3.3 Trigonometry

Question Paper

Course	DP IB Maths
Section	3. Geometry & Trigonometry
Topic	3.3 Trigonometry
Difficulty	Medium

Time allowed: 120

Score: /92

Percentage: /100

Question 1a

Owen, Henry and Tom are rugby players passing a ball in a park. Owen is at point O, Henry is at point H and Tom is at point T. The distance between Owen and Henry is 25 m and the distance between Henry and Tom is 18 m. The angle $O\hat{H}T$ is 96°.

(a)   (i)   Draw and label a diagram to represent the situation described above.

   (ii)   Find the length of the line OT.

[4 marks]

Question 1b

(b) Find the size of the angle $O\hat{T}H$.

[3 marks]

Question 1c

(c) Find the area of the section of the park the players are using to pass the ball.

[3 marks]

Question 2a

A sailboat race takes place annually for under 18's on a large lake. The competitors must sail around five flagged buoys at the points A, B, C, D and E, in a clockwise direction.

B is due east of A, C is due south of B and A is due north of E.
The bearing from A to C is 110° and the bearing from C to D is 220°.
The distance AB = 1200 m, the distance BC = 600 m, the distance CD = 800 m and the distances DE = EA = 1000 m.

(a) Draw and label a diagram to show the buoys A, B, C, D and E and clearly mark the bearings and distances given above.

[3 marks]

Question 2b

The boats all start at A and must complete the course 5 times. A support motorboat is present and can travel across the course from A to C and A to D in case of an emergency.

(b) Calculate the distance from A to C.

[2 marks]

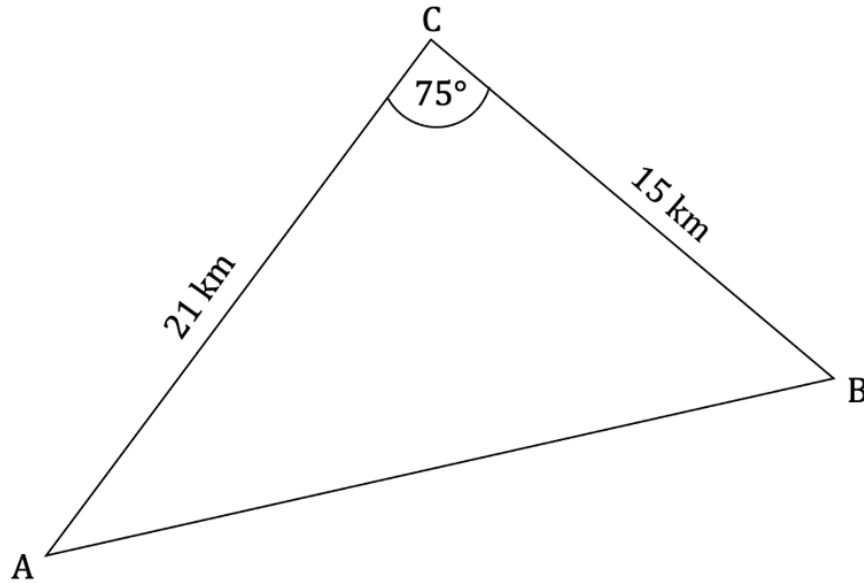## Question 2c

(c) Calculate the distance from A to D.

[3 marks]

Question 2d

(d) Calculate the bearing the support boat must follow to travel from A to D.

[4 marks]

Question 3a

The following diagram shows triangle ABC. AC = 21 km, CB = 15 km, AĈB = 75°.

(a) Find the area of triangle ABC.

[2 marks]

Question 3b

(b) Find AB.

[3 marks]

Question 3c

(c) Given that it is acute, find $C\hat{A}B$.

[2 marks]

Question 4a

Triangle ABC has an area of 122 cm^2, AB $= 24$ cm and BC $= 11$ cm.

(a) Draw and label a diagram to show triangle ABC and clearly mark the distances given.

[1 mark]
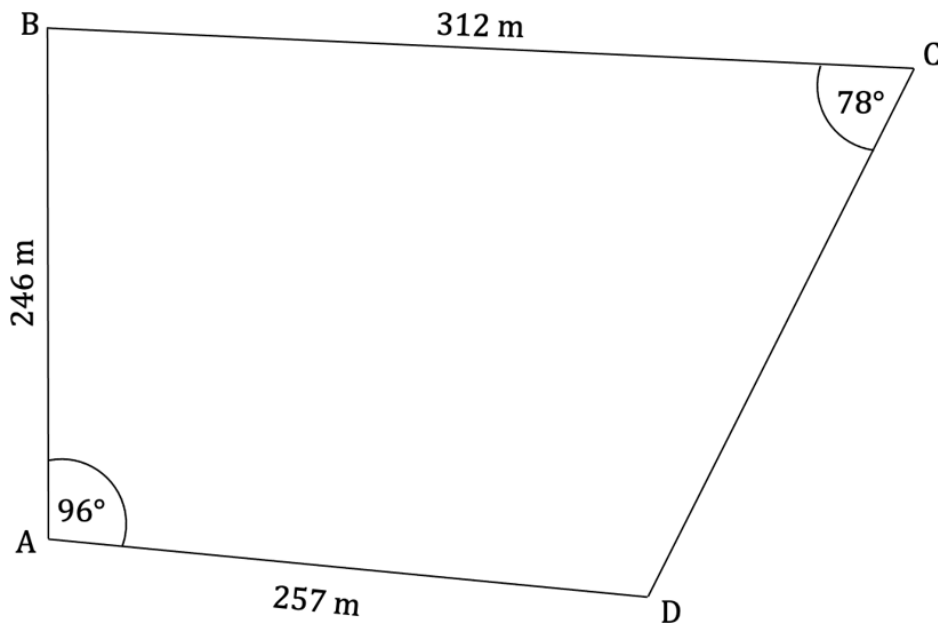
Question 4b

(b) Given that $A\hat{B}C$ is acute, find

    (i) $A\hat{B}C$

    (ii)   AC.

[4 marks]

Question 5a

The quadrilateral ABCD shown below represents a farm paddock, where AB = 246 m, BC = 312 m and AD = 257 m. Angle $\widehat{DAB}$ = 96° and angle $\widehat{BCD}$ = 78°.

A fence is built connecting points B and D to split the paddock into two.

(a) Find the length of the fence.

[3 marks]

Question 5b

(b) Find the area of the paddock ABCD.

[5 marks]

Question 6a

A 38 m high cliff is perpendicular to the sea and the angle of depression from the cliff to a boat at sea is 24°. Climbing the cliff is a rock climber and the angle of elevation from the boat to the climber 14°.

(a) Draw and label a diagram to show the top of the cliff, T, the foot of the cliff, F, the climber, C, the boat, B, labelling all the angles and distances given above.

[2 marks]

Question 6b

(b) Find the distance from the boat to the foot of the cliff.
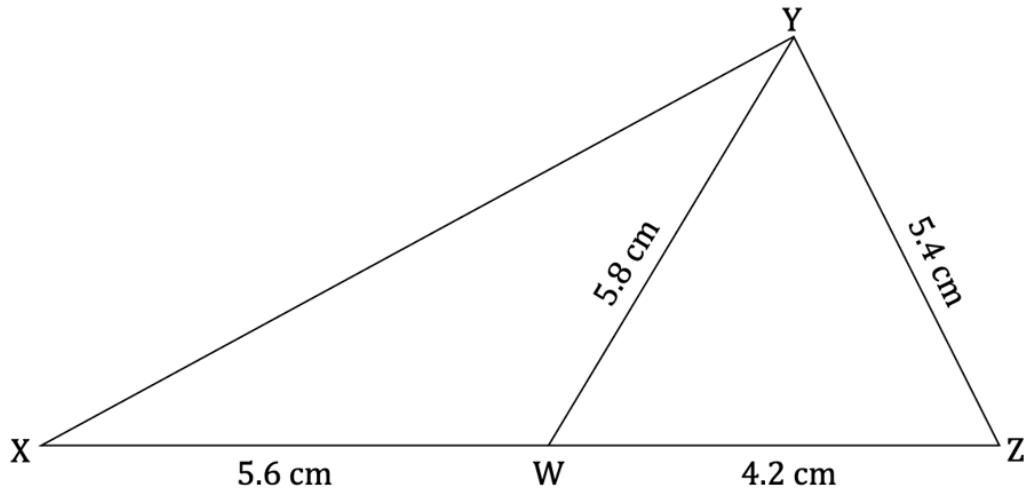
[2 marks]

Question 6c

(c) Find how far the climber must climb to reach the top of the cliff.

[4 marks]

Question 7a

The diagram below shows triangle XYZ with side length YZ = 5.4 cm. The point W is placed such that XW = 5.6 cm and WZ = 4.2 cm and YW = 5.8 cm.

(a) Find the angle YẐW.

[2 marks]

Question 7b

(b) Find the area of triangle XYZ.

[2 marks]

Question 7c

(c) Find the area of triangle XYW.

[3 marks]

Question 8a

The distance between towns X and Y is 134.2 km. The bearing of town X from town Y is 119°. Town Z is 54 km south of town X. The bearing of town Z from town X is 207°.

(a) Draw and label a diagram to show towns X, Y and Z, clearly marking the bearings and distances given above.

[2 marks]

Question 8b

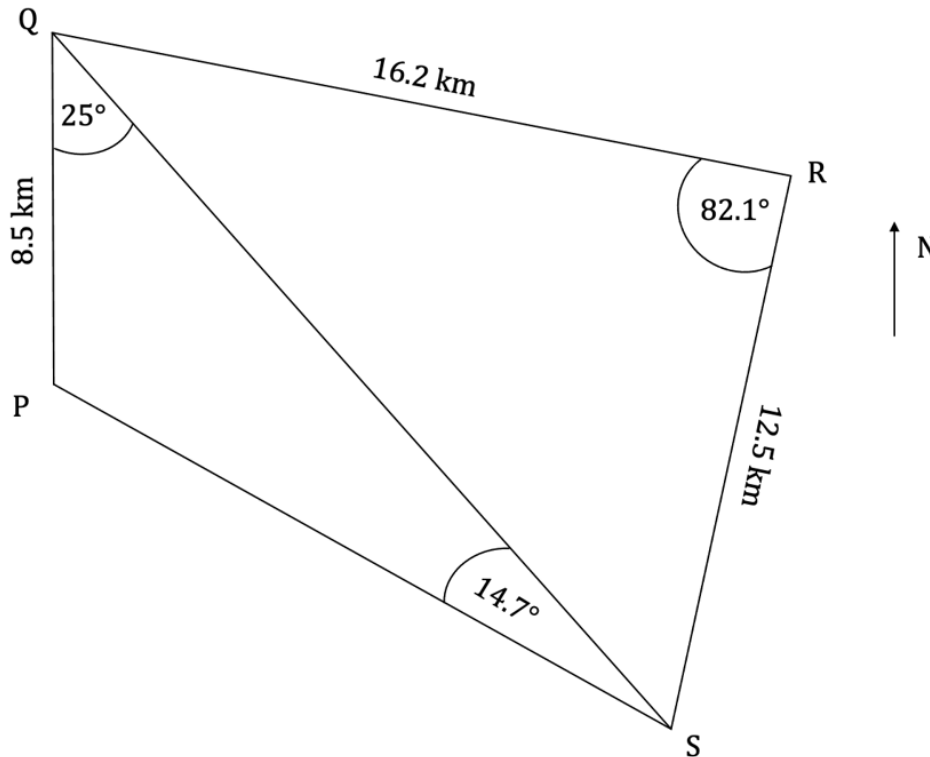(b) Calculate the distance between towns X and Z.

[2 marks]

Question 8c

(c) Calculate the distance between towns Y and Z.

[4 marks]

Question 9

The diagram below shows four Islands P, Q, R and S. PQ = 8.5 km, QR = 16.2 km and RS = 12.5 km. Angle $P\hat{Q}S$ = 25°, angle $Q\hat{S}P$ = 14.7° and angle $Q\hat{R}S$ = 82.1°. Island Q is due north from Island P.

Mark is making deliveries around the Islands. He takes milk from Island Q to Island S, then takes wood from Island S to Island P, finally he delivers fruit from Island P to Island R.

Find the total distance Mark travels.

[8 marks]

Question 10a

Nathan (N) stands 10 m above the ground on the second-floor balcony of an apartment building and can see Melissa (M) in the car park. The angle of elevation from Melissa to Nathan is 21.6°.

(a) Calculate the distance from M to N.
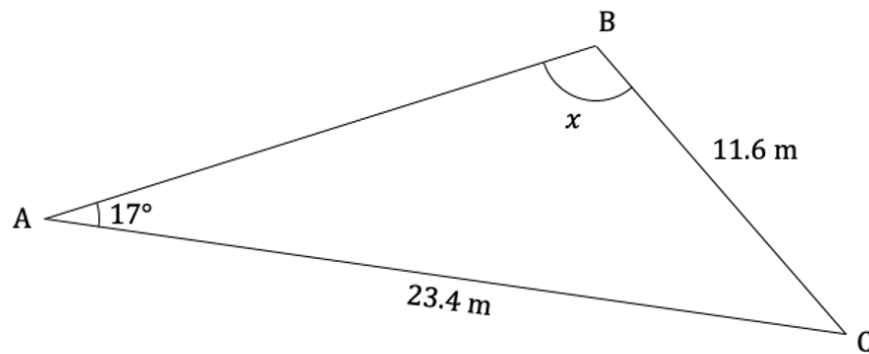
[2 marks]

Question 10b

Louisa (L) is standing on the other side of the car park. The distance between Louisa and Nathan is 1.5 times the distance between Melissa and Nathan.

(b) Calculate the angle of depression from N to L.

[3 marks]

Question 11a

The diagram below shows a field ABC, with angle $B\hat{A}C = 17°$, BC = 11.6 m and AC = 23.4 m.

(a) Given that $B\hat{C}A$ is acute, find the value of x.

[3 marks]

Question 11b

(b) Calculate the perimeter of the field.

[3 marks]

Question 12a

The diagram below shows an architect's drawing of the front view of a house. The house is in the shape of a rectangle with a height of 10.8 m and has a roof in the shape of a right-angled isosceles triangle, BCD. BD = 12.2 m, angle BĈD = 90°. Next to the house is a garage in the shape of a rectangle measuring 4 m × 3.6 m with a roof in the shape of a right-angled triangle with a base, GF, of 4 m and angle EF̂G = 37°.
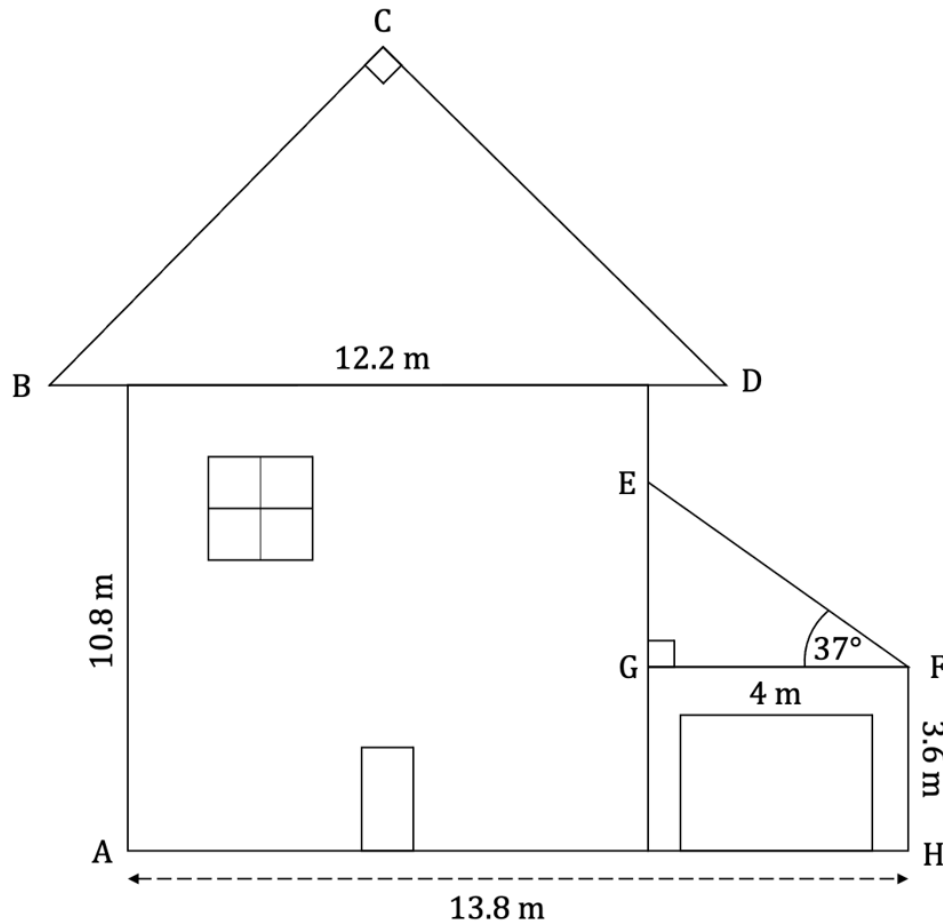
(a) Find the length of

   (i)   EG

   (ii)   BC.

[2 marks]

Question 12b

(b) Find the total area of the front view of the house.

[6 marks]