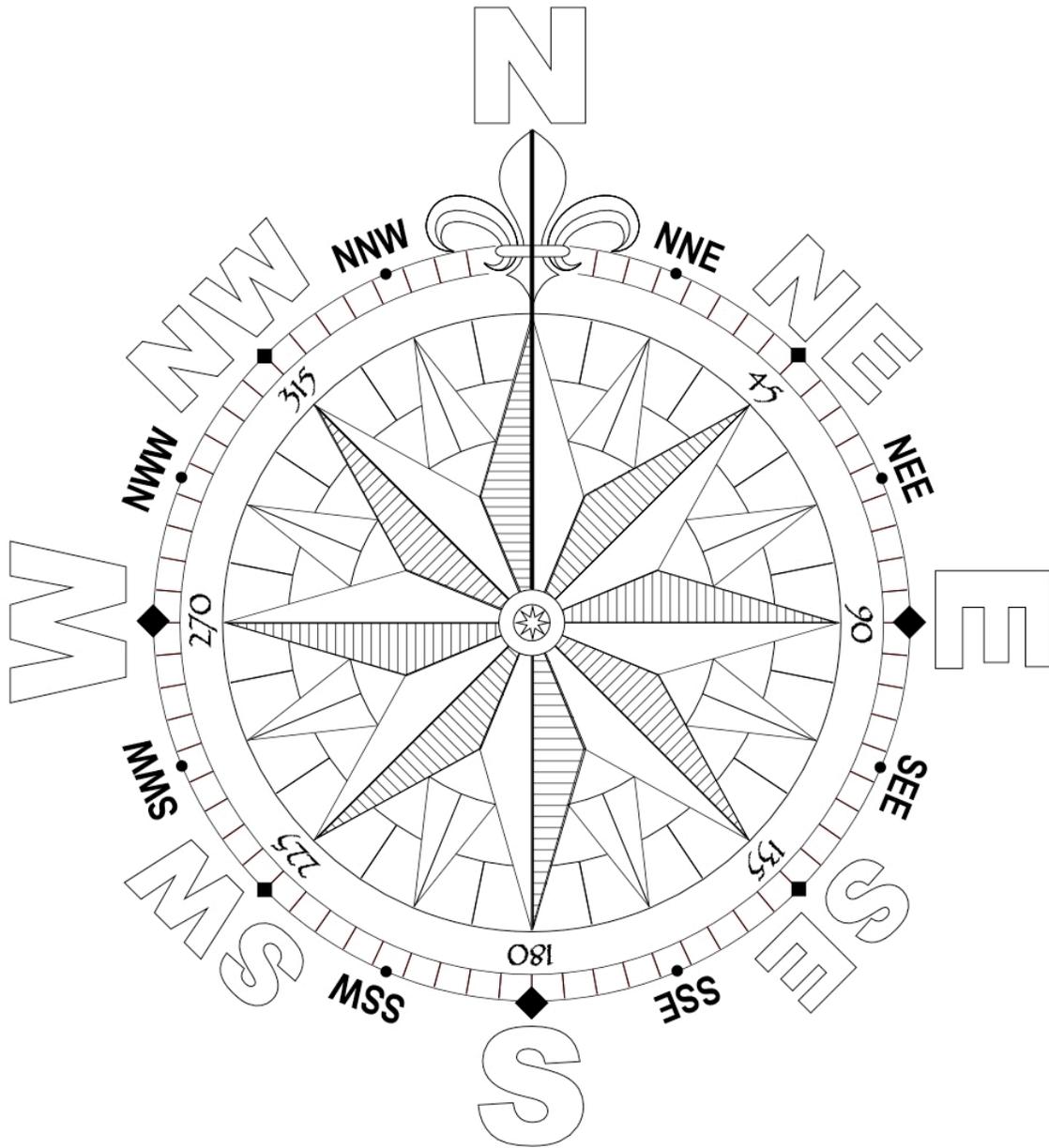
Your Compass Rose names the four cardinal points (N, S, E, W), four half-winds (NW, NE, SW, SE) and eight quarter-winds (SSE, SSW, etc). This was not true of early compasses, because a ship's crew often spoke different languages and very few could read or write. Sailors were expected to name the points from memory.

The numbers on a compass rose were a later development. They come from the 360 degrees in a full circle. The winds and half-winds on this compass rose are based on the 360 degrees of a full circle. Examine a math protractor used to measure angles. Notice that the numbers on a protractor correspond with those on your compass rose.

**Read this article about the Compass Rose. Then color the diagram with the following:**

- Color the white part of the cardinal points **BLUE**.
- Color the half-wind points **RED** and **YELLOW**.
- Color the quarter-wind points **BROWN** and **GRAY**.

## The Compass Rose



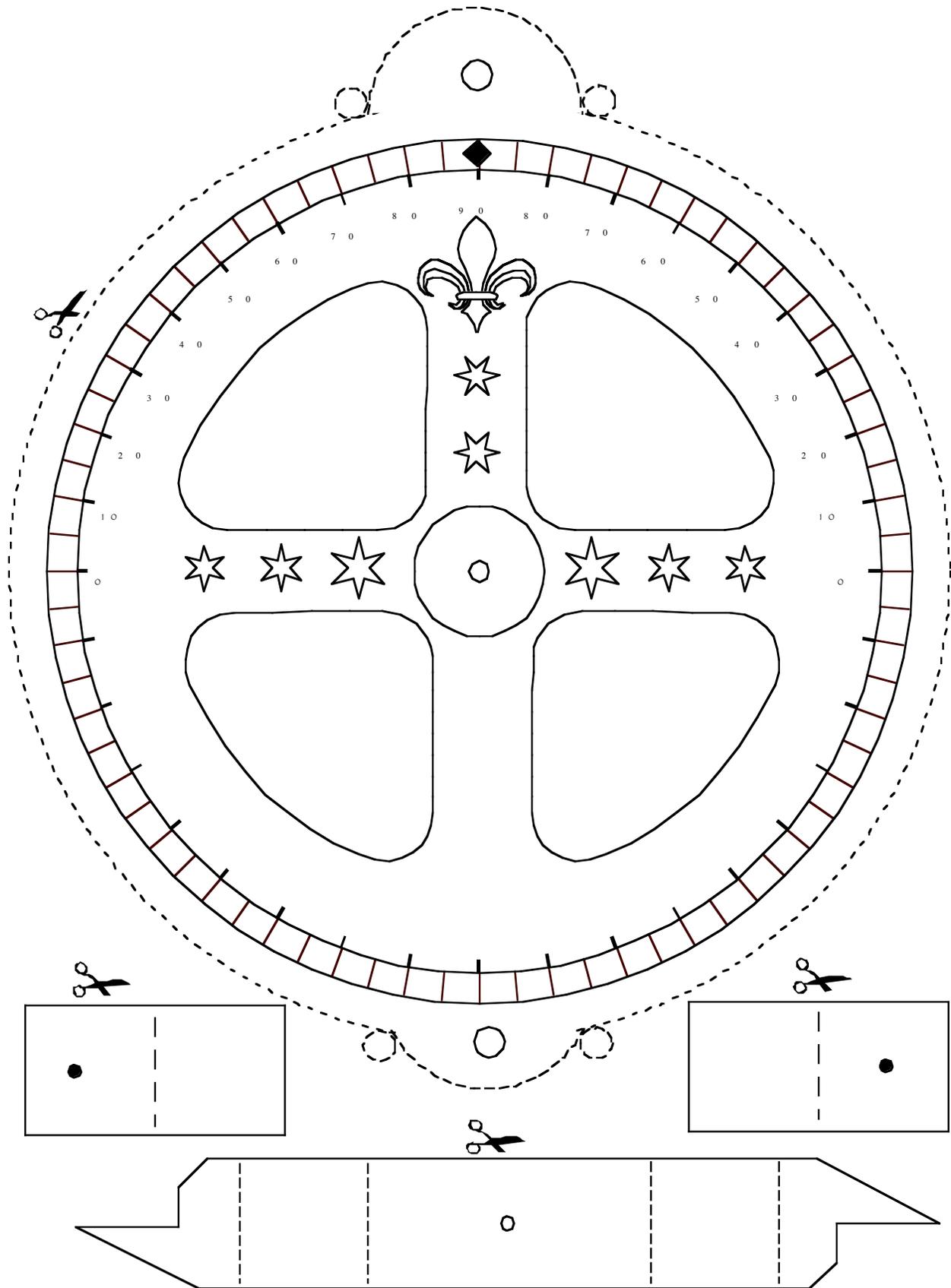
## The Astrolabe

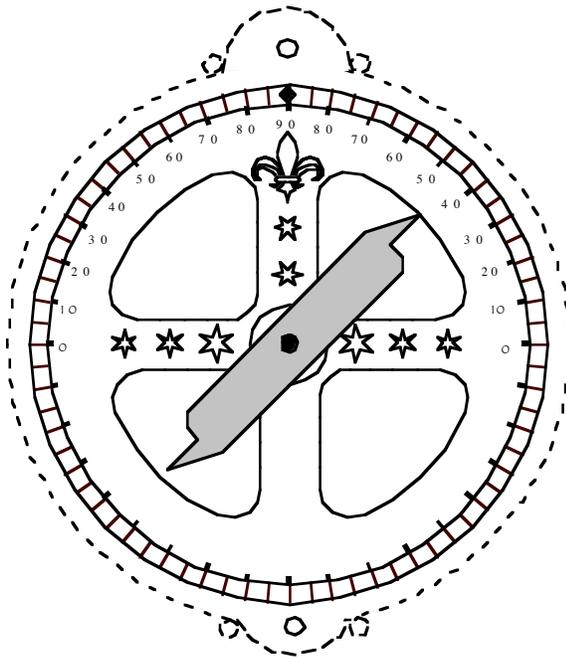
The astrolabe is an ancient instrument used to find the altitude of stars and planets and the height of mountains. Its name means “star-taker.” It is made of a round disc that is marked off in degrees around its circumference. A pointer called an alidade rotates around to indicate the sightings. It is hung vertically from a ring held above the navigator’s head.

To use it the navigator would hang it above his head and turn the alidade until a star could be seen in a straight line through both pinholes. The alidade would point to a mark on the disc circumference that could be converted into degrees of latitude.

Arab travelers crossing the great deserts were probably the first to navigate with astrolabes. By the fifteenth century mariners were using them for ocean crossings. However, it was much more difficult to hold the astrolabe steady on the bouncing deck of a ship than in the desert. Navigators wanted them small (6-7 inches diameter) and heavy (up to 4 pounds). This made them less accurate, but easier to handle.

Later improvements on the same concept included the cross-staff, back-staff, and quadrant. However those instruments needed to be aligned with the horizon. The simpler astrolabe just needed gravity to hang and could be used on the very darkest of nights.





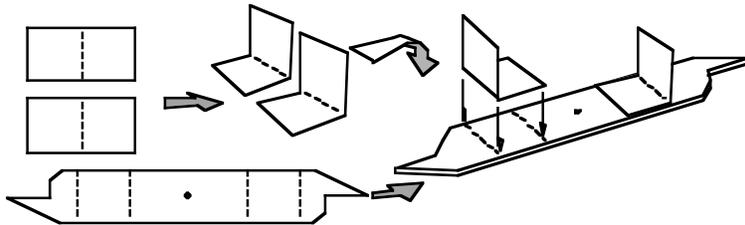
CLASSROOM PROJECT INSTRUCTIONS

Copy the Astrolabe onto heavy tagboard.

Students may color the astrolabe disc.

Cut out the vanes and glue them to the base of the alidade. Don't forget to punch the pinholes.

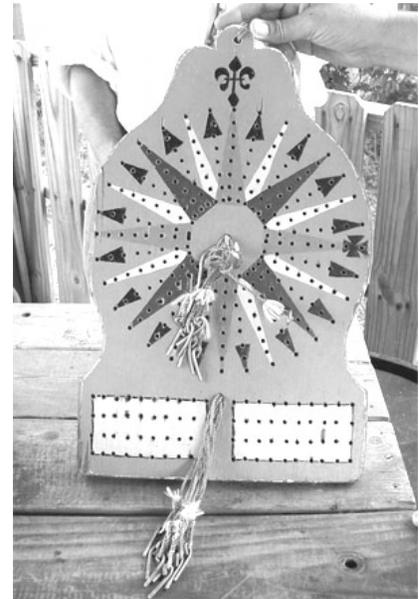
Attach the alidade to the disc with a brass fastener so it rotates.



## The Traverse Board

Sailing ships depended upon the winds and currents progress. They seldom moved in a straight line. When traveling into the wind, a sailing ship must “tack” or zig-zag back and forth to keep moving forward. To keep from getting lost a navigator had to know exactly how many zigs and zags were made, and how long each one was.

The Traverse Board was a way to keep track of that information. It was a simple board that could be used by any seaman. It did not matter if the sailor could read or what language he spoke.



The Traverse Board was basically a compass with 32 rows of holes--- one row of 8 holes along each of the 32 compass points. Eight pegs hung on cord from the center (to record direction), and eight from the middle of the bottom grids (to record speed).

### Using the Traverse Board

#### To Record Direction:

Every half-hour (when the hourglass is turned), place a peg in the hole of the average direction the ship has sailed during that time. Start in the center of the compass rose, and work outward every 30 minutes. The directions were recorded in a rough (temporary) log at the end of every 4-hour watch. Then the pegs were pulled out, and the process started over.

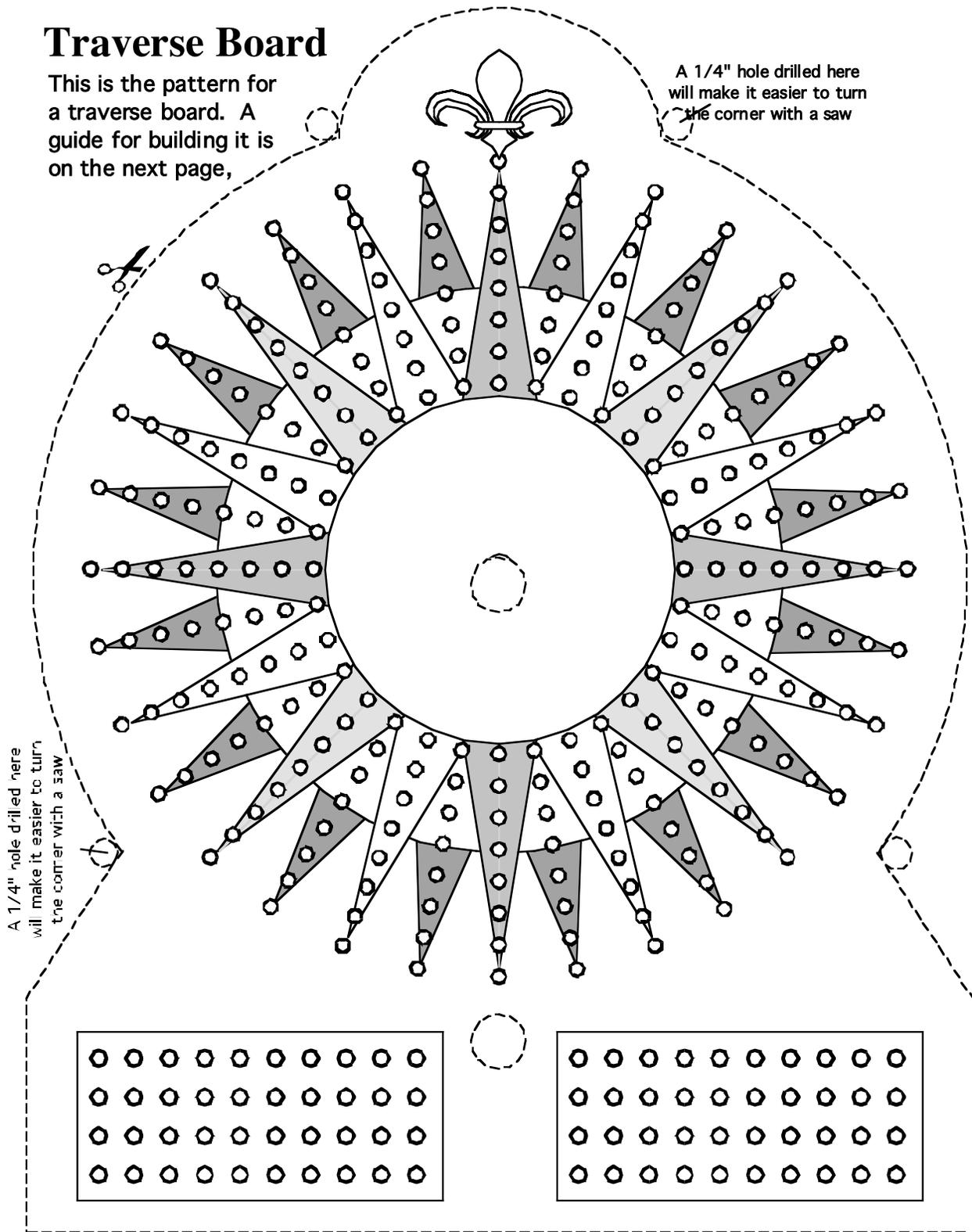
#### To Record Speed:

Each half-hour the speed (in knots from the chip log) was also recorded on the Traverse Board. The first peg was inserted in the left grid to correspond with the speed (0-1-2-3-4-5-6-8 knots). 30 minutes later the second peg was inserted in the right-side grid, and so on until the watch was completed.

# Traverse Board

This is the pattern for a traverse board. A guide for building it is on the next page,

A 1/4" hole drilled here will make it easier to turn the corner with a saw



A 1/4" hole drilled here will make it easier to turn the corner with a saw

# The Crossing

## *Keeping a Navigators Log*

As you cross the Atlantic, you will steer a course like that of the Susan Constant, Discovery, and Godspeed. Accurate records were most important. A Captain had to record the position of the ship, and any other factors that might affect a later voyage.

As carefully trace the route of the Journey to Jamestown in *The Crossing*, record the critical information on this log. Some of it has been completed for you.

| Date                 | Location                        | Heading    | Latitude         | Notes                                |
|----------------------|---------------------------------|------------|------------------|--------------------------------------|
| <i>Dec. 20, 1606</i> | <i>Blackwell, Eng.</i>          | <i>SWW</i> | <i>50° North</i> | <i>Set sail from England</i>         |
| <i>Jan. 5, 1607</i>  | <i>The Downes</i>               |            | <i>48° North</i> |                                      |
| <i>Mid-January</i>   | <i>At Sea</i>                   |            | <i>47° North</i> |                                      |
| <i>Late January</i>  | <i>At Sea</i>                   |            |                  | <i>Changing course</i>               |
| <i>Feb. 6</i>        |                                 | <i>SSE</i> |                  |                                      |
| <i>Feb. 12</i>       |                                 |            |                  | <i>Saw a blazing star at night</i>   |
| <i>Mar. 1</i>        | <i>Canary Islands</i>           |            |                  |                                      |
| <i>Mar. 5</i>        |                                 | <i>SW</i>  |                  | <i>Departed Canary Islands</i>       |
| <i>Mar. 10</i>       |                                 |            |                  | <i>Crossed Tropic of Cancer</i>      |
| <i>Mar. 15</i>       | <i>At Sea</i>                   | <i>W</i>   |                  | <i>Balmy seas</i>                    |
| <i>Mar. 20</i>       |                                 |            |                  |                                      |
| <i>Mar. 24</i>       | <i>Guadelupe</i>                |            |                  |                                      |
| <i>Mar 27</i>        | <i>Nevis</i>                    |            |                  |                                      |
| <i>April 5</i>       |                                 |            |                  | <i>Departed Nevis</i>                |
| <i>April 18</i>      | <i>Somewhere in West Indies</i> |            |                  | <i>Fierce winds ~ terrible storm</i> |
| <i>April 26</i>      | <i>Virginia</i>                 |            |                  |                                      |