1. A lighthouse, *L,* is 3.2 km due West of a port, *P*.
   A ship, *S*, is 1.9 km due North of the lighthouse, *L*.
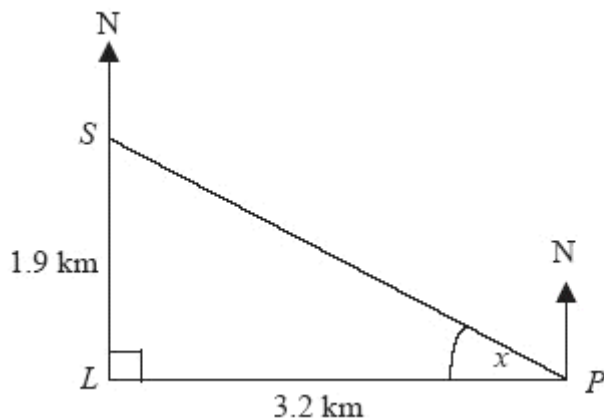

Diagram **NOT** accurately drawn

(a) Calculate the size of the angle marked *x*.
    Give your answer correct to 3 significant figures.

$x =$ ……………….. °

(3)

(b) Find the bearing of the port, *P*, from the ship, *S*.
    Give your answer correct to 3 significant figures.

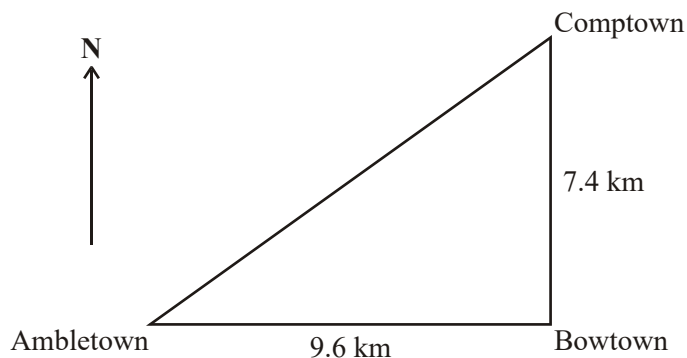…………………... °

(1)
(Total 4 marks)

2.

Diagram **NOT** accurately drawn

Ambletown, Bowtown and Comptown are three towns.

Ambletown is 9.6 km due west of Bowtown.
Bowtown is 7.4 km due south of Comptown.

Calculate the bearing of Ambletown from Comptown.
Give your answer correct to one decimal place.

..............................°
(Total 4 marks)

1. (a) 30.7   3

$$\tan x = \frac{1.9}{3.2}$$

$$x = \tan^{-1}\left(\frac{1.9}{3.2}\right) = 30.7$$

M1 for tan x = $\frac{1.9}{3.2}$ or tan $\frac{1.9}{3.2}$

M1 for $\tan^{-1}\left(\frac{1.9}{3.2}\right)$

A1 for 30.6 – 30.7

(b)   121   1

90 + "30.7"

> *B1 (indep) ft for 90 + "30.7" rounded to 3 or 4 s.f*

[4]

2.   232.4°   4

$\tan C = \dfrac{9.6}{7.4}$

$C = \tan^{-1} \dfrac{9.6}{7.4}$

$C = 52.4$

Bearing = 180 + "52.4"

> *M1 for $\tan C = \dfrac{9.6}{7.4}$*
>
> *M1 for $C = \tan^{-1} \dfrac{9.6}{7.4}$*
>
> *A1 for 52.4 or better*
> *B1 (indep) for 180 + "52.4.."*

[4]

1.   **Higher Tier**

Weaker candidates always find trigonometry challenging. The first task was to use tan and identify the sides correctly. The next step was to calculate 1.9 ÷ 3.2 and then find the inverse tangent. Here many candidates came to grief because they wrote $\tan^{-1} \dfrac{1.9}{3.2}$ and found $(\tan^{-1} 1.9) \div 3.2$.

Other candidates made use of the formulae at the front of the examination paper. They worked out the length of *SP* using Pythagoras, followed generally by the sine rule, almost invariably with sin*x* in the denominator. Some were able to complete the calculation and get full marks. Part (b) was poorly done as many candidates did not realise that a bearing was an angle measured clockwise from North.

Intermediate Tier

The majority of candidates made an attempt at answering this question despite it being near the end of the paper, but many did not recognise that they needed to use trigonometry. It was encouraging that most of those that did were able to identify the tangent of the angle as 1.9/3.2. Some were unable to proceed any further and others made errors when finding $\tan^{-1}$ (1.9/3.2). It was not uncommon, for example, for $\tan^{-1}1.9 \div 3.2$ to be evaluated. Very few used their answer from part (a) when attempting to find the bearing in part (b). Those that did often subtracted the angle from 360 or added it to 180, instead of adding it to 90. Many candidates chose to measure the bearing on the diagram, despite the "Diagram NOT accurately drawn" warning.

2.   This was without doubt the question that caused the greatest difficulty on this paper. Many candidates read the request for the bearing of Ambletown from Comptown as a request for the distance between the two towns and 'happily' applied Pythagoras (often correctly). Attempts were made to calculate an angle using trigonometry, often without specifying the angle (eg tan $= \dfrac{7.4}{9.6}$) and often without any real purpose. Those candidates who calculated an angle correctly nearly always went no further; the level of understanding of bearings is a cause for concern.