IBDP SL Mathematics

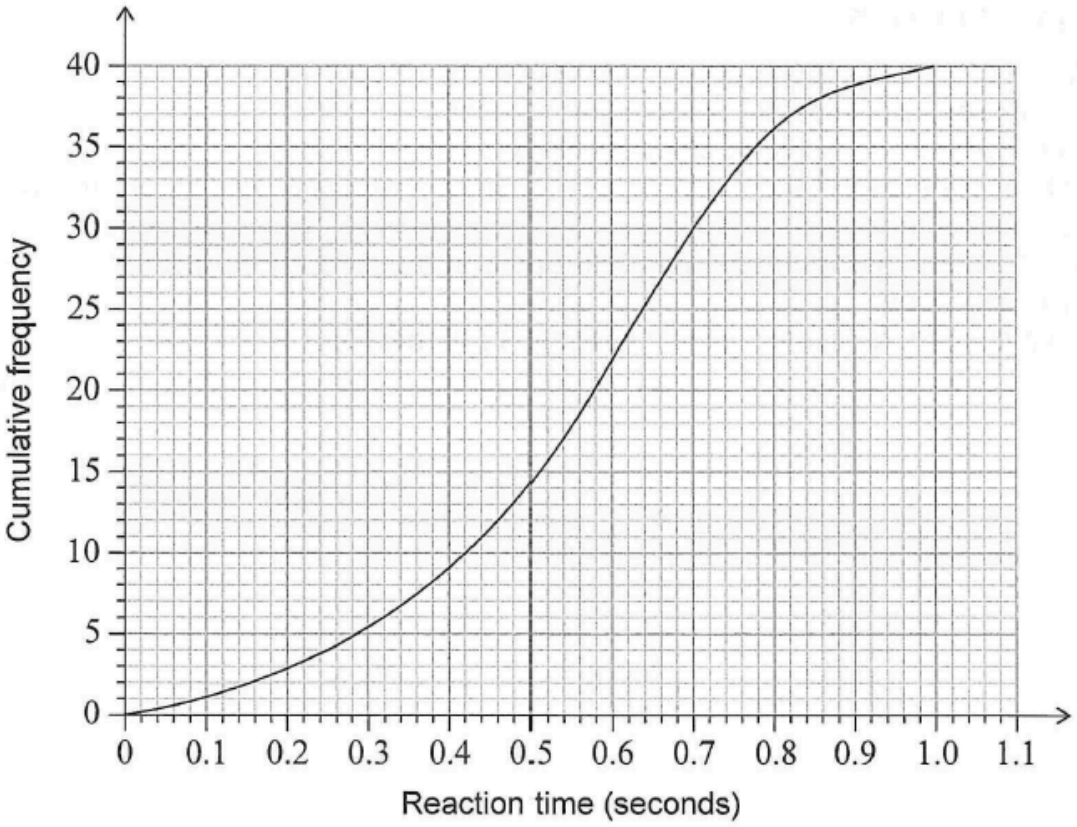
Applications & Interpretation

Year 1 – Semester 2 Final Examination - Paper 2

Question 1

[Maximum mark: 17]

Mackenzie conducted an experiment on the reaction times of teenagers. The results of the experiment are displayed in the following cumulative frequency graph.



(a) Use the graph to estimate the

(i) median reaction time;

(ii) interquartile range of the reaction times. [4]

(b) Find the estimated number of teenagers who have a reaction time greater than 0.4 seconds. [2]

(c) Determine the 90th percentile of the reaction times from the cumulative frequency graph. [2]

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Mackenzie created the cumulative frequency graph using the following grouped frequency table.

Reaction time, t (s)	Frequency
$0 < t \leq 0.2$	3
$0.2 < t \leq 0.4$	a
$0.4 < t \leq 0.6$	13
$0.6 < t \leq 0.8$	14
$0.8 < t \leq 1.0$	b

(d) Write down the value of

(i) a;

(ii) b. [2]

(e) Write down the modal class from the table. [1]

(f) Use your graphic display calculator to find an estimate of the mean reaction time. [2]

Upon completion of the experiment, Mackenzie realized that some values were grouped incorrectly in the frequency table. Some reaction times recorded in the interval $0 < t \leq 0.2$ should have been recorded in the interval $0.2 < t \leq 0.4$.

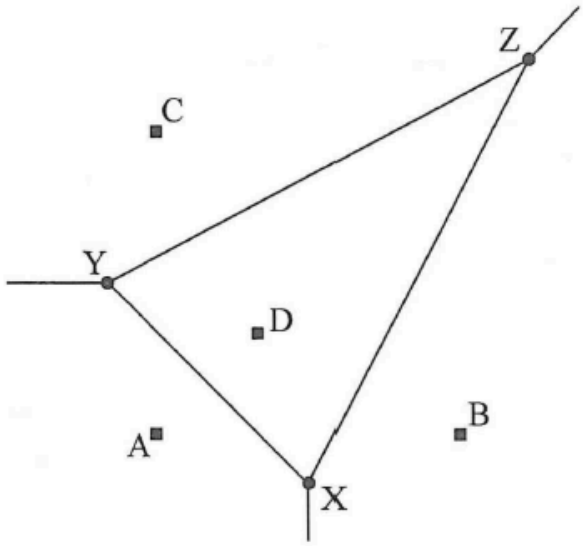
(g) Suggest how, if at all, the estimated mean and estimated median reaction times will change if the errors are corrected. Justify your response. [4]

Question 2

[Maximum mark: 18]

The Voronoi diagram below shows four supermarkets represented by points with coordinates A(0, 0), B(6, 0), C(0, 6) and D(2, 2). The vertices X, Y, Z are also shown. All distances are measured in kilometres.

diagram not to scale



(a) Find the midpoint of [BD]. [2]

(b) Find the equation of (XZ). [4]

The equation of (XY) is $y = 2 - x$ and the equation of (YZ) is $y = 0.5x + 3.5$.

(c) Find the coordinates of X. [3]

The coordinates of Y are $(-1, 3)$ and the coordinates of Z are $(7, 7)$.

(d) Determine the exact length of [YZ]. [2]

(e) Given that the exact length of [XY] is $\sqrt{32}$, find the size of $X\hat{Y}Z$ in degrees. [4]

(f) Hence find the area of triangle XYZ. [2]

A town planner believes that the larger the area of the Voronoi cell XYZ, the more people will shop at supermarket D.

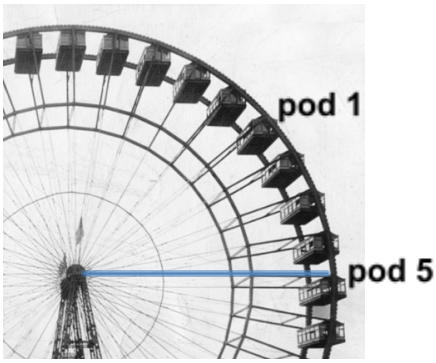
(g) State one criticism of this interpretation. [1]

Question 3 (19 marks)

The original Ferris Wheel, named after George Washington Gale Ferris, was built in Chicago in 1883. It had a circumference of 251 meters. Today, the tallest Ferris wheel in the world is in Dubai and is three times the height of the original.

a. Find the height of both Ferris wheels. [3]

b. For the original Ferris Wheel, given that pod 5 is on a horizontal line from the center of the wheel, and that the arc length between pod 1 and pod 5 is 14.03 meters, find the angle between these two pods. [3]



c. With pod 1 at the position shown, find it's height above the ground. [4]

d. Calculate the location of the passenger pod on the Ain Dubai Ferris wheel (shown below) that would be the same height above the ground as pod 1 on the original Ferris Wheel above. Create a diagram using the given image and give your answer for the location of the pod as an angle of elevation or depression from the center of the wheel. [3]

e. i. Estimate (guess) the cost per minute for a trip on the Ain Dubai Ferris wheel: _____ euro per minute. [1]

ii. The Ain Dubai passenger pods move at a speed, along the arc of the circle, of 20 meters per minute, and the cost of a ticket is 130 UAE dirhams. One euro can be exchanged for 4.21 UAE dirhams. Calculate the cost per minute. [3]

iii. Calculate the percentage error of your estimate in i. above. [2]

