Marine Science

For Australian Students

Navigation and Communications Worksheets

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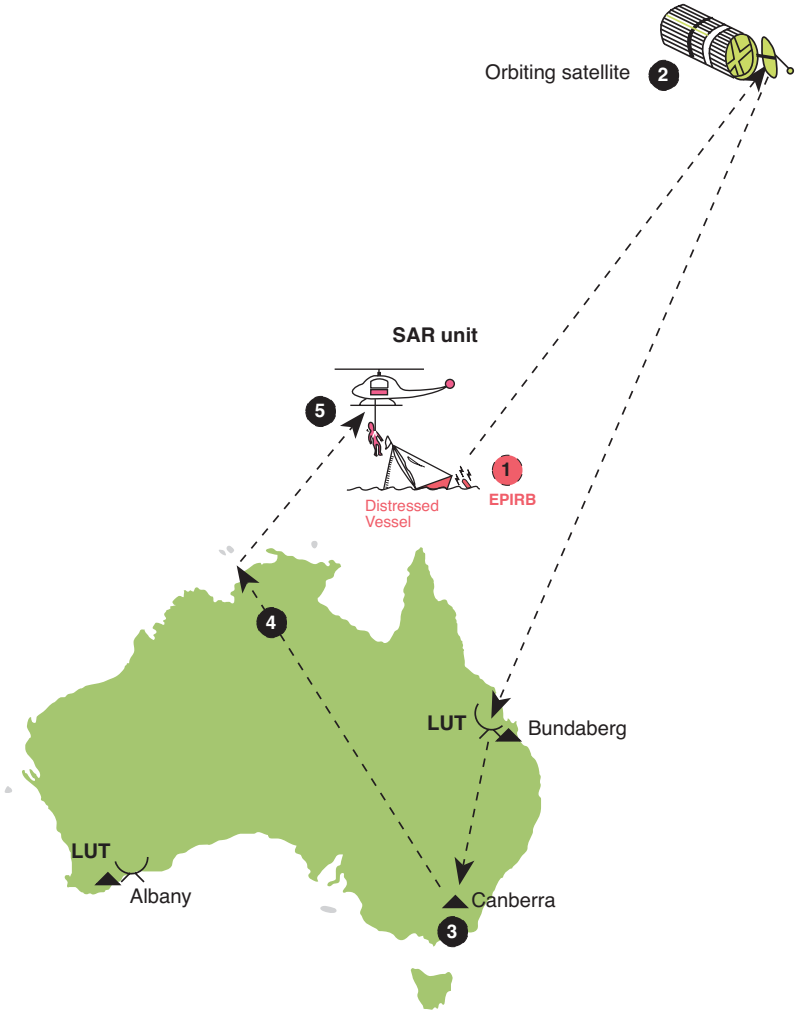


WORKSHEET 1: NAVIGATION DEVICES

Q1. Define a navigation device and explain why the definition is so wide ranging. (Page 4)

Q2. Using the depth sounder as an example, describe how the integration of devices and procedures are used for safe navigation. (Page 4)

Q5. Identify two rescue devices that are used in the case where a ship has to be abandoned and name two safety devices that assist in search and rescue (Page 5)

Q6. Explain the use of a steering compass and identify three features used with this navigation device. (Page 6)

Q7. a. Define term deviation and describe how it is recorded and corrected. (Pages 6 and 7)

b. Identify the deviation for the following ship's headings from the table on page 6,

100°

240°

40°

Q8. Describe how a pleorus is different from the steering compass. (Page 7)

Q9. Describe one difference between a steering compass and a hand-held compass. (Page 8)

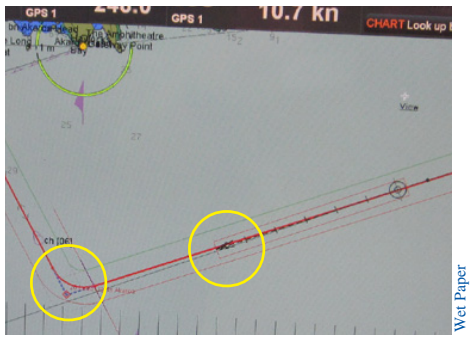
Q10. Describe one advantage of a fluxgate compass (Page 8)

Q11. List any three errors that may give an incorrect readings on a depth sounder. (Page 9)

Q12. Explain why radar is considered the best coastal navigation device (Page 9)

Q13. Define the term GPS and describe the information it provides (Page 10)

Q14. Identify the ship's position and waypoint on the display opposite. (Page 11)



Wet Paper

Q15. Distinguish between speed over the ground and speed through the water and give one example of how it is important. (Page 11)

Q16. Explain how the following navigation and communication devices could be used to enter a port. (Pages 4-11)

Radar:

Ships log:

Echo sounder:

GPS:

Binoculars:

Chart plotter:

Navigation parallel rules:

Pelorus:

Steering compass:

Radio:

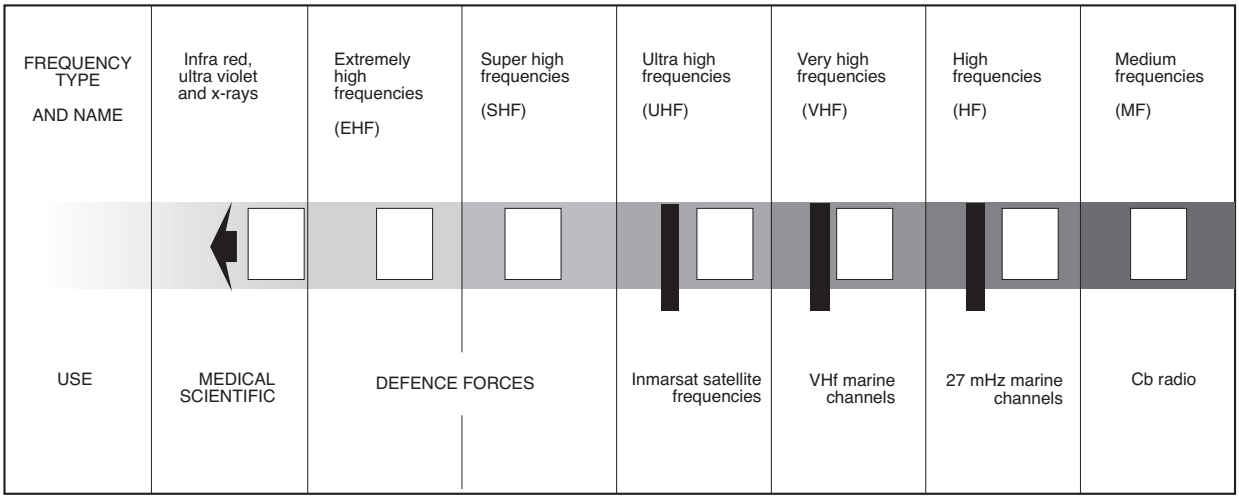
Mobile phone:

WORKSHEET 2: COMMUNICATION DEVICES

Q1. Distinguish between three types of radio with respect to their range , effectiveness in coordination and safety Page 14)

Q2. List the information contained in a DSC alert (Page 14 and 15)

Q3. Complete the diagram below of radio frequencies to distinguish between frequency type, name and use (Page 15)



Q4. Explain what an EPIRB is, what it is designed to do and how it is used in coordination and rescue (Page 16)

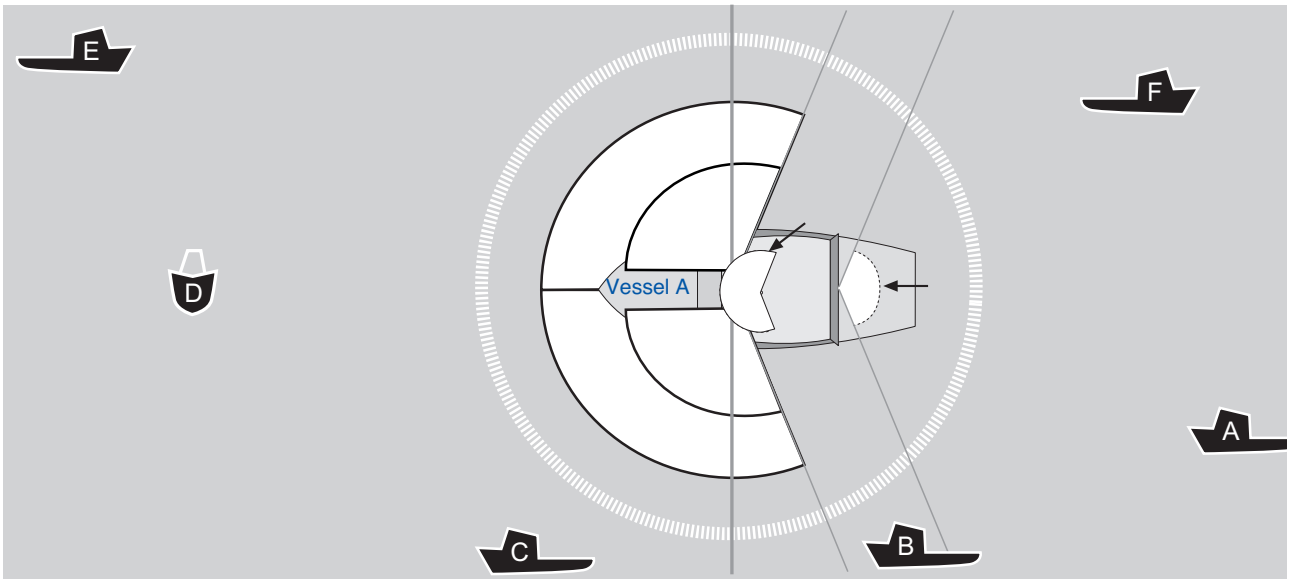
Q5. Explain how flares are ignited, and distances they can be seen in distress situations (Page 17)

Q6. Describe three flag signals used to communicate warnings or distress giving an example for each (Page 18)

Q7. Explain why ships have day shapes and give two examples explaining how their shapes communicate safe navigation (Page 18)

Q8. Define navigation lights on a ship and explain why they are compulsory (Page 19)

Q9. Complete and colour in the diagram below to show the installation of navigation lights (Page 19)



Q10. On the diagram above explain how another powered vessel travelling at the stern would circle vessel A at night on the port side, then turning to starboard when safe to do so. Use the letters A-F to illustrate your answer (Page19)

Worksheet 3: Communication procedures

Q1. Describe the procedure involved in obtaining a radio check and log in from a base station called Redcliffe Coast Guard, on a vHf radio before setting out for a days research aboard a vessel called Research I that had its ship's details registered with the Coast Guard. (Pages 22-23)

Q2. Describe three types of emergency call given on a marine radio and describe when they are used (Page 23)

Q3. Explain how a DSC distress button is used in emergency coordination and what follows immediately after its use. (Page 24)

Q4. Interpret the messages on the two screens below and predict what will happen next (Page 24)

Q5. Analyse COMSAR Circular 25 below and justify the flow chart in terms of search and rescue following a ship's receipt of a DSC alert. (Pages 26-27 + AMSA web page)

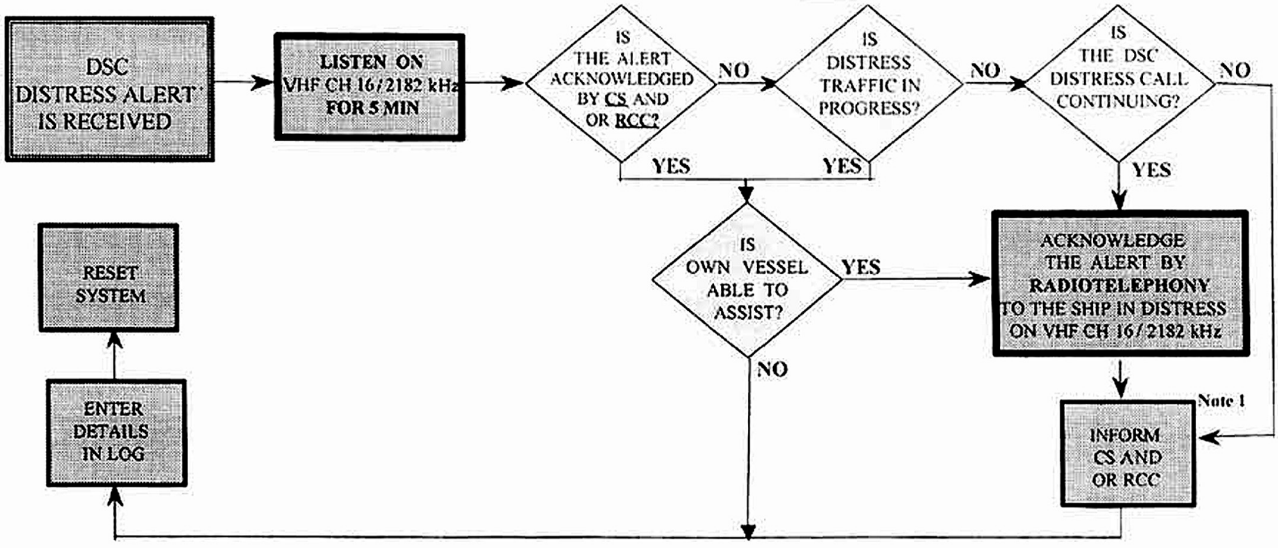
Your analysis should:

a. Identify the parties involved and their roles in the response and the devices used

b. Provide a justification for each step in the process

FLOW DIAGRAM 1

ACTIONS BY SHIPS UPON RECEPTION OF **VHF / MF** DSC DISTRESS ALERT



REMARKS:

Note 1 : Appropriate or relevant RCC and/or Coast Station shall be informed accordingly. If further DSC alerts are received from the same source and the ship in distress is beyond doubt in the vicinity, a DSC acknowledgement may, after consultation with an RCC or Coast Station, be sent to terminate the call.

Note 2 : In no case is a ship permitted to transmit a DSC distress relay call on receipt of a DSC distress alert on either VHF channel 70 or MF channel 2187.5 kHz

CS = Coast Station RCC = Rescue Co-ordination Center

WORKSHEET 4: IALA BUOYAGE A

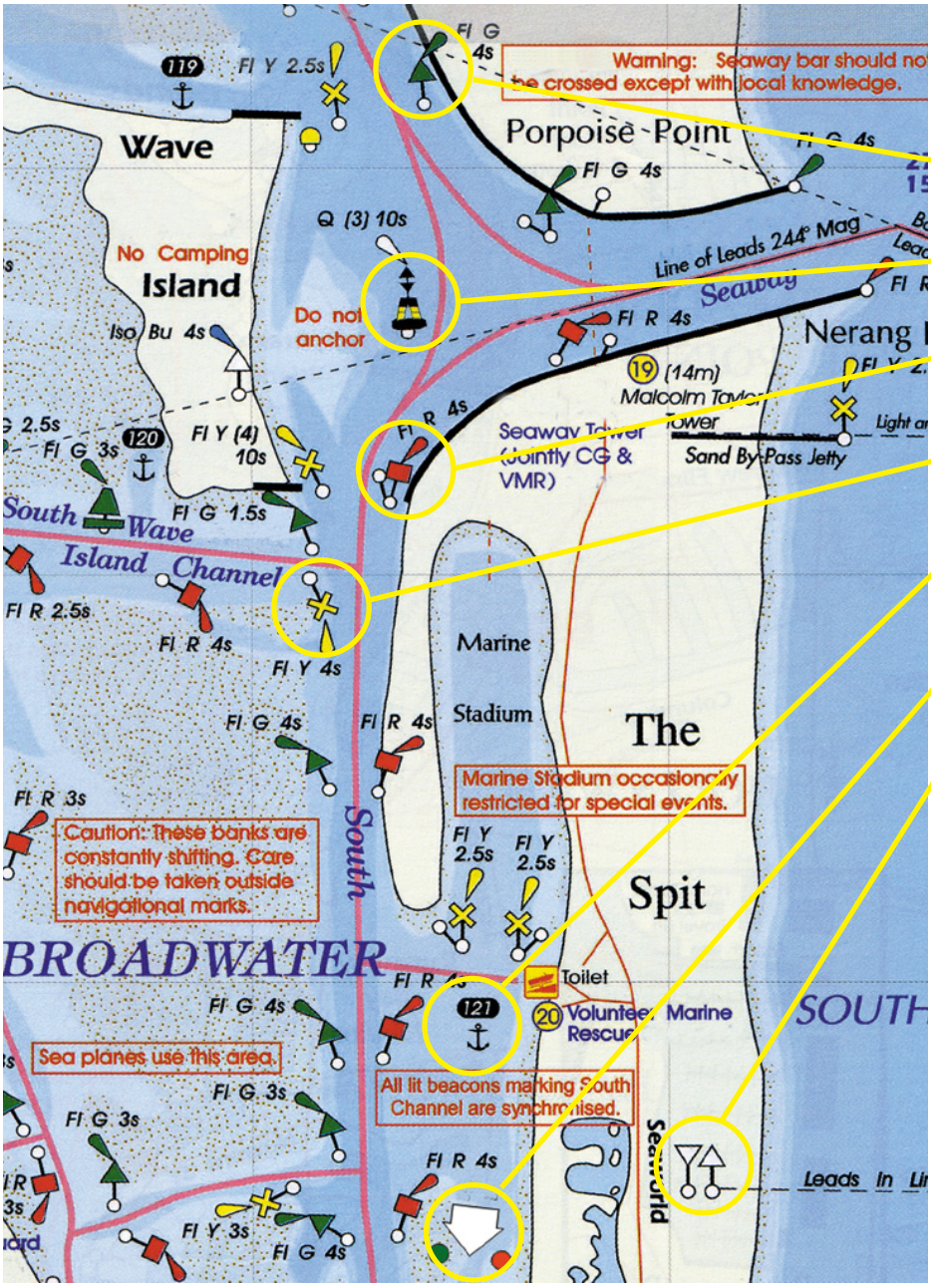
Q1. Define the term pilotage and state its use (Page 28)

Q2. List the five types of IALA markers and describe their possible shapes (Page 28)

Q3. State the rules using these markers, for entering and leaving port (Page 28)

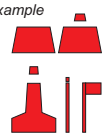
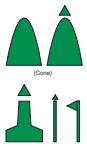
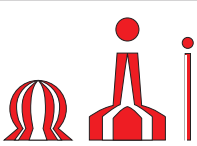
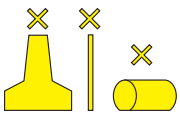
Q4. Explain how a skipper knows the location of a main shipping port on a chart (Page 28)

Q5: Identify the following on the chart below by drawing lines to them. (Pages 28 - 31)



Q6. Explain why the correct chart datum and chart software is used with a GPS when operating vessels in marine environments (Page 10)

Q7. Complete the table below to identify the marks, flags and lights shown in the first column.

Beacon	Day shape	Side to pass	Colour	Light colour	Flashing sequence
Example  *Port lateral mark*	*Can*	*When going into port pass on port side*	*Red*	*Red*	*Various* *Check the chart*
					
					
					
					
					
					
					
					

Worksheet 5: Locating a research site

Questions

Q1. List some of the features that need to be considered when selecting a offshore research site (Page 35).

Q2. Locate the following possible research sites latitude and longitude on the A3 version of Research Bay Chart: Hempel Rock, Coppersmith Rock Lighthouse and Hill 670 Cockermouth Island and Devereux Rk. (Download A3 Chart from www.wetpaper.com.au - Resources section)

a) Hempel Rock

b) Coppersmith Rock Lighthouse

c) Hill 670 Cockermouth Island

d) Devereux Rk

Q3. Calculate distance speed and time for the following information for a research boat. (Page 37)

a. How far can the boat travel in 10 hours if she is travelling at 9 knots?

b. How far can the boat travel in 6 hours at a constant speed of 4 knots?

c. For 2 hours she travels at 10 knots, and for the next 3 hours she can only make 5 knots. How far has she travelled?

d. The boat travels 10 Nm in two hours. How fast did she go?

e. The boat left harbour at 7 a.m. and travelled 5 Nm to a research site arriving at 10 a.m. How well did the boat perform?

f. How long did it take a skipper of a vessel to travel 20 Nm at an average speed of 5 knots?

g. Your research boat is travelling at 4 knots and your navigator predicts 32 Nm to go. How many hours will it take to reach your destination?

Q3. Define the term chart tidal datum (Page 35)

Q4. Calculate the distance and departure time from the Anchorage at Maryport Bay off Carlisle Island to a position north east of Geranium Shoal Lat: 20° 44' S, Long: 149° 16.00' E using the following information.

Research vessel can do 6 knots and draws 1.9 m and is grounded on the 0.4 m mark at Brampton Island.

Estimate the ETD for the morning of 4 January and how long will it take to get to Lat: 20° 44' S, Long: 149° 16.00' E? Use the tide tables in Figure 12.1 .

Tide tables for Brampton Is

Date	Time	m	Date	Time	m
Jan 1	0221	0.99	Jan 4	0409	1.26
	0815	2.32		0930	1.93
	1424	0.51		1559	0.54
	2101	2.55		2252	2.66
Jan 2	0252	1.06	Jan 5	0502	1.99
	0835	2.22		1007	3.32
	1452	0.49		1642	0.71
	2133	2.58		2301	3.55
Jan 3	0321	1.16			
	0900	2.06			
	1524	0.51			
	2201	2.55			

Figure 12.1 Tide tables for Brampton Is

WORKSHEET 7: PLOTTING A SET OF WAYPOINTS

Proposed voyage

Day 1: We have provision our vessel at Maryport Bay on Carlisle Island and plan research scientific shoal on day 1, anchoring at Goldsmith Island that night.

Day 2: Study the bird colony on Tinsmith Island and then return to the anchorage

Days 3 and 4: Estimate fish population at Geranium Shoal and try to tag fish Day 5

Return to anchorage at Maryport Bay

Set a course for these places

Q1. Mark the following waypoints on your chart

WP 01	20° 47.2' S	149° 15. 9' E
WP 02	20° 45.5' S	149° 09. 0' E
WP 03	20° 43.8' S	149° 08. 2' E
WP 04	20° 42.1' S	149° 09. 2' E
WP 05	20° 42.4' S	149° 13. 0' E
WP 06	20° 38.9' S	149° 13. 6' E

DEVIATION TABLE

For use with Chartwork Exercises

Ship's Head by Compass	Deviation	Ship's Head by Compass	Deviation
000°	3½°E.	180°	2½°W.
010°	4°E.	190°	4°W.
020°	4½°E.	200°	5°W.
030°	5°E.	210°	5½°W.
040°	5°E.	220°	6½°W.
050°	5°E.	230°	6½°W.
060°	5½°E.	240°	7°W.
070°	5½°E.	250°	6½°W.
080°	5°E.	260°	6½°W.
090°	5°E.	270°	5½°W.
100°	4½°E.	280°	4½°W.
110°	4°E.	290°	3½°W.
120°	3½°E.	300°	2½°W.
130°	3°E.	310°	1½°W.
140°	2°E.	320°	½°W.
150°	1°E.	330°	½°E.
160°	½°W.	340°	1½°E.
170°	1½°W.	350°	2½°E.
180°	2½°W.	000°	3½°E.

Figure 13.1 Ship's deviation table

Q2. Join the lines of position to join and complete the table below using the deviations given and derived from the table above.

Course		True	Variation	Magnetic	Deviation	Compass course
From	To	T	V	M	D	C
WP1	WP2				5°W	
WP2	WP3				0°W	
WP3	WP4				4.5°W	
WP4	WP5				5°W	
WP5	WP6				3.5°W	
WP6	WP01				.5°W	
Sometimes its easier to use the total error						

Q3. List potential chart hazards for the trip in the table below

From	To	*Potential hazards*
WP1	WP2	
WP2	WP3	
WP3	WP4	
WP4	WP5	
WP5	WP6	
WP6	WP01	

Q4. Calculate potential times for each leg of the trip, if the ship makes 6 knots.

From	To
WP1	WP2
WP2	WP3
WP3	WP4

From	To
WP4	WP5
WP5	WP6
WP6	WP01

WORKSHEET 8: POSITION FIXING

Complete each of the table below to determine a ship's position, in latitude and longitude (to 0.1') for each of the following fixes? In each case the course and deviations are given.

Q1: Course = 80° Deviation = 5°E

Bearing to	*C*	*D*	*M*	*V*	*T*
Solder I	272°C	*5°E*			
Coffin It	209°C	*5°E*			
Sounding	10 m	Latitude:		Longitude:	

Q2: Course = 190° Deviation = 4°W

Bearing	*C*	*D*	*M*	*V*	*T*
Allonby hill	275°C	*4°W*			
Finger and thumb	027°C	*4°W*			
Hill 323 Brampton I	128°C	*4°W*			
Latitude:		Longitude:			

Q3: Course = 10° Deviation = 4°E

Bearing	*C*	*D*	*M*	*V*	*T*
Coffin It	100°C	*4°E*			
Allonby I	226°C	*4°E*			
Solder I	178°C	*4°E*			
Latitude:		Longitude:	Water depth:		

Q4: Plot a course home from Latitude: 20 °43.6' S Longitude: 149 °12.4' E to Waypoint 01 Maryport Bay

a. Locate Waypoint 01 Maryport Bay (see previous exercise), look for hazards and draw line of position
b. Locate the true course: _____
c. Identify the chart variation _____ and calculate the magnetic course _____
d. Identify the deviation (the ship's head is 120°C) D = *3.5°E Correct Yes or No*
e. Describe the compass course to steer _____
f. Identify the distance to be travelled _____
g. If the ships speed is 6 knots calculate the time for the voyage. _____

Q5: After 28 mins, you notice the ship's head is 130°C (deviation = 3°E) and take the following bearings

Bearing	*C*	*D*	*M*	*V*	*T*
Coffin It	343°C	*3°E*			
Maryport It	71°C	*3°E*			
Skiddaw Peak (Brampton)	93°C	*3°E*			
What is your Latitude ?		Longitude ?		Water depth ?	

Q6. Convert the following compass bearings to true and then find the latitude and longitude of the following research positions and mark them on your chart.

Check your answer with the suggested answer given. Note all bearings have been made with a hand-bearing compass.

Research site 1.

Bearing to Skiddow Peak 291^{0}C True bearing =

Bearing to Hill 457 Brampton Is 255^{0}C True bearing =

Bearing to Hill 670 Cockermouth Is 35^{0}C True bearing =

Latitude: Longitude:

Research site 2.

Bearing to Solder Is 187^{0}C True bearing =

Bearing to Finger and Thumb 224^{0}C True bearing =

Bearing to Hill 323 Brampton Is 104^{0}C True bearing =

Latitude: Longitude:

Q7. You are at the anchorage at Maryport Bay, Brampton Island, in position 20°48' S 149°16' E. Mark this on your chart as position A and answer the following questions. Variation for 2014. No deviation.

a. You want to go to Coffin Island. What compass course will you steer?

b How far is it from position A to Coffin Island?

c. How long will it to take to arrive at Coffin Island if you travel at 6 knots?

Q8. Your GPS is playing up and are worried about your deep sea study research site and decide to fix your position. You take the following bearings: Plot this position and mark it on the chart as position C.

Allonby Island Hill 198 275° C True bearing =

Brampton Island Hill 323 133° C True bearing =

Tinsmith Hill 448 342° C True bearing =

Q9 What are the rocks you can see in front of you?

Q10. How do you account for the change in position from point B to point C?

Q11. You are anchored near Geranium Shoal. Locksmith - S (southern tips of Locksmith Island) is in transit with Ladysmith - S. You also have Allonby Island Hill 198 in transit with Tinsmith Island - SE.

a. Mark this position as position D.

b. What is the latitude and longitude of point D?

c. How far are you from Geranium Shoal?

d. What course would you steer to arrive at the shoal?

e. How long will it take you to get there at 6 knots?

f. It is now a 3 m tide. What will your depth sounder read as you find the shoal?

WORKSHEET 9: SET AND DRIFT

Q1.Calculate the set and drift to determine a ships heading to a research site using the information below

At 0615 you depart the anchorage west of Carlisle Island, steering a compass course of 261^0 (C) at 5 knots. At 0703, Allonby Island bears 334.5^0 (C) and Skiddaw Peak (129) bears 069.5^0 (C).

a. What is your fixed position at 0703?

CC = TC =

Allonby bears C = T

Skiddaw bears C = T

Position at 0703 is approx

b. What set and drift have you experienced since departing the anchorage?

Q2.From a position 1.5 nautical miles north of the centre of Cockermouth Island, you steer a compass course of 315^0(C) at 6 knots for 1 hour.

At this time you fix your position as follows:

Carlisle Is (E) 184^0

Tinsmith Is (N) 260^0

Cockermouth Is (E) 134^0

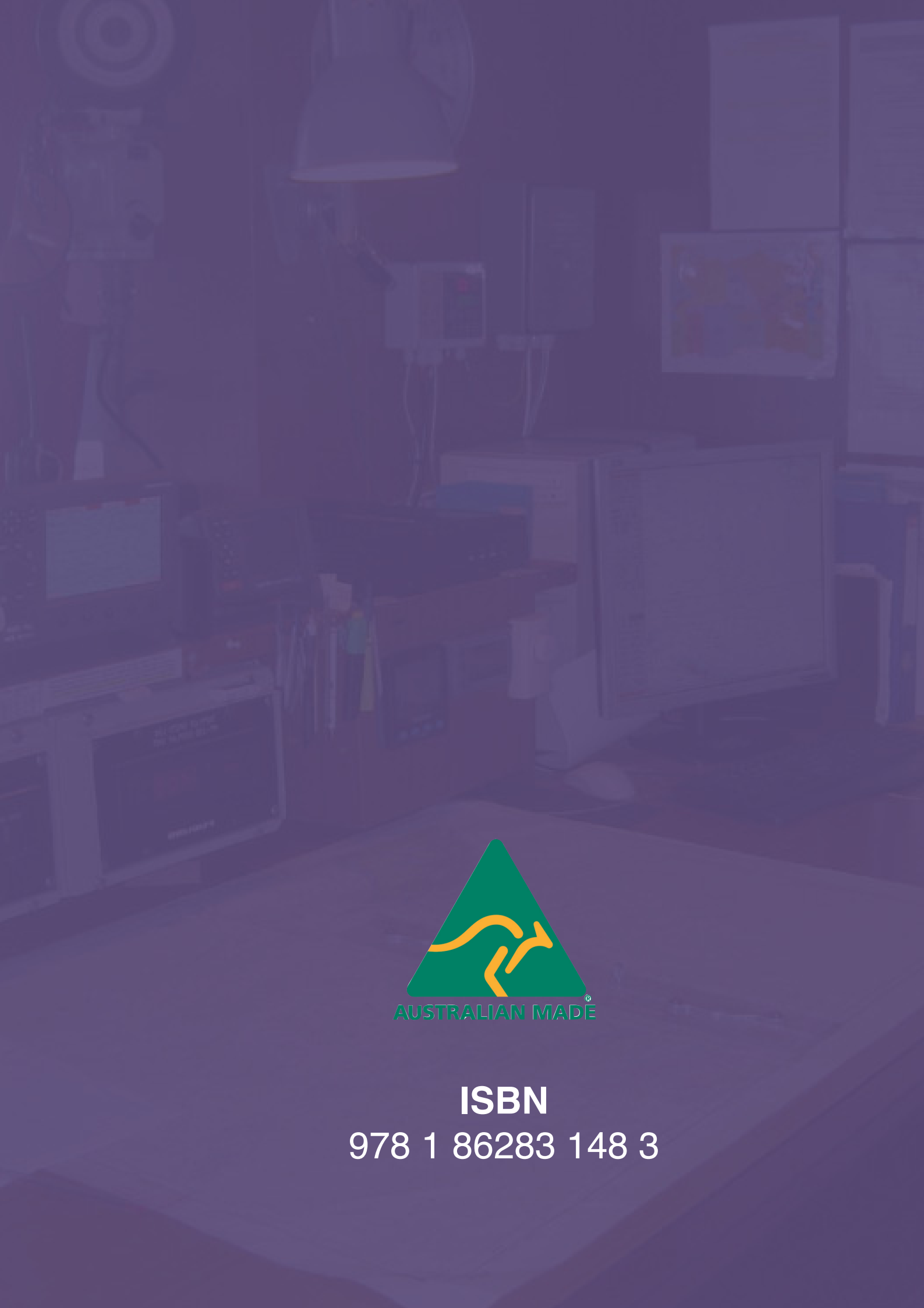
a. What is your fixed position at this time?

b. What set and drift have you experienced?

Q3.You wish to sail from one nautical mile South of Allonby Island to Anchorage at Maryport B near Carlisle Island.

You will experience a set and drift of 1.25 Nautical miles at 20^{0}T. Your speed is 4 knots.

What is the compass course you will need to steer and how long will it take you to reach your destination?



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