

BMA Syllabus for Certificate of Competency
Officer of the Watch and Master Near Coastal Waters STCW II/3

085-21 CHARTWORK AND PRACTICAL NAVIGATION

CHARTWORK

- (a) Given variation and the deviation of the magnetic compass, or gyro error, to convert true courses into compass courses and vice versa. Given a sample table of deviations to extract the deviation thence to convert true courses into magnetic and compass courses. To find the compass course between two positions. The effect of current on speed. Allowance for leeway. Given compass course steered, the speed of the ship and direction and rate of the current, to find the true course made good.
To find the course to steer allowing for a current. Given the course steered and distance run, to determine the set and rate of the current experienced between two positions.
- (b) To fix a position on a chart by simultaneous cross bearings, by bearing and range, or by any combination, applying the necessary corrections. Apply the use of GPS navigator.
- (c) To fix the position by bearings of one or more objects with the run between, allowing for a current, and to find the distance at which the ship will pass off a given point. The use of position lines obtained by any method, including terrestrial position lines and position circles. The use of transit bearings.
- (d) Elementary knowledge of passage planning and execution. Landfalls in thick and clear weather. The selection of suitable anchorages, approaching anchorage and entering narrow waters. The use of clearing marks and horizontal and vertical danger angles. Distance of sighting lights.
- (e) To find the time and height of high and low water at Standard ports and at Secondary ports by tidal differences using Admiralty Tide Tables, Vol 2; the use of tide curves as published in the Admiralty Tide Tables.
- (f) The interpretation of a chart or plan; particularly the information given about Lights, Buoys and other navigational aids; Depths and height contours; Tidal streams; Traffic lanes and separation zones. Recognition of the coast and radar responsive targets. Chart correction. Depths and nature of bottom. Use of soundings.

Note: Questions may be set in this paper requiring descriptive answers as well as work on the chart provided. Oral questions, which may relate to any part of the syllabus, may also be asked.

PRACTICAL NAVIGATION

- (a) Practical questions on plane and Mercator sailing.
- (b) Passage planning.

EXAMINATION STRUCTURE

SECTION A – CHARTWORK – 5 QUESTIONS (inclusive of one Multipart Chart Interpretation question)

SECTION B PRACTICAL NAVIGATION – 3 QUESTIONS

Total Marks: 200 – Chartwork 130 Practical Navigation 70

Candidates must attempt ALL questions.

To achieve a PASS, candidates must obtain at least 90 marks in the Chartwork section and 50 marks in the Practical Navigation section, i.e., 70% overall.

Time allocated 3¼ hrs.

Objective Format Interpretation

CHARTWORK

- (a) 1. Understands True, Magnetic and Compass North.
 - 1.1 Obtains from a sample table of deviations the deviation for any direction of the ship's head.
 - 1.2 Obtains from the chart (or an isogonal chart) the variation for the ship's position and date.
 - 1.3 Calculates the true heading given the compass heading, deviation card and variation.
 - 1.4 Calculates the compass heading given the true heading, variation and deviation card.
 - 1.5 Applies a gyro compass error to convert a gyro heading to true heading and vice versa.
 - 1.6 Applies the compass error to a compass bearing to obtain a true bearing.
 - 1.7 Compares the true bearing, obtained from a transit or horizontal angle (or other) fix, with the compass bearing to obtain the compass error.

- 2. Understands Position and Position Line.

- (c) 2.1 Finds position lines by horizontal and vertical angles, terrestrial bearing, dipping distance of lights, radar and sounding.

- (b) 2.2 Understands position of observer can be ascertained by intersection of two position lines.
- 2.3 Derives latitude and longitude of a position with reference to the scaled borders of the chart.
- 2.4 Measures the course and track distance between two positions on the chart.
- 2.5 Calculates the time required to travel between two positions along a track given the speed of the observer.

- (a) 3. Understands Dead Reckoning and Estimated positions.
 - 3.1 Determines the DR position reached after steaming a given course for a given distance (determined by engine revolutions or log) from a given position.
 - 3.2 Understands that the effect of wind will move a vessel bodily to leeward and applies the leeway angle if specified.
 - 3.3 Obtains from the information on the chart the set and rate of the tidal stream.
 - 3.4 Determines the estimated position based on course and distance since the last known position with an estimation made for leeway, set and drift, or by extrapolation from earlier fixes.
 - 3.5 Obtains, from the initial and estimated positions, the ground track angle, distance and speed made good.
 - 3.6 Obtains the water track given the ground track and set and drift of the tidal stream.
 - 3.7 Obtains the ship's heading given the water track and leeway angle.
 - 3.8 Obtains the mean set and drift of the tidal stream given initial and final fix positions and the water track between them.

- (c) 4. Understands the term Running Fix.
 - 4.1 Obtains the vessel's position on the second position line given the first position line and the ground track and distance between them.
 - 4.2 Obtains the closest distance that a vessel will pass off a given point when making use of special angles and four-point bearings.

- (f) 5. Understands and uses the information provided on charts.
 - 5.1 Recognizes the symbols and abbreviations on a chart.
 - 5.2 Understands the terms included in the margins and title of the chart.
 - 5.3 Recognizes the use of different types of charts e.g., Gnomonic charts and Ocean Plotting sheets.
 - 5.4 Interprets coastline, contours and bottom topography.
 - (d) 5.5 Recognizes suitable passages, approaches and anchorages in clear weather.
 - (f) 5.6 Relates the radar responsive targets of the coastline to the radar display.
 - 5.7 Obtains from the Admiralty Notices to Mariners the corrections to charts and other publications.
 - 5.8 Recognizes traffic lanes, separation zones and deep-water routes.
 - 5.9 Uses NP 5011 and the Mariners Handbook as aids to understanding the chart.

- (d) 6. Recognizes the need for planning a passage.
 - 6.1 Understands the principles contained in Resolution A.893(21) Guidelines for Voyage Planning'.
 - 6.2 Makes use of vertical and horizontal danger angles and clearing marks when entering narrow water.
 - 6.3 Understands the principles involved when making a landfall in thick and clear weather and also in selecting a suitable anchorage.
 - 6.4 Understands that various atmospheric conditions can affect the range of lights.

- (e) 7. Understands the general theory of tides.
 - 7.1 Defines spring and neap tides, height of tide, MHWS, MLWS, MHW,MLWN ranges, chart datum, height of shore objects.
 - 7.2 Finds predicted time and height of high and low water at standard and secondary ports in ATT Volume II.
 - 7.3 Calculates spring and neap ranges for standard and secondary ports in ATT Volume II.
 - 7.4 Uses tables and tide curves to calculate height of the tide at a given time at standard ports only.
 - 7.5 Uses tables and tide curves to calculate the time at which the given height of tide will occur at standard ports only.

Practical Navigation

(a) 1. Uses the parallel sailing formula.

- 1.1 Defines the difference of longitude and departure.
- 1.2 Solves the formula

$$\frac{\textit{departure}}{\textit{difference of longitude}} = \textit{cosine of the latitude}$$

- 1.3 Calculates the distance between two positions on the same parallel of latitude.
- 1.4 Calculates the difference of longitude for a given distance run along a parallel of latitude.
- 1.5 Calculates the latitude given the departure for a specific difference of longitude in that latitude.
- 1.6 Derives the final position after sailing along a parallel of latitude.

(a) 2. Uses the plane sailing formula.

- 2.1 Understands the meaning of and can derive mean latitude.
- 2.2 Calculates the correct departure to use in a plane sailing problem.
- 2.3 Calculates the track and distance between two positions using the plane sailing formula.
- 2.4 Calculates a DR position or an estimated position using the plane sailing formula given compass course and compass error, log distance, estimated speed, tidal and current information and leeway.

(a) 3. Understands the Mercator Chart.

- 3.1 Defines meridional parts.
- 3.2 Understands the relationship between minutes of longitude, meridional parts and the secant of the latitude.
- 3.3 Understands that the Mercator sailing solution should be used in preference to the plane sailing method when:
 - 3.3.1 the difference of latitude is large;
 - 3.3.2 the mean latitude is high;
 - 3.3.3 in general when the distance involved is greater than 600 miles.
- 3.4 Calculates the track and distance between two positions using Mercator sailing.
- 3.5 Calculates the final position given the initial position and track and distance steamed using Mercator sailing.

(b) 4. Passage Planning.

- 4.1 Plan a passage considering the following:
 - 4.1.1 Plot the planned route in a Mercator Chart showing true courses;
 - 4.1.2 Determine distance to destination and distances in between waypoints;
 - 4.1.3 Determine tidal currents during the passage;
 - 4.1.4 Calculate ETA at destination..
- 4.2 Takes into account:
 - 4.2.1 Traffic Separation Schemes;
 - 4.2.2 Restricted waters;
 - 4.2.3 Reporting points and prepare report (VTS);
 - 4.2.4 Meteorological conditions incl. restricted visibility;
 - 4.2.5 Prepares arrival/departure report.