



IB DIPLOMA PROGRAMME

Test 1 P2

Mathematics Standard Level SL

Test on Straight Lines, Surds, Sets and Venn Diagrams, Data and Sampling and Statistics

October 2019

GDC

35 minutes

Instructions to candidates:

- Write down your name in the space provided.
- You can open this paper when given to you, but you will not be able to use your calculator until instructed.
- A graphic display calculator **must be used** for this test.
- Answer all the questions.
- Write your answers in the spaces provided.
- You are advised to show all working, where possible. Where an answer is wrong, some marks may be given for correct method, provided this is shown by written working.
- Unless otherwise stated in the question, all numerical **answers** must be given **exactly** or rounded to 3 significant figures.

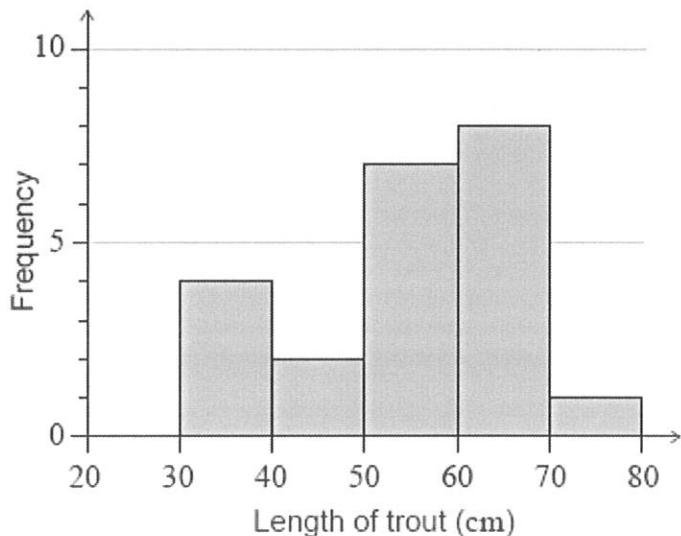
Points: _____ /41

Grade:

Name: _____ *Solutions* _____

Teacher: (AA, ARC or ANU) _____

1. The lengths of trout in a fisherman's catch were recorded over one month, and are represented in the following histogram.



- (a) Complete the following table.

[2 marks]

Length of trout	Frequency
20 cm < trout length ≤ 30 cm	0
30 cm < trout length ≤ 40 cm	4
40 cm < trout length ≤ 50 cm	2
50 cm < trout length ≤ 60 cm	7
60 cm < trout length ≤ 70 cm	8
70 cm < trout length ≤ 80 cm	1

A2 all correct
A1 one mistake

- (b) State whether length of trout is a continuous or discrete variable.

[1 mark]

Continuous

A1

- (c) **Write down** the modal class.

[1 mark]

$$60 \leq l \leq 70$$

A 1

Any trout with length 40 cm or less is returned to the lake.

- (d) Calculate the percentage of the fisherman's catch that is returned to the lake.

[2 marks]

4 out of 22 Al for 22

$$\frac{4}{22} \times 100\% = 18.18\dots = 18.2\%$$

A1

- (e) Estimate the mean trout length.

[2 marks]

Mid-value

$$\bar{x} = \frac{1210}{22} = 55 \text{ cm} \quad A1$$

12

45

33 4

65 8

73

.....

nate the sta-

$$\bar{x} = \frac{1210}{22}$$

$$= 55 \text{ cm} \quad \text{AI}$$

If for sample without
40 cm or less

m_1 for mid-values

- (f) Estimate the standard deviation of the trout lengths.

[1 mark]

$$\sigma = 11.6774.$$

$$\sigma = 11.7 \text{ cm}$$

A |

$$\left(\sigma = 7.62 \right)$$

2. Consider the following Venn diagrams.

Diagram 1

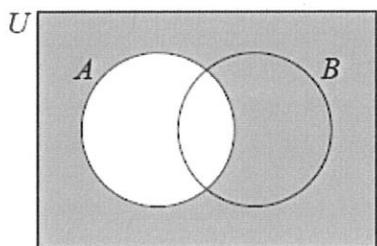


Diagram 2

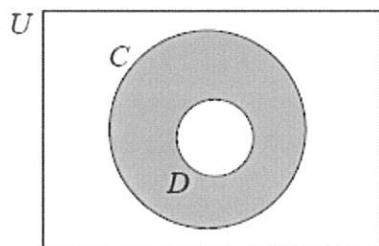
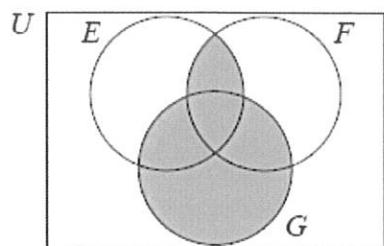


Diagram 3



- (a) Write down an expression, in set notation, for the shaded region represented by Diagram 1.

[1 mark]

A¹

A1

- (b) Write down an expression, in set notation, for the shaded region represented by Diagram 2.

[1 mark]

$D' \cap C$

$(\text{or } (D \cup C')')$

A1

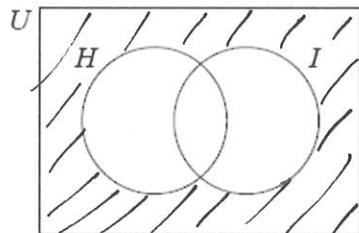
- (c) Write down an expression, in set notation, for the shaded region represented by Diagram 3.

[2 marks]

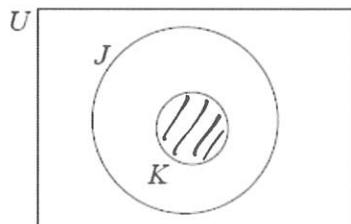
$G \cup (E \cap F)$

A2

(d) Shade, on the Venn diagram, the region represented by the set $(H \cup I)'$. [1 mark]



(e) Shade, on the Venn diagram, the region represented by the set $J \cap K$. [1 mark]



3.

Consider the numbers $3, -5, \sqrt{7}, 2^{-3}$ and 1.75 .

Complete the table below, placing a tick (\checkmark) to show which of the number sets, \mathbb{N} , \mathbb{Q} and \mathbb{R} these numbers belong to. The first row has been completed as an example.

	\mathbb{N}	\mathbb{Q}	\mathbb{R}
3	\checkmark	\checkmark	\checkmark
-5		\checkmark	\checkmark
$\sqrt{7}$			\checkmark
2^{-3}		\checkmark	\checkmark
1.75		\checkmark	\checkmark

[6 marks]

4. The coordinates of point A are (6, -7) and the coordinates of point B are (-6, 2). Point M is the midpoint of AB.

(a) Find the coordinates of M.

[2 marks]

$$M = \left(\frac{-6+6}{2}, \frac{-7+2}{2} \right) \quad M_1$$

$$M = \left(0, -\frac{5}{2} \right) \quad A_1$$

L_1 is the line through A and B.

(b) Find the gradient of L_1 .

[2 marks]

$$m = \frac{2 - (-7)}{(-6) - 6}$$

$$= -\frac{9}{-12}$$

$$= -\frac{3}{4}$$

The line L_2 is perpendicular to L_1 and passes through M.

(c) Write down the gradient of L_2 .

[1 mark]

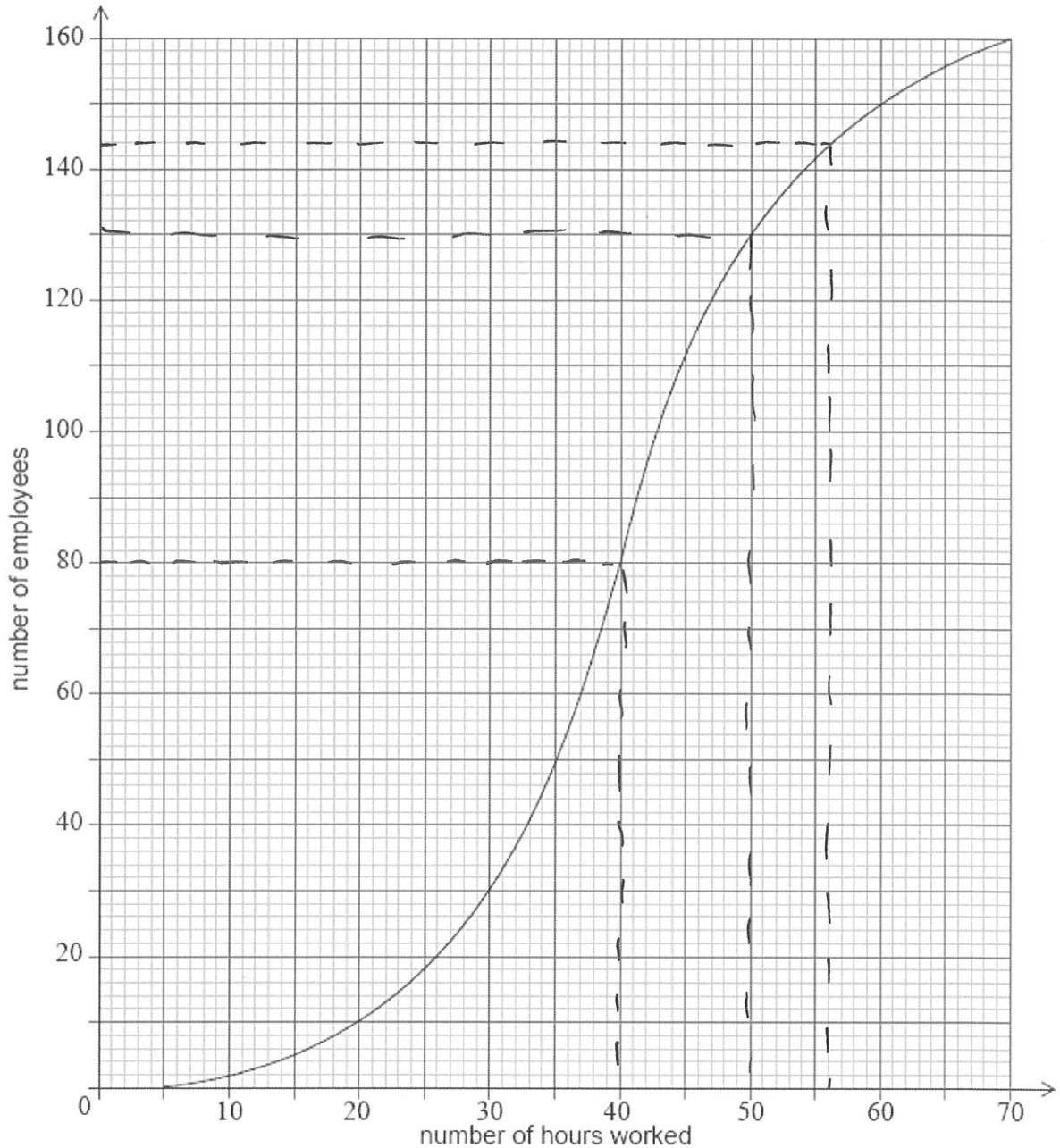
$$\frac{4}{3} \quad A_1 \quad (f.t.)$$

(d) Write down, in the form $y = mx + c$, the equation of L_2 .

[1 mark]

$$y = \frac{4}{3}x - \frac{5}{2} \quad A_1$$

5. A city hired 160 employees to work at a festival. The following cumulative frequency curve shows the number of hours employees worked during the festival.



- (a) Find the median number of hours worked by the employees.

[1 marks]

40 hours

- (b) Write down the number of employees who worked 50 hours or less. [1 mark]

130

- (c) Only 10% employees worked more than k hours. Find the value of k . [2 marks]

$$10\% \text{ of } 160 = 16$$

$$160 - 16 = 144$$

$$56$$

A1

(A1 for 144)

(accept 56.5)

6. An annual dog show averages 3540 visitors. The catering manager is conducting a survey to investigate the proportion of visitors who will spend more than \$20 on food and drinks at the show.

- (a) If he decides to survey the first 40 people through the gate, identify the sampling method used.

[2 marks]

Convenience

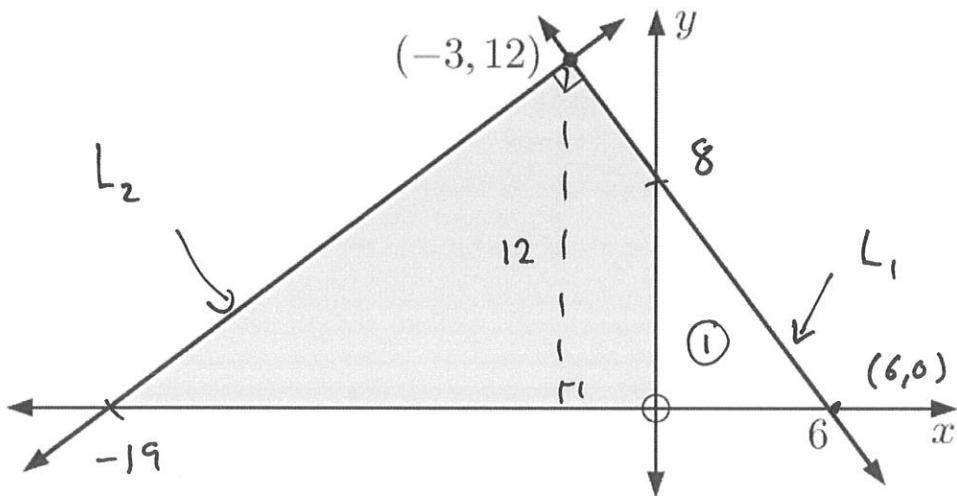
- (b) If he decides to survey every 20th person through the gate, identify the sampling method used.

[2 marks]

Systematic

7. Find the shaded area:

[6 marks]



Equation of L_1 : $m = \frac{0 - 12}{6 - (-3)} = -\frac{12}{9} = -\frac{4}{3}$

$$y - 0 = -\frac{4}{3}(x - 6)$$

$$y = -\frac{4}{3}x + 8 \quad (\text{A1})$$

Equation of L_2 : $m = \frac{3}{4}$ (perpendicular)

$$y - 12 = \frac{3}{4}(x - (-3))$$

$$y = \frac{3}{4}(x + 3) + 12$$

$$y = \frac{3}{4}x + \frac{9}{4} + 12 = \frac{19+6}{2} \times 12$$

$$y = \frac{3}{4}x + \frac{57}{4} \quad (\text{A1})$$

$$= \frac{1}{2} \cdot 25 \cdot 12$$

$$y=0 \quad \text{when} \quad \frac{3}{4}x + \frac{57}{4} = 0 \quad = 150 \quad \text{A1}$$

$$3x = -57$$

$$x = -19 \quad (\text{A1}) \quad \text{Area of triangle } ①$$

$$= \frac{1}{2} \times 6 \times 8$$

$$= 24 \quad \text{A1}$$

$$\text{Shaded area} \quad 150 - 24 = 126$$

A1