Name _____   SYDNEY GIRLS H.S.   [10M3 – 2010]

Year 10 – Statistics + Similarity Test – JULY 2010

- Time allowed: 50 minutes.
- Write all answers on the question paper.
- Show all necessary working.

Total:

★

| 39 |

Question 1   (5 marks)

Eighty-four people were rated on a score of 10 to 15 on their driving ability. These results are given in the frequency table below.

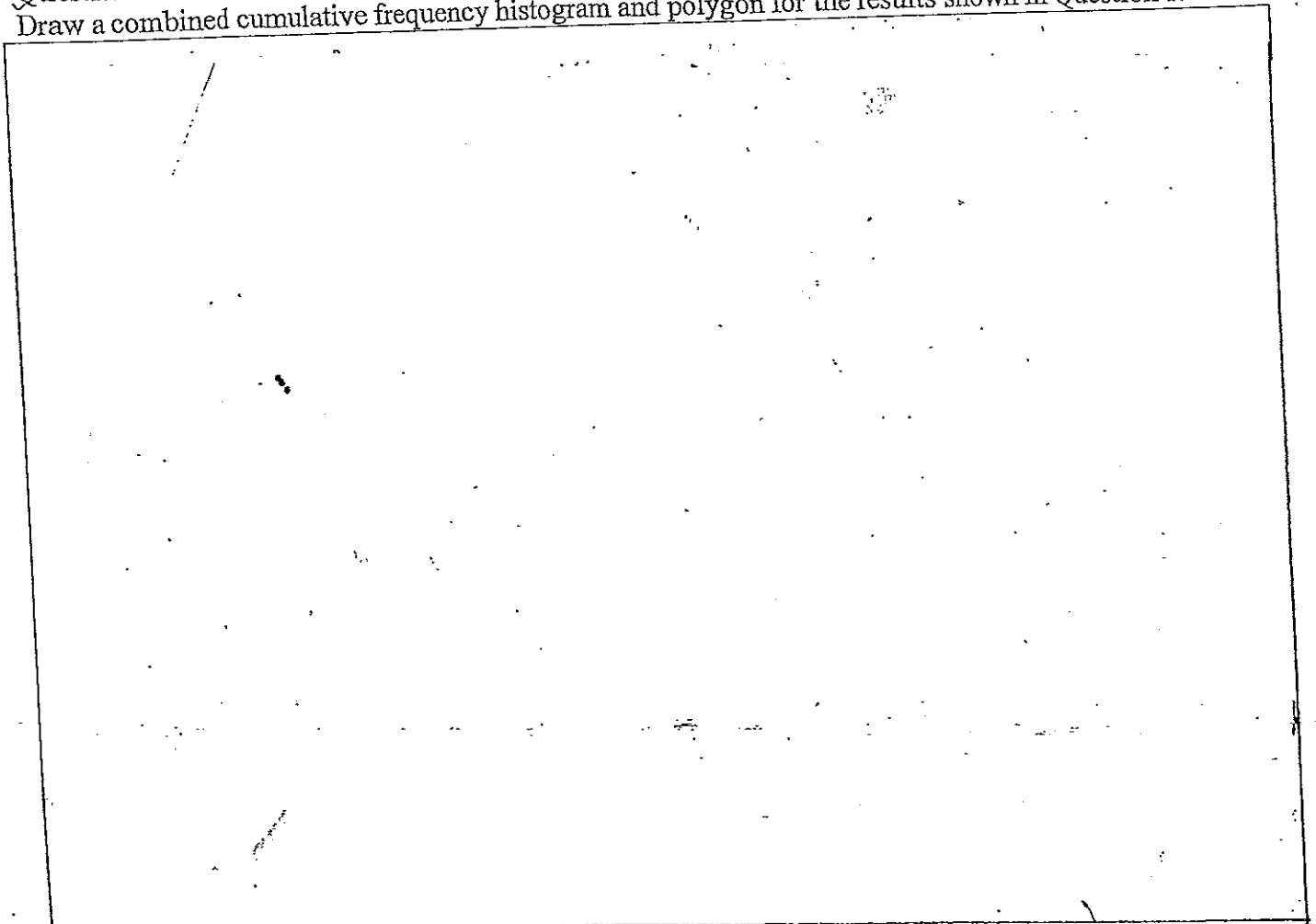| Score	10	11	12	13	14	15
Frequency (f)	8	13	18	20	15	10
cf						

For the results shown above, find the:

(a) mode

(b) median

(c) range

(d) mean $(\bar{x})$

(e) standard deviation (correct to 2 decimal places). (σ)

Question 2   (4 marks)

Draw a combined cumulative frequency histogram and polygon for the results shown in Question 1.

Question 3 (4 marks)

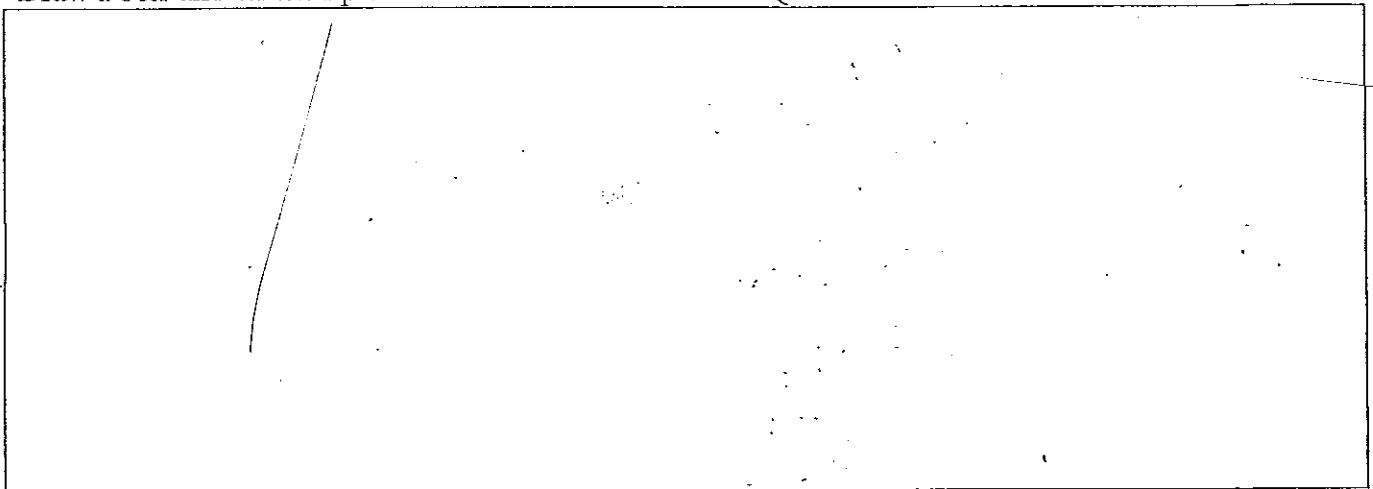For the results shown in Question 1, find the:

(a) 1st Quartile (Q_1)	(c) 3rd Quartile (Q_3)
(b) 2nd Quartile (Q_2)	(d) Inter-Quartile range

Question 4 (4 marks)

Draw a box-and-whisker plot for the information shown in Question 1.

Question 5 (5 marks)

Twelve students were given tests in both English and Maths. The results are given in the table below.

Student	A	B	C	D	E	F	G	H	I	J	K	L
Maths	55	70	60	85	41	50	99	90	45	95	80	70
English	67	70	65	80	75	72	70	85	68	73	70	55

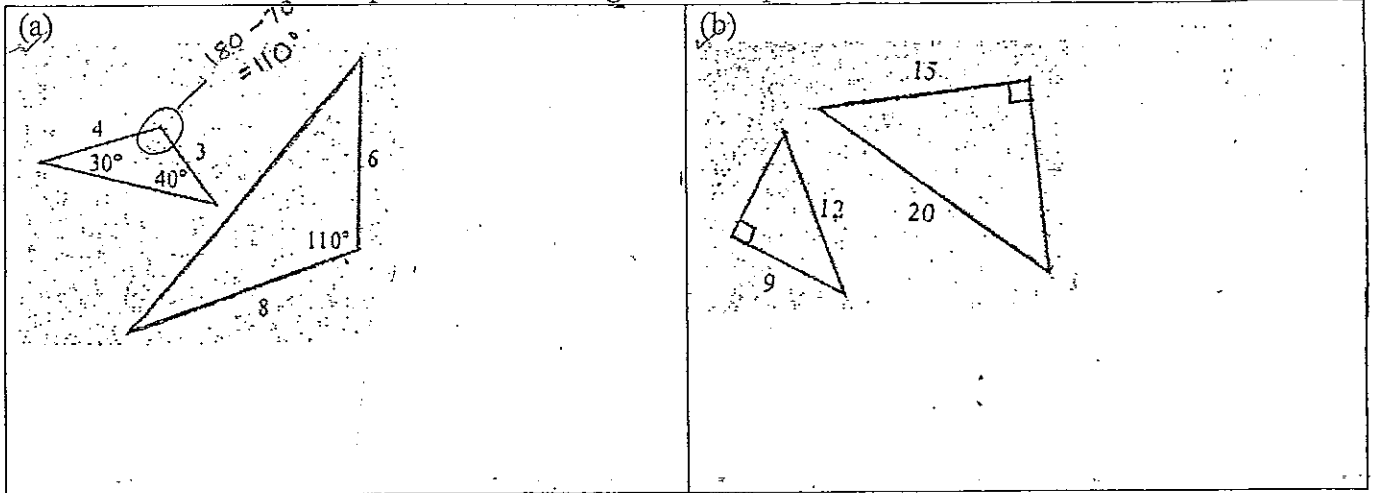(a) Calculate the mean and standard deviation for both tests.

(b) Compare the results for student D. In which test has this student performed better and why?
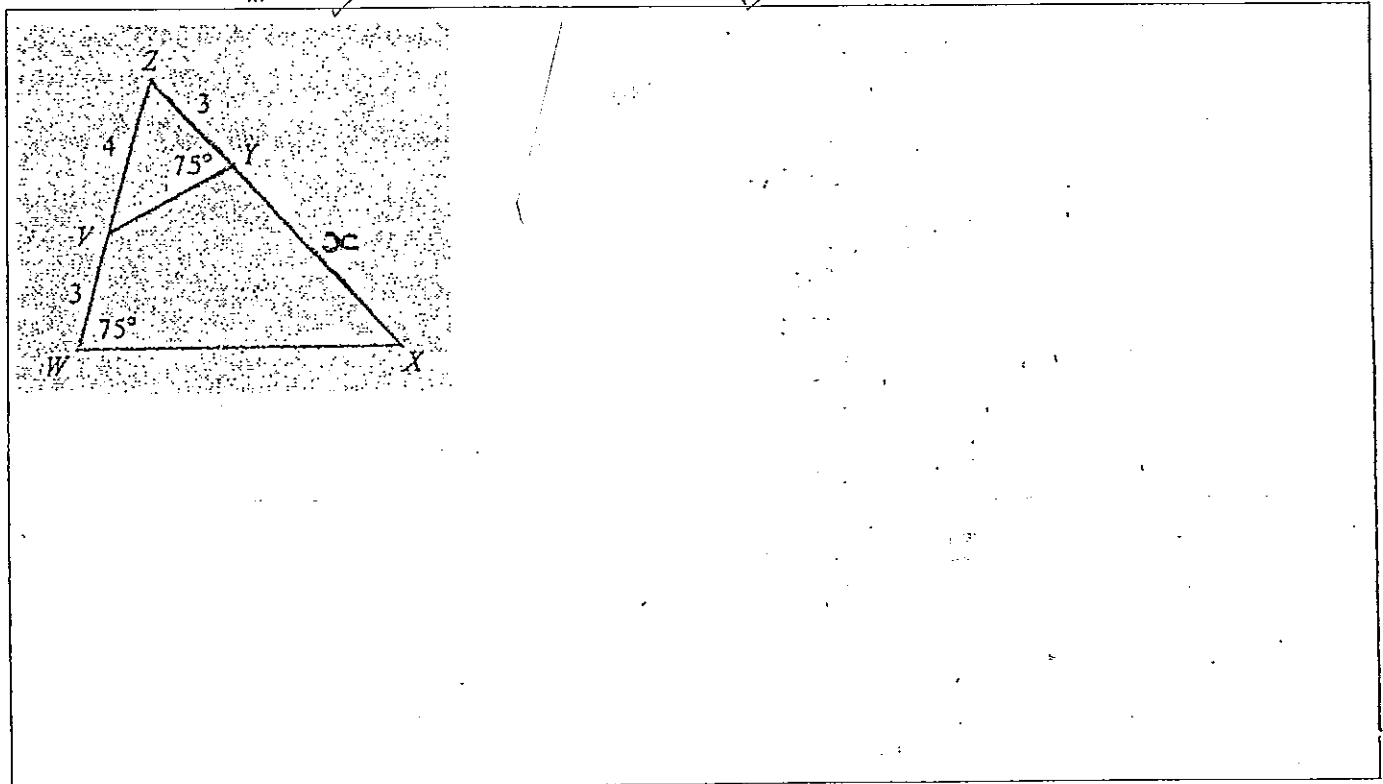
Question 6 (2 marks)

Write the condition used to prove that the triangles in each pair are similar.

(a)

$180 - 70 = 110°$

4
30°
3
40°
6
110°
8

(b)

15
12
20
9

Question 7 (5 marks)

Prove that $\triangle VZY \,|||\, \triangle XZW$ and hence find the value of x.

Z
3
4
75° Y
y
3
75°
W
x
X

Question 8 (3 marks)

Ashley holds up a small stick 20cm from her eye so that it appears to be the same height as the flagpole. She is standing 30m from the pole and the stick is 18cm long. How long is the flagpole?

30 m

20 cm

18 cm
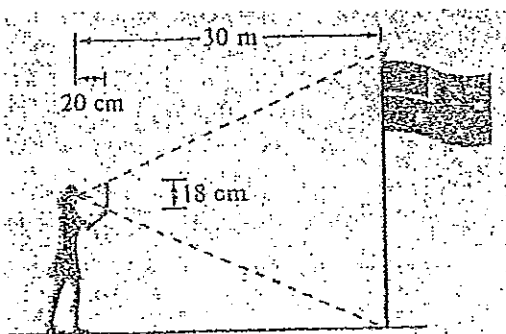
Question 9 (4 marks)

Two similar solids have their volume in the ratio 27:8.

(a) Find the ratio of their corresponding sides.

(b) Calculate the surface area of the larger solid if the smaller solid's surface area is 20.84 cm^2.

✳ **Question 10** (3 marks)

A large cylindrical tank has four times the diameter and 4 times the height of a small cylindrical tank. How many of the small tanks are required to fill the large tank?

End of Test ☺

Name _____

Year 10 – Statistics + Similarity Test

- Time allowed: 50 minutes.
- Write all answers on the question paper.
- Show all necessary working.

Total:

$$\boxed{39}$$

Question 1
Eighty-four people were rated on a score of 10 to 15 on their driving ability. These results are given in the frequency table below.

(5 marks)

Score	10	11	12	13	14	15
Frequency (f)	8	13	18	20	15	10
cf	8	21	39	59	74	84

For the results shown above, find the:

(a) mode $= 13$

(b) median $=$ Av. of 42nd + 43rd Scores
$= 13$

(c) range $= 15 - 10$
$= 5$

(d) mean $\bar{x} \doteqdot 12.607$

(e) standard deviation (correct to 2 decimal places).
$\therefore \sigma \doteqdot 1.48$

Question 2
Draw a combined cumulative frequency histogram and polygon for the results shown in Question 1.

(4 marks)

1 – Histogram
1 – Polygon
2 – Axes
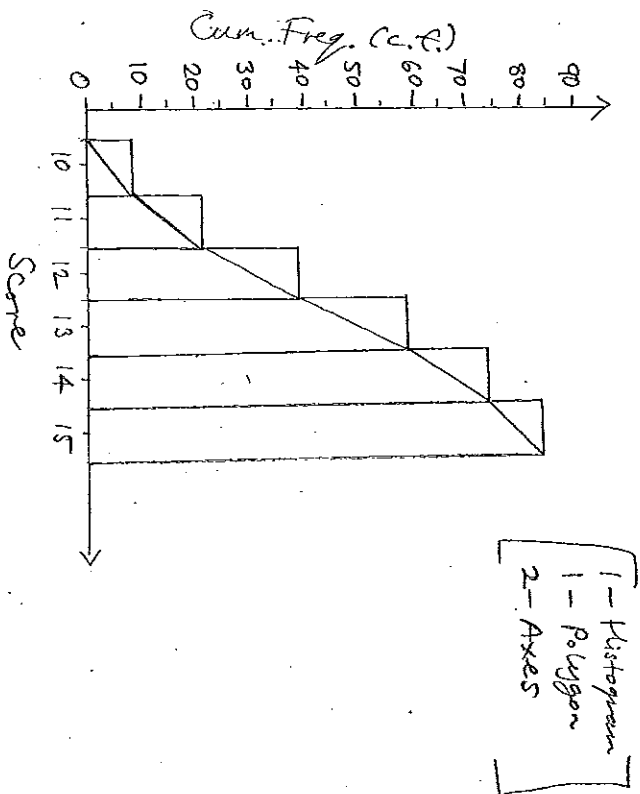
Question 3
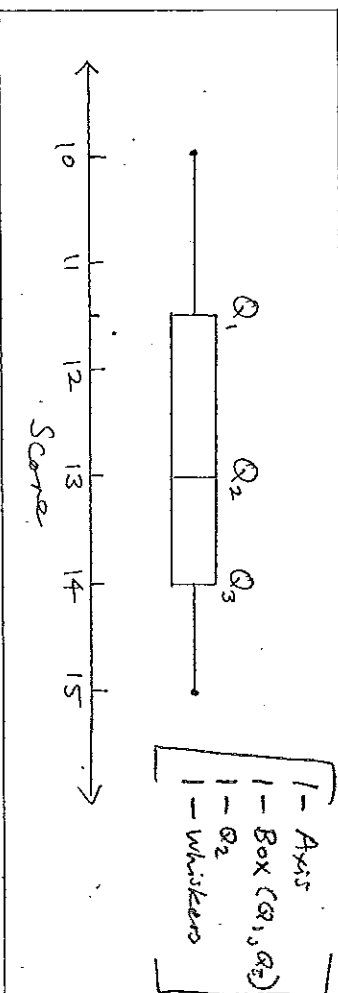For the results shown in Question 1, find the:

(4 marks)

(a) 1st Quartile $(Q_1) =$ Av. of $21^{st} + 22$ Scores
$= \frac{11+12}{2}$
$= 11.5$

(b) 2nd Quartile $(Q_2) =$ Median
$= 13$

(c) 3rd Quartile $(Q_3) =$ Av. of $63^{rd} + 64^{th}$ Scores
$= 14$

(d) Inter-Quartile range
$= Q_3 - Q_1$
$= 14 - 11.5$
$= 2.5$

Question 4
Draw a box-and-whisker plot for the information shown in Question 1.

(4 marks)

1 – Axis
1 – Box (Q_1, Q_3)
1 – Q_2
1 – Whiskers

Question 5
Twelve students were given tests in both English and Maths. The results are given in the table below.

(5 marks)

Student	A	B	C	D	E	F	G	H	I	J	K	L
Maths	55	70	60	85	41	50	99	90	45	95	80	70
English	67	70	65	80	75	72	70	85	68	73	70	55

(a) Calculate the mean and standard deviation for both tests.

Maths: $\bar{x} = 70$
$\sigma \doteqdot 19.11$ (2d.p)

English: $\bar{x} \doteqdot 70.83$
$\sigma \doteqdot 7.17$ (2d.p)

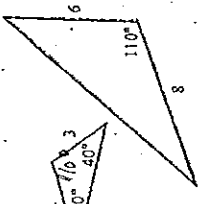(b) Compare the results for student D. In which test has this student performed better and why?

$Z_{(Maths)} = \frac{85-70}{19.11} \doteqdot 0.78\sigma \quad \therefore 0.78\sigma$ above mean

$Z_{(Eng)} = \frac{80-70.83}{7.17} \doteqdot 1.28\sigma \quad \therefore 1.28\sigma$ above mean
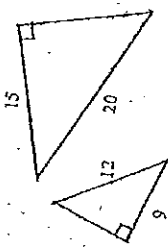
$\therefore$ English test mark is better since it has a higher σ above mean than the Maths test mark.

Two similar solids have their volume in the ratio 27:8.

(a) Find the ratio of their corresponding sides.

Vol. ratio $\quad 27:8$

Side ratio $\quad \sqrt[3]{27}:\sqrt[3]{8}$

$\qquad\qquad = 3:2$

(b) Calculate the surface area of the larger solid if the smaller solid's surface area is 20.84 cm².

Side ratio $\quad 3:2$

S.A. ratio $\quad 3^2:2^2$

$\qquad\qquad = 9:4$

$$\frac{x}{20.84} = \frac{9}{4}$$

$$x = 46.89$$

∴ S.A. of larger solid is $46.89\ cm^2$ $\qquad$ /3

Question 10   cylindrical   (3 marks)

A cylindrical tank is four times the diameter and 4 times the height of a small tank. How many of the small tanks are required to fill the large tank?

$$\text{Small} : \text{Large}$$

Side ratio $\quad 1:4$

Vol ratio $\quad 1^3:4^3$

$\qquad\qquad = 1:64$

∴ The large tank is $64 \times$ the vol. of the small tank

∴ 64 small tanks required to fill large tank. /3

Question 6

Write the condition used to prove that the triangles in each pair are similar.

(a)

$$\frac{3}{6} = \frac{4}{8}$$

Two pairs of side lengths in same ratio + included equal.

(b)

$$\frac{9}{12} = \frac{15}{20}$$

Right-∠ △ + ratio of hyp : side equal in both △'s.

Question 7 (5 marks)

Prove that $\triangle VZY \,|||\, \triangle XZW$ and hence find the value of x.

In △'s VZY and XZW

1. $\angle VZY = \angle XZW$ (common $\angle$)
2. $\angle ZYV = \angle ZWX = 75°$ (given)

∴ $\triangle VZY \,|||\, \triangle XZW$ (equiangular) /3
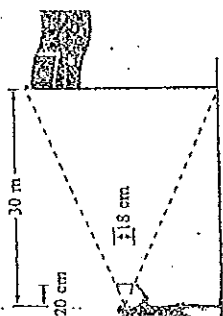
$$\frac{x+3}{4} = \frac{7}{3} \quad \text{(corresp. sides in similar △s)}$$

$$x+3 = \frac{28}{3}$$

$$x = 6\tfrac{1}{3} \quad \text{(Exact A)}$$

/2

$\left[-\tfrac{1}{2} \text{ if missing}\right]$

Question 8 (3 marks)

Ashley holds up a small stick 20cm from her eye so that it appears to be the same height as the flagpole. She is standing 30m from the pole and the stick is 18cm long. How long is the flagpole?

$$\frac{x}{18} = \frac{3000}{20} \quad \text{(corresp. sides in similar △s)}$$

$$x = \frac{5400}{2}$$

$$= 2700\ cm$$

$$= 27\ m$$

$[-1 \text{ if missing}]$

∴ Flagpole is 27m long.