SPECIMEN EXAMINATIONS

FOR

MERCHANT MARINE DECK OFFICERS

CG–101

JULY 1, 1963

UNITED STATES COAST GUARD
TREASURY DEPARTMENT

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FOREWORD

Candidates for merchant marine deck officer's licenses are required to pass written examinations to demonstrate their professional qualifications. This publication contains questions which should acquaint those seeking such licenses with the nature of the material they will be required to know.

The pamphlet "Specimen Examinations for Merchant Marine Deck Officers," CG–101, dated July 1, 1958, is superseded by this publication.

It is hoped that the specimen questions and information contained herein will be helpful to those endeavoring to qualify for licenses as deck officers.

E. J. ROLAND,
Admiral, U.S. Coast Guard,
Commandant.

Dist. (SDL No. 77)
A: None
B: n(100); c(9); e(5); d(2); b, p(1)
C: m(1)
D: i, m, n, or(1)
E: l, m(1)
List 112
List 160

INTRODUCTION

The specimen examinations published herein are for the purpose of acquainting prospective candidates with the nature of the material they will be required to answer in order to qualify for licenses. Candidates will not be asked the same number of questions published under the respective grades and titles; nor are the examining officers precluded from using questions not contained in this publication. However, this book provides a fairly comprehensive guide to the nature of the material used. Candidates should also be prepared to answer questions of the multiple-choice type.

In order to conserve space, duplication of questions under the different grades has been eliminated as far as practical. In studying for the higher grades of license, similar subject matter shown for the lower grades should be carefully reviewed. Candidates for lower grades should also acquaint themselves with the material given for required subject matter in the higher grades, although they will not be required to show the same degree of knowledge of the more difficult problems.

Candidates must be prepared to demonstrate their proficiency in the use and adjustment of the sextant; plotting of courses, bearings, and lines of position on charts, and the application of the International, Inland, and Pilot Rules of the Road through the use of models. An actual demonstration of the candidates knowledge of signaling is also required. A minimum qualifying speed of six words per minute is required for signaling with flashing light.

Effective January 1, 1959, every applicant for an original deck officer's license, raise in grade, or increase in scope of license for service on ocean, coastwise, or Great Lakes vessels of 300 gross tons or over shall be required to qualify as a radar observer. Questions of the type that will be given have been included in this publication under the separate heading "Radar Observer."

Subjects have been numbered in accordance with Table 10.05–45(b). "Subjects for Deck Officers of Ocean or Coastwise Steam or Motor Vessels" in the Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel. A copy of the table is included for convenient reference. Further Table 10.05–45(b) has been categorized into five groups as shown below to set forth the order in which groups of subjects shall be given. The groups will be administered in the order shown. For example, a candidate will be given the applicable subjects in Group One first. These shall be completed in their entirety before proceeding to Group Two and so on. However, the subjects within each particular group will not necessarily be given in the order set forth. This will be left to the discretion of the officer administering the examination in order to provide for the most efficient use of his and the candidate's time.

Group One

Navigation

1. Latitude by Polaris
2. Latitude by Meridian Altitude Method
3. Fix or Running Fix
4. Star Identification
5. Compass Deviation
6. Middle Latitude Sailing

7. Mercator Sailing
8. Great Circle Sailing
9. Piloting

Group Two

1. International and Inland Rules of the Road

Group Three

1. Chart Navigation
2. Aids to Navigation
3. Instruments and Accessories
4. Magnetism, Deviation and Compass Compensation
5. Chart Construction
6. Tides and Currents

Group Four

1. Ocean Winds, Weather and Currents
2. Nautical Astronomy and Navigation Definitions
3. Stability and Ship Construction
4. Seamanship
5. Cargo Stowage and Handling
6. Change in Draft due to Density
7. Determination of Area and Volume
8. Speed by Revolutions
9. Fuel Conservation

Group Five

1. Signaling by International Code Flags, Flashing Light; Lifesaving, Storm and Special Signals
2. Lifesaving Apparatus and Firefighting Equipment
3. Ship Sanitation
4. Rules and Regulations for Inspection of Merchant Vessels
5. Laws Governing Marine Inspection
6. Ship's Business
7. General
8. Practical demonstration of knowledge and use of the sextant

A bibliography of texts which may be helpful is included. This cannot be regarded as complete, and failure to list any specific work is not intended to slight its value. Material in the examination has been drawn from other sources as well as the references cited.

Prior to sitting for a license examination, applicant must meet other requirements. A brief summary of these follows.

AGE AND EXPERIENCE

Applicants must be at least 21 years of age, with the exception of third mates, who must be at least 19 years of age. Minimum qualifying experience is required for each grade of license. These requirements are set forth in detail in CG–191, Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel.

CITIZENSHIP

All applicants for an original, renewal, or raise of grade of license must be citizens of the United States, native born, or fully naturalized. This must be established by acceptable documentary evidence. Persons not able to prove American citizenship will not be examined for an original license.

APPLICATIONS

Form CG–866 (License Applications) may be obtained either by written request or personal application to any Officer in Charge, Marine Inspection, U.S. Coast Guard. It must be completed in all respects. All statements of sea service made therein must be supported by documentary evidence, issued by responsible persons, officers, or organizations. When the application has been completed, it must be presented personally by the applicant at a Marine Inspection Office. Each applicant for an original license is required to have a written endorsement from a Master and two other licensed officers of a vessel on which he has served.

PHYSICAL EXAMINATION

Upon acceptance and approval of his application, the candidate will be sent to one of the offices of the U.S. Public Health Service for a physical examination.

For an original license as master, mate, or pilot, the applicant must have either with or without glasses, at least 20/20 vision in one eye and at least 20/40 in the other. The applicant who wears glasses, however, must also be able to pass a test without glasses of at least 20/40 in one eye and at least 20/70 in the other. The color sense will be tested by means of a pseudo-isochromatic plate test, but any applicant who fails this test will be eligible if he can pass the "Williams" lantern test or equivalent.

REEXAMINATION AND REFUSAL OF LICENSES

Any applicant for license or endorsement who has been duly examined and refused may come before the same Officer in Charge, Marine Inspection, for reexamination at any time thereafter that may be fixed by such Officer in Charge, Marine Inspection, but such time shall not be less than 1 month from the date of his last failure. In the case of another failure, he will not be reexamined until after a lapse of at least 6 months from date of last failure.

A candidate who has been duly examined and refused a license by an Officer in Charge, Marine Inspection, shall not be examined by any other Officer in Charge, Marine Inspection, until 1 year has elapsed from the date of the last refusal without the sanction of the Officer in Charge, Marine Inspection, that refused the applicant.

REQUIREMENTS FOR RENEWAL OF LICENSE

Every Officer in Charge, Marine Inspection, shall, before renewing an existing license to a master, mate, or pilot who has served under the authority of his license within the 3 years next preceding the date of application for renewal, or who has been employed in a position closely related to the operation of vessels during the same 3 year period, require that such licensed officer present an affidavit that he has read within the 3 months next preceding the date of application the Rules of the Road applicable to the waters for which he is licensed and demonstrate his knowledge of the application of the Rules of the Road.

Every Officer in Charge, Marine Inspection, shall, before renewing an existing license to a master, mate, or pilot who has not served under the authority of his license within the 3 years next preceding the date of application for renewal, or who has not been employed in a position closely related to the operation of vessels during the same 3 year period, satisfy himself that such licensed officer is thoroughly familiar with the Rules of the Road applicable to the waters for which he is licensed. A written examination may be required for this purpose, or the applicant may be examined orally and a summary of the oral examination placed in the officer's license file.

CONTENTS

TABLE 10.05–45 (b)—SUBJECTS FOR DECK OFFICERS OF OCEAN OR COASTWISE STEAM OR MOTOR VESSELS

Subjects	Master				Chief mate		Second mate		Third mate		Mate—Limited mineral and oil industry
	Ocean	Coastwise	Yachts	Limited mineral and oil industry	Ocean	Coastwise	Ocean	Coastwise	Ocean	Coastwise	
1. Latitude by Polaris	X	X			X		X				
2. Latitude by meridian altitude method							Sun or star.	Sun	Sun	Sun	
3. Fix or running fix	Any body	Sun or star.	Any body		Any body	Sun or star.	do	do	do		
4. Star identification (any method)	X	X	X		X	X	X				
5. Chart navigation	X	X	X	X	X	X	X	X	X	X	X
6. Compass deviation	Any body	Sun or star.	Sun		Sun or star.	Sun or star.	Sun or star.	Sun	Sun	Sun	
7. (Canceled)											
8. Middle latitude sailing			X					X	X		
9. Mercator sailing	X	X	X			X	X				
10. Great Circle sailing	X										
11. Piloting	X	X	X	X	X	X	X	X	X	X	X
12. Aids to navigation	X	X	X	X	X	X	X	X	X	X	X
13. Speed by revolutions	X	X			X						
14. Fuel conservation	X										
15. Instruments and accessories	X	X	X	X	X	X	X	X	X	X	X
16. Magnetism, deviation and compass compensation	X	X	X	[1] X	X						
17. Chart construction	X	X									
18. Tides and currents	X	X		X	X	X	X	X	X	X	X
19. Ocean winds, weather and currents	X	X	X		X		X		X		
20. Nautical astronomy and navigation definitions	X					X	X		X		[3] X
21. International and inland rules of the road	X	X	X	X	X	X	X	X	X	X	X
22. Signaling by international code flags, flashing light; lifesaving, storm and special signals.	X	X		[2] X	X	X	X	X	X	X	[2] X
23. Stability and ship construction	X	X		X	X	X					
24. Seamanship	X	X	X	X	X	X	X	X	X	X	X
25. Cargo stowage and handling		X		X	X	X	X	X	X		X
26. Change in draft due to density		X			X						
27. Determination of area and volume						X	X				
28. Lifesaving apparatus and firefighting equipment	X	X	X	X	X	X	X	X	X	X	X
29. Ship sanitation	X	X			X						
30. Rules and regulations for inspection of merchant vessels	X	X	X	X	X	X	X	X	X	X	X
31. Laws governing marine inspection	X	X		X	X	X					
32. Ship's business	X	X		X							
33. Such further examination of a nonmathematical character as the Officer in Charge, Marine Inspection, may consider necessary to establish the applicant's proficiency.	X	X	X	X	X	X	X	X	X	X	X

[1] Practical use of the magnetic compass. [2] Lifesaving, storm and special signals. [3] Navigation definitions only.

SUBJECTS NUMBERED IN ACCORDANCE WITH THIS TABLE

SPECIMEN EXAMINATION
FOR
THIRD MATE

2. LATITUDE BY MERIDIAN ALTITUDE METHOD.

Enroute from Argentina to Capetown, a meridian altitude of the sun was observed at D. R. Latitude 37°–02′ South with the sun bearing North. The observed altitude was 75°–11′ and the declination was 23°–10′.6 South.

Required: The Latitude at time of sight.

Candidates may use any method of solution.

75.11.

3. RUNNING FIX-SUN.

Enroute from New Orleans, La. to Tampico, Mexico, in D. R. Latitude 25°–55′ North, Longitude 93°–10′ West, an observation of the sun was taken and the following data recorded:

Observed Altitude (ho)	*Greenwich Hour Angle*	*Declination*
29°–20′.1	55°–37′.4	22°–47′.O S.

The ship's course was 230°, speed 20.3 knots. At LAN a meridian altitude was taken and the following data recorded:

Observed Altitude (ho)	*Declination*
41°–55′.7	22°–46′.3 S.

Required: The ship's position at Local Apparent Noon.

Enroute from Toledo, Ohio to Port of Spain, Trinidad in D. R. Latitude 14°–36′ North and Longitude 62°–32′ West an observation of the sun was taken and the following data recorded:

Observed Altitude (Ho)	*Greenwich Hour Angle*	*Declination*
37°–28′.7	7°–48′.1	23°–01′.4 N.

The ship's course was 165°, speed 11.7 knots. 3h–50m–13s after the a. m. observation, a p. m. observation of the sun was taken and the following data recorded:

Observed Altitude (Ho)	*Greenwich Hour Angle*	*Declination*
80°–16′.0	65°–20′.9	23°–00′.6 N.

Required: The ship's position at the time of p. m. observation.

Candidates may use any method to obtain solution.

In the winter, the following 3 sextant altitudes of the sun were obtained. The height of eye was 65 feet, the sextant index error was 0′.5 on the arc in all observations. Given:

	Observation No. 1	*Observation No. 2*	*Observation No. 3 (Upper Limb)*
Sun Sext. alt.	8°–34′.2	31°–46′.8	49°–26′.7
Bar. Pressure.	29.2 in.	1034 mb	30.0 in.
Temperature	+20° F.	+40° Celsius (Centigrade)	+60° F.

Required: The observed altitude.

GIVEN:

	No. 1	*No. 2*	*No. 3*
Date	1 January 1958	2 May 1958	3 September 1958
GMT	12h–04m–57s	5h–29m–33s	21h–09m–43s
Long.	57°–32′.0 West	15°–29′.0 East	157°–18′.0 West

Required: The meridian angle and declination of the sun in each of the 3 cases. Indicate whether the sun is east or west of the meridian in each case.

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5. CHART NAVIGATION.

What regions of the earth may not be shown by the ordinary Mercator chart projection?

What would be the appearance of straight lines on a Mercator chart if transferred to a globe?

What government agency of the United States publishes charts of foreign waters?

What government agency of the United States publishes charts of the United States and its possessions?

If you wished to measure the distance between point "A" at Latitude 30° and point "B" at Latitude 40° on a Mercator chart with the dividers set to measure 30′ at each step, at what two points on the latitude scale would you set each leg of the dividers in order to obtain the most accurate measurements?

How does a great circle appear when plotted on a gnomonic chart?

Name the various instruments or devices that may be employed in determining the course on a Mercator chart.

What chart would you consult to determine weather conditions, currents, or locations where ice might be encountered?

Distinguish between small scale charts and large scale charts, and state the use of each.

How are charts kept up to date? How would you know when a chart was last corrected?

Having once determined the course to sail a great circle, can this course be used until the destination is reached?

How may the likelihood of encountering gales be determined from a pilot chart?

How is normal *barometric* pressure and temperature indicated on the pilot charts?

What is the true shape of the earth?

Describe the polyconic projection.

Describe the tidal current charts published by the U.S. Coast and Geodetic Survey.

How is the ship's position determined by means of cross bearings (3 bearings) which are taken at different times?

When observing cross bearings of objects, how much should their bearings differ to obtain a good fix?

When obtaining distance off by two bearings on a single object, how is the distance run between bearings determined?

Explain the use of the 26½° to 45° bearing, and state how it can be used to predict the time due abeam.

In taking a vertical sextant angle to determine the distance off an object, where would you find the height of the object?

Explain the 30–60 case, or ⅞ rule, for determining distance off an object by means of two relative bearings on the object and the run between the bearings.

For what purpose is the "danger bearing" used by the navigator?

In the vertical danger angle, what is indicated when the sextant angle is found to be greater than that determined by the desired distance off the vertical object?

By whom are chart catalogues issued, and what information do they contain?

What is meant by "Doubling the angle on the bow," and how is this method used?

What information is contained in the Coast Guard "List of Lights and other Marine Aids"?

What Government agency publishes the Tide Tables?

What publication contains astronomical data for use by mariners?

How may a range provide a bearing?

Where can detailed information about ocean currents be obtained?

State the use of the "bow and beam" or "4 point" bearing, and describe how one is obtained.

State how middle latitude sailing can be used when a vessel's course crosses the equator.

Describe briefly the use of aeronautical radio ranges for surface navigation. What signal is emitted by such stations?

How would you check the calibration for a radio direction finder?

Why is it desirable that a ship's radio direction finder set be capable of receiving signals between 275 and 515 kilocycles?

What publications give information about stations which may be employed by the navigator in determining position by radio?

How are Sailing Directions corrected?

Of what use are Notices to Mariners in correcting charts?

How often are the Notices to Mariners published?

A vessel is on course 045° at a speed of 10 knots. What is her departure each hour? If the vessel is at Latitude 45°, what is her hourly change of longitude?

A vessel is on a course of 060° at a speed of 20 knots. How much does she change her latitude each hour?

How would you obtain a radio bearing, when the minimum, or null, is not well defined?

In picking up a light, what advantage might you gain by going on to the upper bridge, or posting the lookout aloft?

Running coastwise, you sight a buoy bearing 10° on the starboard bow. The buoy marks a dangerous shoal to the right of the buoy with safe water to the left. If, after an interval, the buoy bears 6° on the starboard bow, what would be indicated? What action would you take?

How may vessels in distress enable ships and radio direction finder stations to take radio bearings?

Describe the effect of electrical conductors near the radio direction finder.

A radio beacon is 6° east of your vessel in Latitude 45° North. State the amount and direction to correct a bearing for plotting on a Mercator chart.

From Latitude 60° South and Longitude 150° East to Latitude 60° South and Longitude 150° West, determine the distance by parallel sailing.

A vessel's noon position by observation is Latitude 40°–02′ South and Longitude 15°–09′ West. Her dead reckoning position advanced from the previous noon position is Latitude 40°–20′ South and Longitude 15°–09′ West. *Required:* The set and drift of the current for the previous 24 hours.

You sight a mountain peak just breaking clear over the horizon. If the chart lists the height of the mountain as 720 feet and your height of eye is 45 feet, what is your distance off?

Give the meaning of the following symbols as shown on a chart:

State the meaning of the following abbreviations used on charts to indicate bottom characteristics:

Cl.	P.
Co.	S.
G.	Sh.
M.	Sn.
Oz.	St.

State the characteristics of Deer Island Light in Boston Harbor for which the light list gives the following information:

F. W., Alt. Fl., R., 30 sec., R. sector.

What precaution is necessary if you use a pilot chart to determine variation?

How are ocean currents and their drift indicated on pilot charts?

Describe plotting sheets and their use.

On a vessel outward bound, range lights are seen in line over the stern. If the ship is on gyro-compass heading 150°.5, what is the gyro-compass error, if the chart shows the range line to be 331°–30′ true?

On what part of a Mercator chart do you:

(a) Find the longitude scale;

(b) Find the latitude scale;

(c) Measure distance?

How would one know whether the figures on charts indicating depths mean fathoms, feet and fathoms, or feet?

Do the figures shown on Atlantic Coast charts indicate depths at high or low water?

What is the length of a statute mile?

How is variation indicated on a chart?

6. COMPASS DEVIATION.

Enroute from New York to Rio de Janeiro, in D. R. Latitude 9°–16′ South and Longitude 32°–02′ West, an azimuth of the sun was observed.

The following data was recorded at the time of observation:

Compass Bearing of Sun	*Greenwich Hour Angle*	*Declination of Sun*
273°–00′ psc	75°–39′.1	21°–02′.0 S.

Variation for the locality was 21°–30′ West.

Required:

The true azimuth.

The deviation of the standard compass.

Candidates may use any method of solution.

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8. MIDDLE LATITUDE SAILING.

By middle latitude sailing, find the true course and distance from Gedney Channel lighted whistle buoy in Latitude 40°–28′.8 North and Longitude 73°–53′.7 West, to Nantucket Shoals Lightship, in Latitude 40°–37′ North and Longitude 69°–37′.1 West. Show all work.

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11. PILOTING.

A vessel is heading 205°. At first bearing, a light bears 241° and the log reads 87 miles. At second bearing, the same light bears 258° and the log reads 98 miles. What is the distance off at time of second bearing and when abeam?

Your course is 255° p.s.c., variation 23° East, deviation 2° East. A light is sighted bearing 255° True. On what compass bearing must the light be observed such that the run between bearings would equal your distance off when abeam?

Compass course is North, speed 10 knots, and the first bearing of a light ashore is 26½° on the bow at 10:10 a.m. At 10:52 a.m., the same light bears 45° on the bow. Give the distance the vessel will pass off the light when abeam.

A vessel steering 10° picks up a shore light bearing 30°, log reading 45 miles. Later the same light bore 75°, log reading 56 miles. What is the distance off when abeam?

A vessel is steering North, speed 10 knots, and a bearing is taken of a light 2 points on the bow at 0800. At 0900, the same light bears four points on the bow. How far will the ship pass off the light when abeam on the same course and at what time will she be abeam?

NOTE: Problems may be given pertaining to piloting which are under other titles in this book.

12. AIDS TO NAVIGATION.

When a buoy marks the starboard side of a channel for a vessel entering port, state:

(a) The shape of the buoy;
(b) The color of the buoy;
(c) The type of number on the buoy;
(d) The color of its light.

Define exactly what is meant by an occulting light. (Candidates may submit a sketch such as those contained in the light lists to help demonstrate complete comprehension of the term.)

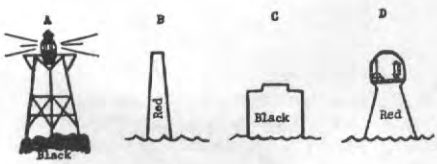
What is meant by the "Period" of a light as listed in the light list?

What height of eye on the part of the observer is assumed in calculating the geographic ranges of lights for charts and light lists?

What significance have buoys which are fitted with a light which shows not less than 60 flashes per minute?

Define exactly what is meant by a quick flashing light. (Candidates may submit a sketch such as that contained in the light list to help demonstrate their complete comprehension of the term.)

Name the types of buoys sketched below and sketch the chart symbol for each.



What system is followed in assigning colors to the lights of buoys in the lateral system of buoyage of the United States?

A vessel hears the radio distance finding signal from a light vessel and 5 seconds later hears the corresponding sound signal. What is her distance from the light vessel?

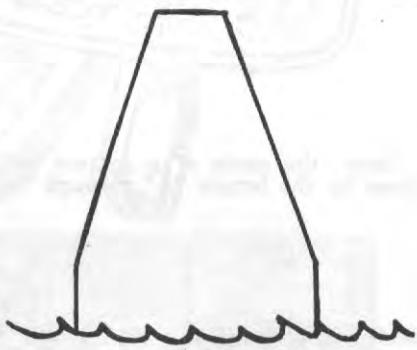
How are the buoys numbered in the United States lateral system of buoyage?

(a) What color would the buoy illustrated be painted?

(b) What sort of number would be assigned such a buoy?

(c) How should such a buoy be left in passing when entering from seaward?

(d) How is such a buoy shown on a chart? Sketch chart marking for such a buoy.



On a clear night, how could you determine whether a navigational light is at its maximum geographic range of visibility when you first sight it?

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15. INSTRUMENTS AND ACCESSORIES.

What is the purpose of the liquid used in the magnetic compass?

Give a brief description of the gyro-compass.

What is a Pelorus?

Describe the Azimuth Circle.

How often should a chronometer be wound?

How are ship barometers checked for accuracy?

What is a chronometer used for?

Define the daily rate of a chronometer.

Describe the Aneroid barometer.

In a heavy sea, the gyro alarm unit in the wheelhouse sounds. What would you do?

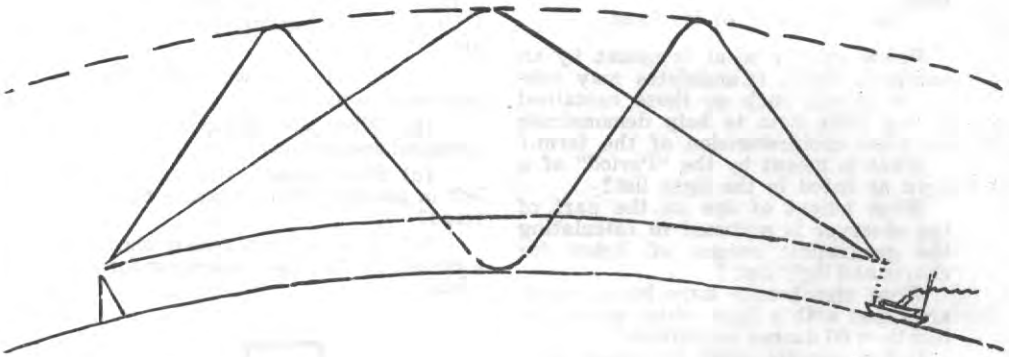
What properties of the earth make the gyro-compass a meridian seeking device?

What three forms of steering are available on a vessel equipped with a gyro pilot or iron mike?

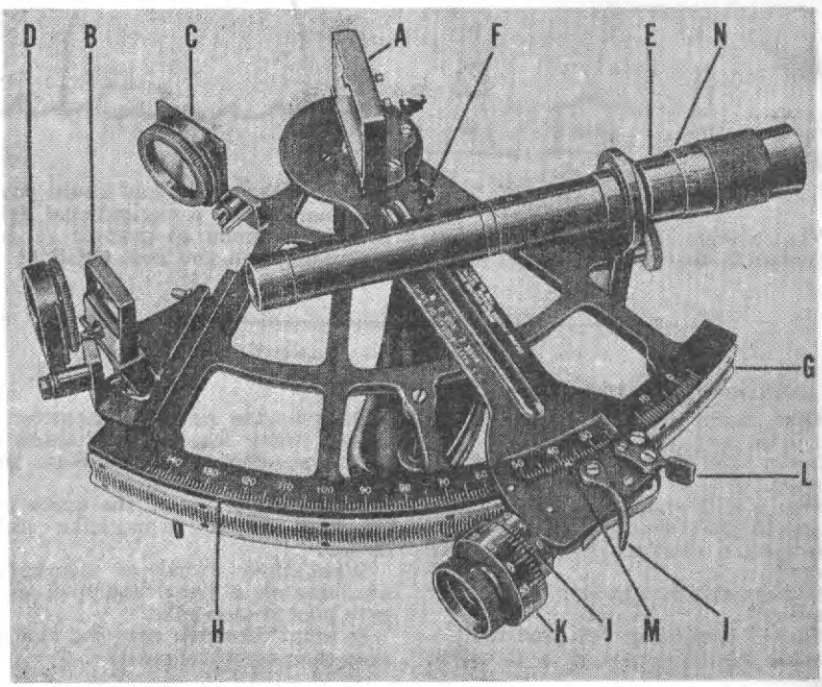
In what direction does the axle of a gyro-compass wheel point?

Make a rough copy of the sketch below and label on it the following: Ground wave, Second sky wave, First sky wave, and Ionosphere.

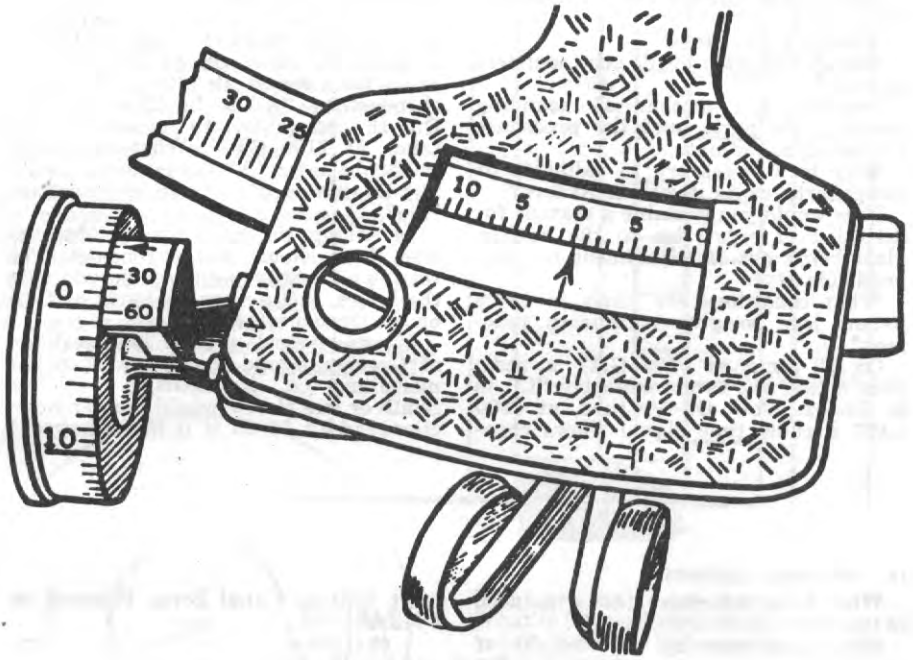
State the names of the waves in the order in which they appear from left to right on the Loran receiver-indicator.



Name the parts of a sextant indicated by the letters "A" through "N" in the diagram below:



What index error is indicated by the reading of the vernier on the micrometer sextant shown below?



Along what line is the value of microseconds in miles the least; i.e., where does the Loran reading give the greatest positional accuracy?

What is a clinometer?

What is a "microsecond"?

Make a rough copy of the sketch below and indicate on it the ground wave, first sky wave and second sky wave.

In using sky waves to obtain a Loran line of position, what precaution is necessary to insure that the complete wave is being used?

What care do you use in handling glass sounding tubes?

Give a brief description of the Radio Direction Finder.

Describe the use of parallel rules.

What errors affect a radio bearing?

When using the fathometer, suppose three distinct flashes are registered on the dial; by which one would you be guided?

How do you haul in a log line and care for it while not in use?

How would you determine whether you are holding the sextant vertically when taking a sight and making the final adjustment of the tangent screw?

What would be the effect on the altitude if the sextant is not held vertically when the sight is taken?

In what position is the loop antenna of a radio direction finder:

(a) When the loudest signal is received;

(b) When the minimum signal is received;

(c) Which is used to obtain the bearing and why?

What do you mean by "arming" the lead?

Describe an engine room telegraph.

What is a taffrail log?

How do you mark a fifty-fathom lead line?

What is a protractor?

Upon what principle do echo sounders operate?

Describe the mechanical sounding machine, its parts, and the procedure for taking soundings.

Why is it necessary to calibrate or compensate radio direction finders?

How would you examine a sextant for detection of error due to the horizon glass being out of adjustment for perpendicularity?

What conditions are likely to cause patent logs to give inaccurate readings?

On 12 June, at 0100 GMT a radio time signal shows chronometer "C" to be 1m–42s slow. On 17 June, at 0900 GMT a radio time signal shows chronometer "C" to be 1m–50s slow. On 18 June, at 0100 GMT an observation was taken. Assuming a constant chronometer rate, what correction should be applied to chronometer "C"?

On 12 December, a radio time signal at 0300 GMT shows chronometer "A" to be 12m–29s slow. On 14 December, a radio time signal at 1200 GMT shows chronometer "A" to be 12m–10s slow. On 16 December, an observation is taken at 2100 GMT. What correction to chronometer "A" is required, assuming there was a constant chronometer rate?

In taking the time for an observation, how should the chronometer be read; i.e., in what sequence do you note the hours, minutes and seconds of time on the chronometer?

If your vessel was on the meridian of Greenwich and the sun was on the meridian; i.e., its bearing was due South or due North, would the chronometer read 12–00–00 if it had no error?

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18. TIDES AND CURRENTS.

What is a reference station as used in the tide tables?

What is meant by the "height of tide"?

What is meant by the "range of the tides"?

At Portland, Maine on 16 August 1958:

(a) What is the tabulated time and height of a.m. low water?

(b) If your chart for Portland showed a depth of 24 feet for a given area, what would be the depth at low water for that area?

(c) If your vessel had its clocks set for Eastern Daylight Saving Time, what would be the ship's time at low water?

At Balboa, Canal Zone, Panama on 6 March 1958:

(a) What is the tabulated time and height of p.m. high water?

(b) If your chart showed a depth of 20 feet for a given area in this vicinity, what would be the depth at high water at this area?

NW of Capul Island, San Bernardino Straits, P. I. on 16 November 1958:

(a) What is the tabulated time and velocity of maximum p.m. flood current?

(b) In what direction does the flood current flow at this position?

(c) What time meridian is used in tabulating the times given for the currents?

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19. OCEAN WINDS, WEATHER AND CURRENTS.

What is "humidity"?

What is a "psychrometer"?

Describe the Centigrade scale for measuring temperature.

Convert 15° Celsius (Centigrade) into the temperature Fahrenheit.

What is atmospheric pressure and what instruments may be used to measure it?

What is normal atmospheric pressure?

On a weather map:

(a) A region where the atmospheric pressure is higher than that of surrounding regions is called a.....

(b) A region where the atmospheric pressure is lower than that of surrounding regions is called a.....

Explain the pressure-volume relationship of gases if temperature is constant. Either state in words or in mathematical notation. (*Boyles Law*).

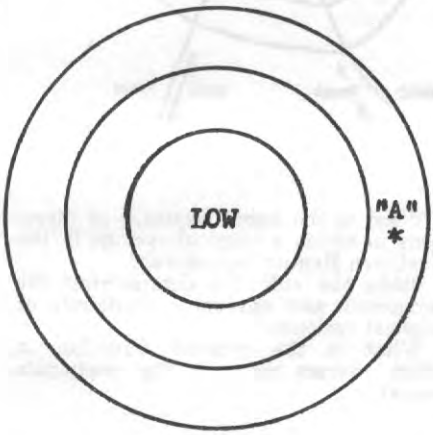
State "*Buys Ballot's Law*".

What is meant by the daily pressure variation of the atmosphere? Where is this weather phenomenon most characteristic?

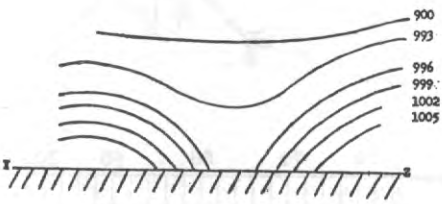
What is an "isobar"?

What wind direction would be most likely for a vessel at position "A" on the weather chart sketched?

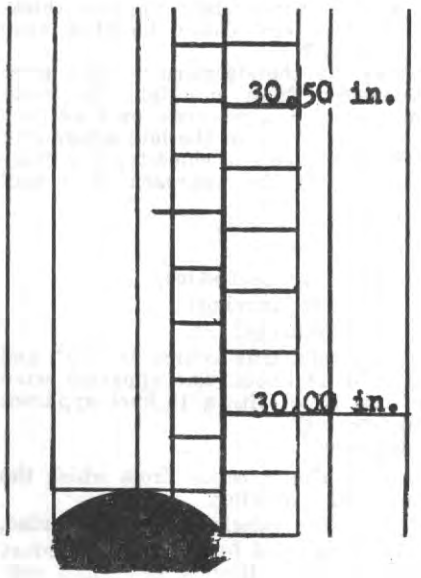
(a) In the Northern Hemisphere;
(b) In the Southern Hemisphere?



Sketched below is a vertical section through an air mass. Show how the isobars on the weather map would represent such an air mass assuming that the air mass is round and concentric. Label appropriately the center of the air mass.



What is the reading on the mercurial barometer sketched below?



What are the "horse latitudes"?

What is "wave direction"?

(a) How is it recorded on the weather report?

(b) How is the wave direction determined?

What are the "doldrums"?

What is a "monsoon"? State its causes.

Make a rough copy of the sketch below and indicate thereon the length and height of the waves.

What is an "anemometer"?

What is a cold front?

Cirrus clouds are composed of what form of water vapour?

Low clouds are defined as those whose mean upper level is 6,500 feet. Middle clouds are defined as those whose mean lower level 6,500 feet and whose mean upper level is 20,000 feet. High clouds are defined as those whose mean lower level is 20.000 feet.

Classify as low, middle, or high the following cloud forms:

(a) Cirrus;
(b) Nimbostratus;
(c) Altostratus.

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In order for clouds to form in the atmosphere, what must be present besides water vapor?

Why do clouds always appear thicker, darker, and closer together near the horizon?

Why do thunderstorms occur most frequently from midnight to early morning at sea, whereas, on land they occur frequently in the late afternoon?

What sequence of cloud types is characteristic of the approach of a cold front?

What is a "growler"?

What is meant by:

(a) Hummocked ice;

(b) Ice jamming;

(c) Icebergs?

A vessel's true course is 175° and speed is 18 knots. The apparent wind is from SSW with a 15 knot apparent wind velocity.

Required:

(a) The direction from which the true wind is blowing.

(b) The velocity of the true wind.

To what wind force on the Beaufort Scale do the following conditions correspond?

Wind Speed.....less than 1 knot;

Sea Condition smooth and mirror like.

What is a squall?

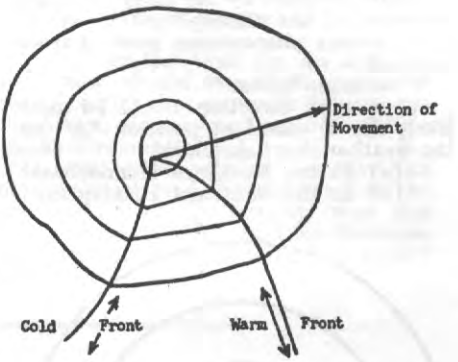
What is a tropical cyclone?

How may clouds provide early indication of a tropical cyclone?

Interpret the wind rose, sketched as it would be shown on a Pilot Chart together with the scale of wind percentages.

When a tornado moves out over the water from land, what name is applied to the resulting phenomenon?

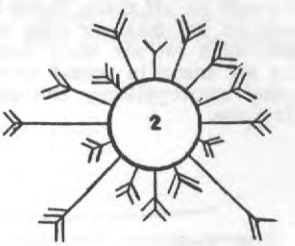
State the usual sequence of winds, clouds, precipitation, pressure and temperature which will be observed on the line of direction of movement of the depression illustrated.

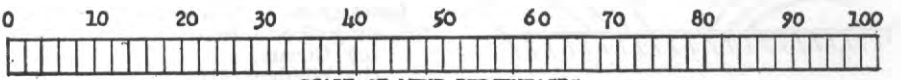


What is the usual sequence of directions in which a tropical cyclone in the Northern Hemisphere moves?

State the rule for determining the dangerous and navigable semicircle of tropical cyclones.

What is the general direction in which storms move in the temperate zones?





SCALE OF WIND PERCENTAGES

Listed below are four months during which tropical cyclones are known to occur in the North Atlantic. Arrange them with the month of highest frequency of such storms first; the next highest, next, etc.

October
May
September
June

Where do tropical cyclones form?

Why do tropical cyclones never form closer than 5 degrees to the equator?

The reported wind velocity in three areas of a weather map are:

Area 1.....10 knots;
Area 2.....20 knots;
Area 3.....30 knots.

In which of the three areas will the isobars be spaced closest?

How should isobars be drawn on a weather chart at a front?

What is the angle that wind arrows normally make with the isobars on weather charts of ocean areas?

In what direction does the wind blow around a cyclonic storm in:

(a) The Northern Hemisphere;
(b) The Southern Hemisphere?

Why are anticyclonic areas normally accompanied by clear and fine weather, whereas cyclonic areas are accompanied by clouds, precipitation, and generally foul weather?

In the Northern Hemisphere, how should a steam vessel maneuver in the navigable semicircle of a tropical cyclone?

If the wind velocity about the center of a tropical cyclone is 75 miles an hour and the speed of the storm along its direction of advance is 25 miles per hour, what is the maximum wind velocity that may be encountered in the dangerous semicircle, and what would be the minimum wind velocity in the navigable semicircle?

What are the "roaring forties," and where are they located?

What weather conditions may result from the movement of a warm air mass over a colder sea surface?

What are the Aleutian and Icelandic lows?

Is it possible for open isobars to exist, that is, isobars that do not form a closed curve? Explain your answer.

Are the Weather Codes provided by the U.S. Weather Bureau solely for use with United States weather reports, or may they be used in coding and decoding weather reports of other nations?

What is the Gulf Stream?

Describe the California current and state what segment it forms in the general circulation of the waters of the North Pacific Ocean.

The direction of the wind is denoted by the direction from which it is blowing. How is the direction of a current denoted?

Under certain conditions in the Northern Hemisphere it may be assumed that the current sets 30° to the right of the direction in which it is driven by the wind and its velocity is 2 percent of the wind velocity. Basing your answer on the foregoing statement, estimate the direction and velocity of the current that may be expected if the wind is from the South South West at 35 knots.

Given:

Noon D. R. position;
Latitude 45°–06′ South;
Longitude 30°–51′ West;
Noon observed position;
Latitude 44°–54′ South;
Longitude 30°–51′ West.

Required: The set and drift of the current, assuming a 24 hour run from the previous noon.

20. NAUTICAL ASTRONOMY AND NAVIGATION DEFINITIONS.

What is:

1. Parallax?
2. Computed altitude?
3. The mean sun?
4. Refraction?
5. A time zone?
6. A meridian?
7. A great circle?
8. The equation of time?
9. Greenwich hour angle?
10. Local hour angle?
11. Dead reckoning?
12. Observed altitude?
13. The Zenith?
14. Meridian angle?
15. Magnetic variation?
16. Local mean time?
17. A knot?
18. A planet?
19. An assumed position?
20. The date line?
21. An Azimuth?
22. Apparent noon?
23. A line of position?
24. The cotangent of an angle?
25. Dip?
26. Local apparent time?
27. The secant of an angle?
28. The cosine of an angle?
29. The tangent of an angle?
30. Mean time?
31. A fix?
32. The sine of an angle?
33. Interpolation?
34. A meridian transit?
35. Relative bearing?
36. The meaning of the term "departure" as used in the sailings?
37. The cosecant of an angle?
38. Semi-diameter of a celestial body? Draw a sketch to illustrate.
39. An intercept?
40. Zenith distance?
41. Declination?
42. A celestial meridian?
43. A reciprocal bearing?
44. A vertical circle?
45. The elevated pole?
46. The celestial horizon?
47. The supplement of an angle?
48. Magnetic deviation? State its cause.

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22. SIGNALING BY INTERNATIONAL CODE FLAGS, FLASHING LIGHT; LIFESAVING, STORM AND SPECIAL SIGNALS.

How would you indicate in signalling by blinker light that you were going to send a message in code?

In receiving a message by blinker you miss all but the last two words "in distress." How would you request the transmitter to repeat that part of the message which you missed?

What is the procedure sign for "Message received"?

Draw all the symbols of the Morse code.

In the Morse code, what does the letter "G" signify when signalling by blinker?

In exchanging messages by means of flashing light, is it always necessary for vessels to establish their identity?

Under what circumstances can vessels signalling by flashing light omit both call and identity components of the message?

What does W W W W --- --- --- --- --- signify during a communication when sent by blinker?

What is the general call employed in signalling by means of flashing light?

If you missed part of a message being sent by blinker light, how would you send "Repeat all after"?

What is the procedure sign for "you are correct"?

In signalling by blinker light, how would you signal: "Erase entire message"?

What is the procedure for the space sign?

Write the entire procedure of a plain language message in Morse Code, leaving out any text.

What code message would you send to a pilot station with the ship's signal searchlight to indicate "I desire a pilot"?

How does a receiving ship acknowledge code groups and numbers in signalling by blinker light?

What is the procedure sign for "from" in blinker signalling?