



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.

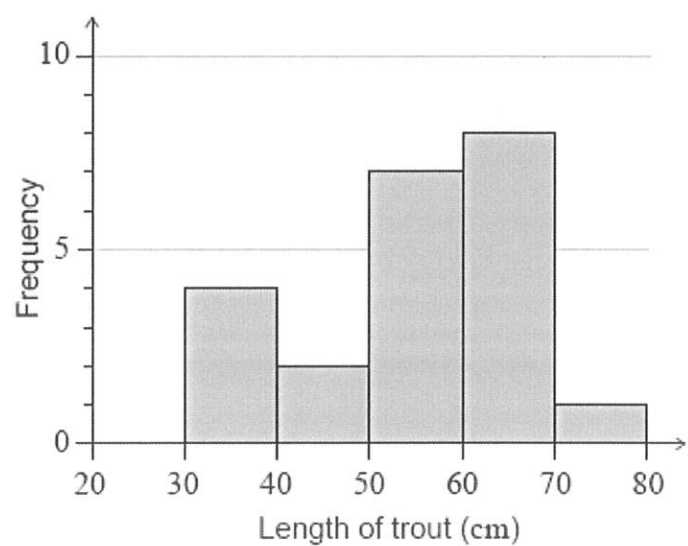
Points: \_\_\_\_\_/41

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]

$$60 \leq l \leq 70$$

A1

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

A1 for 22

$$\frac{4}{22} \times 100\% = 18.18\ldots = 18.2\% \quad \text{A1}$$

(e) Estimate the mean trout length.

[2 marks]

Mid-value

25 0

35 4

45 2

55 7

65 8

75 1

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

If for sample without 40 cm or less

45 2

55 7

65 8

75 1

$$\bar{x} = 59.4 \text{ cm}$$

M1 for mid-values

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

[1 mark]

$$\sigma = 11.6774\ldots$$

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

A1

$$(\sigma = 7.62)$$

2. Consider the following Venn diagrams.

Diagram 1

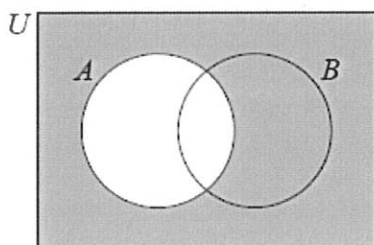


Diagram 2

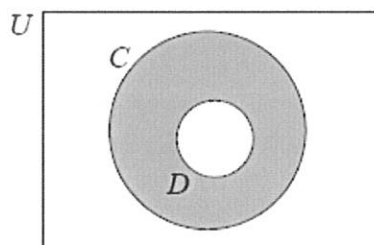
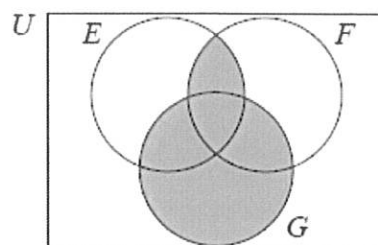


Diagram 3



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

[1 mark]

$A'$

$A'$

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

[1 mark]

$D' \cap C$

(or  $(D \cup C')'$ )

$A1$

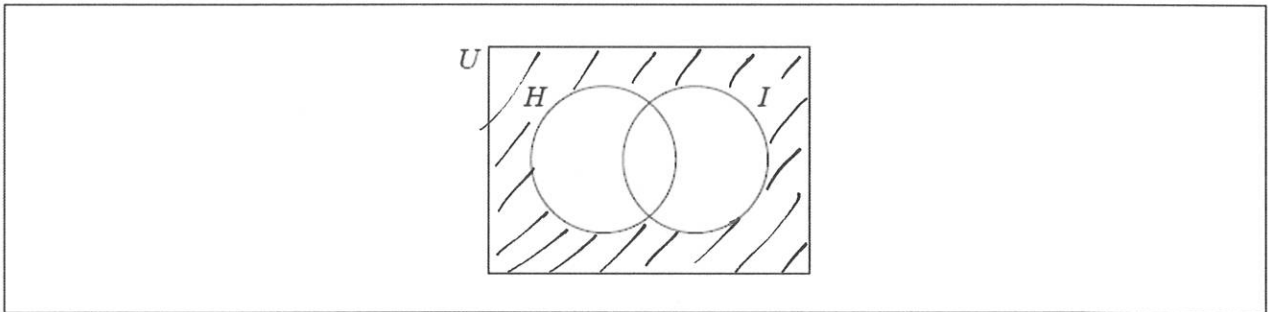
- (c) Write down an expression, in set notation, for the **shaded** region represented by Diagram 3.

[2 marks]

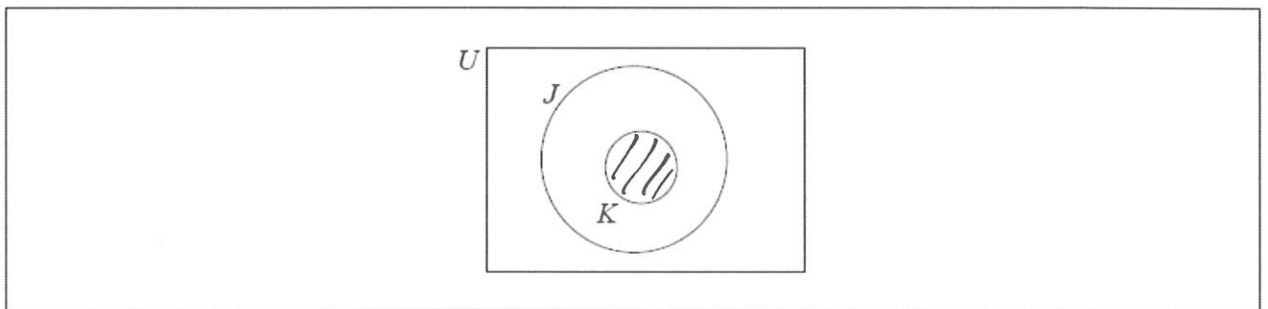
$G \cup (E \cap F)$

$A2$

- (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]

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

M1

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

A1

$L_1$  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]

$$\frac{4}{3}$$

A1

(f.t.)

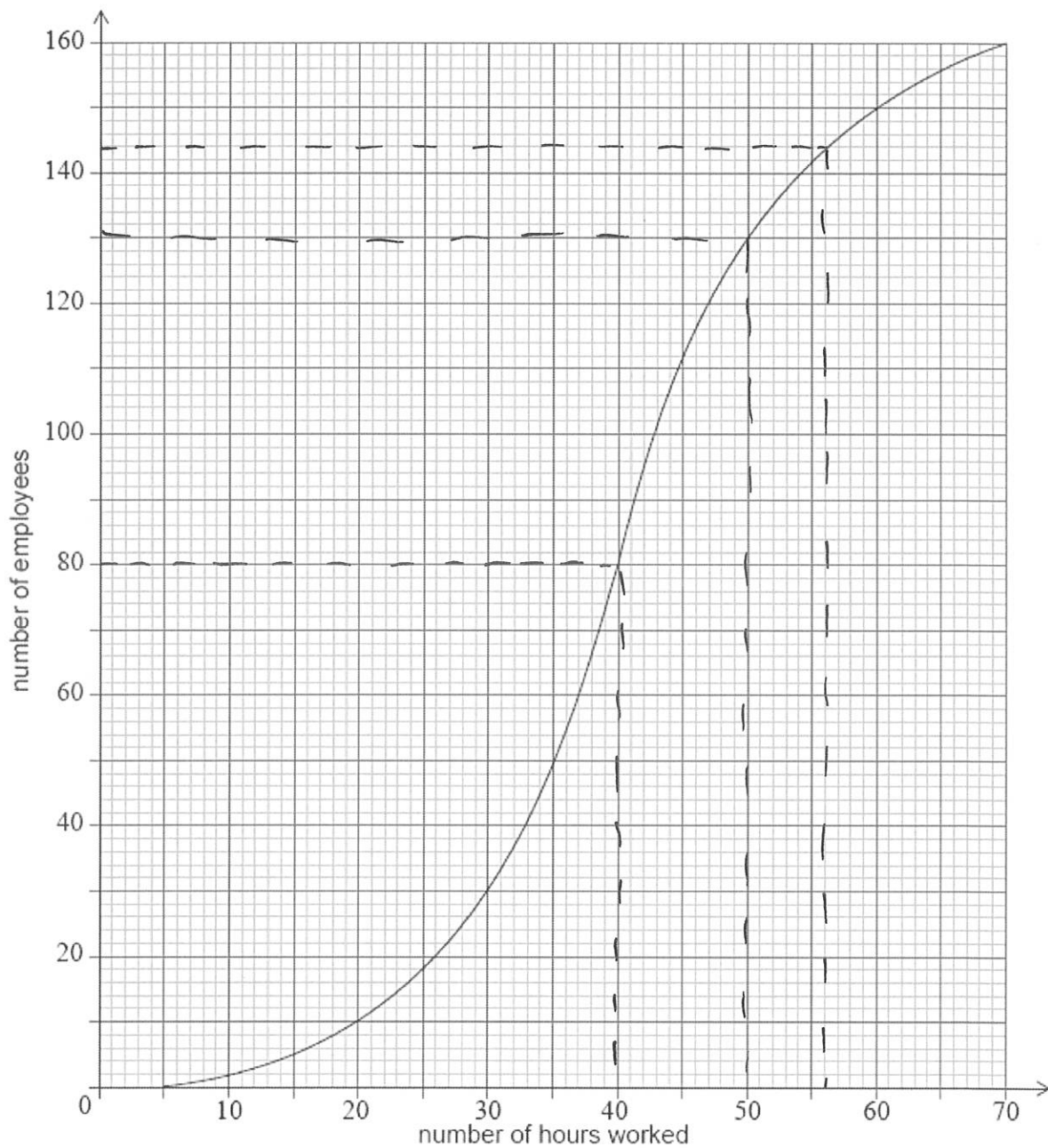
(d) Write down, in the form  $y = mx + c$ , the equation of  $L_2$ .

[1 mark]

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

A1

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 20<sup>th</sup> person through the gate, identify the sampling method used.

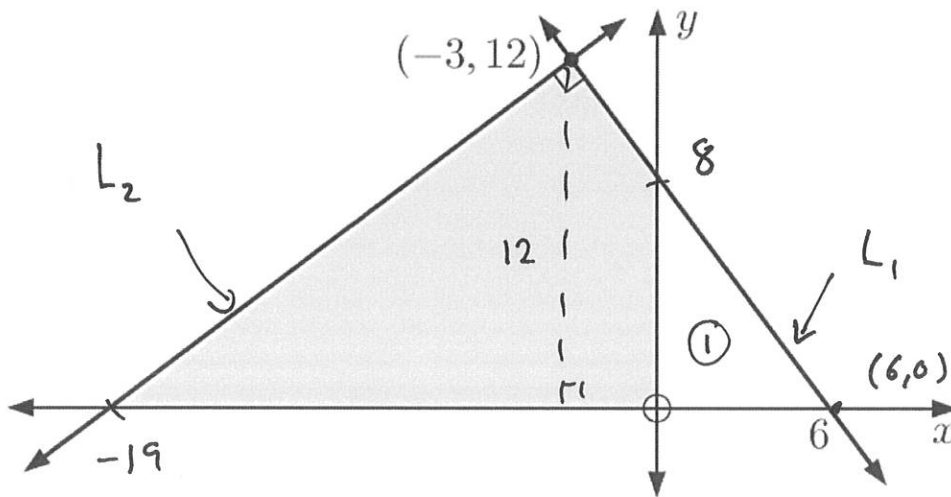
[2 marks]

Systematic



7. Find the shaded area:

[6 marks]



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

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

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

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

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

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

$$y = \frac{3}{4}x + \frac{9}{4} + 12$$

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

Area of large triangle

$$= \frac{19+6}{2} \times 12$$

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

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

$$3x = -57$$

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

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

$$= 24 \quad A1$$

Shaded area  $150 - 24 = 126$

A1