

**Mathematics: Applications and Interpretations SL**

**Paper 1.**

**Version 3**

1. A formula is as follows:

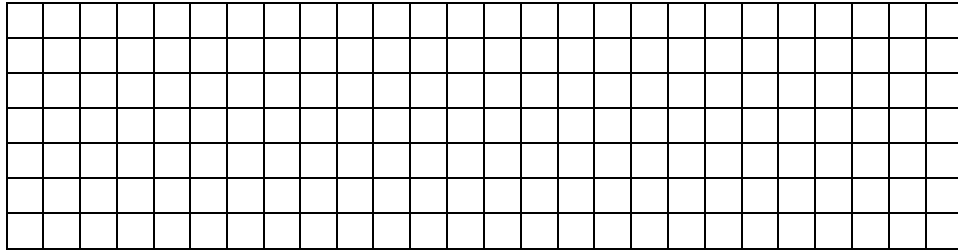
$$A = \frac{30\pi r^2 \sin \theta}{4}$$

- a) Given that  $r = 5.5\text{cm}$ ,  $\theta = 87$  and  $\pi = 3.14$  estimate the area,  $A$ . (2)
- b) State your answer to a) in the form  $a \times 10^b$ , where  $1 \leq a < 10$  and  $b \in \mathbb{Z}$ . (2)
- c) Work out the actual area by using  $\pi$ . (2)
- d) Work out the percentage error between your answer to a) and c) (2)

2. The scores for 8 students have been recorded by a teacher, but the last one is illegible:

3, 5, 7, 8, 4, 5, 6,  $x$

- a) She recalls the mean is 5.5. Hence, work out the value of  $x$ . (2)
- b) Using your GDC, determine the interquartile range of the values. (2)
- c) Graph a box and whiskers plot for this data in the space below: (3)



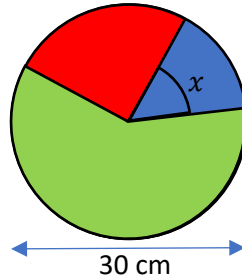
- d) A new student takes the exam, scoring 10. Determine if this student is an outlier, using calculations to justify your answer. (2)

3. Due to inflation, economists predict the cost of half a dozen eggs,  $C$  in USD, will follow this model, where  $n$  is the number of years since 2020:

$$C(n) = 2.00 (1.087)^n$$

- i) State the predicted rate of inflation the economists are using in the model. (1)
- ii) Estimate the price of eggs in 2030. (2)
- iii) Determine the first year in which half a dozen eggs first exceed 5.50 USD (3)

4. A dart board has the following targets:



NOT TO SCALE

- a) Given the angle of the blue sector is  $x$ , the angle of the red sector is  $2x$  and the angle of the blue sector is  $6x$ , show that  $x = 40$  (2)
- b) Find the area of the red section, given that the diameter of the dartboard is 30 cm. (2)

- c) Complete the probability table: (2)

Sector ( $x$ )	Blue	Red	Green
Probability ( $X = x$ )	$\frac{1}{9}$		

- d) The prize awarded for blue is 10 points. For red it is 4 points. Given that the expected mean score is 4, determine the points awarded for hitting the green target. (3)

5. The results of an investigation into commute time and type of transport are presented as follows:

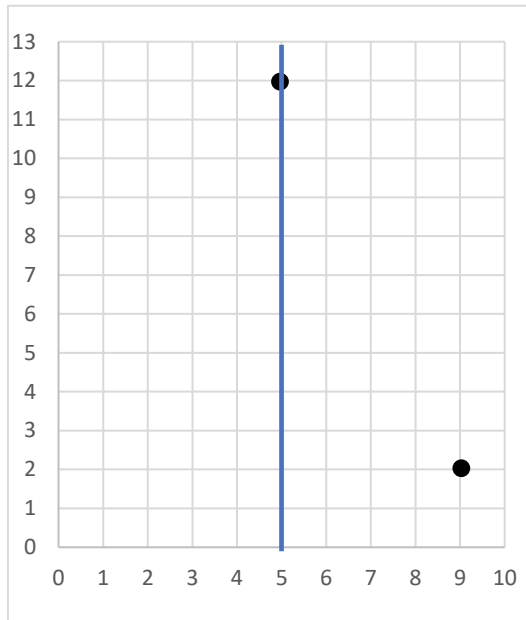
Time to commute, $t$ , in minutes	Car	Bike	Bus
$0 \leq t < 10$	25	15	10
$10 \leq t < 20$	$x$	5	15
$20 \leq t < 30$	10	8	5
$30 \leq t < 40$	5	12	5

A chi-squared test of independence is to be carried out. The researcher has chosen a 5% level of significance.

- Given that 120 people were observed, work out the value of  $x$ . (2)
- State the null hypothesis. (1)
- Show that the  $df = 6$  (2)
- Work out the expected number of individuals taking less than 10 minutes to commute and take the bus. (2)
- Work out the p-value. (1)
- Conclude on the study. (2)

6. A campground has been mapped.

:



There are toilet facilities located at A (1, 8), B (5, 12) and C (9, 2).

Someone has started to complete a Voronoi diagram, by adding perpendicular bisectors between B and C, and A and C.

a) State the equation of the perpendicular bisector between A and C. (2)

The work needs to be continued.

b) Work out the coordinates of the midpoint of A and B. Mark it on the diagram. (2)

c) Calculate the gradient between A and B. (2)

d) Hence, state the gradient of the perpendicular bisector of AB, and add it to the diagram. (2)

e) Complete the Voronoi diagram by clearly indicating the regions closest to A, B, and C. (2)

