

## Probability Worksheet for KS3-5

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.



Watch Officer (calculating distance)



Watch Manager (comparing PODs)



Inspector (decision-making using probability)




Chief Coastguard  
(developing quadratic sequences)

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

Use the information on the accompanying presentation (and the resource sheet in this document) to help solve the following problems.

## Probability Worksheet for KS3-5

### Resource sheet

<p>Sikorsky S-92</p> 	<ul style="list-style-type: none"> <li>• Max Air Speed: 145 knots (165 mph)</li> <li>• Range: 250 nautical miles</li> <li>• Normal flight crew: 4</li> <li>• Endurance: 4 hours</li> </ul>
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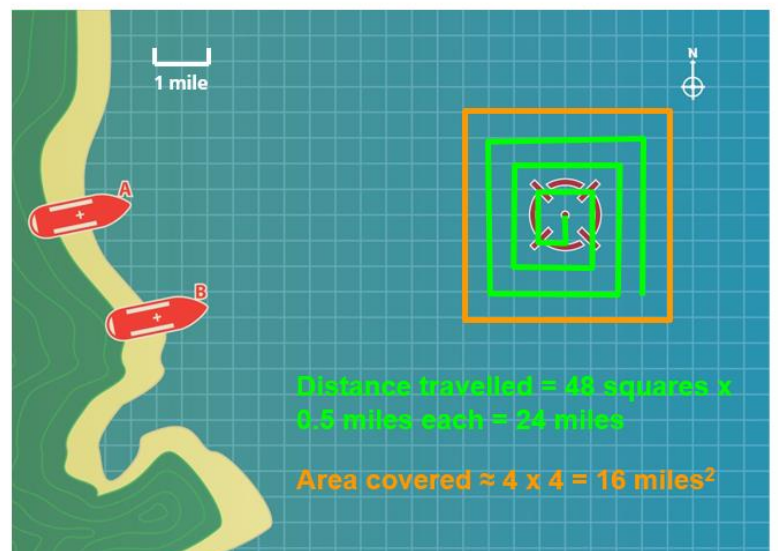
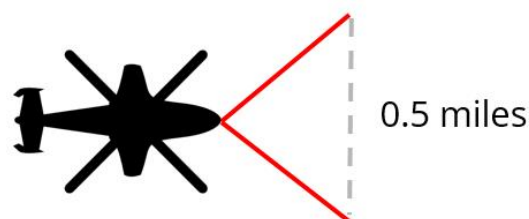
### POD - Probability of Discovery

	10mph	20mph	40mph
Clear conditions	100%	80%	60%
Poor conditions	80%	60%	30%
Storm conditions	60%	40%	10%

## Determining search areas

The coastguard has to develop efficient search techniques.

The speed that a helicopter travels determines its ability to detect search objects.



**POC: Probability of Containment; POD: Probability of Detection; POS: Probability of Success**

$$\text{POS} = \text{POC} \times \text{POD}$$

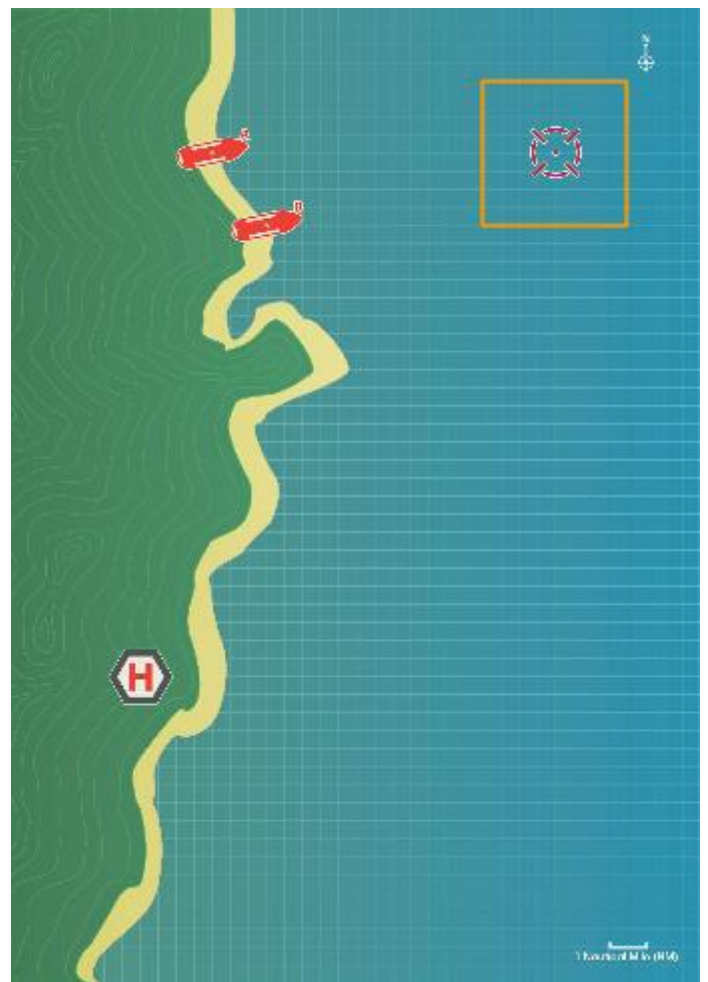
## Probability Worksheet for KS3-5



### Scenario 1

A small passenger ferry has experienced engine failure. It is a clear day and conditions are good. The chief coastguard has asked us to search an area of 16 square miles around the target where he has calculated a **POC** of 70%. This can be seen on the map.

- Mark on a suggested search route and find the distance we will need to travel to search it.
- Use the **POD** table to find out how long it will take to ensure an 80% POD (travelling at 20mph).
- Find the **POS** using these POC and POD values



### Plan

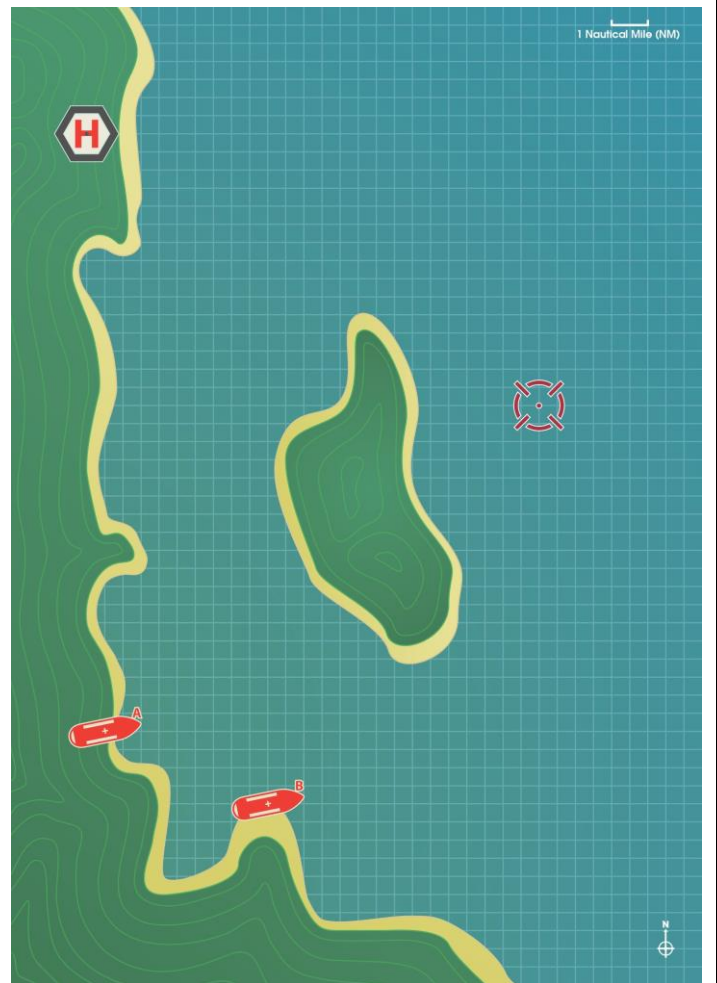
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### Scenario 2

A small sailing boat has sunk off the island in very stormy conditions. The chief coastguard thinks there will be a 90% **POC** within a 9 square mile area around the target on the map.

- Mark on the area and find a search route for the helicopter to take. Find the distance needed to travel.
- Use the **POD** table to find the times taken for a 60% (10mph), 40% (20mph) and a 10% (40mph) POD.
- For each of the three PODs, find the overall **POS** for each rescue mission.



### Plan

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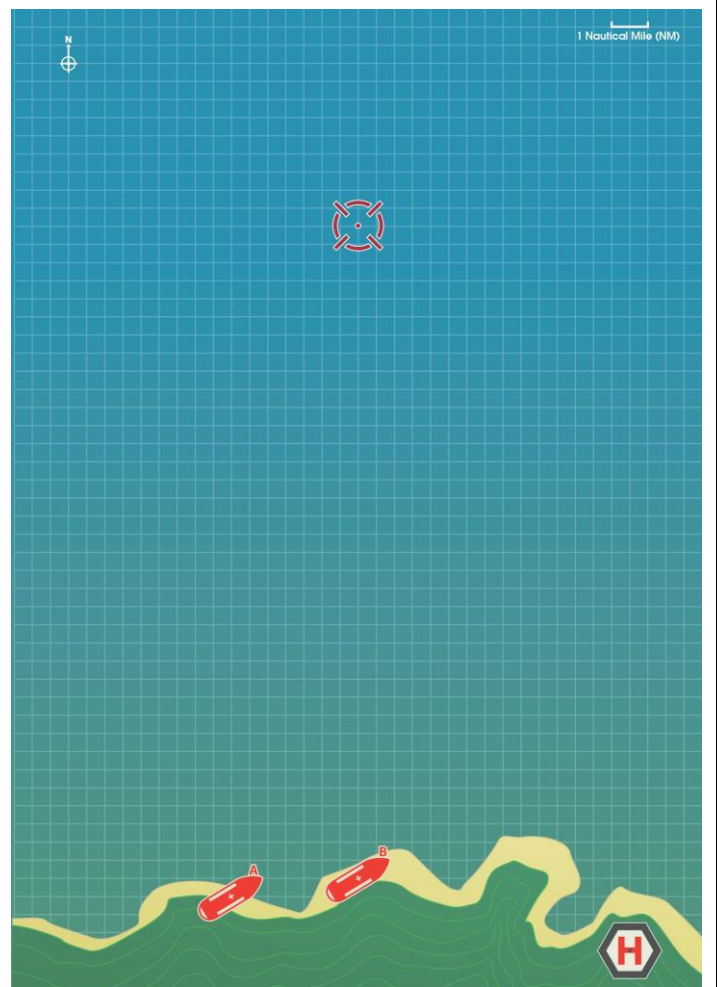


### Scenario 3

In poor conditions, a small fishing boat has suffered from engine failure. The coastguard has calculated an area of 16 miles<sup>2</sup> has a 40% **POC** and 25 miles<sup>2</sup> has a 70% **POC**.

Using what you know about search areas, and **POD** create a plan that has the highest **POS** given the conditions.

*Remember that the helicopter only has a range of 4 hours.*



### Plan



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### Scenario 4

A teenager has been knocked off of his sailing boat in stormy conditions. His boat has been tracked to the target shown on the map.

The chief coastguard suggest that his **POC** starts at 0% at the target, and increases by 20% for every  $\frac{1}{2}$  mile radius increase.

As an experienced member of the Search and Rescue team, identify the best search plan with the greatest possible **POS**.



### Plan

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### Scenario 5

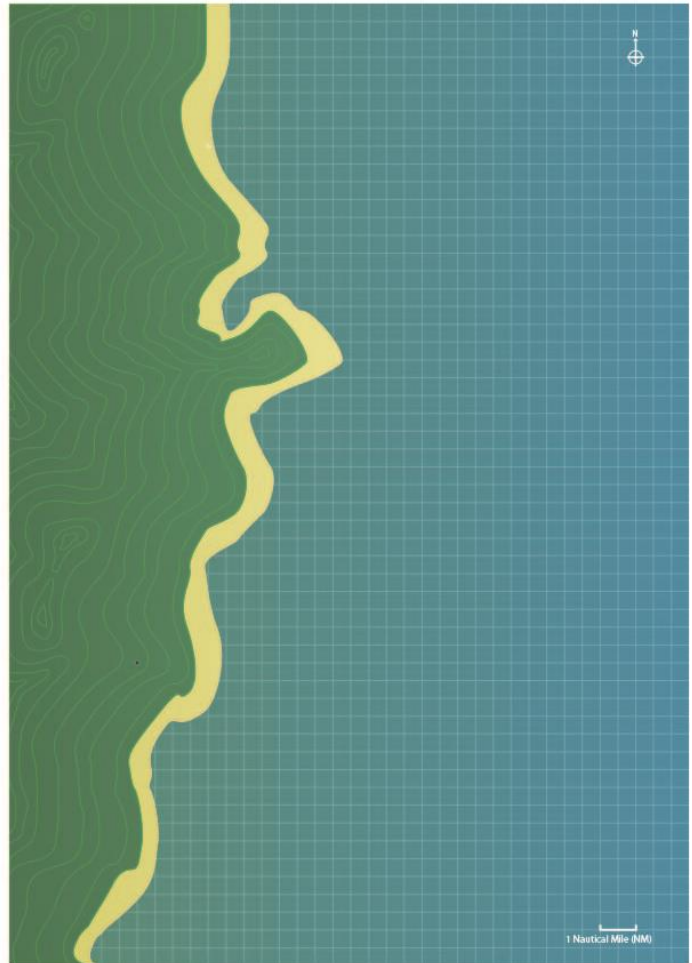
The chief coastguard is finding it challenging having to manually calculate search areas every time we devise a new plan.

Can you use what you know about sequences to try and devise a formula. Use the map to help draw out your areas if you'd like.

Let  $n$  be the length of a side of a search area.

This table may help:

n (length of side)	Total miles searched
1	0
2	8
3	24
4	48
5	80



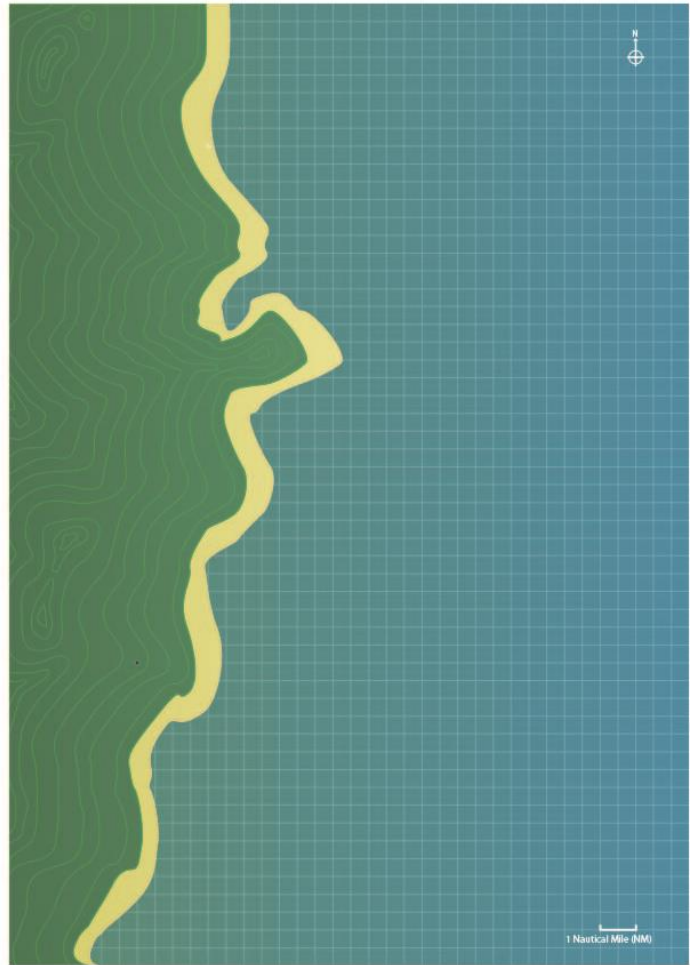
### Calculations

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Circle appropriate challenge ranking:



**Blank Scenario**



**Plan**