3.1 Geometry Toolkit

Question Paper

Course	DP IB Maths
Section	3. Geometry & Trigonometry
Topic	3.1 Geometry Toolkit
Difficulty	Medium

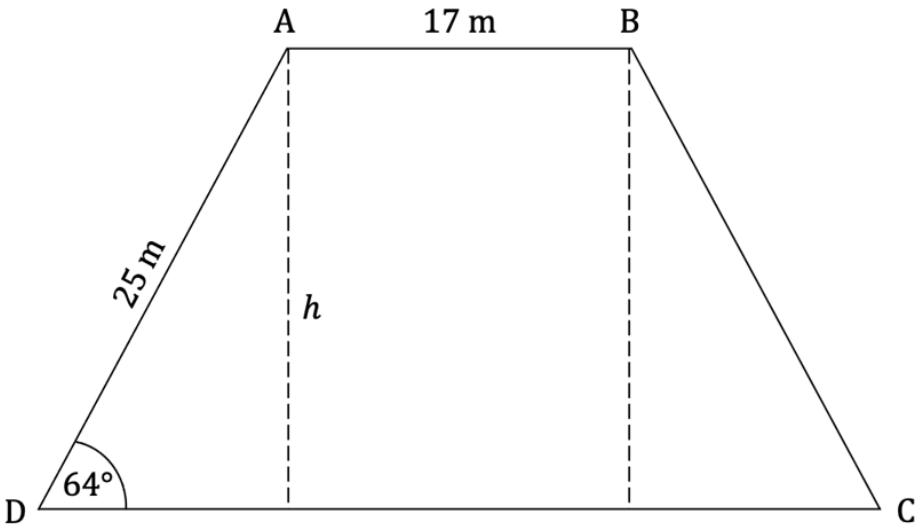
Time allowed: 100

Score: /83

Percentage: /100

Question 1a

ABCD is an isosceles trapezoid where AB = 17 m and AD = BC = 25 m, as shown in the diagram below.



(a) Find the height, h, of the trapezoid.

[2 marks]

Question 1b

(b) Find the area of the trapezoid.

[4 marks]

Question 2

The distance between Ho Chi Minh City and Hong Kong is known to be 1500 km. The bearing of Hong Kong from Ho Chi Minh City is 046°. Another city, Brisbane, is 6500 km from Ho Chi Minh City on a bearing of 136°. Calculate the distance between Hong Kong and Brisbane.

[3 marks]

Question 3a

Point A has coordinates $(4, -6)$ and point B has coordinates $(8, 6)$.

(a) Calculate the distance of the line segment AB.

[2 marks]

Question 3b

(b) Find the equation of the line connecting points A and B.
Give your answer in the form $y = mx + c$.

[2 marks]

Question 3c

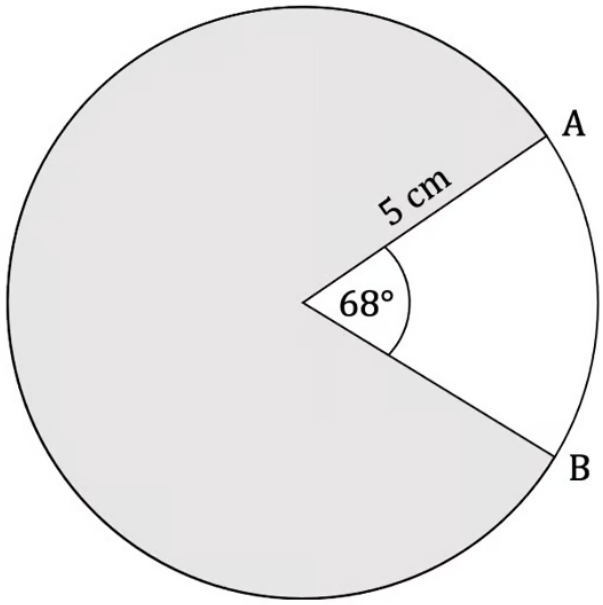
(c) (i) Find the midpoint of [AB].

(ii) Find the equation of the perpendicular bisector to the line segment AB. Give your answer in the form $y = mx + c$.

[4 marks]

Question 4a

The diagram below shows a circle with a 68° sector cut from it. The radius of the circle is 5 cm.



(a) Find the length of

(i) the minor arc AB

(ii) the major arc AB.

[3 marks]

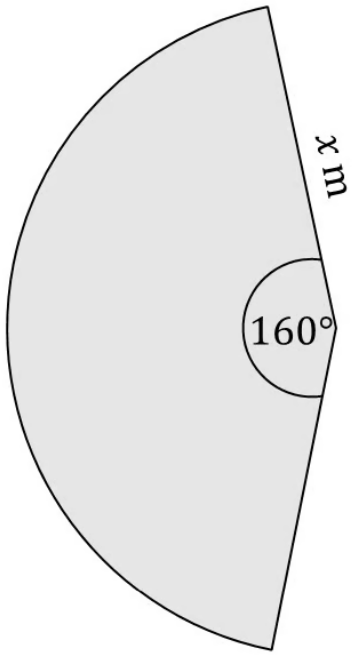
Question 4b

(b) Find the area of the shaded region.

[3 marks]

Question 5a

A lawn sprinkler sprays water over a lawn covering an arc of 160° with a maximum spray distance of x m as shown in the diagram below. The lawn sprinkler waters 20 m^2 of the lawn.



(a) Calculate the value of x.

[4 marks]

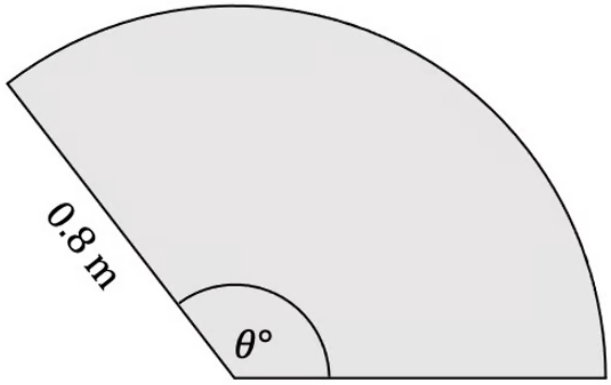
Question 5b

(b) Calculate the length of the outer arc.

[3 marks]

Question 6a

A windscreen wiper blade is 0.8 m long. When in motion the blade moves through an arc of $\theta°$ and wipes an area of $\frac{4}{15}\pi$ m^2.



(a) Calculate the value of θ.

[4 marks]

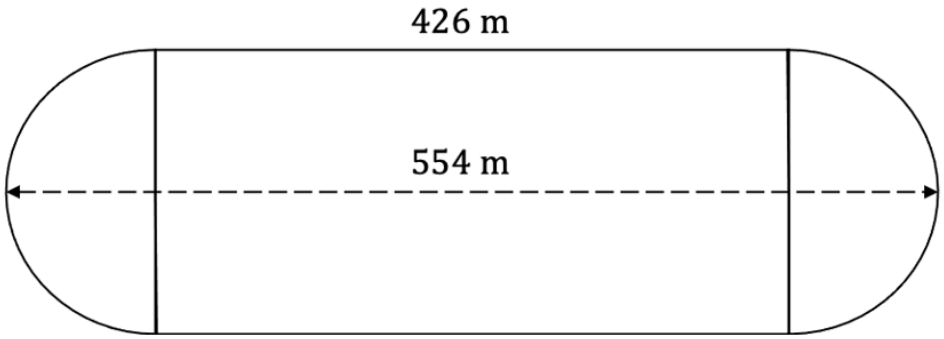
Question 6b

(b) Calculate the length travelled by the outer edge of the blade.

[3 marks]

Question 7a

The diagram below shows a dirt racetrack where the straights are 426 m long and the longest distance from one end of the track to the other is 554m.



(a) Find the total distance around the racetrack.

[3 marks]

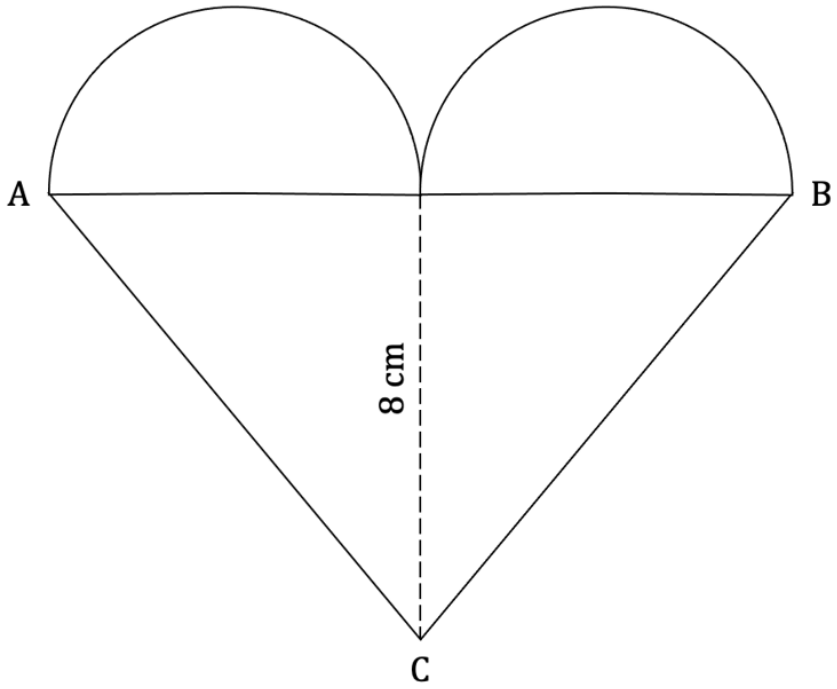
Question 7b

(b) Find the total area enclosed by the racetrack.

[4 marks]

Question 8a

The diagram below shows a cookie cutter in the shape of a heart constructed from a triangle and two identical semi circles. The height of the triangle is 8 cm and its base AB is 13.34 cm.



(a) Find the length of the line AC.

[2 marks]

Question 8b

(b) Calculate the total area of the heart.

[4 marks]

Question 8c

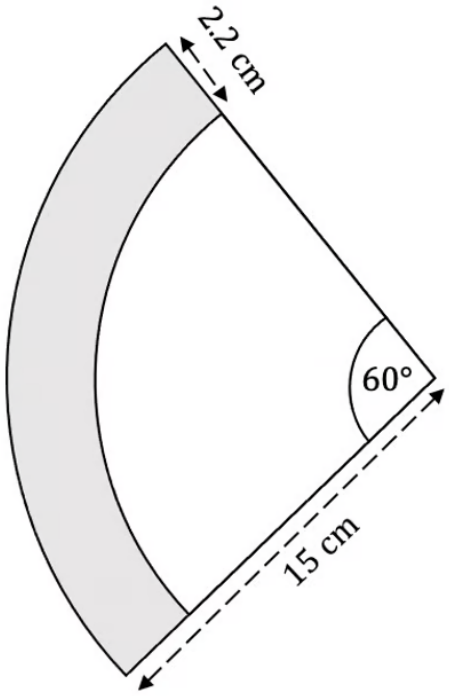
Bob makes some cookie dough and rolls it out on his kitchen bench. The cookie dough covers 1314 cm^2.

(c) Find the number of **full** cookies Bob can cut from the dough.

[2 marks]

Question 9a

The diagram below shows a slice of pizza that forms a sector of a circle with an arc of 60° and radius of 15 cm. The width of the crust is 2.2 cm.



(a) Find the perimeter of the slice of pizza.

[3 marks]

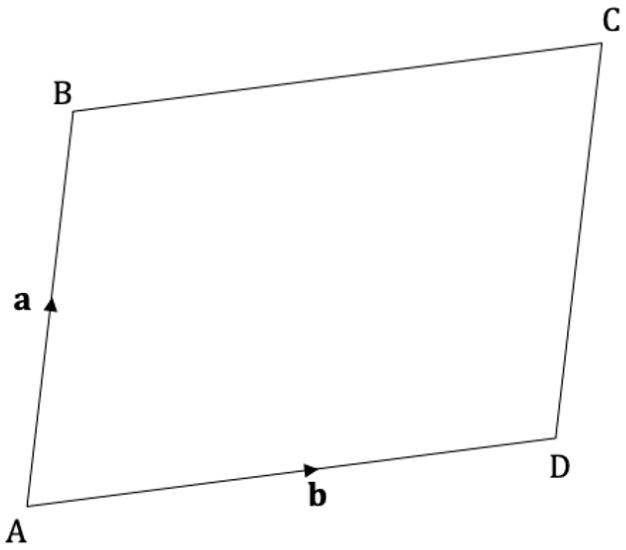
Question 9b

(b) Find the area of the crust.

[3 marks]

Question 10a

A parallelogram ABCD is shown in the diagram below.



$\overrightarrow{AB} = \mathbf{a}$ and $\overrightarrow{AD} = \mathbf{b}$.

A new line is added to the diagram connecting B to D.

A point X lies $\frac{2}{3}$ of the way along $\overrightarrow{BD}$.

(a) Express $\overrightarrow{CX}$ in terms of **a** and **b**.

[4 marks]

Question 10b

A new point Y lies on the line CD such that AXY is a straight line.

(b) Express $\overrightarrow{AY}$ in terms of **a** and **b**.

[3 marks]

Question 11a

Three points are located at A(0, 5), B(6, 4) and C(16, 8).

(a) (i) Find the magnitude of vector $\overrightarrow{AB}$.

(ii) Find the magnitude of vector $\overrightarrow{BC}$.

[4 marks]

Question 11b

(b) Given that the angle $A\widehat{B}C$ is a right angle, find the area of triangle ABC.

[2 marks]

Question 12a

The points A, B, C and D have position vectors $\mathbf{a}$, $\mathbf{b}$, $\mathbf{c}$ and $\mathbf{d}$, relative to the origin O.

The position vectors are given by

$$\mathbf{a} = 2i + 4j - k$$
$$\mathbf{b} = -ri + j + 2k$$
$$\mathbf{c} = 3i + sj$$
$$\mathbf{d} = 2i - 2j - tk$$

where r, s and t are constants.

(a) Given that $\overrightarrow{BA} = \overrightarrow{CD}$, find r, s and t

[5 marks]

Question 12b

A fifth point, E, has position vector **e**, relative to the origin O.

(b) Given that $\overrightarrow{AE} = 3\overrightarrow{CD}$, find the position vector of E.

[5 marks]

Question 12c

(c) Find the unit vector that has the same direction as **e**.

[2 marks]