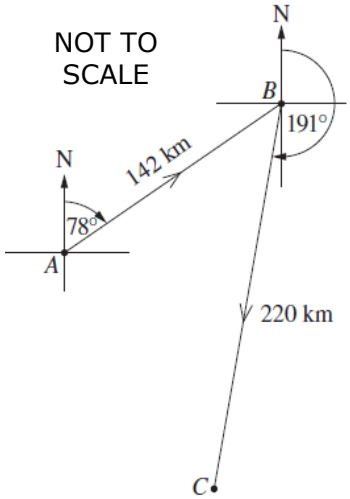
2014 13d Chris leaves island *A* in a boat and sails 142 km on a bearing of 078° to island *B*. Chris then sails on a bearing of 191° for 220 km to island *C*, as shown in the diagram.

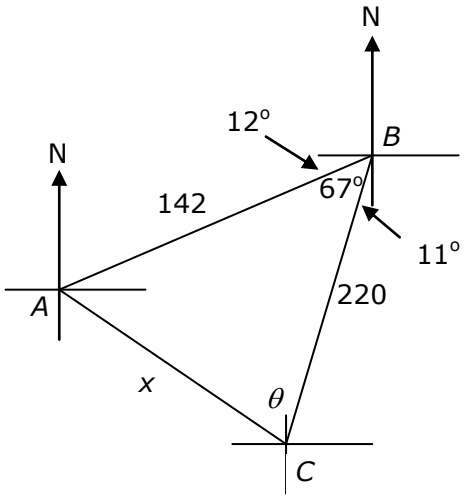


(i) Show that the distance from island *C* to island *A* is approximately 210 km. **2**

(ii) Chris wants to sail from island *C* directly to island *A*. On what bearing should Chris sail? Give your answer correct to the nearest degree. **3**

(i) $270 - (12 + 191) = 67$

$\therefore \angle ABC = 67°$



Let $AC = x$:

$x^2 = 142^2 + 220^2 - 2(142)(220)\cos 67°$

$= 44\,151.11909...$

$x = 210.1216769...$

$= 210$ (nearest whole)

$\therefore$ distance is approx. 210 km.

(ii) Let $\angle ACB = \theta$:

$$\text{Cos } \theta = \frac{210^2 + 220^2 - 142^2}{2(210)(220)}$$

$= 0.782857142...$

$\theta = 38.47707775...$

$= 38$ (nearest whole)

Also, $191 - 180 = 11$, $38 - 11 = 27$ and $360 - 27 = 333$.

$\therefore$ bearing is 333°.

State Mean:
1.45
1.74

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by BOSTES.

Board of Studies: Notes from the Marking Centre

(i) Better responses included a large neat diagram with all information given in the question clearly labelled.

Common problems were:

- incorrectly stating and using the cosine rule;
- correctly substituting into a form of the cosine rule and then just stating the given answer;

- using the given value of $AC = 210$ and the sine rule to find $\angle CDE = 89^{\circ}$;
- using incorrect $\angle CDE$ due of a lack of understanding of bearings and poorly drawn diagrams.

(ii) Candidates who drew a diagram had much greater success with this part. In better responses, candidates used the sine rule to find $\angle ACB$ using sides AC and AB and $\angle ABC$, then correctly calculated the size of the angle between north and AC at C. The correct bearing was then easily found by calculation.

Common problems were:

- not finding the bearing;
- not using the given value of AC from d(i);
- mislabelling angles and confusing the A, B and C from the question with the A, B and C in their sine and cosine rule formulae;
- incorrectly rounding angles and not using brackets correctly when calculating the final bearing;
- citing new angles and sides lengths drawn perhaps on the diagram in the question booklet, but not visible in the answer booklet;
- finding $\angle CED$ and just subtracting without considering the bearing from north.

http://www.boardofstudies.nsw.edu.au/hsc_exams/2014/pdf_doc/2014-maths.pdf