

Vectors Worksheet (ANSWERS) 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.



Maritime Operations Officer



Senior Maritime Operations Officer



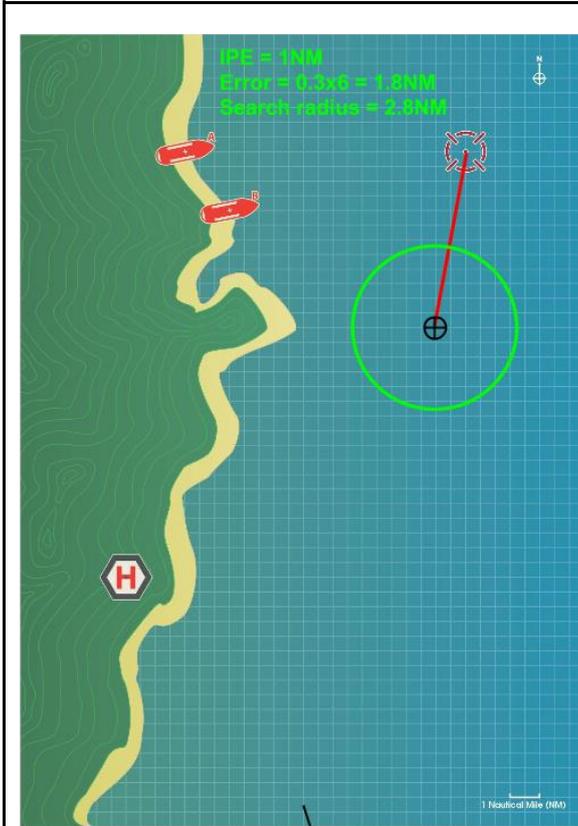
Commander



Chief Coastguard

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

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1) A boat has been spotted in distress by a private plane. They've given the coordinates shown on the map. This report has an IPE (initial position error) of 1 NM (nautical mile).

The coastguard has calculated a relative track (by combining tidal drift, wind driven current and leeway drift) of 6NM/hr on a bearing of 190° .

-  a) Mark on the datum given that it has been 1 hour since the initial reported location.
-  b) Using an error factor of 30% (0.3) and adding the IPE of 1NM, mark on a suitable search area, showing your calculations.

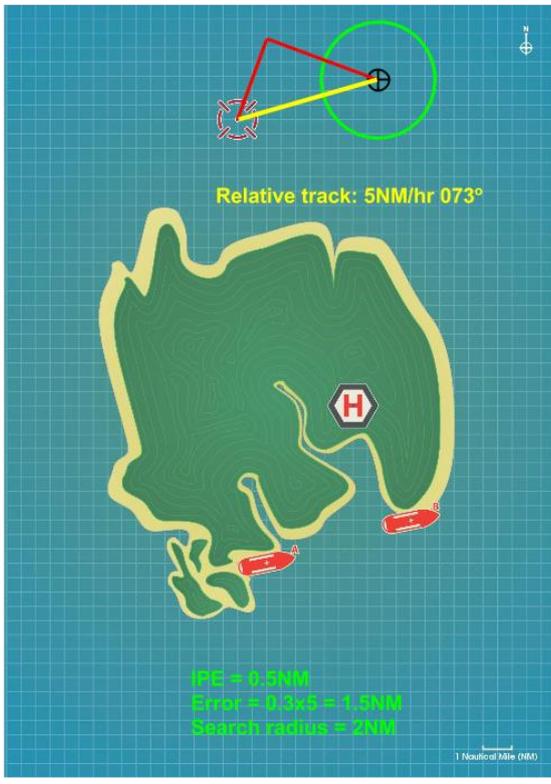
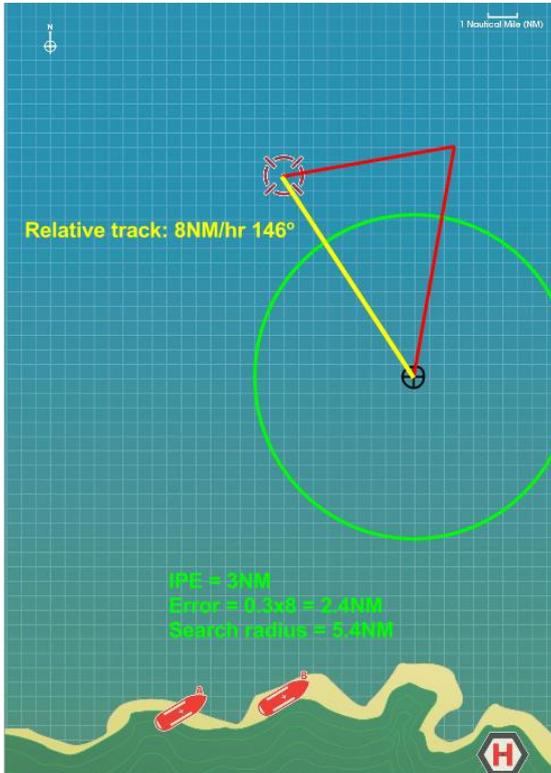


2) A boat has contacted the coastguard stating that it has run out of fuel. They've given their coordinates from their onboard GPS shown on the map. This report has an IPE (initial position error) of 0.25 NM (nautical mile).

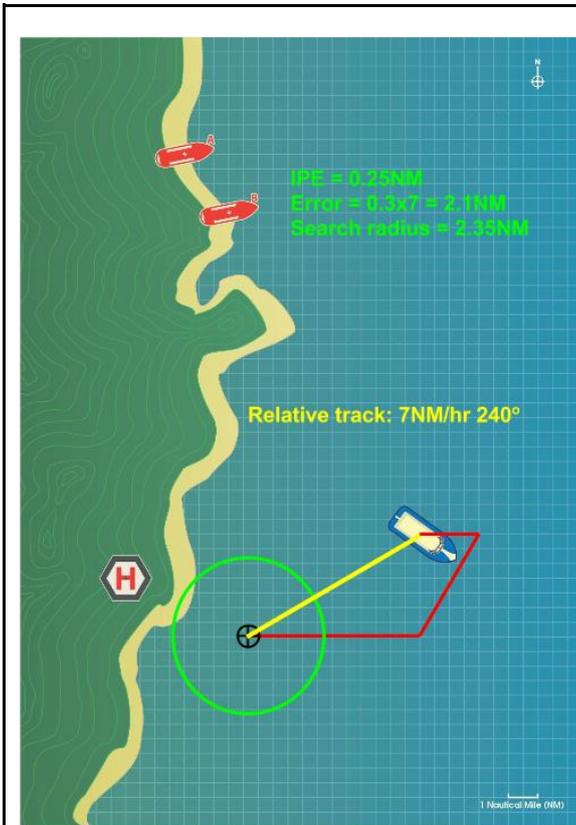
The coastguard has calculated a relative track (by combining tidal drift, wind driven current and leeway drift) of 8NM/hr on a bearing of 330° .

-  a) Mark on the datum given that it has been 30 minutes since the initial reported location.
-  b) Using an error factor of 30% (0.3) and adding the IPE of 0.25 NM, mark on a suitable search area, showing your calculations.

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 <p>Relative track: 5NM/hr 073°</p> <p>IPE = 0.5NM Error = 0.3 x 0.5 = 1.5NM Search radius = 2NM</p> <p>1 Nautical Mile (NM)</p>	<p>3) A small boat has contacted the coastguard stating that it has run out of fuel. They've given their coordinates from their onboard GPS shown on the map. This report has an IPE (initial position error) of 0.5 NM (nautical mile).</p> <p>The coastguard has calculated the following:</p> <ul style="list-style-type: none"> - Tidal drift: 3NM/hr 020° - Wind driven current: 4NM/hr 110° <p>a) Mark on the drift and current, and hence find the datum given that it has been 1 hour since the call came through.</p> <p>b) Using an error factor of 30% (0.3) and adding the IPE of 0.5 NM, mark on a suitable search area, showing your calculations.</p> <p>c) Calculate the bearing and speed of the relative track to support the coastguard in their search efforts.</p>
 <p>Relative track: 8NM/hr 146°</p> <p>IPE = 3NM Error = 0.3 x 3 = 0.9NM Search radius = 3.9NM</p> <p>1 Nautical Mile (NM)</p>	<p>4) A capsized boat, shown on the map, has been spotted by a passenger plane. This report has an IPE (initial position error) of 3 NM (nautical miles).</p> <p>The coastguard has calculated the following:</p> <ul style="list-style-type: none"> - Tidal drift: 6NM/hr 080° - Wind driven current: 8NM/hr 190° <p>a) Mark on the drift and current, and hence find the datum given that it has been 30 minutes since the call came through.</p> <p>b) Using an error factor of 30% (0.3) and adding the IPE of 3 NM, mark on a suitable search area, showing your calculations.</p> <p>c) Calculate the bearing and speed of the relative track to support the coastguard in their search efforts.</p>

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5) A large container ship has experienced engine malfunction. This report has an IPE (initial position error) of 0.25 NM (nautical miles).

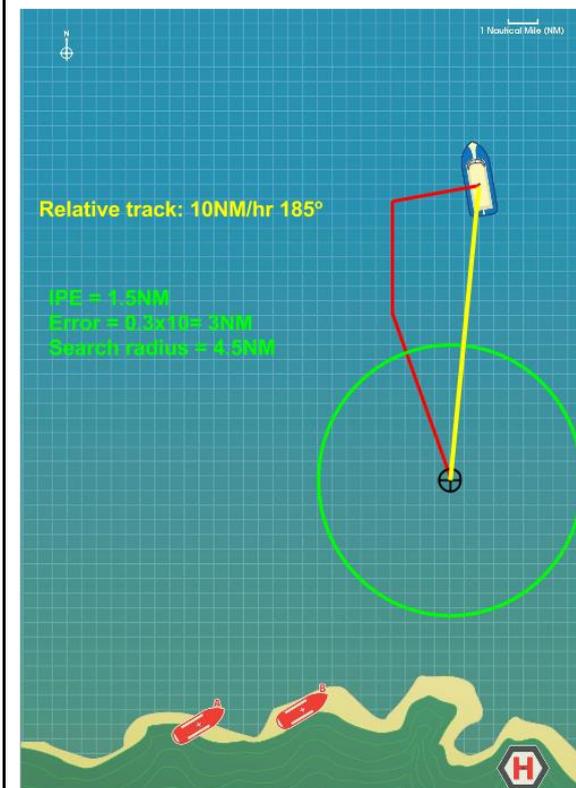
The coastguard has calculated the following:

- Tidal drift: 2NM/hr 090°
- Wind driven current: 4NM/hr 210°
- Wind speed 40NM/hr 270°

a) Given the size of the ship, the leeway will be around 15% of the wind speed. Mark on the tidal drift, wind driven current and leeway, and hence find the datum given that it has been 1 hour since the call came through.

b) Using an error factor of 30% (0.3) and adding the IPE of 0.25 NM, mark on a suitable search area, showing your calculations.

c) Calculate the bearing and speed of the relative track to support the coastguard in their search efforts.



6) Another large container ship has experienced engine malfunction. This report has an IPE (initial position error) of 1.5 NM (nautical miles).

The coastguard has calculated the following:

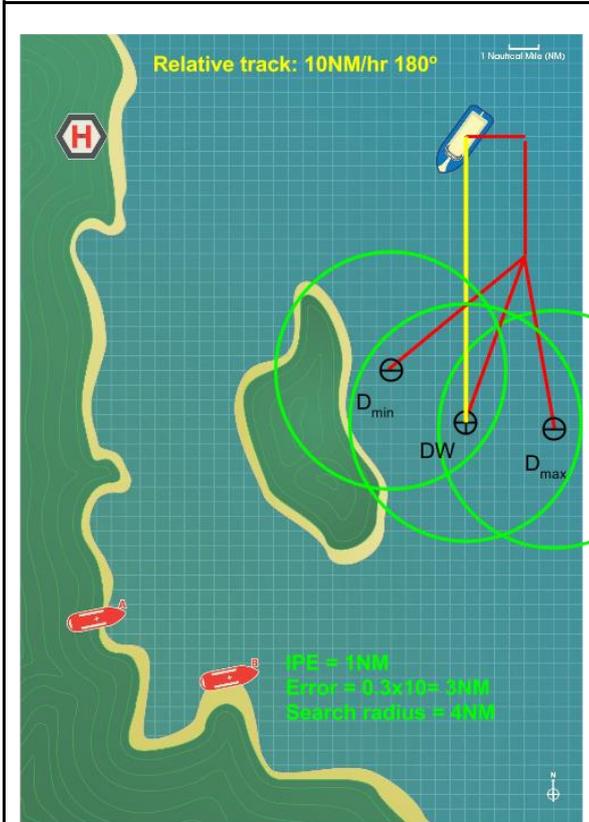
- Tidal drift: 3NM/hr 260°
- Wind driven current: 4NM/hr 180°
- Wind speed 50NM/hr 160°

a) Given the size of the ship, the leeway will be around 12% of the wind speed. Mark on the tidal drift, wind driven current and leeway, and hence find the datum given that it has been 1 hour since the call came through.

b) Using an error factor of 30% (0.3) and adding the IPE of 1.5 NM, mark on a suitable search area, showing your calculations.

c) Calculate the bearing and speed of the relative track to support the coastguard in their search efforts.

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7) Another large container ship has experienced engine malfunction. This report has an IPE (initial position error) of 1 NM (nautical miles).

The coastguard has calculated the following:

- Tidal drift: 2NM/hr 090°
- Wind driven current: 4NM/hr 180°
- Wind speed 30NM/hr 200°

 a) Given the size of the ship, the leeway will be around 10% of the wind speed. Mark on the tidal drift, wind driven current and leeway, and hence find the datum given that it has been 1 hour since the call came through.

 b) Using an error factor of 30% (0.3) and adding the IPE of 1 NM, mark on a suitable search area, showing your calculations.

 c) Calculate the bearing and speed of the relative track to support the coastguard in their search efforts.

 d) The coastguard would like to include divergence in their search calculations. Mark on the D_{min} and D_{max} search areas.