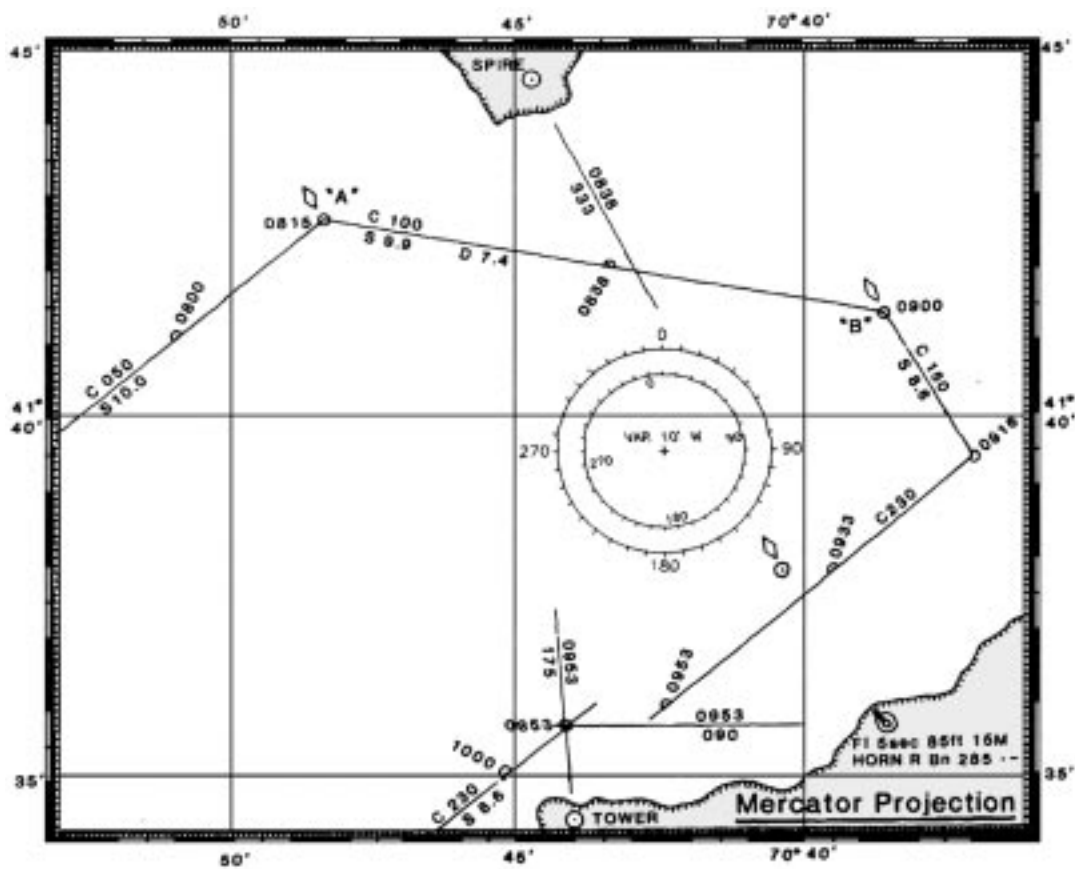


CHART SMART®



Compass and chart fundamentals and basic piloting techniques

This Learning Guide is one of a group of marine-oriented publications offered by United States Power Squadrons. Comments, suggestions, or corrections relating to this or any of the other Learning Guides are not only welcomed but solicited.

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The Ensign	the USPS ensign (flag design)

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Contents

Introduction	v	5 Piloting—	
1 Introduction to Chart Smart	1	Plotting a Course	23
General	1	Motivations For Learning	23
Motivations for Learning	1	Teaching Aids	23
Lesson Plan Outline	1	The USPS Plotter	23
Teaching Aids	1	To Plot a Course With the USPS Plotter	23
2 Piloting—		Lesson Plan Outline	25
The Mariner’s Compass	3	Homework Answers	27
General	3	6 Piloting—	
Motivations for Learning	3	Distance, Speed, Time	29
Teaching Aids	3	Motivations for Learning	29
Homework Comments	3	General Comments	29
Lesson Plan Outline	4	Teaching Aids	29
Homework Answers	7	Homework Comments	29
3 Charts	9	Lesson Plan Outline	31
Motivations For Learning	9	Homework Answers	31
General Comments	9	7 Piloting—	
Teaching Aids	10	Determining Position	33
Lesson Plan Outline	11	General	33
Homework Answers	15	Motivations for Learning	33
4 Aids to Navigation	17	Teaching Aids	33
Motivations For Learning	17	Lesson Plan Outline	35
General Comments	17	Homework Answers	37
Teaching Aids	17	A Chart Smart Supplies	39
Lesson Plan Outline	19	Instructional Materials	39
Homework Answers	21	Quiz Materials	39
		Supplemental Items	39
		B Quiz	41
		C Quiz Answers	45

Introduction

Chart Smart:

- is a Learning Guide that serves as an introduction to piloting
- may be presented to the public in a classroom setting
- requires no exam; however, a quiz is provided to help the student assess their understanding of the material
- results in a certificate of completion
- does not satisfy membership requirements

Prospective students include:

- Boat Smart graduates
- America's Boating Course graduates
- Members entering the Piloting Class (refresher)

Since Chart Smart will typically be offered as a supplement to Boat Smart or America's Boating Course, the job of filling the classroom with Chart Smart students will be part of the publicity and promotion of these courses.

A Microsoft® PowerPoint® presentation is available on the USPS web site, Chart Smart download section, to facilitate upbeat presentations:

www.usps.org/national/eddept

Click on the BPECom link, then click the "Downloadable Information" link. These slides are also available from your DEO on a CD-ROM. Included are numerous PowerPoint (ppt) slides within each file for each Chart Smart section. Ideally, use an LCD projector in the presentations to students. If your squadron does not have access

to an LCD computer projector, the slides may be used to produce hardcopy masters for overhead transparency use. OHTs may then be produced from the ppt masters on a home printer.

In the remainder of this Instructor Manual, the PowerPoint file names are listed with their full names in the Teaching Aids section and then abbreviated in the Speaking Plan descriptions. That is, CS_00_Intro.ppt is the full name of the presentation file and CS-00 is the abbreviation.

Public Announcement of Chart Smart Offering

Using the following information and lesson plan, squadron members should be able to effectively announce the offering of a Chart Smart (CS) class.

General

Typically, a Boat Smart course is an ideal time and place to announce the follow-on Chart Smart class. Chart Smart contents should be presented. It includes the piloting topics of compasses, charts, position determination, and dead reckoning. A sign-up sheet should be passed around. Ideally, Chart Smart class materials should be available and offered for sale during the Boat Smart classes; this will cut down on Chart Smart administration and speed up the first night of the class.

Teaching Aids

- Overhead projector or LCD computer projector
- Overhead transparencies or MS PowerPoint slides from the file CS_00_Intro.ppt

Class Offering Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Presentation	Presentation cover page	CS-00 slide 1	Introduction of material
Chart Smart Topics	What does Chart Smart offer ?	CS-00 slide 2	$60 \times D = S \times T$ TVMDC
Overall Agenda	Chart Smart is short	CS-00 slide 3	Stress two class sessions
Chart Smart Contents	What can the student do after completing Chart Smart?	CS-00 slide 4	Stress hands on examples and use of plotting tools
Plotting Tools	Optional plotting tools may be purchased	CS-00 slide 5	Show USPS plotter and dividers

1

Introduction to Chart Smart

- 1 Using this section, the Chart Smart instructor should be able to effectively launch the first class session of Chart Smart (CS).

General

- 2 Typically, a Chart Smart class is an ideal time and place to talk about USPS, its objectives and the benefits available to members. But don't over do it. The Chart Smart class is intense, covering six chapters and up to six hands-on class exercises in four hours. CS contents should be restated. The hands-on plotting tools should be displayed.

Motivations for Learning

- 3 Charts and compasses are important piloting tools and are essential to cruising safely.

- 4 The objective of this first lesson is to involve students in the class, right from the beginning. It is especially important that you be enthusiastic and positive in leading this first session. It will set the pace for the whole class.

Teaching Aids

- Overhead projector or LCD computer projector
- Overhead transparencies or Microsoft® PowerPoint® slides from the file CS_01_Lesson_Plan.ppt
- Piloting tools of plotter and dividers; tell students about the hands-on exercises

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Introduction	Presentation cover page	CS-01 slide 1	Introduction of material
Agenda	Introduction of entire material	CS-01 slide 3	Introduction and topics for each class session
Tools	Students will need plotters and dividers		8 × 10 inch plotter 6 inch dividers

2

Piloting—The Mariner’s Compass

In this section, students will learn to

- select the right compass for a boat
- install a compass correctly
- care for a compass
- use a compass to steer a correct course by adjusting true course for variation

General

Carefully explain deviation to the student. Emphasize the need to keep all magnetic materials away from a compass, and how to minimize deviation by careful compass location and compensation.

This section includes four examples of the use of TVMDC. In CS_02_Compass.ppt, to simplify the calculations in Example 1 and 2, deviation is assumed to be zero (ppt CS-02 slides 20 and 21). In the optional file CS_02D_Compass_Dev.ppt, examples 3 and 4 utilize non-zero deviation (ppt CS-02D slides 4 and 5). Use care if introducing interpolation (Example 4) in Chart Smart. Students who know interpolation may use it for greater accuracy. Explain that interpolation is taught and used in USPS member courses.

Motivations for Learning

The compass is an important navigational tool in piloting a boat safely.

Teaching Aids

- Overhead projector or LCD computer projector
- Overhead transparencies or Microsoft® PowerPoint® slides from the files CS_02_Compass.ppt, CS_02D_Compass_Dev.ppt, and CS_02T_Dev_Table.ppt
- A compass
- A transparent compass for use on overhead table
- A steel object to demonstrate deviation
- Handout describing compass installation (excerpted from *Chapman*)

Homework Comments

A clarification for students: possibly these two homework problems should be held until the lecture on Section 5 has been completed.

- Problem 9, page 8 of the SM—nav aid R “6” refers to R “6” Fl R 4s buoy (chart center right near the bottom of the compass rose); nav aid RW “OR” refers to the safe water buoy at the entrance to Oyster River.
- Problem 10, page 8 of the SM—RW “OR” refers to the safe water buoy at the entrance to Oyster River; R N “2” is located at entrance to Perkins Cove.

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Introduction	Presentation cover page	CS-02 slide 1	Introduction of material
Agenda	Introduction of New Material	CS-02 slide 2	Lesson Introduction
Compass	Define Important piloting tool	CS-02 slide 3	Figure 2–1
How a Compass Works			
Earth's Magnetic Field	Define and explain	CS-02, slides 4, 5	
Compass Design	Lines of force Effect on compass	CS-02, slide 6	
Compass Construction	Compass card magnets bowl and fluid Lubber's line	CS-02, slides 7, 8	Figure 2–2
Selecting a Compass			
Size	Space available		
Quality	Price not an indicator Pivot friction important Type of fluid		
Installing a Compass			
Location	Important—explain why Parallel to keel Electrical/magnetic influence Possible distortion of readings by compass bowl	CS-02, slide 9	Figure 2–3

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Location (continued)			
Check for Accuracy	Adjust if necessary	CS-02, slide 10	Stress proper care
Compass Course			
Variation	Define/describe: Agonic line Varies with position Westerly variation Easterly variation Where to find variation	CS-02, slides 11, 12, 13	Figure 2–4 Explain in detail using OHT
Deviation	Define/describe: Effect of electronics and metallic materials Deviation in CS is assumed to be 0 unless otherwise stated		Demonstrate deviation on overhead with transparent compass and metallic object; consider use of Sample Ship's Deviation table (ppt)
Calculating a Steering Course			
Magnetic Direction	Language of the compass	CS-02, slides 14, 15	Refer to practice exercise in later sections; Bowditch Bay chart
True Direction	Language of charts	CS-02, slide 16	
Difference between intended vs. actual courses	Cross Track Errors (XTE) (optional)	CS-02, slide 17 (optional)	Explain what may happen to an intended course if XTE's are ignored

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Calculating a Steering Course (continued)			
Converting True to Magnetic and Vice Versa	TVMDC formula (AWSE): add west subtract east down the formula opposite going up	CS-02, slides 18, 19, 20, 21 Examples 1, 2 (zero deviation)	Acceptable acronyms: • TV Makes Dull Children • Can Dead Men Vote Twice
Converting True to Magnetic to Compass and Vice Versa	Deviation is non-zero (optional)	CS-02D, slides 1, 2, 3, 4, 5 (optional) Also, include handouts of CS-02T portrait, slide 1 Examples 3, 4 (optional, non-zero deviation)	Stress deviation is unique for each boat; consider use of the Sample Ship's Deviation Table (ppt) which is in a separate ppt file for portrait style slides. Ex. #3 is simple deviation; Ex. #4 uses interpolation. Use care if introducing interpolation—those who already know it may use it for improved accuracy.

Homework

1. **A compass is an important navigational tool on board a vessel because it:**
 - a. is a speed-determining instrument.
 - b. can be used to establish position and determine the direction a boat is heading.**
 - c. is required by federal, state and local laws.
 - d. will show the direction of true north at a glance.
2. **If a compass is properly mounted, the numbers on the compass card when read at the lubber's line will indicate the direction the boat is heading in reference to:**
 - a. magnetic north.**
 - b. the north star.
 - c. true north.
 - d. the boat's centerline.
3. **Size and quality are two key factors in choosing a compass. The size will often be limited to the:**
 - a. shape of the compass bowl.
 - b. space available to mount it.**
 - c. position of the lubber's line.
 - d. amount of pivot friction.
4. **Mount a compass so that:**
 - a. the compass card can be seen from anywhere in the boat.
 - b. it is as close to your VHF radio as possible.
 - c. it will not be in the way anywhere you can find a place.
 - d. a line through the lubber's line and the center of the compass is parallel to the keel.**
5. **Keep your compass in top condition by keeping it out of direct sunlight and by:**
 - a. storing it on its side to remove pressure on the pivot.**
 - b. not using it in stormy weather.
 - c. not adding too much oil to the compass bowl.
 - d. avoiding exposing it to moisture.
6. **The angular difference between the true geographic pole and the magnetic north pole is called:**
 - a. variation.**
 - b. magnetization.
 - c. deviation
 - d. a line of force.
7. **Variation:**
 - a. is established by the Coast Guard.
 - b. can usually be ignored.
 - c. changes with geographic position.**
 - d. does not show on a chart.
8. **To convert true course to magnetic course:**
 - a. add easterly variation.
 - b. subtract westerly variation.
 - c. add westerly variation.**
 - d. consult Local Notices to Mariners.
9. **Referring to the course you plotted on the practice chart from R "6" to RW "OR", what would be your compass course? (Variation is 15° West, Deviation is 0°).**
 - a. 087
 - b. 193
 - c. 268**
 - d. 323

10. What would be the magnetic course *from* RW “OR” to R N “2” if the variation was 5° East?
(Deviation is 0°)
- a. 060
 - b. 091**
 - c. 180
 - d. 271

3

Charts

In this section students will learn to:

- Use the many helpful features of a nautical chart.
- Select the best types of charts to meet his needs.
- Determine latitude and longitude.
- Find information necessary to keep the charts up-to-date.

Motivations For Learning

Charts are vital to safe boating. A boater must always know where he is and the best way to get to his destination safely.

General Comments

Provide table samples of various types of charts for demonstration purposes. Coast and small-craft nautical training charts are available from NOS. Point out their differences. If your students boat on rivers or lakes, include a local chart of those waters. Most coast training charts (such as the 1210Tr), include a reproduction of Chart No. 1, Nautical Chart on the reverse side.

Statistics tell us that 71% of our students either do not own a boat, or operate a boat under 25 feet in length. Small-craft charts

are designed for small boats that do not have chart tables for 36 × 54 coast charts. You may find small-craft charts available for your area.

For piloting practice, make primary use of Figure 6, Typical Chart, and the Bowditch Bay practice chart in the back of the student manual. The text and homework questions refer to those charts.

Start the session by asking students to call out various features they see on one of the charts you have provided. List these features on the chalkboard to demonstrate the large amount of information available on a nautical chart.

Charts tell a boater where he cannot go. Point out obstructions to safe navigation that a skipper would not be aware of without a chart.

Outline parallels of latitude and meridians of longitude with tape or magic marker on an inexpensive globe, to more clearly illustrate these concepts. Establish the latitude and longitude of your classroom location in advance, so that when you teach the use of geographic coordinates you can give a clear example of how each point on earth has an “address.”

Teaching Aids

- Overhead projector or LCD computer projector
- Overhead transparencies or MS PowerPoint slides from the file CS_03_Charts.ppt
- Dividers
- Small globe to demonstrate Latitude/Longitude
- Samples of:
 - √ coast and small-craft training charts
 - √ local charts
 - √ NOS Chart Catalog for local area
 - √ NOS Dates of Latest Editions
 - √ Local Notice to Mariners for local area
 - √ NOS Coast Pilot for local area

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Introduction	Presentation cover page	CS-03 slide 1	Introduction of material
Agenda	Introduction of New Material	CS-03 slide 2	Lesson Introduction
Charts vs. Road Maps	Show where you can't go; vital to safe boating.	CS-03 slide 3	
What Charts Show			
Student Participation	Contents of charts		See General Comments
Chart Symbols	Abbreviations	CS-03 slides 4, 5	Figure 6 Nautical Chart No. 1
Chart Colors	Four colors—describe	CS-03 slide 6	Nautical Chart No. 1
Direction	000 degrees to 360 degrees	CS-03 slide 7, 8	Refer Bowditch Bay practice chart compass rose
Depths	Feet, meters, fathoms; MLW or MLLW Depths are <i>averages!</i>		Figure 6 Chart title block Nautical Chart No. 1
Depth Contours	Describe/Explain		Nautical Chart No. 1
Heights of Objects	Above mean <i>high</i> water		Nautical Chart No. 1
Nature of the Bottom	Explain importance		Nautical Chart No. 1
Prominent Landmarks	Exactly located landmark Circle around position dot		Nautical Chart No. 1
Dredged Channels	Dashed black lines		Nautical Chart No. 1

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Marine Hazards	Point out samples		Wrecks, rocks
Distance Scales	Nautical/Statute miles		Figure 6 Refer Bowditch Bay practice chart
Vertical Clearances	At mean <i>high water</i> , Heights are <i>averages!</i>		Refer to TR chart for examples
The Latitude-Longitude System	Two sets of imaginary lines Parallels of Latitude Describe, demonstrate Meridians of Longitude Describe, demonstrate	CS-03 slides 9, 10	Figure 7, Figure 8 Demonstrate with a globe; tape or draw lines on a globe; Bowditch Bay chart
L and Lo Scales	Where found: conventional charts small-craft charts Units of measurement: Conventional: minutes/10ths of minute Small craft: minutes/seconds		Figure 9 Refer to L and Lo scales on Bowditch Bay practice chart
Determining L & Lo	Demonstrate	CS-03 slide 11 note—slide 11 and Figure 9 are different examples	Figure 9 Lay dividers on overhead table to demonstrate
Chart Scales	Define <i>scale</i> / explain		Figure 10
Chart Types	Different scales: Sailing, General, Coast, Lake, Harbor, Small Marine Facility	CS-03 slides 12, 13, 14	Show charts of local area; show commercial chart kit

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Use Up-to-date Charts			
Do Not Use Old Charts	<p>Many changes occur</p> <p>Keep Charts Up-to-date</p> <p>Listen to CH 09, CH 16 for USCG Local Guard Notices to Mariners Also on Internet</p> <p>Protect charts with plastic covers</p>	CS-03 slides 15, 16, 17 (optional)	<p>Figure 11, Figure 12</p> <p>Show Dates Latest Ed; show Local Notices</p>
Additional Examples	Demonstrate (optional)		Class Exercise #1—time permitting

Homework

1. **Blue areas on a chart indicate:**
 - a. deep, safe water.
 - b. tidal areas.
 - c. **shallow water.**
 - d. dry land.
2. **Depths on a chart may be in feet, meters, or fathoms. You can tell the measurement used from the:**
 - a. chart compass rose.
 - b. **chart title block.**
 - c. special instruction sheet that accompanies the chart.
 - d. purplish-red explanatory notes in the center of the chart.
3. **Charts of tidal water areas always show vertical clearances of overhead objects at:**
 - a. mid-tide.
 - b. low water.
 - c. a reference plane decided by town authorities.
 - d. **mean high water.**
4. **In the grid system that makes it possible to identify any point on the earth's surface, imaginary latitude lines or parallels of latitude:**
 - a. **run east and west.**
 - b. run north south.
 - c. are numbered from 0° to 180° .
 - d. run through the geographic poles.
5. **On your practice chart in the appendix, what is the latitude and longitude of the beacon on Channel Island in the center of the chart?**
 - a. L $41^{\circ} 41.1' N$, Lo $71^{\circ} 20.9' W$
 - b. **L $41^{\circ} 41.7' N$, Lo $71^{\circ} 24.8' W$**
 - c. L $41^{\circ} 43.9' N$, Lo $71^{\circ} 24.1' W$
 - d. L $41^{\circ} 41.1' W$, Lo $71^{\circ} 20.9' N$

4

Aids to Navigation

- 1 In this section, students will learn to:
 - recognize and understand the purpose of the various kinds of navigational aids
 - use these aids intelligently in the safe operation of a boat
- 5 Create a hypothetical or real chart channel area on the chalkboard, or on prepared photocopied handouts, and ask the students to trace the route of a boat through a channel.
- 6 Construct mockup models of the various types of navigational aids for demonstration purposes.

Motivations For Learning

- 2 Aids to navigation are nautical “street and caution” signs that a boater must understand to move a boat safely.

General Comments

- 3 Color slides depicting the various types of navigational aids found in local waters are excellent teaching aids. Develop these slides as a squadron project.
- 4 Using an overhead transparency, chalkboard, or flip chart, sketch the shapes of various types of navigational aids (nuns, cans, day marks, isolated danger buoys, etc.) and ask the students to identify them.

Teaching Aids

Overhead projector or LCD computer projector

Overhead transparencies or MS PowerPoint slides from the file CS_04_Aids_to_Nav.ppt

Color tables on pages 21-22 of the student manual should be highlighted

CG Color Plates 1-4 on the back pages of the student manual should be highlighted

Color slides of local navigational aids (slide projector needed)

Chalkboard or flip chart

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Introduction	Presentation cover page	CS-04 slide 1	Introduction of material
Agenda	Introduction of New Material	CS-04 slide 2	Lesson Introduction
Aids to Navigation	What Nav Aids tell mariners	CS-04 slide 3	Emphasize safety
U.S. Aids to Navigation	Lateral System clockwise around coast	CS-04 slide 4	CG Color Plates 1–3; Tables on SM pages 21–22
Red-Right-Returning	Define/describe Define Returning 3R Rule on Great Lakes	CS-04 slide 5	Tie red and green balloons to table or instructor's wrists to illustrate starboard and port marks
USWMS System			CG Color Plate 4
Marks			
Two Categories	Define Lateral Define Non-lateral	CS-04 slide 6	
Identification	Daylight/At night Never tie to a mark	CS-04 slide 7	Tables on SM pages 21–22
Two Types of Marks	Buoys Describe features Beacons Describe features Daybeacons/ daymarks	CS-04 slides 8, 9, 10, 11	Color slides of local marks Point out buoys and beacons on Bowditch Bay practice chart
Chart Symbols	Buoy symbols Beacon symbols		Refer to Bowditch Bay chart
Shapes and Colors of Marks			
Stbd. Side of Channel	Describe		CG Color Plate 1 SM page 21 Local marks color slides
Port Side of Channel	Describe		CG Color Plate 1 SM page 21 Local marks color slides

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Numbers and Letters			
Stbd. Side of Channel when "Returning"	Describe— green cans, odd, increasing		CG Color Plate 1 Color slides of local marks
Port Side of Channel when "Returning"	Describe— red nuns, even, increasing		CG Color Plate 1 Color slides of local marks
Other Marks With Lettering	Describe lettering		CG Color Plate 1 Color slides of local marks
Lighted Marks			
Lighted Buoys & Beacons The Lateral System	Structures <ul style="list-style-type: none"> • Light color—starboard side • Light color—port side • Color of other buoys • When lighted • Distance visible • Light patterns • Fixed—describe • Rhythmic—describe 		CG Color Plate 1
Lateral System	Define/describe	CS-04 slides 12, 13	CG Color Plate 1
Side-of-Channel Marks	Define Port side marks Starboard side marks		Color slides of local marks Refer to Bowditch Bay chart
Preferred Channel Marks	Define Port Preferred Channel Starboard Preferred Channel	CS-04 slide 14	Color slides of local marks Refer to Bowditch Bay chart

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Non-Lateral System			
Isolated Danger Marks	Define/describe	CS-04 slide 14	CG Color Plate 1
Safe Water Marks	Define/describe	CS-03 slide 13	CG Color Plate 1
Special Marks	Define/describe	CS-04 slide 14	CG Color Plate 1
Ranges	Define/describe	CS-04 slide 11	Figure 14
Sound Signals	Bells, gongs, whistles	CS-04 slide 15	Figure 15
The USWMS System			
Lateral System	Define differences	CS-04 slides 15, 16	CG Color Plate 4
Cardinal System	Define/describe	CS-04 slides 17, 18(optional)	CG Color Plate 4
Information and Regulatory Marks	Define/describe	CS-04 slides 19, 20, 21(optional)	CG Color Plate 4
Mooring Buoys	Define/describe		CG Color Plate 4
Other Systems			
Intra Coastal Waterway	Define/describe		SM page 24
Western Rivers	Define/describe		CG Color Plate 4
Additional Examples	Lateral System day vs. night; describe light patterns		CG Color Plates 2 and 3—time permitting
Additional Examples	Demonstrate (optional)		Class Exercise #2—time permitting

Homework

1. **An accurate way to find out where you are on the water is to:**
 - a. look at your compass.
 - b. find your location in the Local Notice to Mariners for the area.
 - c. locate your position relative to a particular aid to navigation on a chart.**
 - d. ask a passing boater.
2. **Daymarks are used to identify:**
 - a. precise locations of buoys.
 - b. approximate positions of floating aids.
 - c. isolated danger buoys.
 - d. daybeacons in daytime.**
3. **A can buoy will be _____ in shape and shown on a chart as a small circle and a _____.**
 - a. spherical; square
 - b. round; triangle
 - c. conical; diamond
 - d. cylindrical; diamond**
4. **When returning from sea using the U.S. Aids to Navigation System, you always keep:**
 - a. green side-of-channel marks to starboard.
 - b. yellow marks to port.
 - c. red side-of-channel marks to starboard.**
 - d. lighthouses and other beacons towards shore.
5. **In U.S. waters, solid red starboard side-of-channel marks will have:**
 - a. no numbers or letters.
 - b. odd numbers.
 - c. letters only.
 - d. even numbers.**
6. **As you return from sea, identifying numbers on navigation marks will:**
 - a. increase in value.**
 - b. be the same on both sides of the channel.
 - c. be in 4-inch block letters.
 - d. decrease in value.
7. **In the U.S. system, lighted navigation marks that show the port side of a channel when returning from sea have:**
 - a. green lights.**
 - b. yellow lights.
 - c. red lights.
 - d. white lights.
8. **Red and green horizontally-banded marks identify:**
 - a. fish traps and weirs during seasonal fish runs.
 - b. temporary aids in navigable channels during the holiday season.
 - c. safe water in navigable channels and offshore approaches.
 - d. preferred channels in locations of channel junctions or obstructions.**
9. **In the U.S. system, red and white vertically-striped marks identify:**
 - a. controlled areas of slow speed, no wake, etc.
 - b. dumping ground locations in open water.
 - c. safe water on both sides and the center of navigable channels and offshore approaches.**
 - d. preferred channels where there are channel junctions or obstructions.

10. Two beacons placed a suitable distance apart to show the centerline of a channel are called:

- a. a fairlead.
- b. a range.**
- c. a header.
- d. articulated beacons.

11. Aids to navigation are equipped with sound signals to:

- a. discourage sea birds from building nests.
- b. to help boaters find marks in restricted visibility.**
- c. provide a pleasant nautical background atmosphere.
- d. assist boaters in identifying aids in clear visibility.

5

Piloting—Plotting a Course

- 1 In this section, will learn to:
 - draw a course line
 - determine its direction
 - label it for direction

Motivations For Learning

- 2 To operate a boat safely in unfamiliar, rock-strewn, shallow waters requires constant attention to a boat's position and course. A knowledge of piloting is critical to the safe operation of a vessel.
- 3 Basic piloting skills are necessary for the operators of boats of all sizes; power and sail. A skipper becomes aware of the need for these skills the first time he/she encounters unfamiliar waters, darkness, or restricted visibility.

Teaching Aids

- Overhead projector or LCD computer projector
- Overhead transparencies or MS PowerPoint slides from the file CS_05_Piloting.ppt
- Transparency non-permanent marking pens
- USPS Plotter
- Dividers
- Bowditch Bay practice chart in the back of the student manual

The USPS Plotter

- 4 The 8 × 10 inch USPS plotter is the official plotter for Chart Smart. Its advantage is simplicity. The degree scale runs from 0° through 359°, instead of the 180° segment provided on other plotters. It is therefore unnecessary to rotate the plotter. The 0° and 180° indicators are always positioned north and south, respectively. Note that courses and bearings can be read from either of the two 360° protractor scales, or from the outer edge of the plotter.

To Plot a Course With The USPS Plotter

1. Using one of the edges of the plotter, draw the course line on the chart.
2. Place the center target or "bulls-eye" on the course line at any point.
3. Keeping the center on the course line, align any vertical or horizontal line on the plotter with any meridian of longitude or parallel of latitude on the chart.
4. Read the true course from any one of three locations on the plotter (either protractor or the edge of the plotter). It can be read in either of two directions. Note that the larger protractor has two scales; the inner scale being the true course; the outer scale the reciprocal course.

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Introduction	Presentation cover page	CS-05 slide 1	Introduction of material
Agenda	Introduction of New Materia	CS-05 slide 2	Lesson Introduction
Navigation	Define/describe	CS-05 slide 3	
Piloting	Define/describe	CS-05 slide 3	
Piloting Instruction	Describe four sections		
Plotting a Course			
Plotting	Define		
Plotting Tools	Define/describe USPS Course Plotter	CS-05 slide 4	Figure 16 Place plotter on overhead table to describe
Rules and Standards	Explain why	CS-05 slides 5, 6	
True Direction			
True Direction	Define/describe	CS-05 slide 7	
Chart Compass Rose	Review		
Latitude and Longitude	Review		

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Determining a Course			
Labeling a Course for Direction	Describe	CS-05 slide 8, 9	Figure 17
Practice— Class Exercise	Explain - help students using the plotter Reading true course; Course direction to nearest whole degree	CS-05 slides 8, 9, 10, 11, 12, 13, 14, and 15	Class Exercise #3 Use Bowditch Bay chart Always refer to compass rose for direction
Additional Examples	Reciprocal Courses Define	CS-05 slides 16, 17, 18, 19 (optional)	Class Exercise #4— time permitting

Homework

1. A knowledge of piloting will provide you with two valuable safety skills: 1) the ability to select the safest and most efficient route from one place to another, and 2) the ability to:
 - a. forecast the weather.
 - b. place the target of your plotter on a course line.
 - c. steer your boat in a straight line.
 - d. **determine your position at any time.**

2. Direction on a chart is measured from 000° to 360° in a clockwise direction from:
 - a. your compass heading.
 - b. **true geographic north.**
 - c. true geographic south.
 - d. the lubber's line.

3. The compass rose and _____ will indicate true north and provide north-south direction on charts.
 - a. **meridians of longitude**
 - b. chart title block
 - c. parallels of latitude
 - d. nautical mileage scale

4. Always label courses drawn on charts as _____ courses.
 - a. compass
 - b. reciprocal
 - c. **true**
 - d. estimated

5. When drawing a course line to or from a navigational aid, always draw the line:
 - a. in permanent ink so that it will not smudge.
 - b. parallel to the longitudinal meridians.
 - c. **to or through the circles or dots at the bottom of the symbols.**
 - d. at right angles to the parallels of latitude.

6. Label a course line for direction _____ and as near as practicable to the start of the course.
 - a. in the margin
 - b. on and below the line
 - c. under the nearest latitude line
 - d. **on and above the line**

7. When labeling a course line for direction, always use three digits to the nearest:
 - a. whole minute.
 - b. tenth of a minute.
 - c. **whole degree.**
 - d. whole second.

8. On the practice chart, plot a course from R "6" FI R 4s buoy (chart center right) to RW "OR" safe water buoy at the entrance to Oyster River. The true course is _____. Label your course line.
 - a. 073°
 - b. 118°
 - c. **253°**
 - d. 328°

9. On the practice chart, plot a course from RW “OR” to RN “2” at the entrance to Perkins Cove. The true course is _____. Label your course line.
- a. 025°
 - b. 096°**
 - c. 276°
 - d. 305°

6

Piloting—Distance, Speed, Time

- 1 In this section, students will learn to calculate distance, speed, and time.

Motivations for Learning

- 2 Knowing how to compute distance, speed, and time allows a student to calculate estimated positions at a specific time, and determine how long it will take to reach a destination.

General Comments

- 3 Repetitive practice is one of the best ways to learn the $60 D = ST$ formula. Use the practice exercises illustrated in the OHTs to familiarize students with using the formula. An alternative method of teaching the use of the formula is included at the end of the section.
- 4 Use the operation of an automobile as an analogy. For instance, when teaching computation of distance, ask the class the following questions in sequence:
1. If you were going 60 mph in a car, how far would you go in one hour?
 2. If you were going 60 mph in a car, how far would you go in one-half hour?
 3. If you were going 57 mph in a car, how far would you go in 17 minutes?

Teaching Aids

- Overhead Projector or LCD computer projector
- Overhead transparencies or MS PowerPoint slides from the file CS_06_DST.ppt
- Bowditch Bay practice chart in the back of the student manual
- Dividers
- Small hand calculator (optional)

Homework Comments

- 5 Clarifications for students:
1. Problem 5, page 37 of the SM—nav aid R “6” refers to R “6” Fl R 4s buoy (chart center right near the bottom of the compass rose); nav aid RW “OR” refers to the safe water buoy at the entrance to Oyster River
 2. Problem 6, page 37 of the SM—RW “OR” same as in #5; R N “2” is located at entrance to Perkins Cove

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Introduction	Presentation cover page	CS-06 slide 1	Introduction of material
Agenda	Introduction of New Material	CS-06 slide 2	Lesson Introduction
The DST Formula			
$60 \times D = S \times T$	Explain the formula elements (60D <small>Street</small> T)	CS-06 slides 3, 4	Use automobile analogy—see above
DST Circle Diagram	Explain this alternative method	CS-06 slide 5	Figure 22
Distance	How to compute How to measure Nautical mile scale One minute of latitude Walking the dividers Practice exercise How to label course line for distance	CS-06 slides 6, 7, 8, 9	Figure 18 OHT worksheet. Show use of dividers to measure D. Figure 19 Show labeling on OHT worksheet
Speed	How to compute Practice exercise Labeling a course line Determining boat speed	CS-06 slides 10, 11, 12	Figure 20
Time	How to compute Twenty-four hour clock Practice exercise	CS-06 slides 13, 14, 15, 16, 17	Figure 21

Homework

1. **The 60 D = SStreet formula is a method of:**
 - a. estimating the draft of a boat when you know its length.
 - b. computing distance, speed, or time, when any two of the values are known.**
 - c. establishing nautical time of day in daylight savings time.
 - d. computing the difference between statute and nautical miles.

2. **Distance in piloting is always expressed in:**
 - a. nautical or statute miles.**
 - b. knots.
 - c. scope.
 - d. boat lengths.

3. **A nautical mile is:**
 - a. shorter than a statute mile.
 - b. equal to one minute of longitude.
 - c. equal to one minute of latitude.**
 - d. used along coastal highways.

4. **The distance of a course line is always labeled:**
 - a. under and near the middle of the course line.**
 - b. on top and near the middle of the course line.
 - c. on top of the course line near its origin.
 - d. under the course line and below the course label.

5. **The distance in nautical miles from R “6” to RW “OR” is:**
 - a. 1.8 nm.
 - b. 5.6 nm.
 - c. 9.3 nm.**
 - d. 11.1 nm.

6. **The distance in nautical miles from RW “OR” to R N “2” is:**
 - a. 2.3 nm.
 - b. 8.1 nm.
 - c. 12.9 nm.**
 - d. 14.4 nm.

7. **If you run your boat 46 minutes at a speed of 6.0 knots, how far will you go?**
 - a. 6.0 nm.
 - b. 4.6 nm**
 - c. 7.8 nm.
 - d. 46.0 nm.

8. **If you run your boat 1 hour and 24 minutes at 11.4 knots, how far will you go?**
 - a. 8.1 nm.
 - b. 12.3 nm.
 - c. 16.0 nm.**
 - d. 24.4 nm.

9. **A knot is defined as:**
 - a. something you should not do.
 - b. one nautical mile per hour.**
 - c. speed of a boat when not affected by current.
 - d. one statute mile per hour.

Questions 5 and 6 refer to the course lines you drew on the “Bowditch Bay” practice chart.

10. What is the speed of your boat if you travel 8.0 nautical miles in 48 minutes?
- 4.8 kn.
 - 6.1 kn.
 - 10.0 kn.**
 - 11.4 kn.
11. You left your marina at 1000. At 1130 you determine that you have traveled 12.5 nautical miles. What has been your speed?
- 8.3 kn.**
 - 9.2 kn.
 - 12.5 kn.
 - 15.0 kn.
12. When computing time in navigation, it is always expressed in:
- seconds to the nearest whole second.
 - hours and tenths of hours.
 - daylight saving time.
 - minutes to the nearest whole minute.**
13. What is the elapsed time if you depart at 1327 and arrive at your destination at 1601?
- 0h 34 m.
 - 1h 34 m.
 - 2h 34 m.**
 - 3h 78 m.
14. You plan a cruise of 21.0 nautical miles. If you leave port at 0830 and cruise at a speed of 12 knots, at what time will you arrive at your destination?
- 0930
 - 1015**
 - 1030
 - 1110
15. Nautical time is always expressed in _____ digits.
- three
 - four**
 - six
 - nine
16. In nautical time, 11:51 A.M. is:
- 1151 hours.
 - 1151**
 - 2351
 - 2351 hours.
17. In nautical time, 11:51 P.M. is described as:
- one thousand one hundred fifty-one.
 - twenty-three fifty-one hours.
 - eleven fifty-one.
 - twenty-three fifty-one.**
18. 2221 nautical time is the same as _____ conventional time.
- 2.22 P.M.
 - 10:21 P.M.**
 - 11.21 P.M.
 - 12.21 P.M.
19. Nautical time 47 minutes later than 11:51 a.m. would be:
- 1104
 - 1198
 - 1228
 - 1238**
20. Nautical time 47 minutes later than 0044 would be:
- 0091
 - 0131**
 - 1331
 - 2357

7

Piloting—Determining Position

- 1 In this section students will learn to estimate the boat position at any time, using elementary methods of dead reckoning to plot simple bearings for establishing a fix.

General

- 2 Point out to the student that all navigation involves two principles:
 1. Determining the position of a boat
 2. Directing a boat safely from one place to another
- 3 Keep the instruction as basic as possible.
- 4 Have patience in teaching this section. Make sure the students are with you on each step as you go through the plotting exercise. Table instructors should encourage students who pick the subject up quickly to help those who are having trouble. The plotting exercise (pages 44–45) should be completed as a class exercise, step by step. Emphasize plotting standards and the need to label positions, courses and lines of position according to USPS plotting standards.

Motivations for Learning

- 5 Skipper should be aware of the approximate chart positions of their boats at all times. This information is essential to the safety of a vessel and its crew. Basic to such knowledge is a technique of navigation known as dead reckoning.

Teaching Aids

- Overhead Projector or LCD computer projector
- Overhead transparencies or MS PowerPoint slides from the file CS_07_Determining_Position.ppt
- Sample Plotting Sheet, Figure 23 on page 42 of the student manual

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Introduction	Presentation cover page	CS-07 slide 1	Introduction of material
Agenda	Introduction of New Material	CS-07 slide 2	Lesson Introduction
Dead Reckoning	Define Three factors	CS-07 slides 3, 4	
Dead Reckoning Track	Define Purpose Why important Rules for	CS-07 slide 5	
DR Position	Define/describe When calculated/ plotted Value	CS-07 slide 5	
Labeling a DR Track	Describe	CS-07 slide 6	Figure 23, Figure 24
Labeling a DR position	Describe	CS-07 slide 6	Figure 23, Figure 24
Lines of Position	Define/describe Purpose/Why important Value	CS-07 slide 6	Figure 23
Bearings	Define Magnetic bearings Bow-on bearings True bearing Why needed How determined How plotted	CS-07 slides 7, 8, 9	Figure 23
Labeling a Bearing	Describe	CS-07 slide 10	Figure 23, Figure 24

Lesson Plan Outline

Topic	Key Idea	Slide (ppt)	Emphasis/Other TAs
Fixes	Define/describe How established Alongside known object Intersect two LOPs	CS-07 slides 10, 11, 12	
Labeling a Fix	Describe	CS-07 slides 10, 11, 12	Figure 23, Figure 24
Plotting Exercises	Follow Sample Plotting Sheet	CS-07 slides 13, 14	Figure 23 Class Exercise #5
Additional Examples	Demonstrate (optional)	CS-07 slides 15, 16, 17, 18, 19, 20 (optional)	Class Exercise #6— time permitting

Homework

1. **Dead reckoning is the estimating of a boat's position by applying course and distance traveled from:**
 - a. any location on a DR track.
 - b. a previously determined position.**
 - c. any point on a depth curve.
 - d. any estimated position.
2. **A dead reckoning track is:**
 - a. a course line that is absolutely correct in its accuracy.
 - b. the actual course of a vessel plotted over the bottom.
 - c. a measured course used to practice navigational exercises.
 - d. the intended course line of a vessel as plotted on a chart.**
3. **The value of plotting a DR track is that it will:**
 - a. keep a skipper informed of the approximate position of a vessel.**
 - b. provide instant information of marine facilities whenever needed.
 - c. give an exact position of a vessel at any given time.
 - d. always tell a skipper where to expect heavy seas.
4. **Always label a DR position on a chart with:**
 - a. a small half-circle placed on top of a course line around a dot of position.**
 - b. the letters "DR" in italic capital letters alongside a dot of position.
 - c. a magenta circle around a dot of position.
 - d. a full circle around a dot of position on the course line.
5. **A bow-on bearing is one taken:**
 - a. by setting the compass on the boat's bow.
 - b. on the bow of another boat.
 - c. directly ahead of the vessel.**
 - d. while a boat is right alongside a buoy.
6. **To plot a compass bearing on a chart it must be:**
 - a. converted by using the 60 D Street formula.
 - b. taken as the direction of the vessel from an object.
 - c. converted to a true bearing.**
 - d. taken over the stern of the boat.
7. **Label a bearing on a chart by showing the plotted time in four digits above the line and**
 - a. the direction in three digits alongside the time.
 - b. no other labeling is necessary.
 - c. the direction in three digits below the line.**
 - d. magnetic course on top of the line.
8. **A relatively accurate position of a vessel at a given time that is determined without reference to a former position is called a:**
 - a. plot.
 - b. bearing.
 - c. DR position.
 - d. fix.**

9. A fix is frequently established when alongside known charted objects and:

- a. when two DR positions are plotted at the exact same time.
- b. at the intersection of two plotted lines of position which were taken at approximately the same time.**
- c. when taking a single bow-on bearing.
- d. whenever estimating your position.

10. A fix is labeled on a chart with a small circle around a dot of position or:

- a. around the intersect point of two lines of position.**
- b. around a triangle marking two lines of position.
- c. by writing the word FIX in capital letters next to a dot of position.
- d. the intersect point of two DR positions.

A

Chart Smart Supplies

- 1 There are a number of items that will be necessary or helpful to the instructor of this course, some of which are listed here.

Instructional Materials

1. Chart Smart Student Manual (item 01-73-105)
2. Additional Student Practice Chart—Bowditch Bay (item 02-73-119)
3. USPS 8 x 10 Plotter (item 11-73-111)
4. USPS Dividers—6 Inch (item 11-73-115)
5. Chart Smart OHT's. Microsoft PowerPoint slides are available either (a) as downloadable files from the USPS Members Page > Educational Department > Basic Public Education Committee home page > Downloadable Information > BPECom:
<http://www.usps.org/national/eddept> or (b) from your DEO on a CD.

- 2 **Note:** check the on-line USPS Educational Department Catalog for current prices and revised item numbers.

Quiz Materials

- 3 There is no exam per se; an optional quiz is available—see the above USPS web site, Chart Smart download site, for an optional quiz in Microsoft Word (doc) format. The quiz and answer key is also available in Appendix B and C, respectively of this Instructor Manual.

Supplemental Items

- Chart Smart Instructor Set (Includes Instructor and Student Manuals)
- Boating Instructor's Set (optional—includes The Squadron Boating Course Instructor and Student Manuals)
- USPS Mini-Quik Course 5 × 6 Plotter (For use on overhead projector)
- *This is USPS* Brochure (item 08-30-106)

B

Quiz

Name: _____ Date: _____ Group: _____

1. Blue areas on a chart indicate:
 - a. deep, safe water.
 - b. tidal areas.
 - c. shallow water.
 - d. dry land.
2. Charts of tidal water areas always show vertical clearances of overhead objects at:
 - a. mid-tide.
 - b. low water.
 - c. a reference plane decided by town authorities.
 - d. mean high water.
3. In the grid system that makes it possible to identify any point on the earth's surface, imaginary latitude lines or parallels of latitude:
 - a. run east and west.
 - b. run north and south.
 - c. are numbered from 0° to 180°.
 - d. run through the geographic poles.
4. An accurate way to find out where you are on the water is to:
 - a. look at your compass.
 - b. find your location in the Local Notice to Mariners for the area.
 - c. locate your position relative to a particular aid to navigation on a chart.
 - d. ask a passing boater.
5. Direction on a chart is measured from 000° to 360° in a clockwise direction from:
 - a. your compass heading.
 - b. true geographic north.
 - c. true geographic south.
 - d. the lubber's line.
6. When labeling a course line for direction, always use three digits to the nearest:
 - a. whole minute.
 - b. tenth of a minute.
 - c. whole degree.
 - d. whole second.
7. If a compass is properly mounted, the numbers on the compass card when read at the lubber's line will indicate the direction the boat is heading in reference to:
 - a. magnetic north.
 - b. the north star.
 - c. true north.
 - d. the boat's centerline.
8. Mount a compass so that:
 - a. the compass card can be seen from anywhere in the boat.
 - b. it is as close to your VHF radio as possible.
 - c. it will not be in the way—anywhere you can find a place.
 - d. a line through the lubber's line and the center of the compass is parallel to the keel.
9. Variation:
 - a. is established by the Coast Guard.
 - b. can usually be ignored.
 - c. changes with geographic position.
 - d. does not show on a chart.
10. A nautical mile is:
 - a. shorter than a statute mile.
 - b. equal to one minute of longitude.
 - c. equal to one minute of latitude.
 - d. used along coastal highways

11. A plotted course line is labeled as follows:
- course above the line, distance and speed below the line.
 - a course line is never labeled.
 - course and distance above the line.
 - distance above the line, course below the line.
12. The value of plotting a DR track is that it will:
- keep a skipper informed of the approximate position of a vessel.
 - provide instant information of marine facilities whenever needed.
 - give an exact position of a vessel at any given time.
 - always tell a skipper where to expect heavy seas.
13. A bow-on bearing is one taken:
- by setting the compass on the boat's bow.
 - on the bow of another boat.
 - directly ahead of the vessel.
 - while a boat is right alongside a buoy.
14. To plot a compass bearing on a chart it must be:
- converted by using the 60 D Street formula.
 - taken as the direction of the vessel from an object.
 - converted to a true bearing.
 - taken over the stern of the boat.
15. A fix is frequently established when alongside known charted objects and:
- when two DR positions are plotted at the exact same time.
 - at the intersection of two plotted lines of position which were taken at approximately the same time.
 - when taking a single bow-on bearing.
 - whenever estimating your position.

Bowditch Bay Day Cruise

The following questions refer to a fictional day's cruise on Bowditch Bay. You will need the Bowditch Bay practice chart from the back of your student manual, your plotter, and your dividers. You may use a calculator if you wish.

You are anchored alongside G "9" which is located approximately 3.5 nm north of the entrance to Black Fish Creek. You decide to make a run to R "4" BELL which is located at L 41° 42.3' N, Lo 71° 13.5' W, to do some fishing.

16. The true course from G "9" to R "4" is:
- 019
 - 067
 - 089
 - 247
17. Assuming a deviation of 0°, you will steer your boat on compass course of:
- 052
 - 082
 - 232
 - 262
18. What is the distance from G "9" to R "4"?
- 12.1 nm
 - 14.8 nm
 - 15.7 nm
 - 16.5 nm
19. While fishing at R "4", you note dark clouds developing in the western sky, and decide to head home to Black Fish Creek via safe water buoy RW "BC". If you leave R "4" at 1245 and travel at 8 knots, at what time should you arrive at RW "BC"?
- 1329
 - 1337
 - 1417
 - 1455

Name: _____ Date: _____ Group: _____

20. If you arrive at RW "BC" at 1405, what was your actual boat speed?
- a. 4.6 Kn
 - b. 9.2 Kn
 - c. 9.8 Kn
 - d. 10.2 Kn
21. What is the latitude and longitude of the lighthouse on Channel Island?
- a. L 40o 38.5" N, Lo 71o 04.8" W
 - b. L 41o 41.7" N, Lo 71o 24.8" W
 - c. L 41o 44.6" N, Lo 71o 34.8" W
 - d. L 41o 45.2" N, Lo 72o 35.1" W

C

Quiz Answers

1. **Blue areas on a chart indicate:**

- a. deep, safe water.
- b. tidal areas.
- c. shallow water.**
- d. dry land.

Reference: page 9, column 1

2. **Charts of tidal water areas always show vertical clearances of overhead objects at:**

- a. mid-tide.
- b. low water.
- c. a reference plane decided by town authorities.
- d. mean high water.**

Reference: page 11, columns 1 and 2

3. **In the grid system that makes it possible to identify any point on the earth's surface, imaginary latitude lines or parallels of latitude:**

- a. run east and west.**
- b. run north and south.
- c. are numbered from 0° to 180°.
- d. run through the geographic poles.

Reference: page 12, column 1

4. **An accurate way to find out where you are on the water is to:**

- a. look at your compass.
- b. find your location in the Local Notice to Mariners for the area.
- c. locate your position relative to a particular aid to navigation on a chart.**
- d. ask a passing boater.

Reference: page 9, column 1

5. **Direction on a chart is measured from 000° to 360° in a clockwise direction from:**

- a. your compass heading.
- b. true geographic north.**
- c. true geographic south.
- d. the lubber's line.

Reference: page 28, column 1

6. **When labeling a course line for direction, always use three digits to the nearest:**

- a. whole minute.
- b. tenth of a minute.
- c. whole degree.**
- d. whole second.

Reference: page 28, column 2

7. If a compass is properly mounted, the numbers on the compass card when read at the lubber's line will indicate the direction the boat is heading in reference to:

- a. **magnetic north.**
- b. the north star.
- c. true north.
- d. the boat's centerline.

Reference: page 4, column 1

8. Mount a compass so that:

- a. the compass card can be seen from anywhere in the boat.
- b. it is as close to your VHF radio as possible.
- c. it will not be in the way—anywhere you can find a place.
- d. **a line through the lubber's line and the center of the compass is parallel to the keel.**

Reference: page 4, column 1

9. Variation:

- a. is established by the Coast Guard.
- b. can usually be ignored.
- c. **changes with geographic position.**
- d. does not show on a chart.

Reference: page 5, column 1

10. A nautical mile is:

- a. shorter than a statute mile.
- b. equal to one minute of longitude.
- c. **equal to one minute of latitude.**
- d. used along coastal highways.

Reference: page 33, column 2

11. A plotted course line is labeled as follows:

- a. **course above the line, distance and speed below the line.**
- b. a course line is never labeled.
- c. course and distance above the line.
- d. distance above the line, course below the line.

Reference: page 29, column 2; page 34, column 2; page 35, column 1

12. The value of plotting a DR track is that it will:

- a. **keep a skipper informed of the approximate position of a vessel.**
- b. provide instant information of marine facilities whenever needed.
- c. give an exact position of a vessel at any given time.
- d. always tell a skipper where to expect heavy seas.

Reference: page 41, columns 1 and 2

13. A bow-on bearing is one taken:

- a. by setting the compass on the boat's bow.
- b. on the bow of another boat.
- c. **directly ahead of the vessel.**
- d. while a boat is right alongside a buoy.

Reference: page 43, column 1

14. To plot a compass bearing on a chart it must be:

- a. converted by using the 60 D Street formula.
- b. taken as the direction of the vessel from an object.
- c. **converted to a true bearing.**
- d. taken over the stern of the boat.

Reference: page 43, column 1

- 15. A fix is frequently established when alongside known charted objects and:**
- when two DR positions are plotted at the exact same time.
 - at the intersection of two plotted lines of position which were taken at approximately the same time.**
 - when taking a single bow-on bearing.
 - whenever estimating your position.

Reference: page 43, column 2

Bowditch Bay Day Cruise

The following questions refer to a fictional day's cruise on Bowditch Bay. You will need the Bowditch Bay practice chart from the back of your student manual, your plotter, and your dividers. You may use a calculator if you wish.

You are anchored alongside G "9" which is located approximately 3.5 nm north of the entrance to Black Fish Creek. You decide to make a run to R "4" BELL which is located at L 41o 42.3' N, Lo 71o 13.5' W, to do some fishing.

- 16. The true course from G "9" to R "4" is:**
- 019
 - 067**
 - 089
 - 247

- 17. Assuming a deviation of 0°, you will steer your boat on compass course of:**
- 052
 - 082**
 - 232
 - 262

- 18. What is the distance from G "9" to R "4"?**
- 12.1 nm**
 - 14.8 nm
 - 15.7 nm
 - 16.5 nm

- 19. While fishing at R "4", you note dark clouds developing in the western sky, and decide to head home to Black Fish Creek via safe water buoy RW "BC". If you leave R "4" at 1245 and travel at 8 knots, at what time should you arrive at RW "BC"?**
- 1329
 - 1337
 - 1417**
 - 1455

- 20. If you arrive at RW "BC" at 1405, what was your actual boat speed?**
- 4.6 Kn
 - 9.2 Kn**
 - 9.8 Kn
 - 10.2 Kn

- 21. What is the latitude and longitude of the lighthouse on Channel Island?**
- L 40o 38.5" N, Lo 71o 04.8" W
 - L 41o 41.7" N, Lo 71o 24.8" W**
 - L 41o 44.6" N, Lo 71o 34.8" W
 - L 41o 45.2" N, Lo 72o 35.1" W

