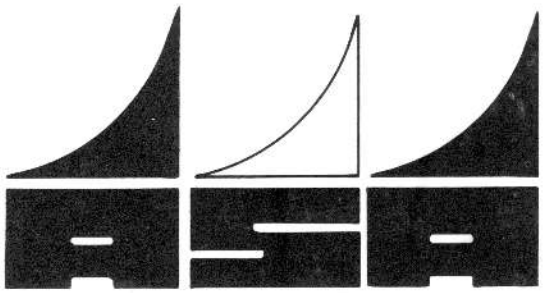
The Annapolis Book of SEAMANSHIP

Work Book

for the



American Sailing Association®

ADVANCED COASTAL CRUISING STANDARD

A STEP-BY-STEP GUIDE TO HELP THE READER LEARN THE KNOWLEDGE REQUIRED TO QUALIFY FOR CERTIFICATION AS AN ADVANCED SAILOR.

By JOHN ROUSMANIERE

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Introduction

Not long after THE ANNAPOLIS BOOK OF SEAMANSHIP first appeared in the autumn of 1983, the American Sailing Association selected it as the official reference manual for sailing school students who have progressed beyond the beginner level and are working on two of the ASA's advanced ratings, the Coastal Navigation Standard (which covers piloting) and the Advanced Coastal Cruising Standard (which includes the foundations of good seamanship). This work book is intended to help students and instructors make best use of ANNAPOLIS in the classroom, at home, and on board their boats.

Here are the essentials of the seaman's art, from dead reckoning to predicting weather to surviving a gale. Anybody who masters the information here and in the relevant sections in ANNAPOLIS should have no trouble meeting those important ASA standards, and, with due experience, commanding his or her own cruising sailboat.

Part I covers the Coastal Navigation Standard and Part II, the Advanced Coastal Cruising Standard. Each opens with a detailed review -- keyed to ANNAPOLIS -- and closes with a

long multiple-choice answer quiz. As you study ANNAPOLIS alongside this manual, pay careful attention to the drawings, where Mark Smith brilliantly shows the most important theories, techniques, and equipment. Part III is the ASA's Advanced Coastal Cruising Standard Afloat Skills requirement, which is as good an outline of the competent cruising sailor's craft as I have seen. The correct answers to the quiz questions, with explanations, are in Parts IV and V.

Leaving you with this work book and its fascinating subject, I repeat the wish I made in the Foreword to ANNAPOLIS:

> May your days and nights afloat be as happy and interesting as mine have been, and may you never make the mistake of believing that you know all there is about sailing. Nobody knows it all. Nobody can know it all, but here (I hope) you will learn at least a little.

John Rousmaniere

I. Coastal Navigation Standard

Review and Quiz

ASA Work Book

I. Coastal Navigation Standard

Review

A. Publications and Tools

1. Charts. Charts may be purchased from the National Ocean Survey or NOS-authorized sales agents, many of which are waterfront chandleries. Always use the newest edition available. Coast and harbor charts are large scale (1 inch of chart = 150,000 inches on the globe to 1:50,000 and lower); they cover relatively small areas in considerable detail so are most useful when the boat is near shore. Small-scale sailing and general charts (1:600,000 to 1:150,000) cover very large areas with little detail. Standardized symbols, described and explained in National Ocean Survey Chart 1, provide considerable detail about a body of water. Among the most important symbols are a green

or black diamond (can), a red diamond (nun), a purple dot (lighted buoy), a purple exclamation mark (lighthouse), "+" (submerged rock), "*" (rock visible at low tide), a dotted circle (hazard to navigation), and broken or solid contour lines (which link points of equal depth). (THE ANNAPOLIS BOOK OF SEAMANSHIP, pages 156-167 and insert after page 144)

2. Notice to Mariners. Available in both national and local editions, this is a weekly announcement of changes in buoy locations, water depths, and other important information. Chart corrections are shown to scale and may be cut out and pasted on charts. The local edition (available from your Coast Guard district) is the most helpful for pleasure sailors. (161, 333)

3. Tide and Current Tables. Various official and commercial booklets and tables show range of water depths between high and low tide, times of slack water and high and low tide, and direction and strength of tidal currents. The Tidal Current Tables provide the most information. Complete data are shown for a relatively few places, called reference stations, but corrections may be readily made for thousands of other locations. Tidal information is based on predictions; actual conditions may vary. (120-123, 214-223)

4. Other Publications. Several other publications valuable to navigators and pilots are compiled by the NOS and sold by it and its authorized agents. These include the Coast Pilot

and the Light List. Some nongovernmental publications include much the same information to help the navigator avoid hazards, anticipate tidal and current changes, and identify aids to navigation. (168-169)

5. Minimum Inventory of Publications: (158-169)

a. The most recent edition of the largest-scale charts available covering every body of water you may sail in and each harbor you may stop at.

b. The Coast Pilot (or a "cruising guide"), the Light List, and a list of local radio aids to navigation.

c. For tidal areas, tide and current tables.

d. A summary of the Rules of the Road. Boats larger than 39 feet must carry a copy of the Rules (USCG publication M16672.2).

e. First-aid, sailing, and engine manuals.

f. A ship's log (or a notebook divided into columns for course, speed, wind, etc.)

6. Piloting Tools. The following piloting tools are essential or strongly recommended (186-189):

a. A large, compensated cockpit compass.

b. A course and bearing plotter.

c. Dividers.

d. A box of number 2 pencils and a fine-tip pen.

e. A watch (preferably with a stop watch function).

f. An electronic calculator.

g. Binoculars.

h. A depth sounder or lead line.

i. A speedometer.

B. The Magnetic Compass

1. Checking for Deviation. Deviation, the difference between the magnetic and compass directions, is caused by the boat's magnetic field. A simple way to check for it is to run down ranges (or transits) on North-South and East-West alignments. Compare the actual compass courses with the plotted ones to determine the amount and direction of deviation. Look for metal near the compass. You can try to correct the compass by adjusting its compensators with a nonmagnetic screwdriver, but for best results, hire a compass adjustor. (177-181)

2. Correcting and Uncorrecting. When "correcting" (changing a bearing or course from compass degrees to magnetic to true), add Easterly variation or deviation and subtract Westerly ones. When "uncorrecting" (working from true degrees to magnetic to compass), subtract Easterly and add Westerly. (182-184)

C. Plotting

1. The Dead Reckoning Position. Dead reckoning is based solely on course steered and distance run. Label the D.R. with a half-circle and update it at regular intervals (frequently in bad weather). To determine distance run, use this version of the Speed/Time/Distance formula:

$$\text{Distance run} = \frac{\text{speed} \times \text{time in minutes}}{60}$$

Other helpful versions of the formula are:

$$\text{Speed} = \frac{60 \times \text{distance}}{\text{time}} \qquad \text{Time} = \frac{60 \times \text{distance}}{\text{speed}}$$

Speed and distance run must be in the same standard -- knots and nautical miles (on salt-water charts) or miles per hour and statute miles (on Great Lakes charts). (190-196)

2. Current and Leeway. When determining which course you should steer to reach your destination, factor in the effects of current, leeway, and steering errors so you can compensate in the other direction. Use the Rule of 60 (see 6, below) to make these calculations. These forces are usually the causes of differences between the D.R. position and a reliable fix. (189-190, 219-223)

3. The Estimated Position. The E.P. is based on the D.R. plus another factor, usually a line of position (LOP) that is either a compass or radio bearing on an aid to navigation

or some other charted object or a range between two charted objects, although a depth sounding or an estimate of current or leeway may also be used. Label the E.P. with a box. (200-201)

4. The Fix. The most reliable position, the fix is based on two or more LOPs. To minimize errors, try to cross two bearings at a right angle and three bearings at 60-degree angles. Label a fix with a circle. The running fix, while not as trustworthy, provides a way to plot a position over time using one object, advancing one bearing to cross a second. (202-203)

5. Distance Off. A better way to fix your position with only one aid is to cross an LOP with a circle of position (COP), the boat's distance from the aid. To determine distance off, use one of several simple distance off formulas, such as doubling the relative bow bearing, or some other technique. A COP may also be used to estimate a position. (207-211)

6. The Rule of 60. This simple formula allows calculation of course changes required to avoid an approaching hazard or to compensate for current pushing the boat to one side.

$$\text{Course alteration} = \frac{60 \times \text{desired distance off}}{\text{distance ahead}}$$

"Distance ahead" is the distance (in miles) to the object that must be skirted or to the destination. When skirting a

hazard, "desired distance off" is the distance (in miles) you must pass from it. When compensating for current, it's the distance the current will push you to the side by the time you reach your destination; to find that distance, multiply the drift (current velocity) by the number of hours it will affect you. (213)

7. Piloting with Soundings. A depth sounding can be a line of position. You may also follow a depth contour when piloting in poor visibility. (214-215)

D. Aids to Navigation

1. The Lateral System. Predominating in North America, this buoyage system defines the boundaries of safe channels. (Other parts of the world use the cardinal system, in which buoys point out hazards.) The rule is "Red Right Returning": When entering a harbor, leave to STARBOARD all buoys that are red, even-numbered, and nun-shaped, and that show red lights; leave to PORT all buoys that are green, black, odd-numbered, and can-shaped, and that show green lights. Numbers increase going into the harbor. Other types of buoys and beacons are used in special situations. (144-151)

2. Lights. Red and green buoy lights mark sides of channels and white ones mark entrances to or important turning points in channels. Several light characteristics are used on buoys, and some have special significance. Lighthouse lights may be green, red, and/or white, but in general the colors have no special significance (the exception is fixed red, which indicates danger). Light characteristics are shown in the Light List and on most charts. (148-150, 152-155)

Coastal Navigation Standard Quiz

A. Publications and Tools

1. You're entering a small, unfamiliar harbor and have a choice of two charts, one with a scale of 1:150,000, the other 1:50,000. Which should you use?

- (A) Either one. They cover the same area.
- (B) The 1:150,000-scale chart. The larger the second number, the greater the detail.
- (C) The 1:50,000-scale chart. The smaller the second number, the greater the detail.

2. One day early in the sailing season you notice that a familiar buoy has drifted or been moved a mile. What should you do?

- (A) Alert the local police.
- (B) Alert the Coast Guard.
- (C) Check Notice to Mariners to see if it has been moved by the Coast Guard or some other official agency. If so, mark the new location on your charts. If not, alert the Coast Guard.

3. The Tidal Current Tables say that slack water ends at 10:00 and at 11:00 you'll have a favorable 2-knot current.

It's now 10:45 and nearby buoys show no current at all. What could be wrong?

- (A) Nothing. Buoys show only the water flow on the surface, not the currents beneath, which are the ones that really count.
- (B) Perhaps you didn't add one hour for Daylight Time when you read the tables, or recent winds may have delayed the tide change.
- (C) Be patient. It's only 45 minutes since the tide change.

4. How often should you buy charts and publications?

- (A) Only when they're too mildewed, creased, or marked up for easy use.
- (B) Purchase every new (usually annual) edition of tide tables, the Coast Pilot, and your most used charts. You can update less important charts using Notice to Mariners.
- (C) Buy only new tide tables annually.

5. Assuming you have room for only three official publications on board, and you're sailing in a tidal area, which ones should you carry?

- (A) A coast chart for your cruising area, a harbor

chart for the trickiest harbor you'll enter, and the Tidal Current Tables.

- (B) The Rules of the Road, the Tide Tables, and the Coast Pilot.
- (C) Any three charts covering your area.

6. If you had room for only three piloting tools on board, which would they be?

- (A) Dividers, plotter, and binoculars.
- (B) Compass, pencil, and watch.
- (C) Electronic calculator, depth sounder, and speedometer.

B. The Magnetic Compass

1. Running down a range on a course that you have plotted as 085 degrees magnetic, you read the compass course as 080 degrees. What's wrong and what can you do about it?

- (A) You have 5 degrees of Westerly variation. Hire a compass adjustor to eliminate it.
- (B) You have 5 degrees of Easterly variation. Reverse your course to see if the error exists on the reciprocal heading, then try to eliminate it by adjusting the compensators.
- (C) You have 5 degrees of Easterly deviation. Check

around the compass for steel objects. Try to eliminate any deviation with the compensators, or call a compass adjustor.

2. Your compass has a deviation of 4 degrees West, and the local variation is 13 degrees East. If the compass course is 178 degrees, what are the magnetic and true courses?

- (A) 174 magnetic, 191 true.
- (B) 174 magnetic, 187 true.
- (C) 182 magnetic, 169 true.

C. Plotting

1. At 9:30 a.m., a lighthouse is dead abeam. You steer a steady course of 280 degrees paralleling the shore until 10:09, when a water tank on land is dead abeam. On the chart, the distance between the two objects is 4.2 nautical miles. What speed have you averaged?

- (A) 6.5 knots.
- (B) 6.5 m.p.h.
- (C) 8.4 knots

2. Sailing in a tidal area, you make a fix that agrees with your dead reckoning plot. Ninety minutes later you make another fix that places you 3 miles South of your D.R.

You're certain that the helmsmen steered well. What is the most logical explanation for the error?

- (A) A 3-knot North current.
- (B) A 2-knot South current.
- (C) A 2-knot North current.

3. Sailing in rough weather, you have a choice of the following three pieces of evidence to use to make an estimated position. List them in order of reliability.

- (A) A depth sounding.
- (B) A compass bearing on a lighthouse.
- (C) Tidal current based on observation of buoys.

4. List these three fixes made in rough weather in order of reliability.

- (A) Three compass bearings: one on a lighthouse, another on a buoy anchored in 200 feet of water, and the third on a buoy anchored in 500 feet. They cross at 30-degree angles and create a 300-yard "cocked hat."
- (B) A running fix using a buoy anchored in 300 feet.
- (C) Two compass bearings: one on a smokestack and the other on a church steeple. Both objects are charted, and the bearings cross at an 85-degree angle.

5. In a situation like the one shown on page 207, you start the stopwatch at point 1, when the lighthouse is 45 degrees off the bow, and stop it 13 minutes later at point 2, when the lighthouse is dead abeam. The helmsman, who has been watching the speedometer, says that the boat has averaged 5.5 knots. What is the distance off the lighthouse? Are you able to make a fix?

- (A) There's not enough data to figure distance off or to make a fix.
- (B) Distance off = 5.5 miles. A fix is impossible since there's only one LOP.
- (C) Distance off = 1.2 miles. To make a fix, take a compass bearing on the lighthouse at point 2. The boat is on the LOP 1.2 miles from the lighthouse.

6. The rhumb-line compass course to your destination, 20 miles away, is 010 degrees. You predict that your boat will average 5 knots and that between current, leeway, and steering errors, she will be pushed to port at an average rate of 1.5 knots. What course should you steer to compensate?

- (A) 028 degrees.
- (B) 352 degrees.
- (C) Steer 010 degrees until you see your destination, then head toward it.

7. What are the main problems when piloting with depth soundings?

- (A) Not considering the instrument's likely errors, and failing to be attentive to visual evidence of approaching shoal water, such as breaking waves.
- (B) Being misled by schools of fish, and failing to take into account the transducer's location below the waterline.
- (C) All of the above.

8. In the chart on page 206, what are the magnetic courses and distances from False Ducks Lt. to R"68T"; and from R"68T" to "69T"?

- (A) 003 degrees/7.3 miles; 340 degrees/3.2 miles.
- (B) 009 degrees/7 miles; 341 degrees/3 miles.
- (C) 014 degrees/7.3 miles; 351 degrees/3.2 miles.

9. Again using the chart on page 206, on a densely foggy day you're at buoy S off Long Point (above "4sec") and plan to sail across the bay and anchor over the 20-foot spot to the East of Grape Island. Your average speed will be 4.5 knots. What should your strategy be?

- (A) Sail straight across on a course of 031 degrees.
- (B) Sail 021 degrees for 1.2 miles until clear of

Timber Island, then 033 degrees.

- (C) "Run out your time" between buoys. First, sail 021 degrees for 16 minutes until clear of Timber Island; then sail 030 degrees for 95 minutes to "68T"; finally, sail 035 degrees for 20 minutes to the 20-foot spot.

D. Aids to Navigation

1. Trying to find a harbor on a foggy night, you come across red lighted buoy number 2 and, 100 yards to its East, red nun number 4. In which direction does the harbor probably lie?

- (A) Who knows?
- (B) East.
- (C) West.

2. A light you're trying to identify sometimes seems to flash every 4 seconds, at other times every 6 seconds. What should you do?

- (A) Stop the boat and keep looking at the light until you're sure of its characteristic.
- (B) Shine a bright flashlight at it.
- (C) Ask somebody else whose eyes are rested to try to identify it.

3. You're approaching the Brenton Reef light shown on the chart on page 164. Using a formula on pages 154-155, and assuming that your eyes are nine feet above water and the visibility is good, how many nautical miles will you be from the light when you see it clearly?

- (A) 14.1 miles.
- (B) 25 miles.
- (C) 16.3 miles.

II. Advanced Coastal Cruising Standard

Review and Quiz

II. Advanced Coastal Cruising Standard

Review

A. Sail Theory

1. Air Flow. The sails shape the wind to create a small forward force and a larger side force, which causes heeling and leeway (side-slippage). The side forces can be almost neutralized by a well-shaped keel or centerboard. (THE ANNAPOLIS BOOK OF SEAMANSHIP, pages 20-22)

2. True Wind and Apparent Wind. The true wind is what you feel when stationary, the apparent wind what you feel when moving. The apparent wind is caused jointly by the true wind and the boat's motion, and is stronger than the true wind on a beat and weaker on a run. The apparent wind governs how the sails are trimmed. (36-37)

3. Sail Shape. The many sail controls are adjusted to affect the amount of draft in the sail (the sheets, outhaul, and mast bend); the amount of twist in the leech (the sheets

and jib lead fore and aft position); the position of deepest draft (the Cunningham and halyard); the rise and fall of the boom (the boom vang); and the sail's angle of attack to the wind (the sheets, traveler, and jib lead athwartships position). The leech lines are adjusted to keep the leech from chattering. In general, when sailing upwind in light and moderate winds the sails are kept moderately full and powerful. As the wind builds, sheets are trimmed and sail controls tightened to decrease draft and pull it forward. When the heel and helm become excessive, the sails are further depowered to decrease heel. (62-77)

4. Balance and Helm. The side forces of mainsail and jib should just about balance themselves out. Under way, the sail plan's center of effort (its center of exposed area) should be about over the underbody's center of lateral resistance (the balance point of the hull under the water). If the C.E. is aft of the C.L.R., the boat has weather helm (the bow pulls to windward). If it's forward of the C.L.R., she has lee helm (the bow pulls to leeward). To decrease weather helm, ease the traveler or main sheet, depower the sails, decrease the angle of heel, or rake (tilt) the mast forward. To decrease lee helm, trim the traveler or main sheet, ease the jib sheet, increase the angle of heel, or rake the mast aft. (22-23, 78-81)

B. Weather

1. Prevailing Winds and Thermals. Prevailing winds are caused by large-scale air circulation in wind belts around the globe. In most of North America, the prevailing wind is from the Southwest. Hot-air thermals over land create local low-pressure areas into which cool air pours to make the sea or lake breeze. (94-100)

2. Barometer and Thermometer. Wind and weather, and their changes, are caused by differences in air pressure and temperature. The greater the pressure differences, the greater the wind. Air flows "downhill" from high-pressure mounds into low-pressure valleys, and is redirected by the earth's spin -- clockwise around highs and counter-clockwise around lows. A falling or rising barometer foretells an impending weather change; the faster the fall or rise, the more radical -- and possibly dangerous -- the alteration may be. (100-107, 112-113)

3. Fog and Clouds. Temperature and moisture differences cause clouds both on the earth's surface (as fog) and in the atmosphere (as clouds). Fog is most likely when warm, moist air crosses cool or cold water. Since the dew (water saturation) point in the air is a function of humidity and temperature (which can be measured) fog can be predicted using various instruments. The shape, height, and density

of clouds are reliable indicators of approaching weather changes; steep, dark clouds are more ominous than flat, white ones. (108-111, 116-119)

4. Weather Information. Reliable weather reports and forecasts and warnings of dangerous developments are distributed to the public by the following media: National Weather Service VHF/FM radio broadcasts; weather maps printed in newspapers, shown on television, or transmitted over weather facsimile machines; and airport radio broadcasts. Marinas, yacht clubs, and other facilities may display flag or light storm warnings. (114-115)

C. Seamanship

1. Sail Selection. The normal cruising boat has several combinations of sails available: full mainsail and large genoa jib for light and moderate winds; full mainsail and small genoa for fresh winds; reefed mainsail and small jib for strong winds; and storm trysail and storm jib for gales. The crew should set enough sail so the boat is sailing reasonably fast, comfortably, and in control, with moderate weather helm, and with less than about 25 degrees of heel. (66-67)

2. Heavy Weather. In heavy weather, wear foul-weather gear and a safety harness, stay rested (with as few people on deck as necessary), keep the cabin dry, and prepare your boat carefully so gear doesn't break loose. If possible, pull the dinghy on deck. Reef or shorten sail to keep the helm balanced and heel and motion under control. Steer carefully, especially when running before steep seas. In a storm, avoid land, keep track of your position, and be alert to wind shifts. (282-293)

3. Storm Tactics. Running before it, heaving-to, and lying ahull all have their advantages in certain situations for every boat. Prepare to use all three, possibly discounting the last if waves are breaking heavily and the first if a lee shore threatens. (294-295)

4. Advanced Anchoring. Drop two anchors (either bow and stern or from the bow alone) to increase the hold and minimize swinging. When docking stern-first, drop the anchor well out and back in carefully. Raft-up using all docking lines to keep the masts from tangling; separate from the other boats in rough weather. Handle ground tackle carefully when putting great loads on it -- for example, when kedging-off. Weighing a fouled anchor may be difficult without special equipment, such as a buoyed trip line to allow retrieval from any direction or a grapnel to grab the rode or anchor. At night in rough weather, one or two

people should be on deck at all times to watch for dragging by your and other boats. (276-281)

5. Emergencies.

a. When aground, try to sail or kedge off; on a lee shore, protect the topsides with fenders and put an anchor out to windward. (297)

b. Secure a tow line around the sturdiest fitting, backing it up if necessary. At first tow at slow speed. Keep both boats in troughs or on crests. (298-299)

c. If the helm fails, steer with sails or try to rig an emergency system. (300-301)

d. Get the remnants of a broken mast away from the hull as soon as possible and make a jury rig. (302-303)

e. If somebody falls overboard, assign a lookout, stop the boat as soon as possible, turn, and approach the swimmer on a close reach under mainsail alone, with the engine on but out of gear. Pick the victim up over the leeward side. If you fall overboard, remove bulky clothing and conserve your energy. (304-307)

f. Plug major leaks and holes with whatever is available. Unless your boat is obviously sinking, resist the temptation to abandon ship for a life raft. (308-311)

g. Put out a stove fire by cutting off the fuel supply. Aim a fire extinguisher at the base of a fire with a sweeping motion. (312)

6. Distress Signals. Officially recognized distress signals include an orange flag with a black square, red flares, rockets, orange smoke, a fire, code flags "NC," the signal "S-O-S," the transmitted word "Mayday," an EPIRB radio beacon, and a person slowly raising and lowering arms. Unofficial but widely recognized signals include waving an orange or red flag, flying the national flag upsidedown, a flashing strobe light, and dye marker in the water. (313-315)

7. Responsibilities and Documents. Except when racing, fly the national flag or ensign from 8:00 a.m. until sunset. Respect other crews' rights and privacy, and don't take undue advantage of their mistakes. Avoid obstructing or inconveniencing boats that are racing or are obviously undercrewed. Be alert to the effect of your wake. Offer assistance where needed, both at docks and at sea. Keep your own boat clean and neat. Store official documents, engine manuals, charts, and other important papers in accessible, dry locations. Chart the location of all important safety items. Tell your crew what to do in emergencies. (317)

D. Engineering

1. The Engine. Read and understand your engine's manual and rigorously observe the recommended maintenance schedule. Keep track of daily use and needs in a log. Top off fuel tanks at every possible opportunity, using a fuel strainer. Since dirt may be kicked up from fuel-tank bottoms in rough weather, replace fuel filters regularly. Run the engine frequently at high speed to keep it well lubricated. If the engine temperature rises quickly, cut down on R.P.M.s; if it does not drop, stop the engine and check the cooling water intake -- carry a spare water pump and impeller. If the engine stalls, there may be an air lock; stop (anchoring off to the side of a crowded channel) and bleed the bubble from the fuel line. Clean spark plugs in gas engines with an emery board. (299, 325)

2. Maintenance. Perform scheduled maintenance on every part of the boat. The more frequently an object is used, the more often should it be inspected. Keep salt water from accumulating below and on sails and fittings. Fold or roll sails. Tune the mast so it is straight athwartships in moderate wind. Tape cotter pins, and don't weaken them by bending them too far. Go aloft periodically to inspect fittings. Keep a good supply of back-up fittings, tape, and lubricants. Winterize thoroughly. (318-327)

E. Safety

1. Lightning. Make sure the mast is grounded to the keel with a sturdy wire leading from a stay. When lightning is in the air, don't touch anything metal or work electronic instruments. (291)

2. Crew Safety. Make sure everybody knows who's in charge. Know the abilities and weaknesses of your crew, and don't ask more of them (or yourself) than can reasonably be expected. Encourage beginners to take increasing responsibility. Life-jacket rules must be imposed for anybody who can't swim a moderate distance. Nobody should swim off the boat alone or without a swimming ladder rigged. Keep children in sight when they're on deck. Dress carefully for warmth, dryness, and sure footing. (253-256)

3. Poor Visibility. When sailing in fog, hoist a radar reflector high in the rigging, keep a careful lookout, slow down, and sound the correct horn signals. (233, 243)

4. Onshore Safety. Watch your footing on docks and don't fend off at floats and piers with your feet and hands. Move trailers carefully, being especially alert to overhead electrical wires, which can kill when they touch masts. Be extremely careful when working with electrical tools near the water. (46-55)

Advanced Coastal Cruising Standard Quiz

A. Sail Theory

1. List the following combinations of sail plan and underbody configuration in order of efficiency for close-hauled sailing, beginning with the most efficient.

- (A) Small sail area and large, poorly-shaped keel.
- (B) Moderate sail area and no keel.
- (C) Large sail area and medium-size, well-shaped keel.

2. Assume that you're running dead before the wind at a boat speed of 5 knots and that the apparent wind speed is 8 knots. What is the true wind speed? What will be the approximate apparent wind speed after you have turned around and begun sailing close-hauled at a boat speed of 5 knots?

- (A) True wind = 5 knots; close-hauled apparent wind = 8 knots.
- (B) True wind = 13 knots; close-hauled apparent wind = 18 knots.
- (C) True wind = 10 knots; close-hauled apparent wind = 15 knots.

3. You're sailing close-hauled in a light wind and a powerboat passes. What should you do to keep your boat from being stopped by the powerboat's wake?

- (A) Keep the same sail trim and steer a little more off the wind, with the jib's leeward telltale lifting.
- (B) Trim the sails flatter and steer closer to the wind.
- (C) Ease the sheets slightly to make the sails more full and keep both jib telltales streaming.

4. You're reaching in a gusty wind. Most of the time the boat is easy to steer, but every now and then a puff of wind causes her to heel so far that the helmsman can barely control the wheel due to weather helm. What should you do?

- (A) Ask a stronger person to steer.
- (B) If you're not in a hurry, shorten sail so you're comfortable in the gusts; if you're in a hurry, luff the sails in gusts and trim them back in lulls.
- (C) Reef or change to a smaller jib.

B. Weather

1. Turn to the chart on pages 164-165. At 8:00 a.m. on August 6, the sky was slightly overcast, the air temperature on Newport Neck was 65 degrees, and a 12-knot North wind was blowing. At noon, the sky was clear except for small puffy culmulus clouds over the land, the air temperature was 80 degrees, and the Northerly was 5 knots. What kind of wind can you expect to be blowing by 3:00 p.m.?

- (A) A moderate to fresh South or Southwest onshore sea breeze, which will be sucked in by the thermal over the hot land and kill off the Northerly offshore land breeze.
- (B) A 5-knot Northerly.
- (C) A flat calm; the land and sea breezes will cancel each other out.

2. On the same kind of day in the area covered on the same chart, what sort of wind would there be if a large low-pressure cell were located to the South and a large high were to the North?

- (A) Very little; the air flows around the two cells cancel each other out.
- (B) A moderate West wind.
- (C) A moderate to fresh Easterly that may veer toward the Southeast in the afternoon.

3. It's a warm, humid spring morning and you're sailing down a river toward a cold lake. Under what circumstances can you expect to encounter fog as you enter the lake at the mouth of the river?

- (A) If a warm South wind begins to blow.
- (B) If the river is warmer than the lake.
- (C) Both of the above.

4. Looking to the West over a period of two hours, you see altocumulus clouds gradually deepen and darken. What actions should you take?

- (A) Have another beer. Altocumulus clouds mean fair weather.
- (B) Tune the radio to a commercial or weather station to the West to find out if any squalls are coming your way.
- (C) Prepare for a gale.

C. Seamanship

1. When should a typical racer-cruiser be reefed?

- (A) When white caps appear on the water.
- (B) When you see nearby boats reef.
- (C) When the helmsman must fight the helm to hold her on course.

2. Where should you hook your safety harness tether when you're steering on starboard tack in rough weather?

- (A) To the starboard lifelines.
- (B) To a starboard deck fitting.
- (C) Around the steering pedestal.

3. What's the best storm tactic to use in a gale?

- (A) Run before it, steering around bad waves.
- (B) Heave-to and go below.
- (C) Try them all and use the one that works best.

4. In a storm, given a choice between entering an unfamiliar, narrow harbor and being beaten about by rough seas offshore, what should you do?

- (A) Head away from land and wait for the storm to pass, then return and enter the harbor.
- (B) Learn as much as you can about the harbor from the

Coast Pilot and charts and try to enter it.

- (C) Heave-to off the harbor entrance and wait for a break in the weather.

5. Before heading out on a cruise, how much should you tell your crew about emergency equipment (like fire extinguishers and safety harnesses) and emergency procedures (like manoverboard recoveries)?

- (A) As little as possible; you'll only frighten them. Save it until you need it.
- (B) All you can if the forecast is pessimistic.
- (C) All you can regardless of the weather forecast.

6. If you're in trouble and need help but have no flares or other official distress signals, what should you do?

- (A) Save yourself.
- (B) Do anything that's both visible and out of the ordinary to get another crew's attention.
- (C) Abandon ship and swim to shore.

7. As you sail into harbor on starboard tack, you're obstructed by a fleet of racing sailboats all sailing on port tack. What should you do?

- (A) Sail on without making a signal; you have right of way, and it's their responsibility to avoid you.
- (B) Sound two blasts on your horn to warn their crews and hold your course so you don't confuse them.
- (C) Do your best to avoid obstructing them or confusing their crews as you work toward your destination.

D. Engineering.

1. What are typical causes of engine problems?

- (A) Dirty fuel and air locks.
- (B) Underuse and overheating.
- (C) An unopened engine manual and a slothful owner.

2. What are your sails' and gear's worst enemies?

- (A) Sun rays and salt deposits.
- (B) Chafe due to rubbing against harder objects and vibration from constant luffing.
- (C) All of the above.

E. Safety

1. What special precautions should you take during lightning storms?

- (A) Don't operate the Loran receiver, hold wire halyards, or stand near stays.
- (B) Don't hold wet Dacron or nylon lines.
- (C) Don't go below; it's much safer on deck.

2. In rough weather, what is the skipper's main concern as regards to crew?

- (A) Avoid hurting people's feelings with abrupt commands.
- (B) Clearly assign key jobs to competent people.
- (C) Do his best to guarantee that everybody on board is happy and kept busy.

3. In fog, what sound signals should a sailboat and moving powerboat make?

- (A) Long-short-short (sailboat); long (powerboat).
- (B) Two longs (both).
- (C) Short (sailboat on starboard tack), two shorts (sailboat on port tack); one long (powerboat).

4. What should a crew do first after trailering a boat to a launching ramp and before stepping her mast?

- (A) Wash road dirt and grease off the hull.
- (B) Loosen the tie-down lines to minimize strain on the hull and trailer.
- (C) Carefully inspect the parking lot and ramp for overhead power wires.

5. Turn to the Tidal Current Chart on page 169. It's two hours after the flood starts at Pollock Rip Channel and this chart accurately represents the current flow. You're at Woods Hole and plan to sail West to Cuttyhunk Island. Under what wind and sea conditions would you decide to sail up Vineyard Sound instead of on Buzzards Bay? Why?

- (A) In all conditions, in order to take advantage of the favorable currents flowing out of Woods Hole and up Vineyard Sound.
- (B) In all conditions except a strong Southwest wind, which may create dangerously rough seas when it meets the West-bound current.
- (C) Never. Vineyard Sound is too narrow for safe navigation and Buzzards Bay is very wide.

6. On the chart on page 155, which are the most safe and least safe anchorages in a Northeast gale?

- (A) Most safe: in the cove near Pillar Point. Least safe: White's Bay.
- (B) The exact opposite of answer A.
- (C) Most safe: East of Association Island. Least safe: West of Association Island.

III. Afloat Skills

III. Afloat Skills

To completely satisfy the American Sailing Association's Advanced Coastal Cruising Standard, the student -- while sailing for at least 30 hours, day and night -- must demonstrate nine important boat-handling skills laid out in the ASA CRUISING LOG BOOK. These Afloat Skills include most of the techniques covered in Parts I and II, and are listed below with relevant page numbers in THE ANNAPOLIS BOOK OF SEAMANSHIP.

1. To be able to act as helmsman while demonstrating the proper techniques of beating, reaching, running, tacking, jibing, heading up, bearing away, and luffing in about 20 knots of wind. (34-43, 82-85, 287-289)

2. To be able to sail upwind to best advantage using wind shifts, tides, and local geography. (36-41, 82-83, 96-97, 198, 204-205, 216-223)

3. To be able to sail a compass course with sails trimmed to best advantage. (36-39, 84-85)

4. To be able to demonstrate correct methods and precautions when towing a dinghy. (44-45)

5. To be able to carry out manoverboard procedures at

nighttime. (304-307)

6. To be able to demonstrate the correct procedures for hoisting, setting, trimming, jibing, dousing, and packing a spinnaker. (86-92)

7. To be able to pick up and cast off moorings, to anchor, and to weigh anchor. (45-46, 264-281)

8. To be able to demonstrate how to take a sounding by two different methods. (214-215)

9. To be able to stand a navigation watch during a passage of about 20 miles by night and 20 miles by day and demonstrate the following piloting skills: at least one fix determined by one bearing and one transit (range); at least one fix determined by three or more simultaneous visual bearings; at least one running fix by taking two bearings on the same known object; and one radio direction finder fix. (192, 202-203, 207-211, 225-227)

IV. Coastal Navigation Standard Quiz Answers

A. Publications and Tools

1. (C) "Small number, small area." When you want the greatest detail, rely on the chart with the smaller second number. That's the one with the larger scale.

2. (C) Unless the new position seems improbable and unsafe -- in which case you should notify the Coast Guard immediately -- check Notice to Mariners and mark the new buoy position on your chart. If the Coast Guard or another agency is going to move a buoy (because of shoaling, a wreck, or some other reason), it usually will do so during the off-season.

3. (B) The down-current tilt and ripple of a buoy are the best indicators of moving water. It's easy both to make a mistake reading the tables and to forget that they are only predictions. Unless the weather has thrown the tide table predictions for a loop, at the end of slack water the currents should speed up markedly.

4. (B) Tide and current tables are useless beyond their year of coverage. The safest way to guarantee complete, up-to-date chart coverage is to buy new charts annually.

The Light List and Coast Pilot have frequent new editions.

5. (A) A coast chart and a harbor chart for the most difficult port are vital. The Tidal Current Tables provide more data than the Tide Tables.

6. (B) Piloting is almost impossible without an accurate compass, a pencil to keep track of your course and position on the chart, and a timepiece for working with tide tables and the Speed/Time/Distance formula. While dividers and a plotter are extremely helpful, you can lay off distances and courses with a straight edge. Binoculars, a calculator, a depth sounder, and a speedometer are important tools, but not necessary ones.

B. The Magnetic Compass

1. (C) Your problem is deviation, not variation, which is the difference between true and magnetic directions. Deviation is the difference between magnetic and compass headings. Here, the boat's magnetic field is pulling the needle 5 degrees to the East.

2. (B) When "correcting" -- working from compass to magnetic to true -- add Easterly errors and subtract Westerly ones. (See the flow chart on page 184.) Therefore:

178 (compass) - 4 (West) = 174 (magnetic)

174 (magnetic) + 13 (East) = 187 (true)

C. Plotting

1. (A) You should use the Speed/Time/Distance formula to solve for Speed:

$$\text{Speed} = \frac{60 \times 4.2 \text{ (distance)}}{39 \text{ (time)}} = 6.5 \text{ knots}$$

2. (B) A 2-knot South current pushes an object 3 nautical miles to the South in 90 minutes (only winds are named after their direction of origin).

3. (B) (C) (A) Good compass bearings are always the best evidence of your position. Estimates of currents -- gauged by observation, not solely by the Tidal Current Tables -- can also be helpful. Depth soundings may be inaccurate in rough seas.

4. (C) (A) (B) Bearings taken on buoys anchored in deep water (which may swing about) are not as reliable as those taken on shallow-water buoys or fixed, charted objects (as this large "cocked hat" suggests). A running fix should be considered an estimated position in rough weather.

5. (C) Using the Speed/Time/Distance formula to solve for Distance run,

$$\text{Distance} = \frac{5.5 \text{ (speed)} \times 13 \text{ (time)}}{60} = 1.2 \text{ miles}$$

With the technique of doubling the bow bearing, the distance off equals the distance run between bearings. Therefore, the boat is 1.2 miles -- the distance run -- off the lighthouse at point 2. Cross that circle of position with a compass bearing to the lighthouse taken at point 2 and you have a fix.

6. (A) At a speed of 5 knots, your boat will be under way for 4 hours. With drift of 1.5 knots she will be pushed to port a total of 6 nautical miles. Therefore, you must steer at a point 6 miles to starboard of the destination. Using the Rule of 60,

$$\text{Alteration} = \frac{60 \times 6 \text{ miles}}{20 \text{ miles}} = 18 \text{ degrees}$$

Since the compensation is to starboard, it is added to the rhumb-line course: 010 + 018 = 028 degrees.

7. (C) Tunnel vision and excessive reliance on indicators are common human problems with all electronics.

8. (C) If you chose A, you used the outer, true ring; if B, you misread the magnetic ring and did not use the .1-mile increments on the marginal scale.

9. (C) Answer A takes you through Timber Island. Answer B

misses "68T," an important guide when approaching the rocky shore in the fog.The safest strategy in poor visibility is to run out your time while leapfrogging from buoy to buoy. At a speed of 4.5 knots, you'll go 1.2 miles in 16 minutes; that will carry you past nun RS to a point (just below the "a" in "Island") that is safely clear of Timber Island. Then run out your time to flashing buoy "68T" (it takes 95 minutes to go 7.1 miles at 4.5 knots). Finally, run out your time to your destination (20 minutes to go 1.5 miles).

D. Aids to Navigation

1. (B) Since buoy numbers increase as you enter a channel, it's a safe bet that the harbor lies to the East. Proceed slowly in poor visibility.

2. (C) Unless identification of the light is crucial to your safety, you may sail on. Shining a bright light will only harm your night vision.

3. (A) First, multiply 1.144 times the square roots of the light's height (87 feet) and the height of eye (9 feet). Then add the two products: 10.7 + 3.4 = 14.1 miles. Answer B is the light's nominal range, answer C is the correct answer for statute miles. Since the combined geographic range is less than the nominal range, the light's loom will be visible well beyond 14.1 miles.

V. Advanced Coastal Cruising Standard Quiz

Answers

V. Advanced Coastal Cruising Standard Quiz

Answers

A. Sail Theory

1. (C) (A) (B) Large sails create large drive, and well-shaped moderate-size keels resist leeway better than poorly-shaped large ones. Most boats cannot sail close-hauled without a keel or centerboard.

2. (B) The true wind speed is the sum of the running apparent wind speed and the running boat speed. The close-hauled apparent wind speed is slightly less than the sum of the true wind speed and the close-hauled boat speed. You'll save yourself considerable grief if you make these calculations before heading up from a run to a close-hauled course, since what seems like a light wind often ends up being a painfully fresh one.

3. (C) Making the sails more full and steering by them is the best way to get through rough water. Allowing the leeward telltale to lift (or "stall") for more than a few seconds will slow you down; trimming the sails flatter and pinching is worst of all.

4. (B) There are many ways to depower a sail, both

long-term (such as changing jibs and reefing) and temporary (like letting the sails luff and moving jib leads aft or the traveler car outboard). Racing sailors "trim for the lulls" and spill air in the puffs, while cruisers "trim for the puffs" and sail slower in the lulls.

B. Weather

1. (A) Every sign here points toward the imminent appearance of the onshore sea breeze. Cool air will be sucked in from the water by the thermals rising over the hot land and kill off the Northerly.

2. (C) With counterclockwise air flow around the low to the South and clockwise circulation around the high to the North, the two pressure cells mesh to create an Easterly in between (the lower illustration on page 101 shows how this works). The greater the pressure differential between the two cells, the less effect will local thermals have on the wind direction. On this day, the wind may shift slightly toward the seabreeze direction -- that is, it may veer from East to Southeast -- as the hot afternoon wears on.

3. (C) Fog often results from a combination of cool water and warm air -- whether carried by a South wind or by warm water. Once out in the lake, you may be colder but not as fogged-in as at the river mouth.

4. (B) A piling-up and darkening of clouds is an early

squall warning, but it does not necessarily foretell a storm.

C. Seamanship

1. (C) Every boat is different, and neither the sea condition nor the behavior of other crews is the final word on how you should handle your own vessel. The best indicator of your seaworthiness is the feel of the helm.

2. (B) Always hook the tether as far to windward ("uphill") as possible to a secure deck fitting. A lifeline, or even a lifeline stanchion, may snap.

3. (C) While many boats may end up running before it, and while heaving-to in very rough seas may invite a capsize, there's no absolute rule on which tactic to use. Know thy boat and her tendencies.

4. (A) Forget about entering the harbor. Even waiting near shore may be dangerous. Get out into relatively safe deep water, heave-to, and be patient.

5. (C) Regardless of the conditions, everybody must be aware that sailing can be risky and know where life jackets, safety harnesses, and other essentials are located. At least two or three responsible people on board must be prepared to handle the big emergencies long before they occur.

6. (B) Any unusual activity -- waving your arms, blowing

many blasts on a horn, flying a sail in a strange way -- will attract attention. Don't be tempted to abandon the boat; until she sinks you have no better life raft.

7. (C) To the letter observance of the Rules of the Road is no substitute for good seamanship. Here, though you technically have right of way, good seamanship, common sense, and putting yourself in the other crew's position require you to give way and pass well astern of a boat whose crew is distracted. Be especially alert to the effect of your wake, which, though it may not seem big to you, can rock all the wind oit of a small boat's sails.

D. Engineering

1. (C) Your engine manual and assiduous maintenance offer the best protection against the general run of problems -- of which the ones mentioned in A and B occur most often.

2. (C) The boat's environment and use combine to provide her own worst enemies against which fresh water and tape are the best defenses.

E. Safety

1. (A) Lightning may pass through an antenna and short out the instrument. Wet lines and sails may be handled safely unless there is an unusual amount of static electricity in the air, and even then any shock probably will be a mild

one. If you're frightened, go below.

2. (B) While the crew's happiness and personal fulfillment are both desirable in normal conditions, the skipper's most important concern in bad weather is to make sure that key jobs -- such as steering, sail changing, and piloting -- are performed by the most qualified people available. This is where good leadership makes all the difference.

3. (A) It used to be that sailboats made different signals on different tacks, but today they make the same signal -- long-short-short -- while a powerboat underway sounds a single long. (A stopped powerboat sounds two longs.) If the fog is so bad that you can barely see beyond your own bow, the safest thing to do is to anchor well outside the channel and make the proper signal -- ring a bell for 5 seconds every minute and/or sound a horn in a short-long-short sequence.

4. (C) The biggest danger in a launching area is pulling masts and rigging into overhead electrical wires. Some manufacturers of small, trailerable boats are so concerned about this accident, which has killed several sailors, that they place permanent warning labels on masts.

5. (B) Though narrower than Buzzards Bay, Vineyard Sound is plenty wide for safe navigation -- see the scale on the chart. The main hazard, however, is the rough seas kicked up by a strong wind running against a current; 1 knot of

Notes and Calculations

current may double wave height. In rough conditions, therefore, it may be safer (and faster) to sail in unfavorable current in order to have smoother water.

6. (A) Almost all charts are oriented so North is at the top. Because a Northeaster blows from the top right corner toward the bottom left corner, look for protection behind high land toward the upper right. Here, hills as high as 300 feet are to windward of the cove between Pillar and Everleigh Points, while the wind will whistle all the way across Henderson Harbor before driving waves into exposed White's Bay. Association Island, running Northeast to Southwest, offers no protection in a Northeaster for boats on its flanks.

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