1. An old tower (BT) leans at 10° away from the vertical (represented by line TG).
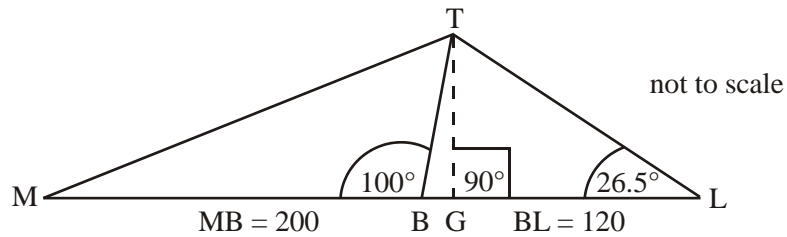
The base of the tower is at B so that $M\hat{B}T = 100°$.

Leonardo stands at L on flat ground 120 m away from B in the direction of the lean.

He measures the angle between the ground and the top of the tower T to be $B\hat{L}T = 26.5°$.

(a) (i) Find the value of angle $B\hat{T}L$.

    (ii) Use triangle BTL to calculate the sloping distance BT from the base, B to the top, T of the tower.

(5)

(b) Calculate the vertical height TG of the top of the tower.

(2)

(c) Leonardo now walks to point M, a distance 200 m from B on the opposite side of the tower. Calculate the distance from M to the top of the tower at T.

(3)
(Total 10 marks)

2. The diagram below shows a field ABCD with a fence BD crossing it. AB = 15 m, AD = 20 m and angle $B\hat{A}D$ = 110°. BC = 22 m and angle $B\hat{D}C$ = 30°.

diagram not to scale
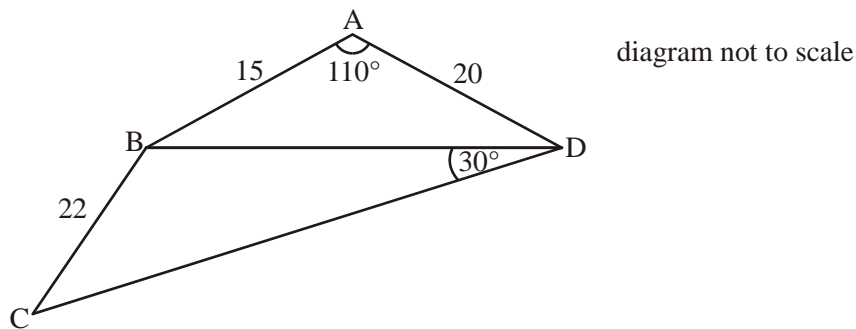
(a) Calculate the length of BD.

(3)

(b) Calculate the size of angle $B\hat{C}D$.

(3)

One student gave the answer to (a) "correct to 1 significant figure" and used this answer to calculate the size of angle $B\hat{C}D$.

(c) Write down the length of BD correct to 1 significant figure.

(1)

(d) Find the size of angle $B\hat{C}D$ that the student calculated, **giving your answer correct to 1 decimal place**.

(2)

(e) Hence find the percentage error in his answer for angle $B\hat{C}D$.

(3)
(Total 12 marks)

3. (a) A farmer wants to construct a new fence across a field. The plan is shown below. The new fence is indicated by a dotted line.

Diagram not to scale

75°

40°

410 m
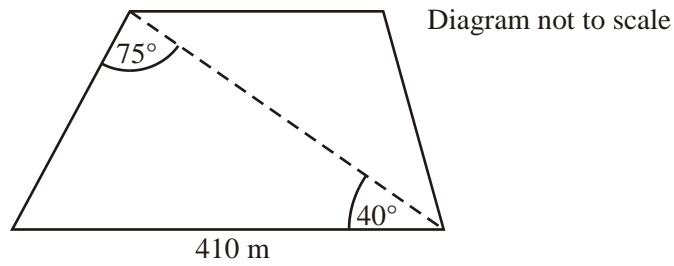
Calculate the length of the fence.

(5)

(b) The fence creates two sections of land. Find the area of the smaller section of land ABC, given the additional information shown below.

A   B

Diagram not to scale

245 m

24°

C
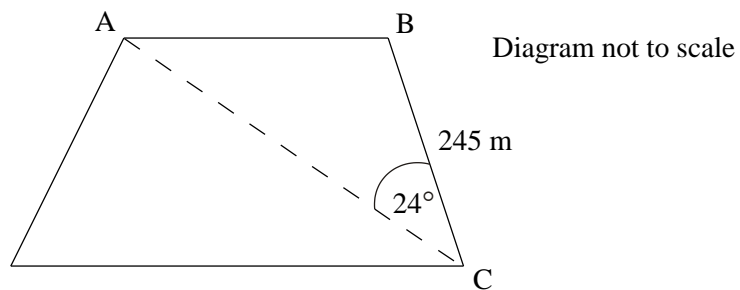
(3)
(Total 8 marks)

4. A recreation park has two trains. Train 1 takes visitors from the entrance (E) to the swimming pool (S), to the mini golf (M) and back to the entrance. Train 2 takes visitors from the entrance (E) to the play area (P), to the racing track (R) and back to the entrance. This is shown in the diagram.
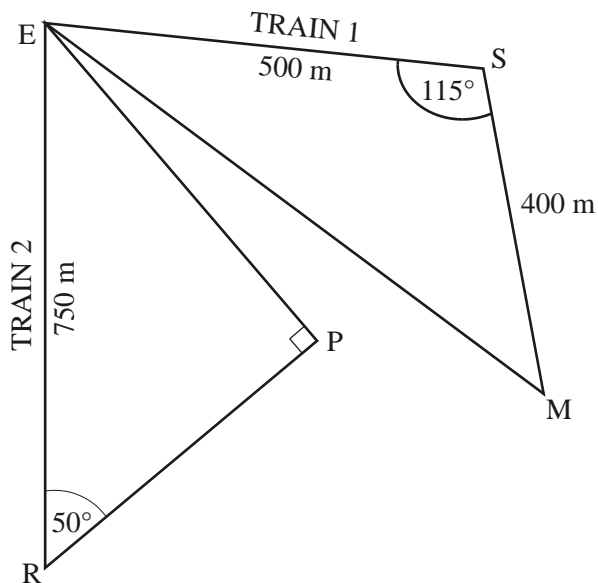
ES = 500 m
SM = 400 m
ER = 750 m
EŜM = 115°
ER̂P = 50°
EP̂R = 90°

[not to scale]

(a) Calculate the total distance **Train 2** travels in one journey from E to P to R to E.

(5)

(b) (i) Show that EM = 761 m correct to 3 s.f..

(ii) If the trains travel at 2 ms^{-1} find the time taken for **Train 1** to complete a journey from E to S to M to E. Give your answer to the nearest second.

(6)
(Total 11 marks)