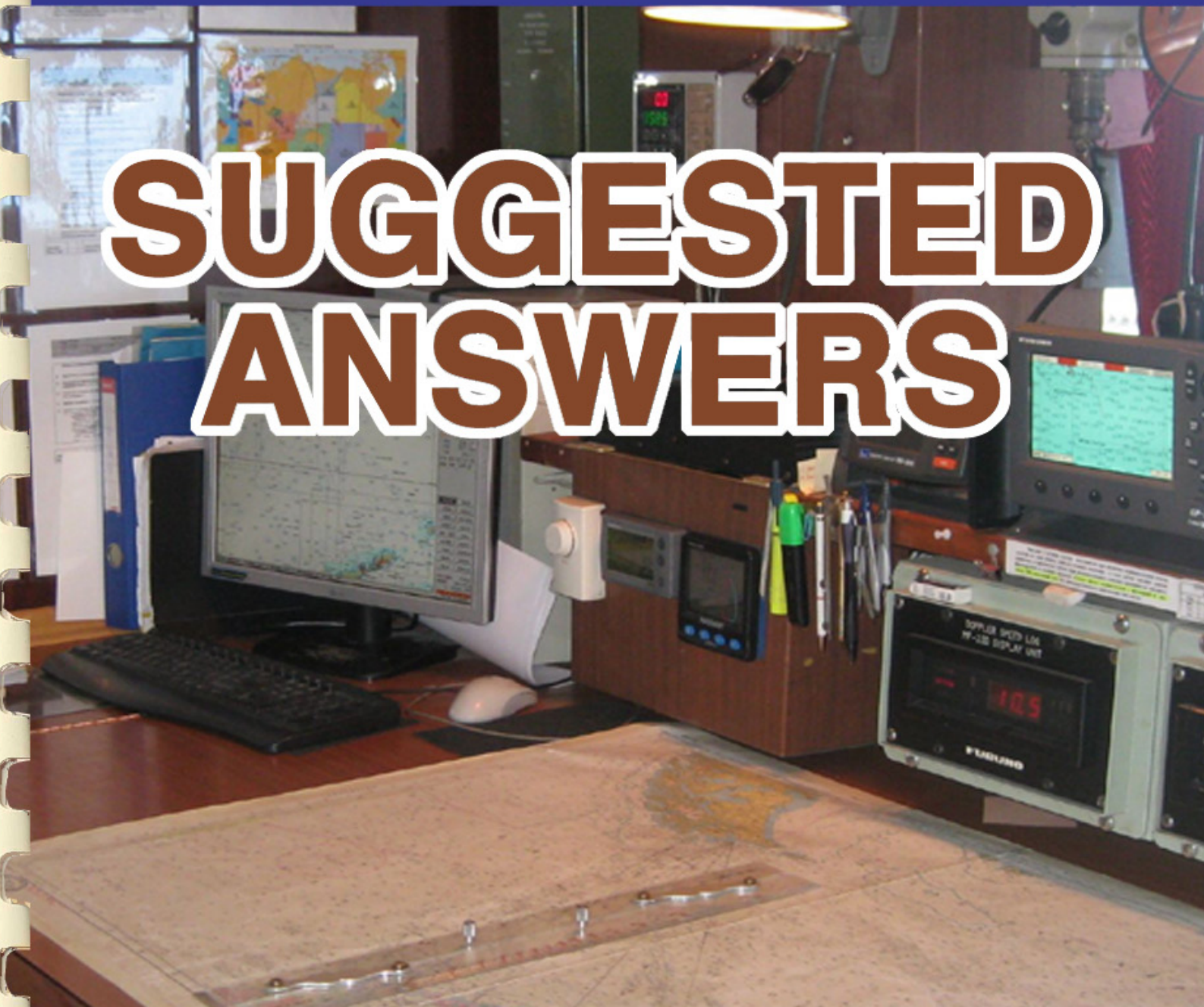
Marine Science

For Australian Students

Navigation and Communications Worksheets



SUGGESTED ANSWERS

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ANSWERS
WORKSHEET 1: NAVIGATION DEVICES

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

A navigation device is a piece of equipment used to safely move a vessel from place to place at sea.

Devices can include satellites in the air, radios and receivers in base stations on land or form part of a system of devices, power supplies and software packages that operate as one to provide information to a ships master. They can be located on various parts of the ship and connected to alarm systems if indicate their failure or be located on chart tables and be as simple a pencil, parallel ruler, chart, watch and binoculars.

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

A transducer, to collect signals from the sea floor, is mounted on the hull with cables running to a sounder mounted at the helm. A marine grade battery, mounted in a well ventilated place will power the device.

Marine grade cables will connect the devices.

Procedures to ensure safe operation will include regular inspections of cables, battery terminals and checking to ensure the battery is fully charged.

vessels and ecotourism operations using a set of binoculars and a ships horn.

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)

All crew get into life rafts or lifeboats. Both are fitted with EPIRB'S but the lifeboat will have a motor, marine radio and basic navigation equipment that is used to communicate with other ships or drive the liferaft to a safe location.

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

The steering compass is a magnetic compass used to steer the ship on a course that has been plotted from a chart.

Its main features include

A compass card that is graduated in 360 degrees mounted in the bowl of a compass. The card is a circle marked off in a clockwise direction in 360 equal units (360 degrees). North is marked at 0°, east at 90°, south at 180° and west at 270°.

A lubber line is a mark or projection on the compass bowl which allow the skipper to sight the compass course calculated from the chart.

A compass adjusters deviation card to show the ship's individual magnetic field effects on the compass.

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

This error is due to the effect of Earth's magnetic field on the ship's individual magnetic field.

It is found by creating a deviation card by swinging the compass around a known mark and can be corrected by a set of magnets.

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

100°	*ANS 4.5°E*
240°	*ANS 7°W*
40°	*ANS 5°E*

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

The pelorus is used to take bearings that are not visible from the steering compass.

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

A steering compass is usually a fixture near the helm, the hand bearing compass is free and can be carried to the most suitable spot on the boat for navigational observations.

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

It can be fitted with microprocessors which can automatically compensate for both deviation and variation thus providing a true bearing.

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

Any of these: differences in the reflective properties of the seabed

maladjustment of controls (particularly sensitivity)

marine growth on the transducer

ship rolling and pitching, temperature, salinity and sediment layers in the water

second trace returns (echoes from great depth returning after the next pulse transmission)

a school of marine life, water too deep, turbulence around the transducer (especially in heavy weather and when reversing)

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

Radar eliminates so many of the problems of visual navigation. It can 'see' in the dark, penetrate fog and mist and combine all the usual coastal navigation plotting systems into one. This enables the navigator to check a boat's progress at regular intervals without leaving the wheelhouse.

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

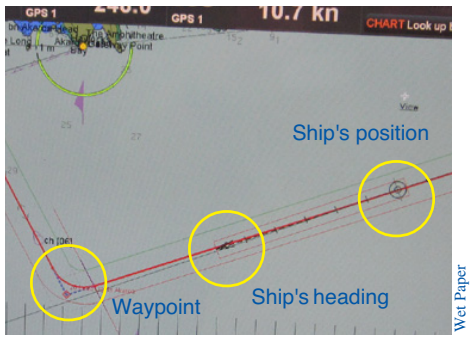
GPS is a satellite-based navigation system based on the precise timing of signal transmission paths between at least three (up to eight) satellites and a receiver on board a ship.

The intersection of the (three-dimensional) ranges so derived provides a position fix of accuracy generally a good deal better than 100 m.

The fix position is displayed in terms of latitude and longitude.

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

See figure opposite



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

A GPS can calculate speed over ground. A ship's log calculates speed through the water and is particularly important when calculating fuel use and times of arrival in ports.

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

Radar: *To see if any other ships were in the way*

Ships log: *To determine the speed of entry and the need to slow the ship*

Echo sounder: *To check the depth of water and verify it with the chart*

GPS: *To determine position at sea and verify on chart*

Binoculars: *To see if any small craft were in the vicinity*

Chart plotter: *To assist in steering ship through waypoints*

Navigation parallel rules: *Used with chart to check position and plan course*

Pelorus: *Take bearings to transfer to chart for manual navigation*

Steering compass: *Used to check chart and course into port*

Radio: *Radio used to advise shore station of arrival times. The shore station would then advise small craft of the arrival of a bigger ship in the harbour.*

Mobile phone: *used to contact the ships pilot for messages*

WORKSHEET 2: COMMUNICATION DEVICES

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

27 Mhz sets are inexpensive, basic entry marine radios with a limited range of up to 10-15 nautical miles and are affected by terrain, islands and atmospheric conditions and very limited in their ability to aid coordination and safety.

VHF sets are recommended for better quality and communication. Effective range is up to 20 nautical miles and they contain DSC (Digital Selective Calling) and GPS connectivity functions making them very useful in coordination and safety.

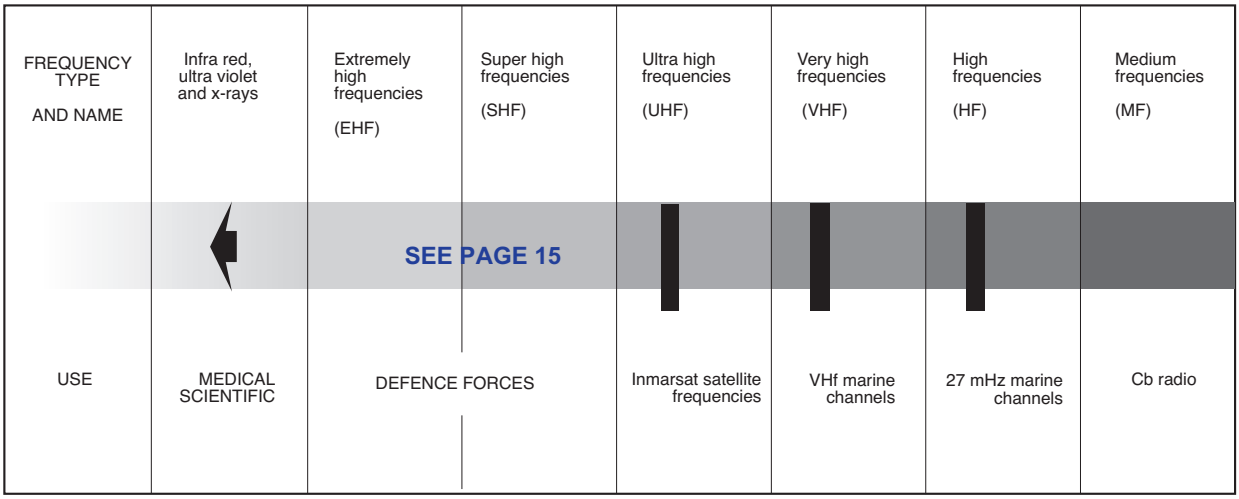
MF/HF sets are required for coastal and overseas cruising, trading and research vessels. Their range is 200 nautical miles and contain sophisticated programmed technology with allows identification of the ship and accurately identifies its position at sea.

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

The distress alert message, latitude and longitude and the time the message was sent

the type of emergency eg fire, piracy, man overboard, flooding,

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)

An EPIRB is a emergency position indicating radio beacon *and when activated in a life-threatening situation, assists rescue authorities in their search to locate those in distress.*

EPIRBs are designed to float in the water for up to 48 hours to optimise the signal to a satellite.

406 MHz EPIRBs come in two basic types: those that provide an encoded (GPS) location and those that do not.

The satellite system can calculate a beacon's location, but locating a distress site is usually much faster if the beacon signal provides a GPS location.

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

Flares are ignited by: Reading the instructions, unscrewing a cap, pulling a tab up and out quickly and holding the flare to leeward

Red flares are visible by aircraft for about 8 nautical miles at night and 4 nautical miles during the day.

Parachute flares are usually fitted with a firing mechanism located underneath the bottom cap.

These flares are visible for about 20 nautical miles at night and a lesser distance during the day.

Flares are ONLY to be used to attract attention in a distress situation at sea.

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

Flags R over Y indicates boats are to slow down and create no wash as they pass other boats fitted with equipment,

that if moved suddenly, could cause accidents on board. Example a crane lifting heavy loads on a barge

Flags NC adjacent is the international signal for distress Example fire on board

Flag A Diver down below: Example Boat in seaway with snorkellers must fly flag when snorkellers enter the water

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

They allows skippers of other vessels to navigate safely around them to avoid collisions.

Example 1. A dredge has three day shapes

a. Two balls on top of each other indicate which side other vessels can pass

b. Two diamonds on top of each other indicates where the obstruction is and

c. One ball over one diamond over one ball, indicates that this type of vessel is restricted in its ability to manoeuvre around other vessels.

Example 2. A ship at anchor: A ship at anchor will show a shape of a round ball on the bow of the vessel so other ships

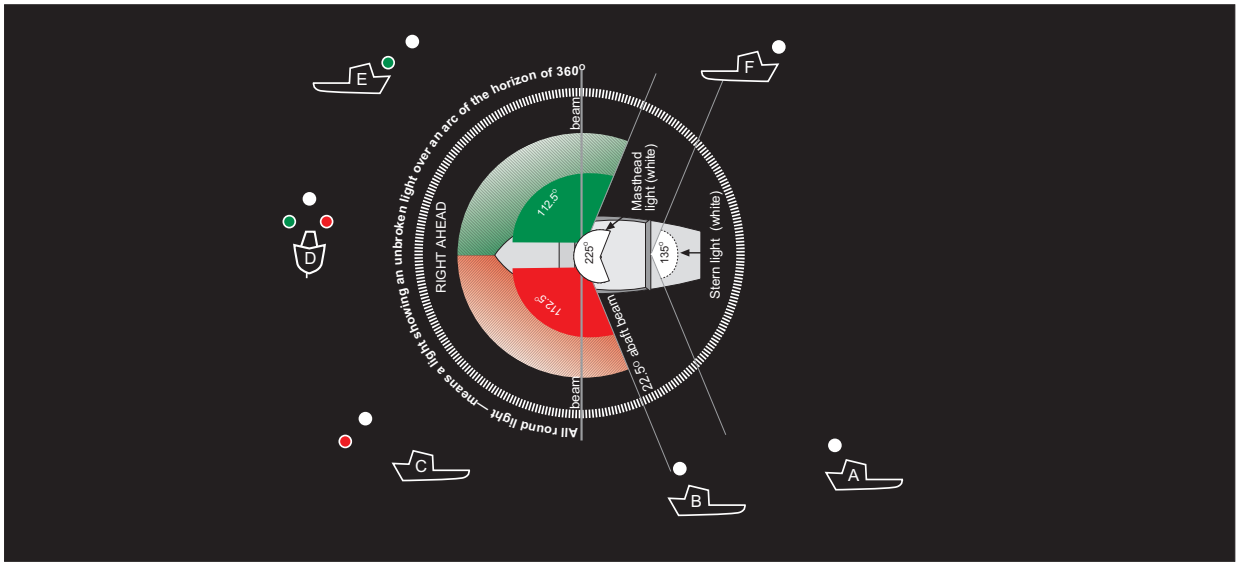
using a pair of binoculars can plan a course of safely navigate around her.

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

Navigation lights are devices shown by a ship that indicate its position and orientation. They are compulsory

on all ships around the world and are used at night or in periods of restricted visibility so that the vessels can avoid collisions.

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)

At positions A and B she will only see the masthead light and in this case cannot determine if the vessel is

anchored or underway. So the skipper approaches with caution deciding to pass on the port side.

When she gets to position C she will see a red light under the white light and then realise show is passing a powered

vessel and take appropriate action.

At D she will be dead in from of the powered vessel and she both port and starboard navigation lights.

- If she was to stop now all the other vessel would see is a white light and there would be risk of a collision.

- So the boat passing steams to a safe position E where she can turn.

- At this point she sees a white light over a green lights and travels to point F where the green disappears.

This means she is in a safe position and can carry on.

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)

Call on channel 16

Redcliffe Coast Guard, Redcliffe Coast Guard, this is Research I Research I (OVER)

Research I this is Redcliffe Coast Guard please switch to Channel 73.

Redcliffe Coast Guard, this is Research I, Research I, am going out for today to Dugong Shoals, ETR 1400 hrs three persons on board, and requesting a radio check and log in (OVER)

Research I this is Redcliffe Coast Guard your signal strength is FOWER to FIFE, you are logged in (OVER)

Redcliffe Coast Guard, this is Research I, thank you (OUT) Research I this is Redcliffe Coast Guard (OUT)

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

Securite is a safety signal used when a station wants to pass information concerning safety such as navigational warnings or weather warnings and are identified by the word.

Pan Pan is an urgency signal indicates that the station sending it has a very urgent message to transmit concerning the safety of a ship or aircraft, or the safety of a person.

Urgency messages are sent on all distress frequencies and are identified by the words PAN PAN - PAN PAN - PAN PAN

A Mayday call is a distress signal and denotes an emergency involving grave and imminent danger to life or a vessel.

After 5 minutes if a shore station fails to respond to the call, all craft in the vicinity should attempt to relay the message and render any assistance.

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

The DSC distress button is located on VHf/Mf/Hf radios and is pushed when there is an emergency involving grave and imminent danger to life or a vessel. It is pushed once to send the distress alert message, latitude and longitude and the time. The category menu is then used to choose the type of emergency eg fire, piracy, man overboard, flooding, etc. The button is then pushed again for five seconds to send the emergency situation.

A loud confirmation sound will be heard.

Immediately after messages have been sent, the radio is used to send a mayday call.

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

Screen A: Shows that a distress call from ship number 235999946 is about to come on channel 16

Screen B: Says the vessel is flooding at 1507 UTC and that the Latitude is 44° 44N and Longitude 044°44W

A mayday call from ship number 235999946 will come very soon

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)

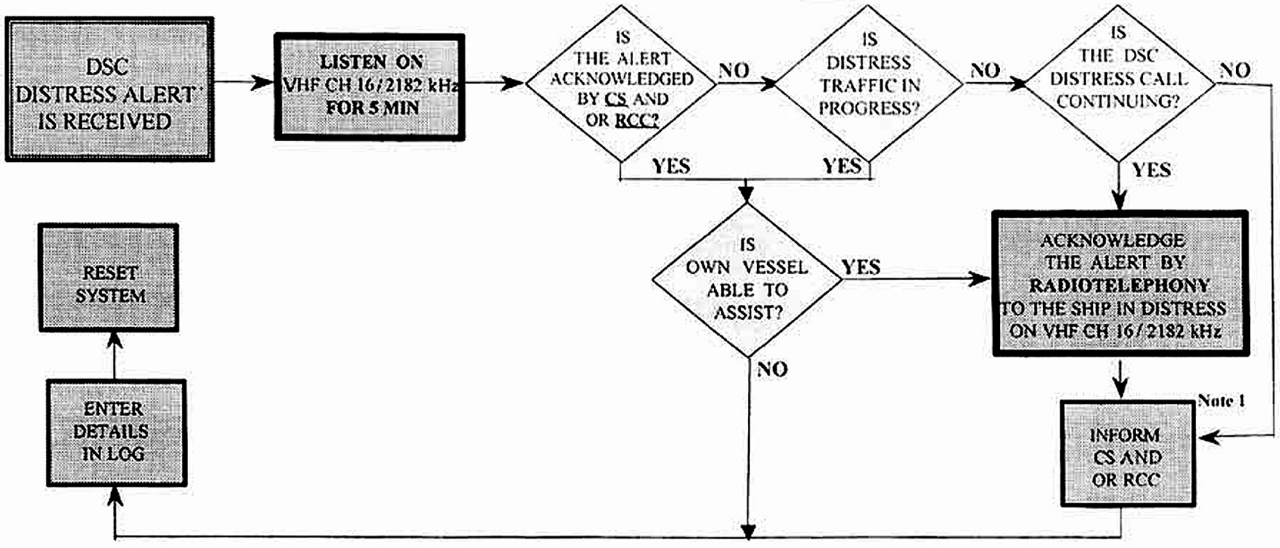
Your analysis should:

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

Students own answers

WORKSHEET 4: IALA BUOYAGE A

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

Pilotage is a inshore navigation system involving frequent use of five types of markers and a variety of markers with other navigation directives located in coastal and inshore waterways. Its use is to guide ships safely in and out of port so as to avoid collisions

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

The five type of markers are lateral, cardinal, isolated danger, safe water and special marks which can be shaped as cans, cones, spheres, pillars or spars..

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

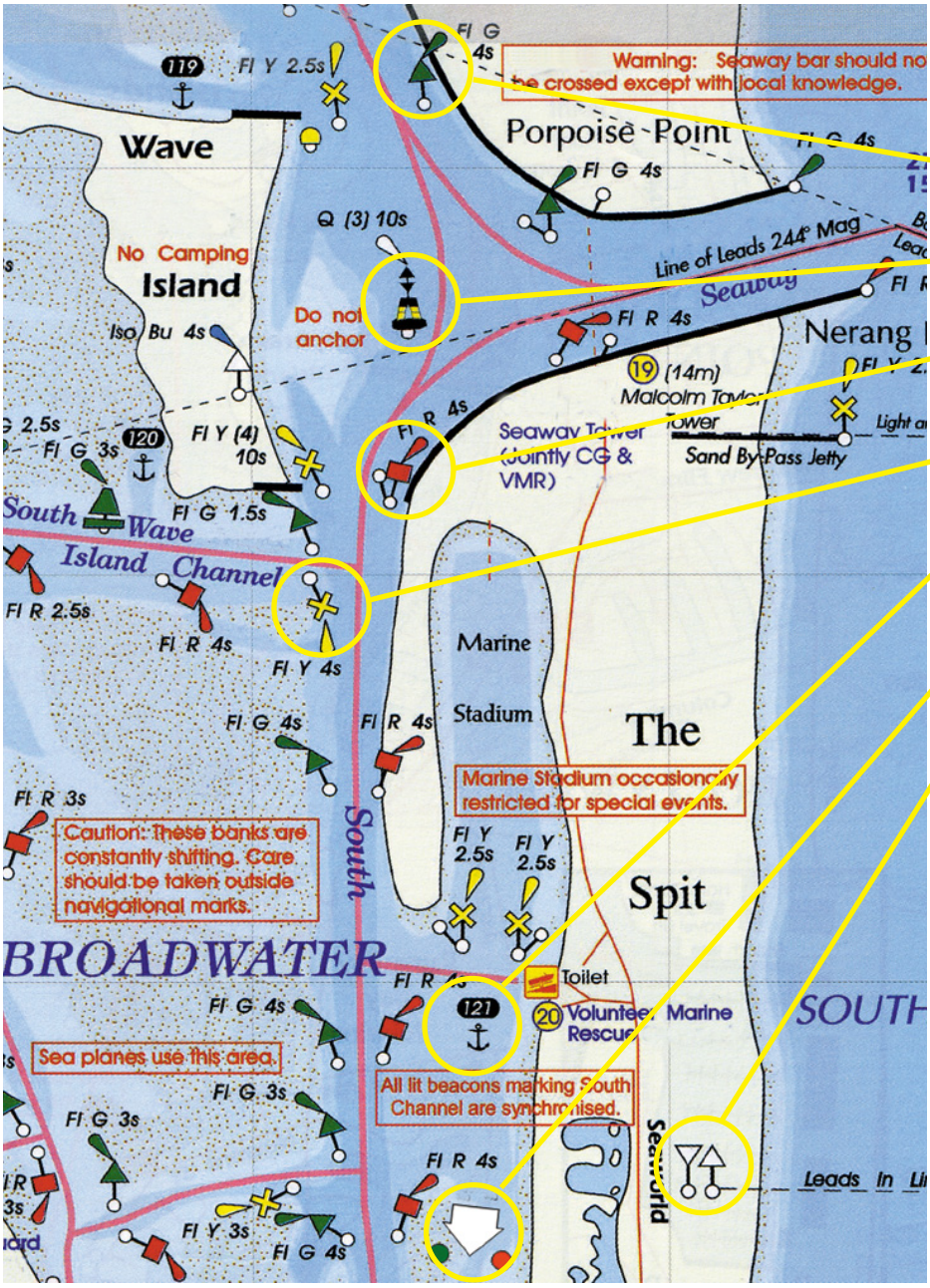
Upon entering port, the port hand mark (red) should be passed on your vessels port side as shown in Figure 28.1.

When departing a port, the port hand buoy (red) should be passed on the vessels starboard side as shown in Figure 9.2b

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

the direction of buoyage may be indicated by the symbol shown in

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



Starboard mark

East cardinal mark

Port lateral mark

Special mark

Anchorage

Direction of buoyage

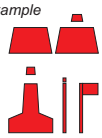
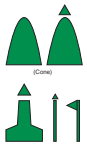
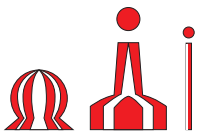
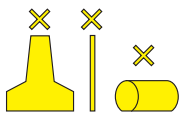
Leads in line

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

It is advisable to switch the unit on and select the correct chart datum before departing. GPS units require time to initialize, and the skipper needs time to assess the accuracy of the position information prior to starting the voyage.

- Use the wrong datum and you end up on the rocks

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*
	*Cone*	*When going into port or upstream pass on starboard side*	***Green***	***Green***	***Various***
	***Two separated cones - top facing up, bottom facing down***	***Safe water to the east - consult chart***	***East is black/yellow/ black. (cones point up and down)***	***White***	***3 flashes in a group***
	***Two separated cones - both facing up***	***Safe water to the north - consult chart***	***North is black upper with yellow base. (direction of cones is up)***	***White***	***Uninterrupted flash***
	***Two separated cones - both facing down***	***Safe water to the south - consult chart***	***South is black base with yellow upper. (cones point down)***	***White***	***6 flashes in a group + 1 long flash***
	***Two separated cones - both facing inwards***	***Safe water to the west - consult chart***	***West is yellow/ black/yellow. (cones point into centre)***	***White***	***9 flashes in a group***
	***The top mark has two black spheres positioned vertically and clearly separated.***	***Some type of local danger - wreck, shoal - consult chart***	***Two black balls separated clearly***	***White flash***	***The light comprises a white flash showing groups of two***
	***Painted red and white vertical stripes and have one red ball on the top.***	***Safe water beyond this point***	***Red and white vertical stripes. Ball is red***	***White flash***	***A white light followed by a period of darkness.***
	***The top carries a yellow cross***	***Consult your chart***	***Yellow cross***	***Yellow flash***	***Yellow flash other than that used for the white lights above***

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).

Facilities such as fresh water, camping, chart features, safe anchorages, tides, currents, soundings

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	*Lat: 20º 44.4' S, Long: 149º 13.8' E*
b) Coppersmith Rock Lighthouse	*Lat: 20º 36.0' S, Long: 149º 07' E*
c) Hill 670 Cockermouth Island	*Lat: 20º 46.3' S, Long: 149º 24.0' E*
d) Devereux Rk	*Lat: 20º 48.5' S, Long: 149º 18.8' E*

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?

D = S x T = 9 x 10 = 90 Nm

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

D = S x T = 4 x 6 = 24 Nm

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 = S x T = 10 x 2 + 5 x 3 = 20 + 15 = 35 Nm

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

S = D / T = 10 / 2 = 5 knots

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?

S = D / T = 5 / 3 = 1.7 knots, very poor speed, could row faster!

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

T = D / S = 20 / 5 = 4 hours

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?

T = D / S = 32 / 4 = 8 hours

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

Chart datum is the level of water that charted depths on a nautical chart are measured from.

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: 20º 44' S, Long: 149º 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: 20º 44' S, Long: 149º 16.00' E? Use the tide tables in Figure 11.1 .

About 11.5Nm.

Minimum sounding at bar is 0.2m

Therefore need at least 1.9m-0.2m = 1.7m of tide to

cross therefore must reach the bar near

High tide. (0930hours).

At 6 knots, 11.5Nm takes 1.92hours

Tide tables for Brampton Is

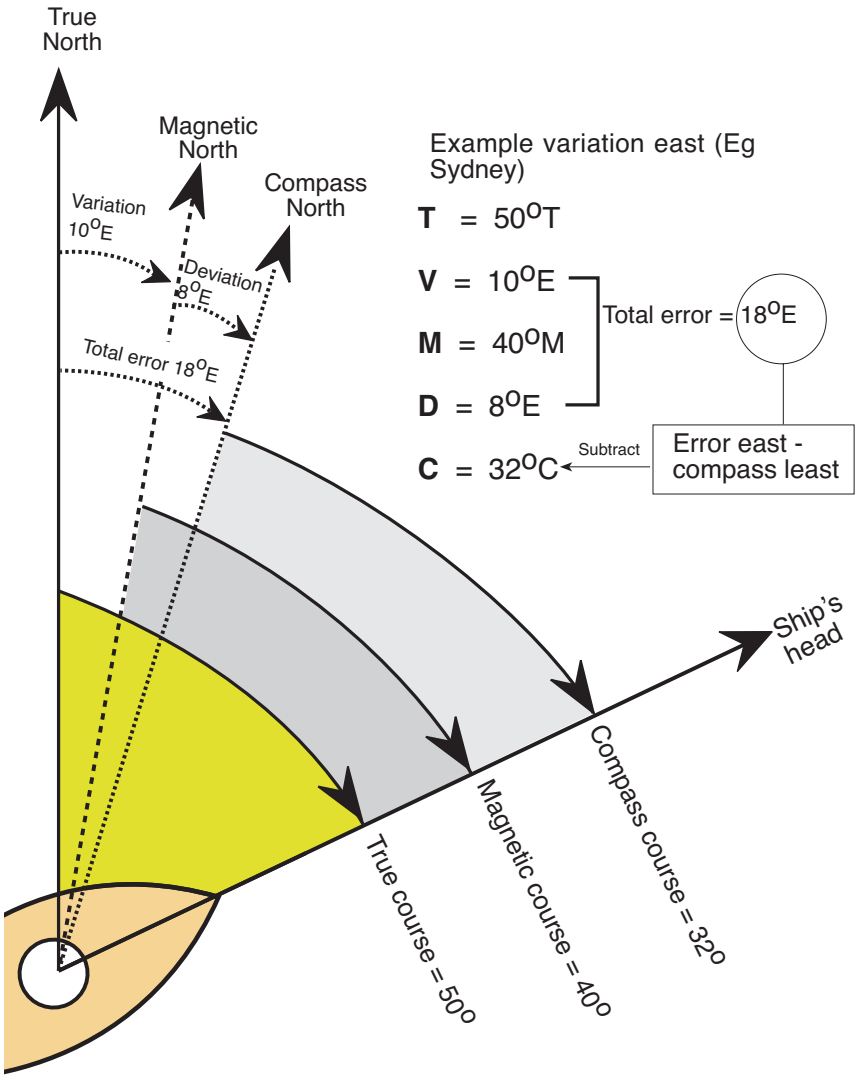
Date	Time	m	Date	Time	m
Jan 1	0221	0.99	Jan 4	0409	1.26
	0815	2.32		0930	1.93
	1424	0.51		1559	0.54
	2101	2.55		2252	2.66
Jan 2	0252	1.06	Jan 5	0502	1.99
	0835	2.22		1007	3.32
	1452	0.49		1642	0.71
	2133	2.58		2301	3.55
Jan 3	0321	1.16			
	0900	2.06			
	1524	0.51			
	2201	2.55			

Figure 11.1 Tide tables for Brampton Is

WORKSHEET 6: CALCULATING A COURSE TO STEER

Questions

Q1. Explain the meaning of the term ships head by completing the illustration below (Page 41)



Q2. Define a ship's heading (Page 42)

This is the heading of a vessel in degrees and is calculated from a chart's variation and ships deviation table.

Q3. Calculate the ships head from the information in the table below (Pages 40-41)

Example	a.	b.	c.	d.	e.
True bearing	323°T	85°T	243°T	5°T	356°T
Variation (error)	8°E	5°W	10°E	10°E	12°W
Compass bearing	315°C	90°C	233°C	355°C	8°C

In example d. think of 5°T as 365°T before you subtract the 10°. In example e. 356° + 12° = 368°, which becomes 8°C.

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

See page over

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 from the table above.

Course		True	Variation	Magnetic	Deviation	Compass course
From	To	T	V	M	D	C
WP1	WP2	*285°T*	*8°E*	*277°M*	5°W	*282°C*
WP2	WP3	*333°T*	*8°E*	*325°M*	0°W	*325°C*
WP3	WP4	*30°T*	*8°E*	*22°M*	4.5°W	*17.5°C*
WP4	WP5	*96°T*	*8°E*	*88°M*	5°W	*83°C*
WP5	WP6	*09°T*	*8°E*	*01°M*	3.5°W	*357.5°C*
WP6	WP01	*165°T*	*8°E*	*157°M*	.5°W	*157.5°C*

Sometimes its easier to use the total error

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

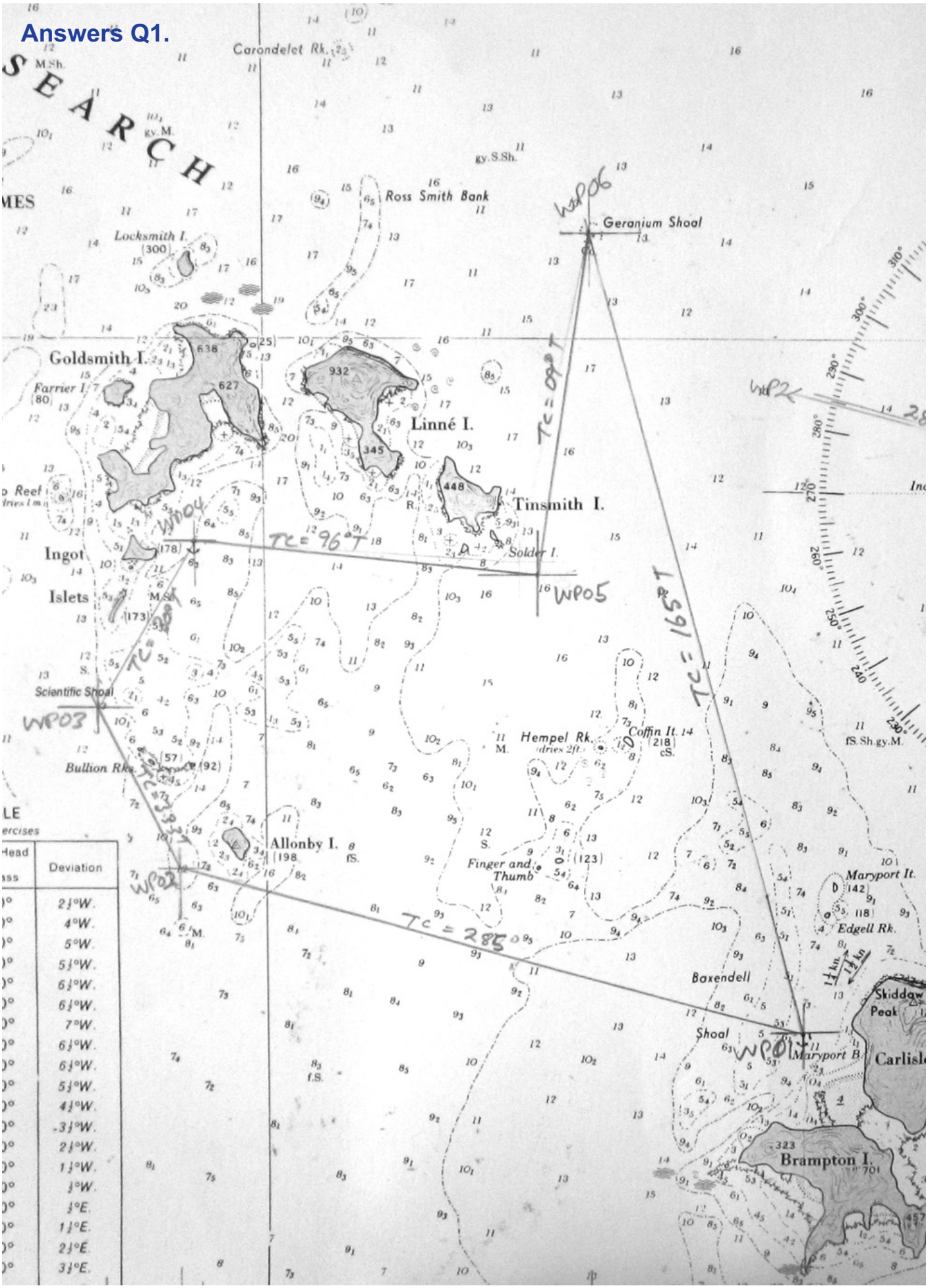
From	To	*Potential hazards*
WP1	WP2	*Allonby I*
WP2	WP3	*Bullion Rcks, waves on Scientific shoal*
WP3	WP4	*Ingot Islets*
WP4	WP5	*Solder Is and shoal*
WP5	WP6	*Tinsmith I and low tide at Geranium Shoal*
WP6	WP01	*Coffin It, currents*

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

Answers Q1.



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*	*277°M*	*8°E*	*285°T*
Coffin It	209°C	*5°E*	*214°M*	*8°E*	*222°T*
Sounding	10 m	Latitude:	*20 °42.8' S*	Longitude:	*149 °15.4' E*

Q2: Course = 190° Deviation = 4°W

Bearing	*C*	*D*	*M*	*V*	*T*
Allonby hill	275°C	*4°W*	*271°M*	*8°E*	*279°T*
Finger and thumb	027°C	*4°W*	*023°M*	*8°E*	*031°T*
Hill 323 Brampton I	128°C	*4°W*	*124°M*	*8°E*	*132°T*

Latitude: *20 °45.7' S* Longitude: *149 °12.7' E*

Q3: Course = 10° Deviation = 4°E

Bearing	*C*	*D*	*M*	*V*	*T*
Coffin It	100°C	*4°E*	*104°M*	*8°E*	*112°T*
Allonby I	226°C	*4°E*	*230°M*	*8°E*	*238°T*
Solder I	178°C	*4°E*	*182°M*	*8°E*	*190°T*

Latitude: *20 °43.6' S* Longitude: *149 °12.4' E* Water depth: *15 m*

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: *128°T (ANS)*
c. Identify the chart variation *8°E (ANS)* and calculate the magnetic course *120°C (ANS)*
d. Identify the deviation (the ship's head is 120°C) D = *3.5°E*
e. Describe the compass course to steer *116.5°C (ANS)*
f. Identify the distance to be travelled *116.5°C (ANS)*
g. If the ships speed is 6 knots calculate the time for the voyage. *T = d/s = 4.9/6 = .81 hrs = 49 mins (ANS)*

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*	*346°M*	*8°E*	*354°T*
Maryport It	71°C	*3°E*	*74°M*	*8°E*	*82°T*
Skiddaw Peak (Brampton)	93°C	*3°E*	*96°M*	*8°E*	*106°T*

What is your Latitude ? *20 °45.9' S* Longitude ? *149 °14.2' E* Water depth ? *9.4 m*

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 = 299^{0}T*

Bearing to Hill 457 Brampton Is 255^{0}C *True bearing = 263^{0}T*

Bearing to Hill 670 Cockermouth Is 35^{0}C *True bearing = 43^{0}T*

(Suggested answer 20^{0}48.8' S, 149^{0}21.3' E)

Research site 2.

Bearing to Solder Is 187^{0}C *True bearing = 195^{0}T*

Bearing to Finger and Thumb 224^{0}C *True bearing = 232^{0}T*

Bearing to Hill 323 Brampton Is 104^{0}C *True bearing = 112^{0}T*

(Suggested answer 20^{0}46.8' S, 149^{0}11.2' E)

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?

True course = 334^{0}T *Compass course = 326^{0}T*

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

4.2 miles

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

42 minutes

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 = 283^{0}T*

Brampton Island Hill 323 *133° C* *True bearing = 141^{0}T*

Tinsmith Hill 448 *342° C* *True bearing = 350^{0}T*

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

Finger and Thumb Rock.

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

Steered the wrong course, steel interference, current and tide

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?

20^o 38.6' S, 149^o 15.2' E

c. How far are you from Geranium Shoal?

1.4 miles

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

TC = 261^o CC = 253^o

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

14 minutes

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

2.4 metres (add tide)

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 = 261^o TC = 269^o

Allonby bears 334.5^o C = 342.5^{o}T

Skiddaw bears 069.5^{o}C = 077.5^{o}T

Position at 0703 is approx 20^o 48.4'S, 149^o 10.6' E

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

0703-0615 = 48 minutes.

Speed is 5 knots,

so D = 5knots x 48/60 = 4Nm

Set = 224^{o}T and Drift = 1.5Nm

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?

True course is 323^o, bearings are 192^{o}T, 268^{o}T and 142^{o}T.

Fixed position after approx 1 hour is 20^o 41.4'S, 149^o 19.7'E

b. What set and drift have you experienced?

Set = 203^{o}T Drift = 1.4Nm

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?

True course to steer is 116^{o}T, so compass course to steer is 108^{o}C

D = 5.8Nm,

so T = 5.8 / 4 knots

= 1.45 hr

= 1 hr 27 minutes.

Worksheet 10: Using a smart phone compass

What to do

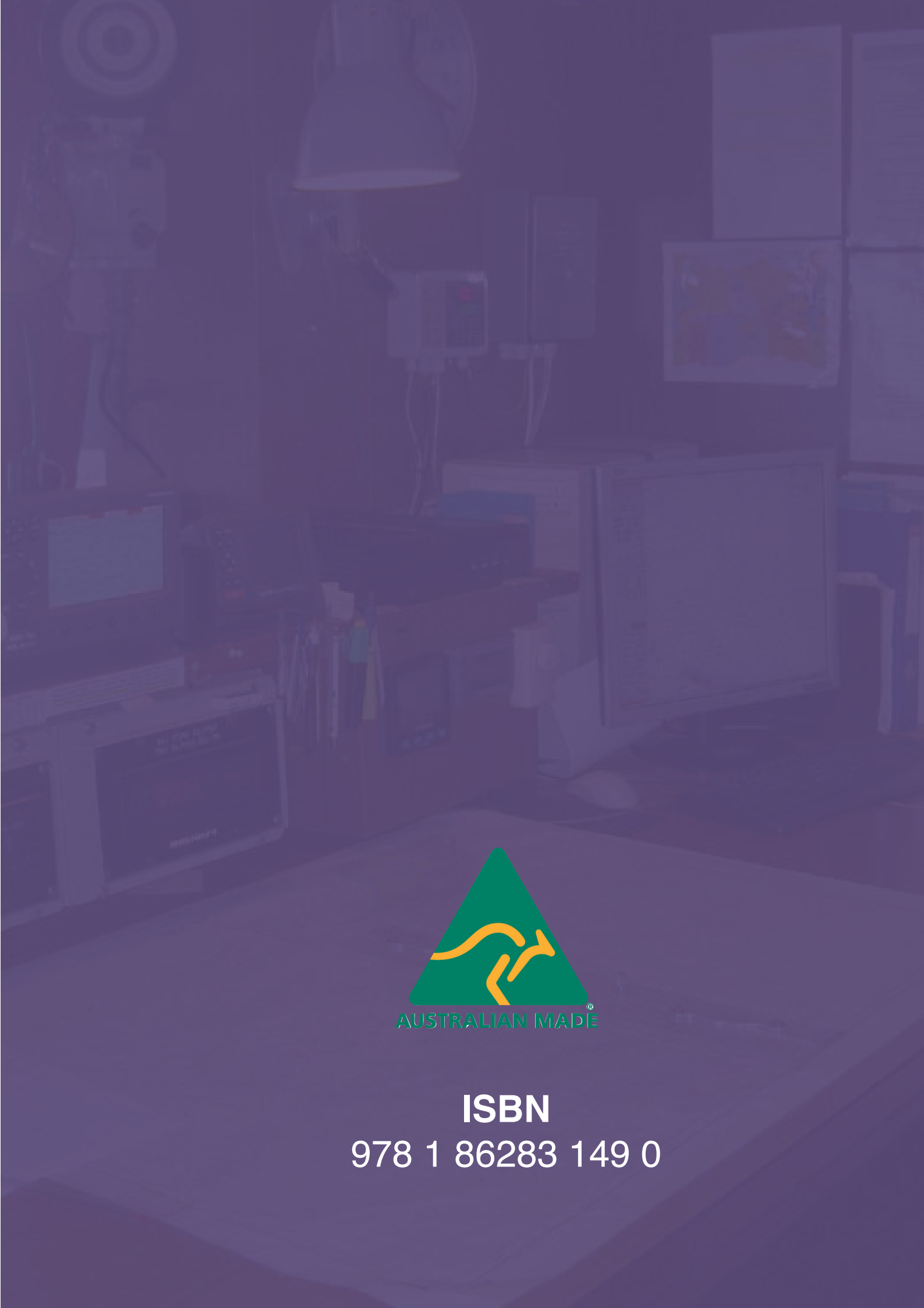
1. Obtain a local chart and take three bearings using your mobile phone app. Record them in the space below and draw a cocked hat to locate your position on the chart.

Your own answers

Figure 18.1 Magnetic bearing on a mobile phone app
Wet Paper

2. Make a mud map of your research site in the space below and describe how to locate your study site for future research.

Your own answers



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