KS2 Project 2

These resources are based on real-life challenges faced daily by HM Coastguard. Each problem has been assigned a coastguard rank according to its challenge level to enable easy differentiation.

Maritime Operations Officer

Senior Maritime Operations Officer

Commander

Chief Coastguard

The four levels vary in terms of scaffolding and challenge, but are all based on the same scenario.

Differentiation

Level	Scale	Area Calculations	Speed/ Distance
Watch Officer	1cm:1km	N/A	Metric
Watch Manager	1cm:5km	Area given	Metric
Inspector	Need ruler	Find area of square	Imperial
Chief Coastguard	Need ruler	Find area of circle	Mix

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Support / guidance

Task 1

Students should draw the 3 lines on and measure the distances with a ruler and use the scale to find out how far it is. They should use the calculations below:

- Watch Officer: x 1
- Watch Manager: x 5
- Inspector & Chief Coastguard: divide by their measurement of 1NM scale on map (e.g. 7cm ÷ 0.8 = 8.75NM)

Task 2

To find the time taken for the helicopter to get from ship to base they should divide their distances by:

- Watch Officer and Manager: ÷ 4
- Inspector and Chief Coastguard: ÷ 2.5

To find the time for the boats, they should multiply their distances by:

- Watch Officer and Manager: x 1
- Inspector and Chief Coastguard: x 1.5

Task 3

Ensure students include the time to winch and unload 4 people in each journey for helicopters and 20 per journey for the boats.
Students will approach this with some degree of trial and error. It would be a good idea to turn this into a class competition to see who can rescue all of the passengers in the shortest time.

To simplify the task for weaker students, you may want to change the scenario so that only 1 boat is available. This will make calculations much more straightforward.

Task 4

Students should use their answer from task 3 and convert it to hours, then multiply by 400 to find out the amount of fuel consumed for the helicopter and by 60 for each of the boats. To convert minutes to hours, they should divide by 60. This might be a good teaching point (is 1.5 hours the same as 1 hour 50 minutes?).

You could ask students to edit their task 3 answers based on re-fuelling times. As a real challenge, you could ask them to identify when the best times to refuel would be - prompting them to calculate how much fuel they have left at a given time. Assume 100kg fuel/minute refuelling time for simple calculations.

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Task 5

Student's two-way tables should look like below:

	Men	**Women**	**Children**	**Total**
On board	146	86	148	380
Overboard	19	12	19	50
Total	165	98	167	430

Task 6

Here students need to be able to divide the area into parts. In the Watch Manager scenario this could be done by breaking the search area into 50m^2 strips and counting. In this case they would get 600 strips = 600 seconds (10 minutes)

Inspector students will need to find the area of a 200m square = 40,000m then divide by 50 to get 800 seconds (13 minutes and 20 seconds). As Chief Coastguard, they will need to use the area of a circle formula to get 31,415 m^2 then divide by 50 to get 628 seconds (10 minutes, 28 seconds).

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Scenario

A passenger ferry is in distress off the west coast of England. Your job is to ensure that everyone is successfully rescued. Here's the call that came into the Search and Rescue base:

'The Atlantis' >>> Mayday, mayday. We have suffered an engine explosion and are beginning to sink. Urgent help required.

'Coastguard' >>> OK. We've tracked your GPS location and will dispatch a helicopter and 2 lifeboats immediately. What is your passenger situation?

'The Atlantis' >>> We have 430 persons. 98 are female and there are 167 children. 50 people are overboard - including 12 women and 19 children. The water is 11°C.

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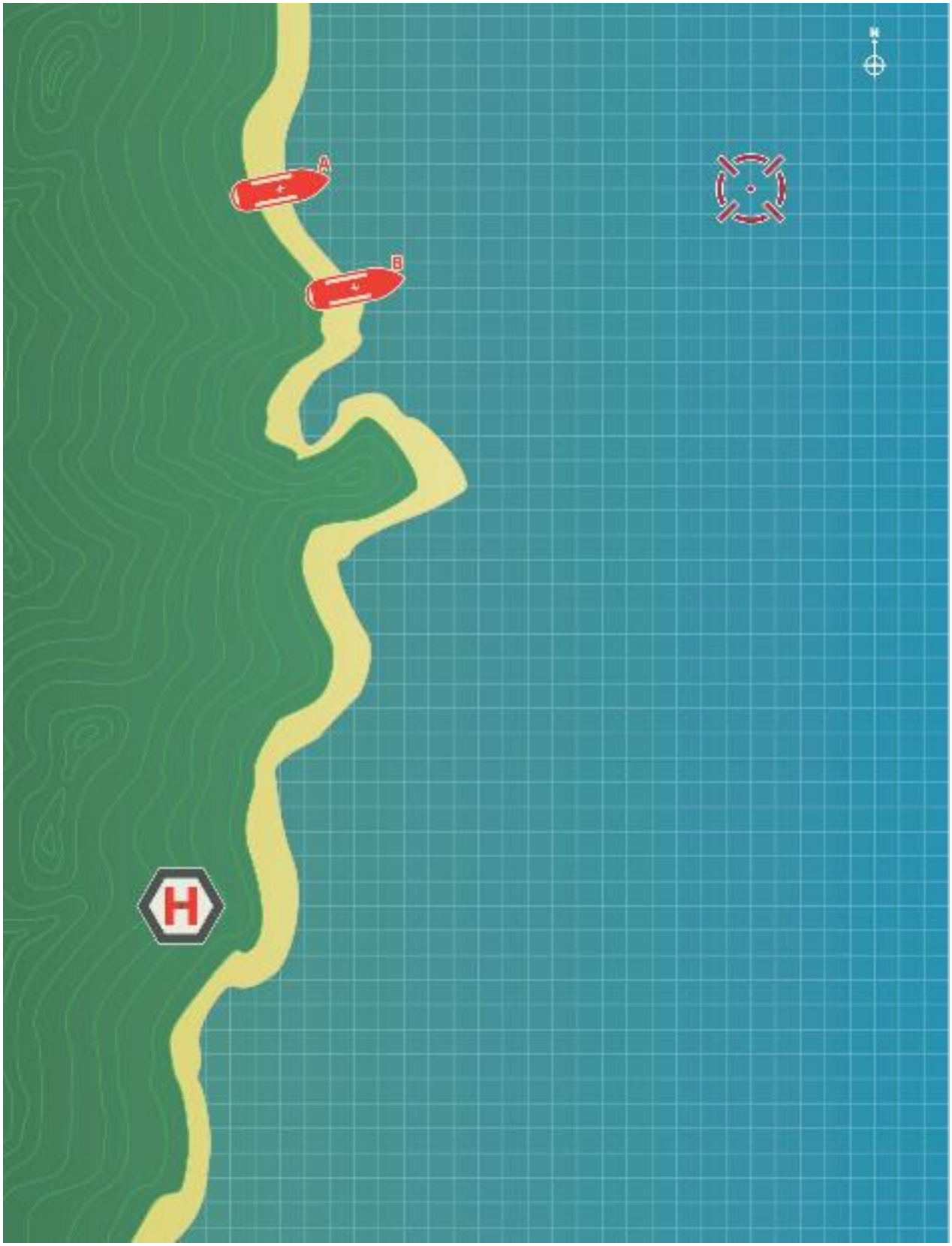
Watch Officer



Scale 1cm:1km

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Task 1

Identify how far the target is away from Lifeboat station A, B and the helicopter base.

Task 2

The boats can travel at 60 km/hr.
The helicopter can travel at 240 km/hr.

Find out how long it would take each to reach the target.

Task 3

The helicopter can carry 4 people at a time.
The boats can take 20 passengers at a time.
It takes 2 minutes to get each person from the ship to a helicopter and 1 minute for the boat.
It takes 1 minute per person to get them out of the helicopter at the base and 30 seconds for the boats.

Plan a rescue operation to successfully rescue all 430 people and get them back to the helicopter base.

Task 4

The helicopter uses roughly 400kg of fuel every hour and has a 1000kg capacity.
The boats use roughly 60kg of fuel per hour and have a 300kg capacity.

Use your answer to task 3 to estimate how much fuel is used. How many times do you need to refuel each boat/helicopter?

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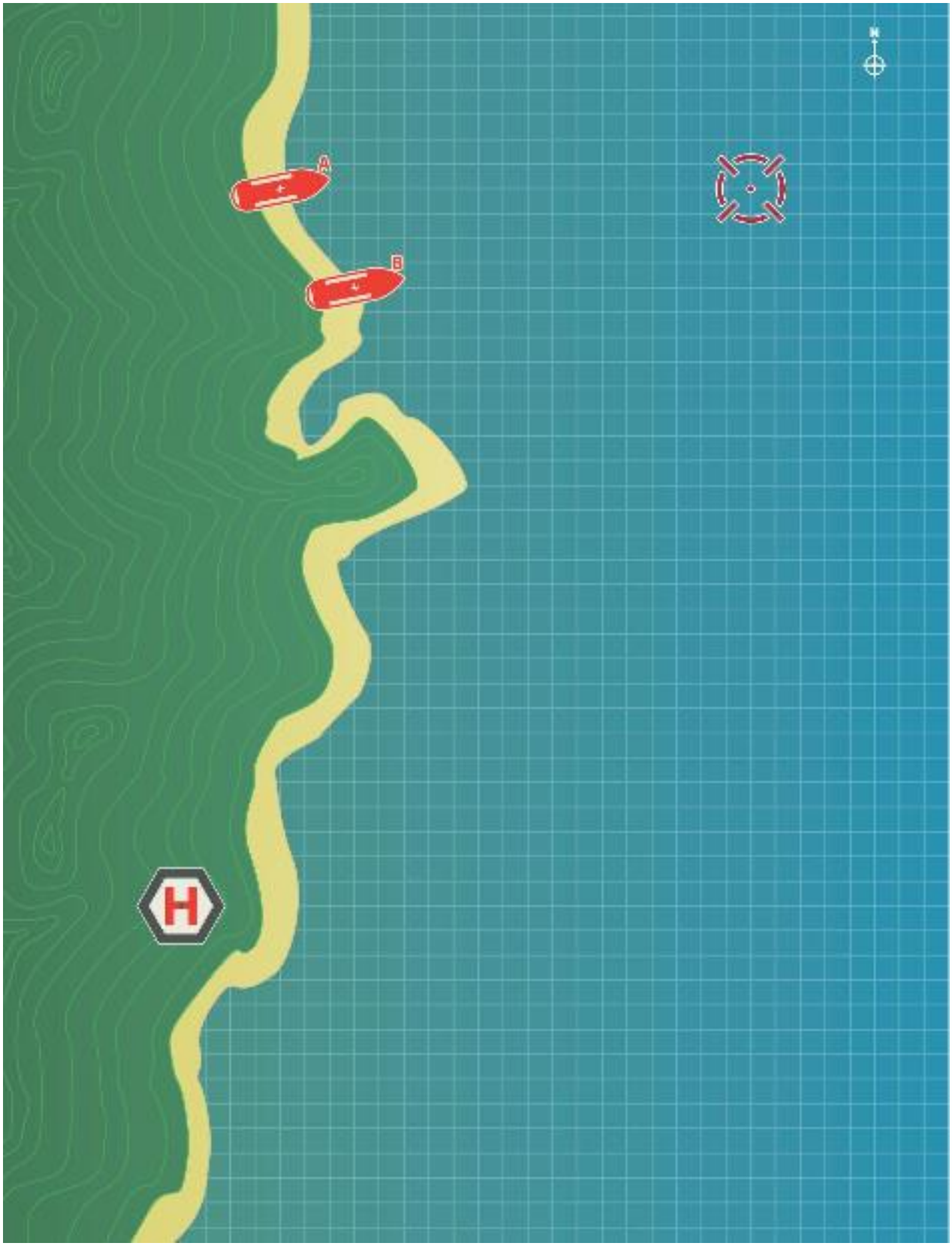
Watch Manager



Scale 1cm:5km

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Task 1

Identify how far the target is away from Lifeboat station A, B and the helicopter base.

Task 2

The boats can travel at 60 km/hr.
The helicopter can travel at 240 km/hr.

Find out how long it would take each to reach the target.

Task 3

The helicopter can carry 4 people at a time.
The boats can take 20 passengers at a time.
It takes 2 minutes to get each person from the ship to a helicopter and 1 minute for the boat.
It takes 1 minute per person to get them out of the helicopter at the base and 30 seconds for the boats.

Plan a rescue operation to successfully rescue all 430 people and get them back to the helicopter base.

Task 4

The helicopter uses roughly 400kg of fuel every hour and has a 1000kg capacity.
The boats use roughly 60kg of fuel per hour and have a 300kg capacity.

Use your answer to task 3 to estimate how much fuel is used. How many times do you need to refuel each boat/helicopter?

Task 5

Complete the two way table below and use it to plan who to rescue first.

	Men	**Women**	**Children**	**Total**
On board				
Overboard				
Total				

Task 6

It's estimated that a helicopter pilot can accurately search a $50m^2$ area every second in this visibility.

It is expected that the overboard passengers are within a $30{,}000m^2$ region around the boat. What is the maximum time needed to search this area?

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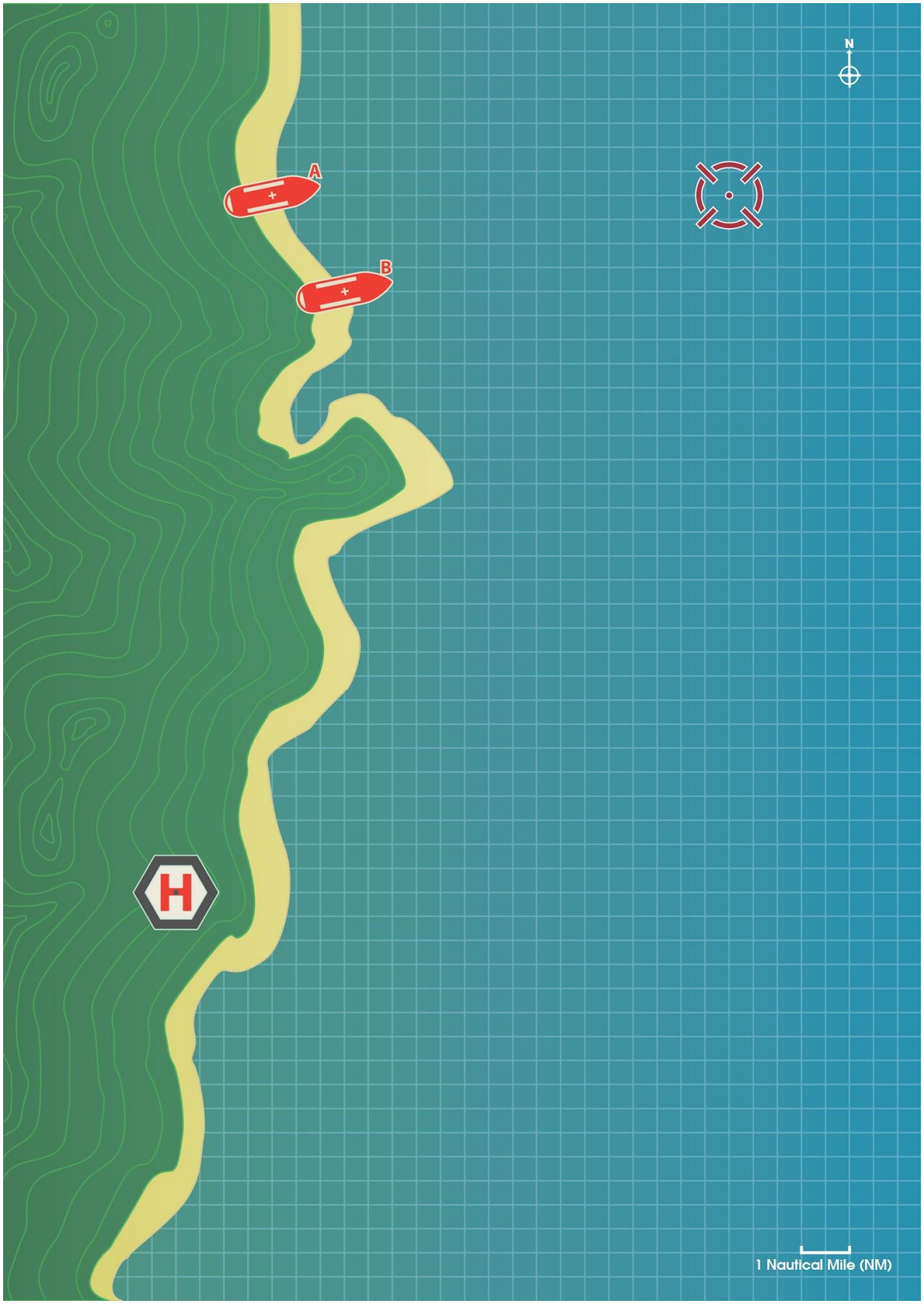
Inspector



Work out the scale using a ruler

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Task 1

Identify how far the target is away from Lifeboat station A, B and the helicopter base.

Task 2

The boats can travel at 40mph.
The helicopter can travel at 150mph.

Find out how long it would take each to reach the target.

Task 3

The helicopter can carry 4 people at a time.
The boats can take 20 passengers at a time.
It takes 2 minutes to get each person from the ship to a helicopter and 1 minute for the boat.
It takes 1 minute per person to get them out of the helicopter at the base and 30 seconds for the boats.

Plan a rescue operation to successfully rescue all 430 people and get them back to the helicopter base.

Task 4

The helicopter uses roughly 400kg of fuel every hour and has a 1000kg capacity.
The boats use roughly 60kg of fuel per hour and have a 300kg capacity.

Use your answer to task 3 to estimate how much fuel is used. How many times do you need to refuel each boat/helicopter?

Task 5

Complete the two way table below and use it to plan who to rescue first.

	Men	**Women**	**Children**	**Total**
On board				
Overboard				
Total				

Water Temperature (°C)	Expected Time Before Exhaustion	Expected Time of Survival
10–15.6°	1 – 2 hours	1 – 6 hours

Task 6

It's estimated that a helicopter pilot can accurately search a 50m^2 area every second in this visibility.
It is expected that the overboard passengers are within a square region around the boat of length 200m. What is the maximum time needed to search this area?

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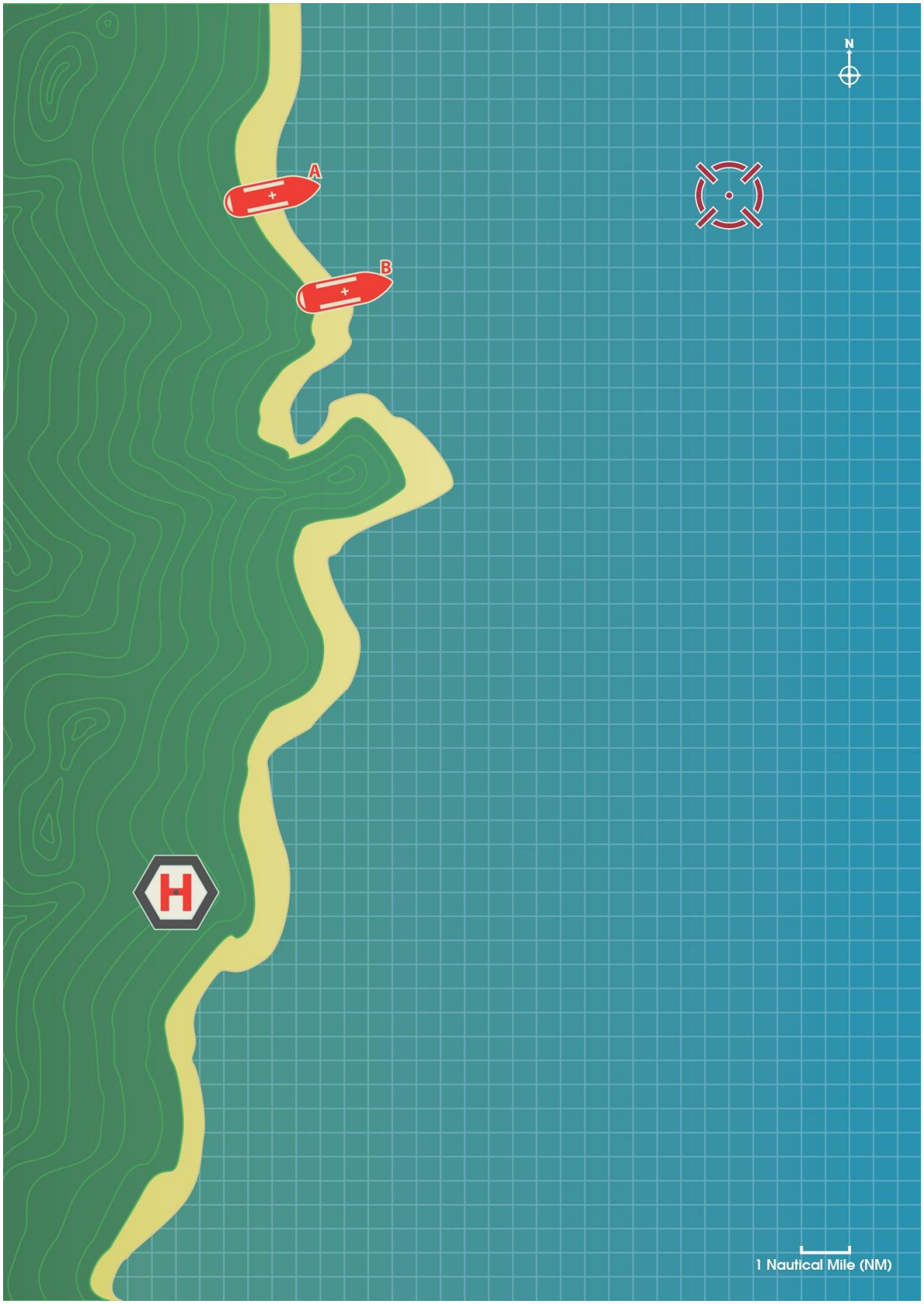
Chief Coastguard



Work out the scale using a ruler

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Task

Plan a full scale rescue operation including timings for each vessel and an order of who to rescue first. You will need to include time required to search the area for overboard passengers, and the time taken to load/unload passengers.

- The helicopter can carry 4 people at a time.
- The boats can carry 20 people at a time
- The helicopter can travel at 240 km/hr. (1 mile = 1.6km)
- The boats can travel at 60 km/hr. (1 mile = 1.6km)
- It takes 2 minutes to winch each person from the ship to the helicopter and 1 minute into a boat.
- It takes 1 minute per person to get them out of the helicopter at the base and 30 seconds from a boat.
- The helicopter uses roughly 400kg of fuel every hour.
- The boats use roughly 60kg of fuel every hour.
- It's estimated that a helicopter pilot can accurately search a 50m^2 area every second in these conditions.
- Overboard passengers should be within a 100m radius from the ship.

The following tables may be useful:

	Men	Women	Children	Total
On board				
Overboard				
Total				

Water Temperature (°C)	Expected Time Before Exhaustion	Expected Time of Survival
10–15.6°	1 – 2 hours	1 – 6 hours

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