Sydney Technical High School

Mathematics

YEAR 10 ASSESSMENT TASK 2

AUGUST 2015

Name _____ Teacher _____

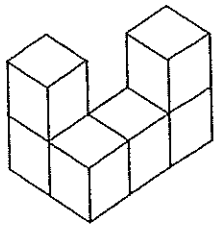
Instructions

- Time allowed - **90 minutes**
- Show necessary working.
- Use a pen only and a ruler for straight lines.
- Marks shown are a guide and may need to be adjusted.
- Full marks may not be awarded for careless work or illegible answers.

Part A – Mult. Choice	/10
Part B – Question 11	/17
Question 12	/16
Question 13	/18
Question 14	/16
Question 15	/15
TOTAL	/92

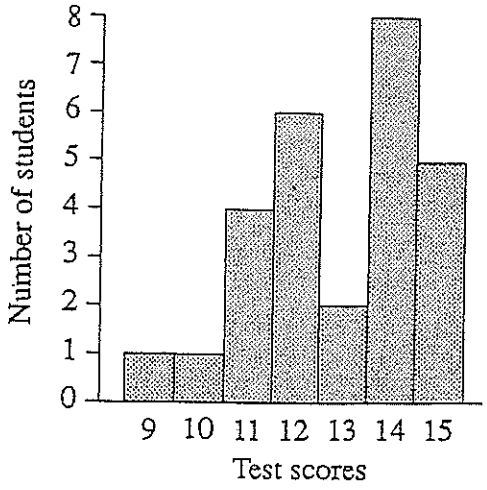
PART A – MULTIPLE CHOICE

QUESTION 1 The solid shown is made by joining cubes together, each having edges of 1 cm. What is the total surface area of the solid in cm^2?



A. 32 B. 36 C. 31 D. 26

QUESTION 2 The results of a Year 10 class test are shown in the frequency histogram below:

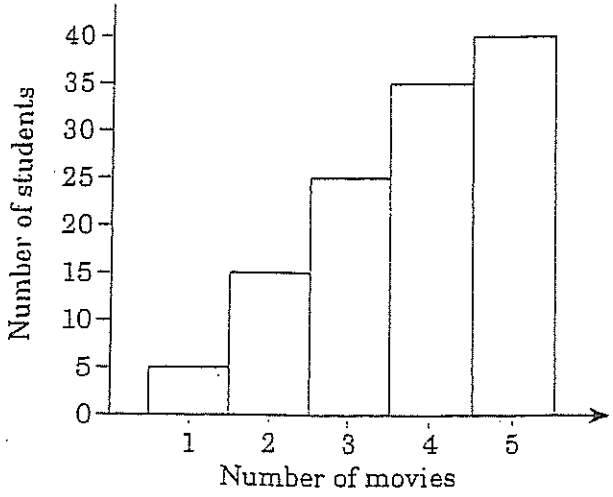


The median test score is:

A. 11 B. 12 C. 13 D. 14

QUESTION 3 Students were surveyed about the number of movies that they watched last week.

The results are shown below in the cumulative frequency histogram:



How many students said that they watched four movies last week?

A. 5 B. 10 C. 25 D. 35

QUESTION 4 The mean and standard deviation of a set of scores are m and s respectively.

If 4 marks are added to each score, what are the mean and standard deviation of the new set of scores?

A. Mean $= m$, Standard Deviation $= s$

B. Mean $= m + 4$, Standard Deviation $= s$

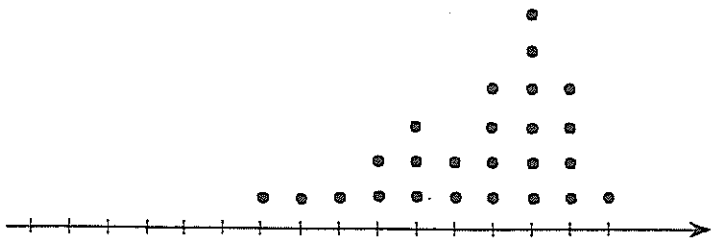
C. Mean $= m$, Standard Deviation $= s + 4$

D. Mean $= m + 4$, Standard Deviation $= s + 4$

QUESTION 5 The dot plots below use a similar scale. They show class scores in tests taken before and after a unit of work was completed.

Before

After



Which statement about the change in scores is correct?

A. The mean increased and the standard deviation decreased.

B. The mean increased and the standard deviation increased.

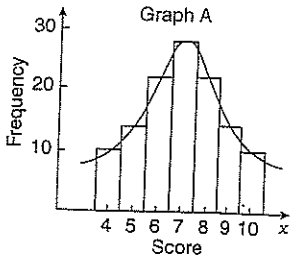
C. The mean decreased and the standard deviation decreased.

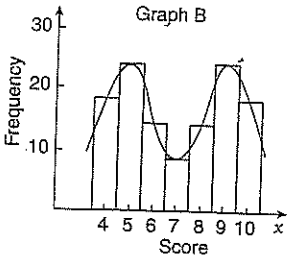
D. The mean decreased and the standard deviation increased.

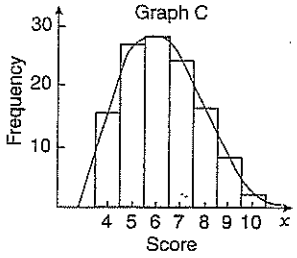
QUESTION 6 Each edge of a cube is increased by 60%. What is the percentage increase in the cube's surface area?

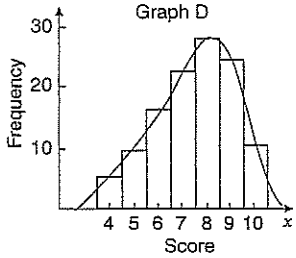
A. 28 B. 60 C. 156 D. 1180

QUESTION 7 The graphs below show sets of scores with the same range.





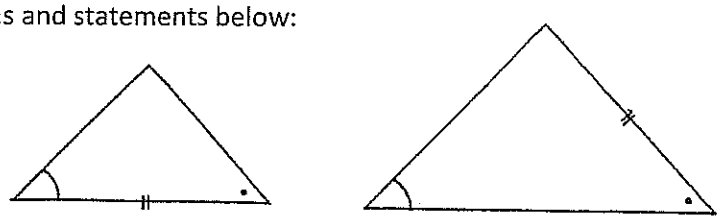


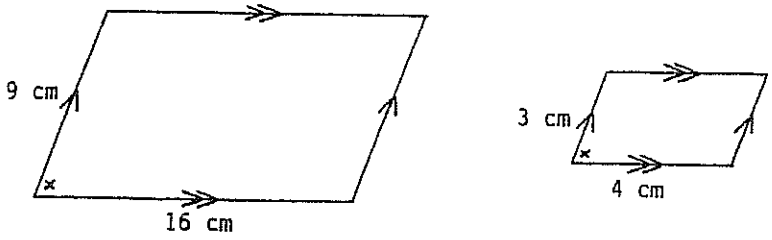


Which graph shows scores that are positively skewed?

A. A B. B C. C D. D

QUESTION 8 Consider the diagrams and statements below:





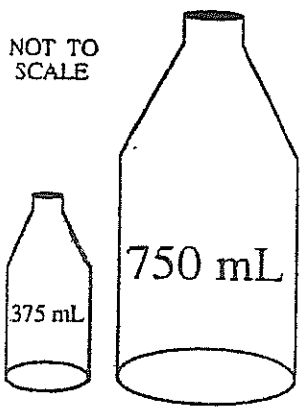
I: The two triangles are similar. II: The two parallelograms are similar.

Which statement above is true? A. I only B. II only C. Both I and II D. Neither I nor II

QUESTION 9 These soft drink bottles are similar.

The larger bottle has twice the capacity of the smaller bottle. The ratio of heights of the bottles is closest to:

A. 1.26 : 1 B. 1.41 : 1 C. 2 : 1 D. 8 : 1



QUESTION 10

A company changes the size of its CHOC BAR by increasing all dimensions by 10% to make a similar solid bar. The percentage increase in volume is closest to:

A. 10% B. 21% C. 30% D. 33%

PART B – FREE RESPONSE

QUESTION 11

a) Write the formula for the:

i) volume of a sphere _____ 1

ii) surface area of a cone _____ 1

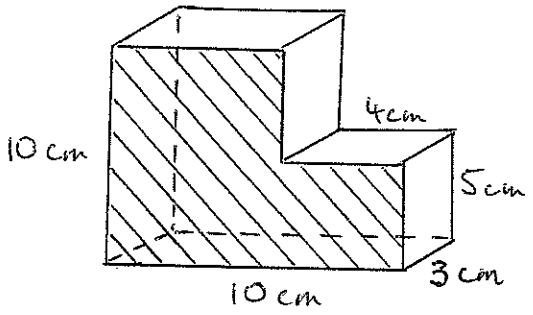
b) A cube has sides of 20 cm. Find its:

i) surface area ii) volume iii) capacity in litres 3

_____

_____

c) A solid set of small toy steps has dimensions as shown:



Find the: i) area of the end shaded face ii) volume 3

_____

_____

_____

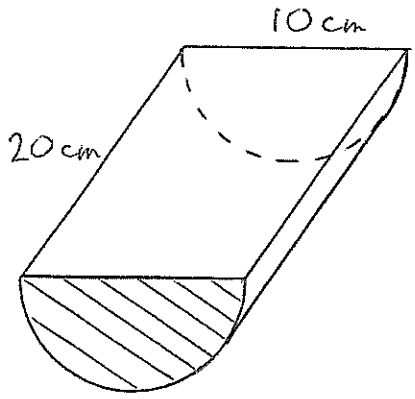
iii) surface area

_____

_____

_____

d) A semi-cylinder solid has diameter 10 cm and length 20 cm as shown. Find, in terms of π :



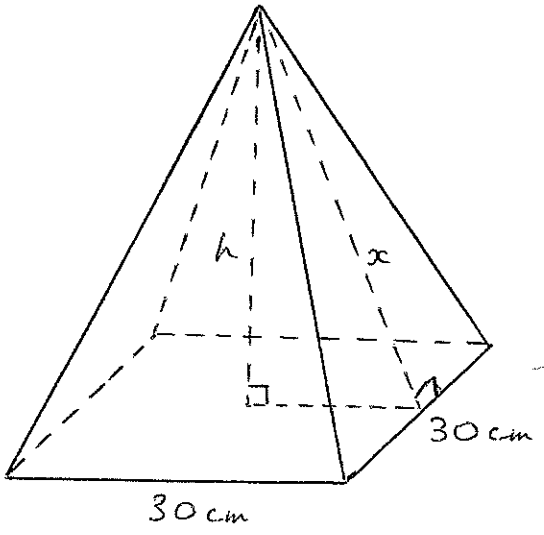
i) the area of the end shaded face 3

ii) the volume

iii) the surface area

e) A square pyramid has a base side of side 30 cm and a volume of 10,800 cm^3.

i) Using $V = \frac{1}{3}Ah$, find h. 3



ii) Find x, the perpendicular height of one of the side faces.

iii) Find the surface area of the pyramid.

f) A metal sphere has radius 12 cm. Find, in terms of π:

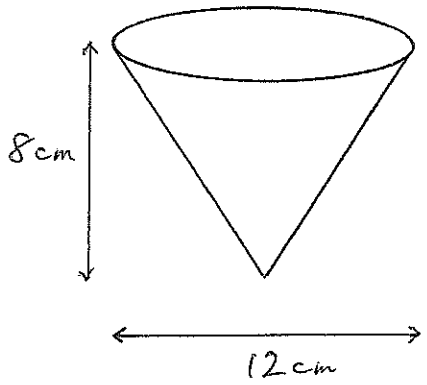
i) its surface area ii) its volume 2

g) A sphere has a volume of $4500\pi\ cm^3$. Find its radius. 1

QUESTION 12

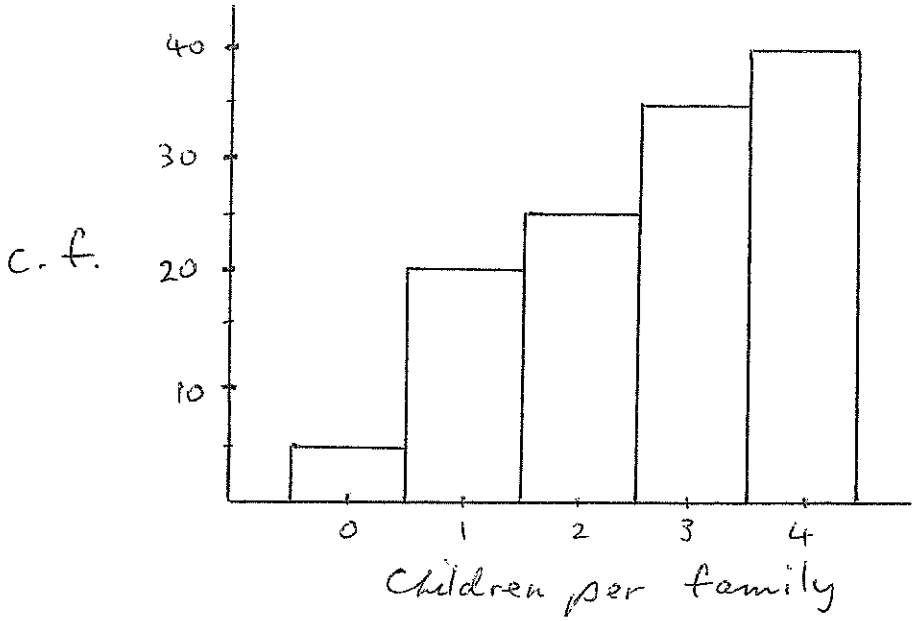
a) For the cone shown, find the:

i) volume, correct to 3 significant figures. 2



ii) surface area, in terms of π. 2

b) A survey of families asked them asked them how many children they each had. The results are shown in the cumulative frequency histogram below:



i) How many families were surveyed? _____ 1

ii) What is the modal number of children? _____ 1

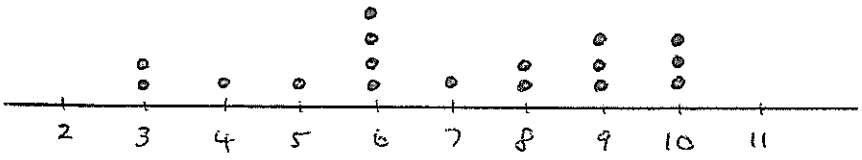
iii) How many families had 4 children? _____ 1

iv) Use a ruler to draw in the c.f. polygon (ogive). Use it to find the median number of children per family. _____ 1

v) Find the upper quartile. _____ 1

vi) Find the interquartile range. _____ 1

c)



From the dot plot above, find the:

i) range _____ ii) median _____ 4

iii) lower and upper quartiles L.Q. _____

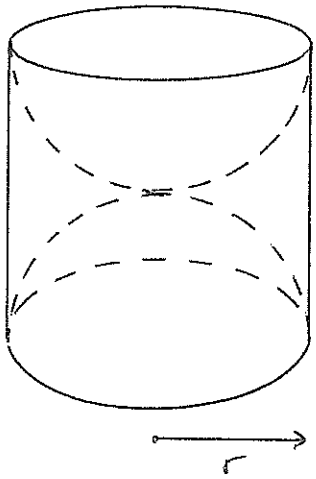
U.Q. _____

d) Using a ruler, neatly draw a box-and-whisker plot for the information in c) 2

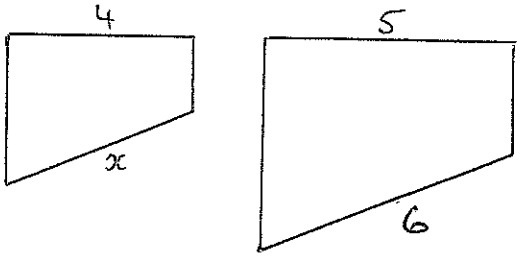
QUESTION 13

a) A solid is in the shape of a cylinder with two hemi-spheres removed as shown. The cylinder has radius r units.

Find an expression for the surface area of the solid in terms of π. Simplify your answer. 2



b) The two shapes shown are similar. 3



i) What is the enlargement factor? _____

ii) Find the value of x. iii) Find the ratio of areas.

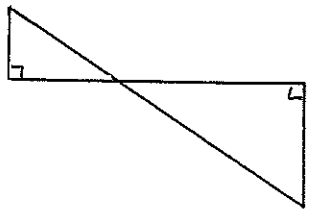
iv) If the area of the smaller shape is 30 cm^2, 1

find the area of the larger shape.

c) Circle YES or NO according to whether the triangles are similar or not. 2

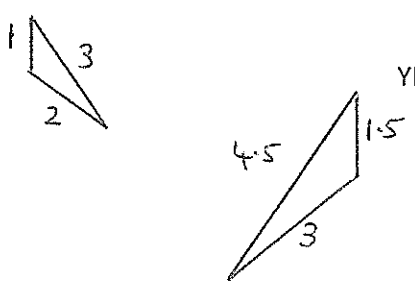
If YES, concisely summarise the applicable test.

i)



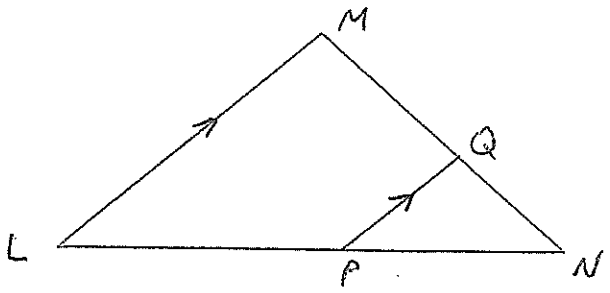
YES --- NO _____

ii)



YES --- NO _____

d)



i) Prove that ΔPQN is similar to ΔLMN. 3

ii) If $PQ = 5, MQ = 3, QN = 2, PN = 4$, find the length of:

∝) LP _____ 1

β) LM _____ 1

e) Two similar solids A, B have their corresponding sides in the ratio 3 : 2 2

i) What is the ratio of their surface areas? _____

ii) The solids are filled with water. How many times larger is volume A compared to volume B?

_____

f) Two similar pyramids have their volumes in the ratio 27 : 64 3

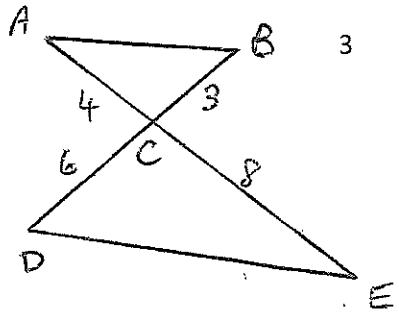
i) What is the ratio of their heights? _____

ii) Express the ratio in i) in the form $1 : x$ _____

iii) What is the enlargement factor for their surface areas?

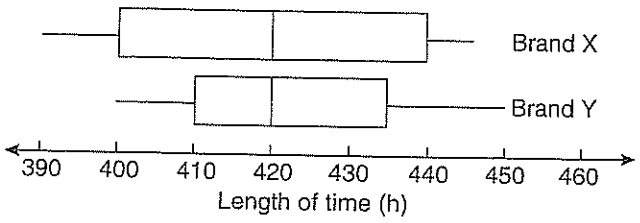
QUESTION 14

a) Prove that ΔABC is similar to ΔEDC. 3



b) A researcher tested two different brands of batteries to see how long they lasted.

Her results are shown in the double box-and-whisker plot below.



i) Find the interquartile range for Brand Y batteries. _____ 1

ii) What percentage of Brand X batteries last longer than 440 hours? _____ 1

c) For the scores in this distribution table, find the:

i) mean (1 dec.) _____ 1

ii) standard deviation _____ 1
(1 dec.)

Score	Frequency
3	10
4	25
5	15
6	40

d) Jordan's results in two tests, and each test's mean and standard deviation, are shown below.

	Score	$\bar{x}$	s.d.
Maths	82	70	12
Science	82	70	4

i) In which test, Maths or Science, did Jordan score better relative to the rest of the class? 1

_____

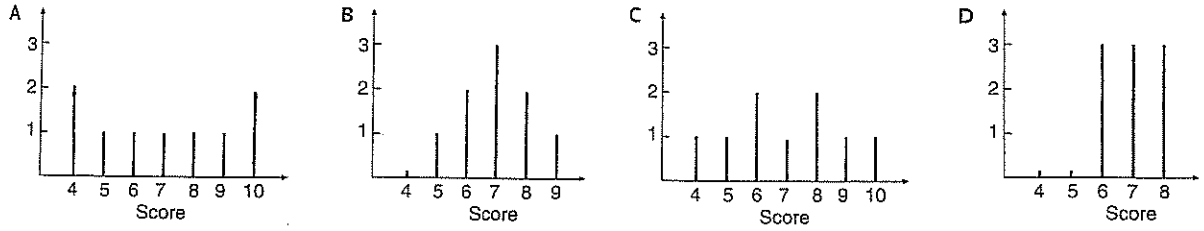
ii) An extra student, Eric, sits both tests and scores 78% in Maths, 75% in Science. 2

What happens to the standard deviation in:

α) Maths? _____

β) Science? _____

e) The graphs below show four different distributions of 9 scores. Each set of scores has a mean of 7.



Arrange A, B, C, D in order of increasing standard deviation _____, _____, _____, _____ 1

f) A 1 cm^3 ingot of gold is flattened and reshaped _____ 2

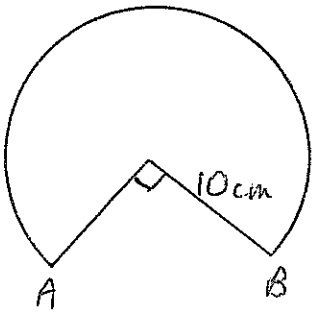
into a thin circular medal. If the medal in 2 mm _____

thick, what is its radius, to the nearest mm? _____

_____

_____

g) The shape shows three-quarters of a circular disk, centre O and with radius 10 cm. When points A and B are joined a cone will be formed.



Find the:

i) slant height of the cone _____

_____ 1

ii) radius of the cone's base circle _____

_____

_____

_____ 2

QUESTION 15

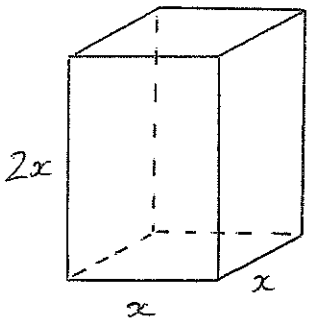
a) A rectangular tank with a square base of 5 metres contains water to a depth of 4 metres.

A solid cube of edge 3 metres is placed at the bottom of the tank. What is now the level of the water in the tank, in metres?

A. 5.02 B. 5.08 C. 5.4 D. 6.67 E. 7 Answer _____ 1

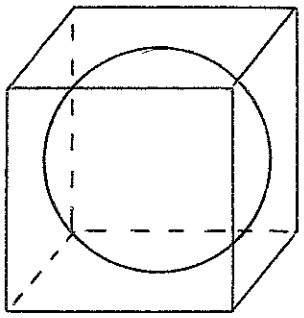
b) A square prism has a height which is twice its base width. 2

Its surface area is 1690 cm^2. Find its volume.



c) A sphere exactly fits inside a cube. Find the percentage of the cube's volume occupied by the sphere. 2

Give your answer correct to 1 decimal place.

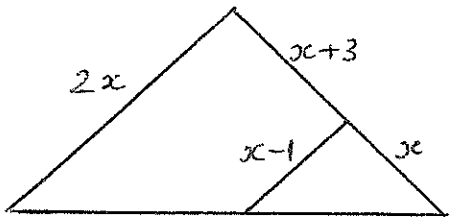


d) The ratio of volumes for two similar cylinders is 1 : 5 3

i) What is the ratio of their radii? (answer to 2 dec. places)

ii) The surface area of the smaller cylinder is 50 cm^2. Find the larger surface area (answer to 1 dec. place)

e) The two triangles are similar. Find the value of x. 2



f) Two similar cones have surface areas 90 cm^2 and 100 cm^2. If the volume of the larger cone is 500 cm^3, find the smaller volume (1 dec. place). 2

g) Find the mean number of children per family in Question 12b) 2

h) The mean of n scores is m. When a new score k is added, the mean changes to y. 1

What is the new score k?

-------- END OF TEST --------

SYDNEY TECHNICAL HIGH SCHOOL

MULTIPLE CHOICE ANSWER SHEET

Name : .....

Teacher: .....

Course YEAR 10 – AUGUST 2015

Completely fill the response oval representing the most correct answer.

Do not remove this sheet from the answer booklet.

1. A ○ B ○ C ○ D ○
2. A ○ B ○ C ○ D ○
3. A ○ B ○ C ○ D ○
4. A ○ B ○ C ○ D ○
5. A ○ B ○ C ○ D ○
6. A ○ B ○ C ○ D ○
7. A ○ B ○ C ○ D ○
8. A ○ B ○ C ○ D ○
9. A ○ B ○ C ○ D ○
10. A ○ B ○ C ○ D ○

SYDNEY TECHNICAL HIGH SCHOOL

MULTIPLE CHOICE ANSWER SHEET

ANSWERS

Name : .....

Teacher: .....

Course YEAR 10 – AUGUST 2015

Completely fill the response oval representing the most correct answer.

Do not remove this sheet from the answer booklet.

1.	A ○	B ○	C ○	D ●	D
2.	A ○	B ○	C ●	D ○	C
3.	A ○	B ●	C ○	D ○	B
4.	A ○	B ●	C ○	D ○	B
5.	A ●	B ○	C ○	D ○	A
6.	A ○	B ○	C ●	D ○	C
7.	A ○	B ○	C ●	D ○	C
8.	A ●	B ○	C ○	D ○	A
9.	A ●	B ○	C ○	D ○	A
10.	A ○	B ○	C ○	D ●	D.

Sydney Technical High School

ANSWERS

Mathematics

YEAR 10 ASSESSMENT TASK 2

AUGUST 2015

Name _____ Teacher _____

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PART A – MULTIPLE CHOICE

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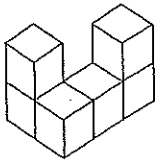
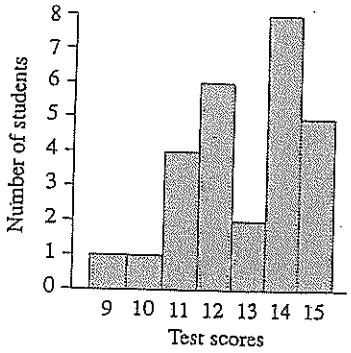


A. 32 B. 36 C. 31 D. 26

QUESTION 2 The results of a Year 10 class test are shown in the frequency histogram below:

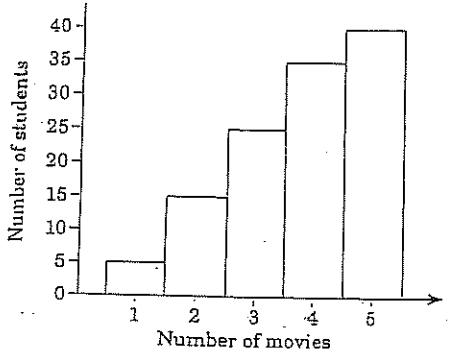


The median test score is:

A. 11 B. 12 C. 13 D. 14

QUESTION 3 Students were surveyed about the number of movies that they watched last week.

The results are shown below in the cumulative frequency histogram:



How many students said that they watched four movies last week?

A. 5 B. 10 C. 25 D. 35

QUESTION 4 The mean and standard deviation of a set of scores are m and s respectively.

If 4 marks are added to each score, what are the mean and standard deviation of the new set of scores?

A. Mean $= m$, Standard Deviation $= s$

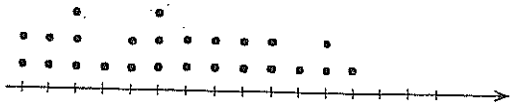
B. Mean $= m + 4$, Standard Deviation $= s$

C. Mean $= m$, Standard Deviation $= s + 4$

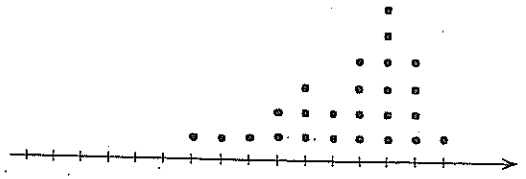
D. Mean $= m + 4$, Standard Deviation $= s + 4$

QUESTION 5 The dot plots below use a similar scale. They show class scores in tests taken before and after a unit of work was completed.

Before



After



Which statement about the change in scores is correct?

A. The mean increased and the standard deviation decreased.

B. The mean increased and the standard deviation increased.

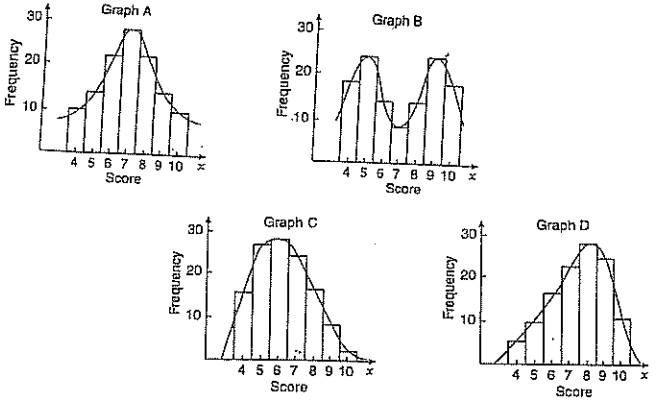
C. The mean decreased and the standard deviation decreased.

D. The mean decreased and the standard deviation increased.

QUESTION 6 Each edge of a cube is increased by 60%. What is the percentage <u>increase</u> in the cube's surface area?

A. 28 B. 60 C. 156 D. 1180

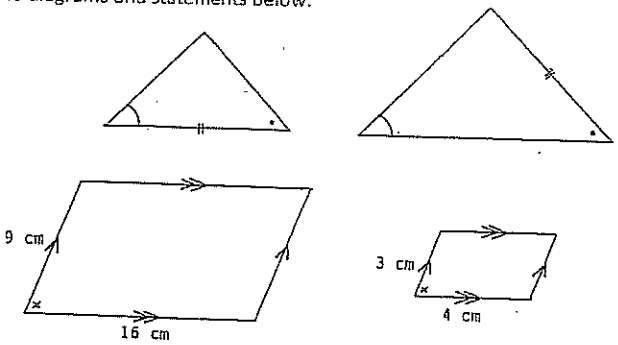
QUESTION 7 The graphs below show sets of scores with the same range.



Which graph shows scores that are positively skewed?

A. A B. B C. C D. D

QUESTION 8 Consider the diagrams and statements below:



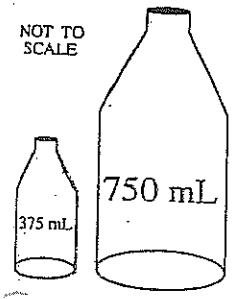
I: The two triangles are similar. II: The two parallelograms are similar.

Which statement above is true? A. I only B. II only C. Both I and II D. Neither I nor II

QUESTION 9 These soft drink bottles are similar.

The larger bottle has twice the capacity of the smaller bottle. The ratio of heights of the bottles is closest to:

A. 1.26 : 1 B. 1.41 : 1 C. 2 : 1 D. 8 : 1



QUESTION 10

A company changes the size of its CHOC BAR by increasing all dimensions by 10% to make a similar solid bar. The percentage increase in volume is closest to:

A. 10% B. 21% C. 30% D. 33%

PART B – FREE RESPONSE

QUESTION 11

a) Write the formula for the:

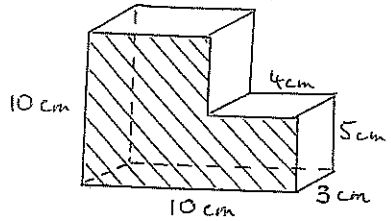
i) volume of a sphere $V = \frac{4}{3}\pi r^3$ 1

ii) surface area of a cone $SA = \pi r^2 + \pi r s$ 1

b) A cube has sides of 20 cm. Find its:

i) surface area $2400\ cm^2$ ii) volume $8000\ cm^3$ iii) capacity in litres 8 3

c) A solid set of small toy steps has dimensions as shown:

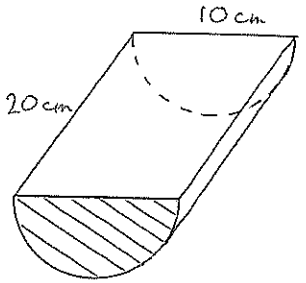


Find the: i) area of the end shaded face $100 - 20 = 80\ cm^2$ ii) volume $80 \times 3 = 240\ cm^3$ 3

iii) surface area

$80 + 80 + 15 + 12 + 15 + 18 + 30 + 30 = 280\ cm^2$

d) A semi-cylinder solid has diameter 10 cm and length 20 cm as shown. Find, in terms of π:



i) the area of the end shaded face $\frac{\pi \times 5^2}{2} = \frac{25\pi}{2}\ cm^2$ 3

ii) the volume $\frac{25\pi}{2} \times 20 = 250\pi\ cm^3$

iii) the surface area $\frac{25\pi}{2} + \frac{25\pi}{2} + 200 + \pi \times 5 \times 20$

$= 125\pi + 200\ cm^2$

e) A square pyramid has a base side of side 30 cm and a volume of 10,800 cm^3.

i) Using $V = \frac{1}{3}Ah$, find h. 3

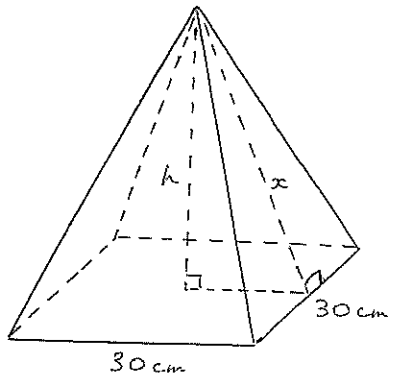
$10800 = \frac{1}{3} \times 900 \times h$

$h = 36\ cm$

ii) Find x, the perpendicular height of one of the side faces.

$x^2 = 15^2 + 36^2$

$x = 39$



iii) Find the surface area of the pyramid.

$900 + \left(\frac{1}{2} \times 30 \times 39\right) \times 4 = 3240\ cm^2$

f) A metal sphere has radius 12 cm. Find, in terms of π:

i) its surface area

$4\pi \times 12^2 = 576\pi \text{ cm}^2$

ii) its volume

$\frac{4}{3}\pi \times 12^3$

$= 2304\pi \text{ cm}^3$

2

g) A sphere has a volume of $4500\pi \text{ cm}^3$. Find its radius.

$\frac{4}{3}\pi r^3 = 4500\pi$

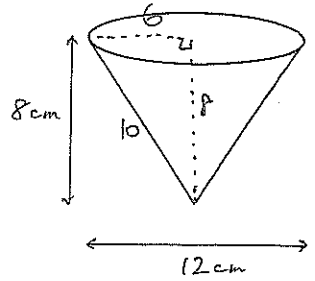
$r^3 = 3375$

$r = 15 \text{ cm}$

1

QUESTION 12

a) For the cone shown, find the:



i) volume, correct to 3 significant figures.

$V = \frac{1}{3} \times \pi \times 6^2 \times 8$

$= 96\pi$

$\doteq 302 \text{ cm}^3$

2

ii) surface area, in terms of π.

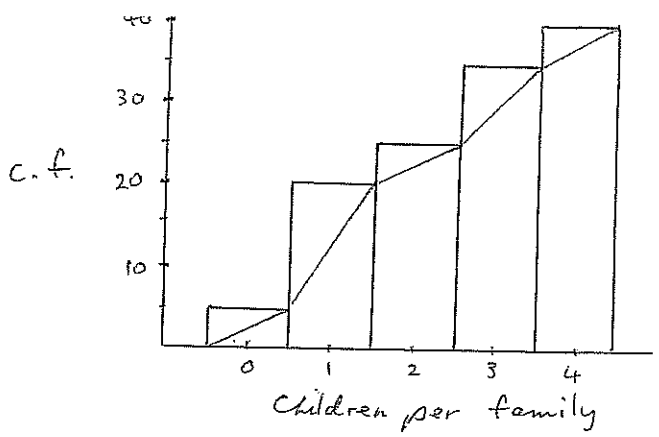
$SA = \pi \times 6^2 + \pi \times 6 \times 10$

$= 36\pi + 60\pi$

$= 96\pi \text{ cm}^2$

2

b) A survey of families asked them asked them how many children they each had. The results are shown in the cumulative frequency histogram below:



i) How many families were surveyed? 40 1

ii) What is the modal number of children? 1 1

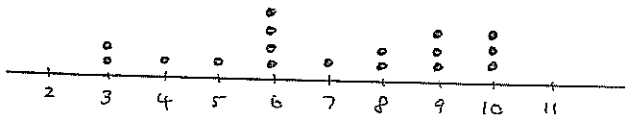
iii) How many families had 4 children? 5 1

iv) Use a ruler to draw in the c.f. polygon (ogive). Use it to find the median number of children per family. 1.5 1

v) Find the upper quartile. 3 1

vi) Find the interquartile range. $3 - 1 = 2$ 1

c)



From the dot plot above, find the:

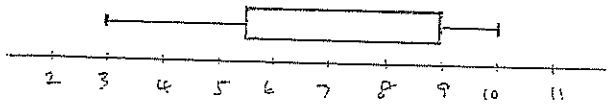
i) range 7 ii) median 7

iii) lower and upper quartiles L.Q. 5.5

U.Q. 9

4

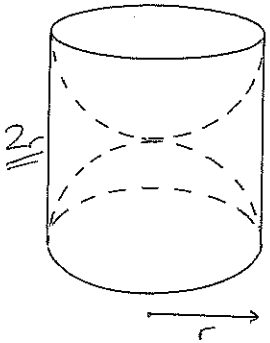
d) Using a ruler, neatly draw a box-and-whisker plot for the information in c) 2



QUESTION 13

a) A solid is in the shape of a cylinder with two hemi-spheres removed as shown. The cylinder has radius r units.

Find an expression for the surface area of the solid in terms of π. Simplify your answer. 2

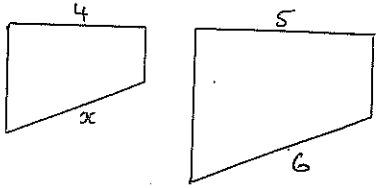


$2\pi r \times 2r + 4\pi r^2$

$= 4\pi r^2 + 4\pi r^2$

$= 8\pi r^2 \ u^2$

b) The two shapes shown are similar. 3



i) What is the enlargement factor? $\frac{5}{4}$

ii) Find the value of x. $\frac{5}{4} = \frac{6}{x}$

$x = 4.8$

iii) Find the ratio of areas. 16 : 25

iv) If the area of the smaller shape is 30 cm^2, find the area of the larger shape. 1

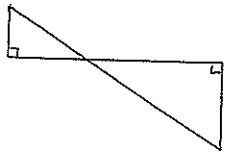
$\frac{16}{25} = \frac{30}{A}$

$16A = 750$

$A = 46.875 \ cm^2$

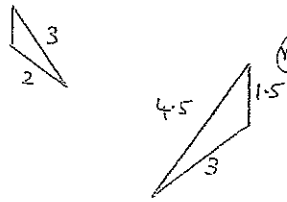
c) Circle YES or NO according to whether the triangles are similar or not. 2

If YES, concisely summarise the applicable test.

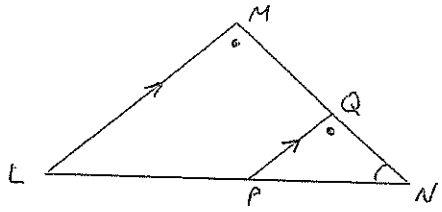
i) 

(YES) NO equiangular

need both

ii) 

(YES) NO equal ratio of corresponding sides.

d) 

i) Prove that ΔPQN is similar to ΔLMN. 3

LN is common

$LM = \angle PQN$ (corresponding angles, parallel lines)

$\therefore \Delta PQN \parallel\parallel \Delta LMN$ (equiangular)

ii) If $PQ = 5, MQ = 3, QN = 2, PN = 4$, find the length of:

$\alpha)$ LP 6 1

$\beta)$ LM $\frac{LM}{5} = \frac{5}{2}$ 1

$LM = 12\frac{1}{2}$

e) Two similar solids A, B have their corresponding sides in the ratio 3 : 2 2

i) What is the ratio of their surface areas? 9 : 4

ii) The solids are filled with water. How many times larger is volume A compared to volume B?

$\frac{27}{8} = 3\frac{3}{8}$ times

f) Two similar pyramids have their volumes in the ratio 27 : 64 3

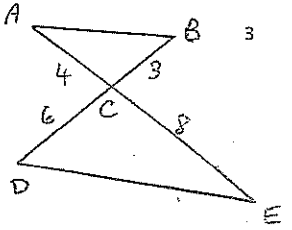
i) What is the ratio of their heights? 3 : 4

ii) Express the ratio in i) in the form 1 : x $1 : \frac{4}{3}$

iii) What is the enlargement factor for their surface areas? $\frac{16}{9}$

QUESTION 14

a) Prove that ΔABC is similar to ΔEDC. 3



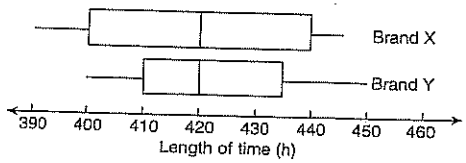
$\angle ACB = \angle ECD$ (vertically opposite angles)

$\frac{AC}{EC} = \frac{BC}{DC} = \frac{1}{2}$

$\therefore \Delta ABC \parallel\parallel \Delta EDC$ (equal ratio of sides about an equal angle)

b) A researcher tested two different brands of batteries to see how long they lasted.

Her results are shown in the double box-and-whisker plot below.



i) Find the interquartile range for Brand Y batteries. 25 1

ii) What percentage of Brand X batteries last longer than 440 hours? 25% 1

c) For the scores in this distribution table, find the:

i) mean (1 dec.) 4.9 1

ii) standard deviation (1 dec.) 1.1 1

Score	Frequency
3	10
4	25
5	15
6	40

d) Jordan's results in two tests, and each test's mean and standard deviation, are shown below.

	Score	$\bar{x}$	s.d.
Maths	82	70	12
Science	82	70	4

i) In which test, Maths or Science, did Jordan score better relative to the rest of the class? 1

Science

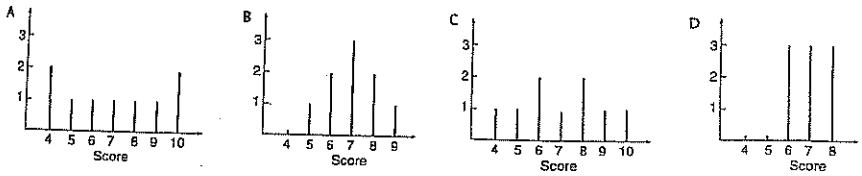
ii) An extra student, Eric, sits both tests and scores 78% in Maths, 75% in Science. 2

What happens to the standard deviation in:

∝) Maths? decreases

β) Science? increases

e) The graphs below show four different distributions of 9 scores. Each set of scores has a mean of 7.



Arrange A, B, C, D in order of increasing standard deviation D, B, C, A 1

f) A 1 cm^3 ingot of gold is flattened and reshaped into a thin circular medal. If the medal in 2 mm thick, what is its radius, to the nearest mm? 2

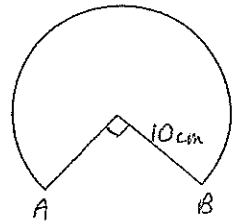
$1000 = \pi r^2 h$

$= \pi r^2 \times 2$

$\therefore \pi r^2 = 500$

$\therefore r = \sqrt{\frac{500}{\pi}} \doteq 13$ mm

g) The shape shows three-quarters of a circular disk, centre O and with radius 10 cm. When points A and B are joined a cone will be formed.



Find the:

i) slant height of the cone 10 cm 1

ii) radius of the cone's base circle 2

Method 1 $2\pi r = \frac{3}{4} \times 2\pi \times 10$

$r = \frac{15\pi}{2\pi}$

$= 7.5$ cm

Method 2 $\pi rs = \frac{3}{4} \times \pi \times 10^2$

$\therefore r = \frac{75\pi}{10\pi}$

$= 7.5$ cm

QUESTION 15

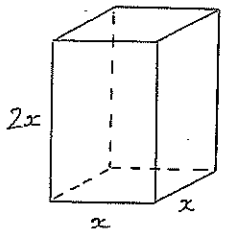
a) A rectangular tank with a square base of 5 metres contains water to a depth of 4 metres.

A solid cube of edge 3 metres is placed at the bottom of the tank. What is now the level of the water in the tank, in metres?

A. 5.02 B. 5.08 C. 5.4 D. 6.67 E. 7 Answer B 1

b) A square prism has a height which is twice its base width. 2

Its surface area is 1690 cm^2. Find its volume.



$10x^2 = 1690$

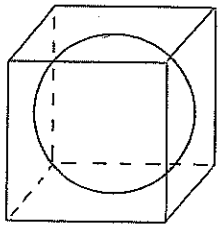
$x^2 = 169$

$x = 13$

$\therefore$ Vol $= 13 \times 13 \times 13 = 4394 cm^3$

c) A sphere exactly fits inside a cube. Find the percentage of the cube's volume occupied by the sphere. 2

Give your answer correct to 1 decimal place.



$\frac{\frac{4}{3}\pi r^3}{8r^3} = \frac{4\pi}{24} \times 100\%$

$= 52.4\%$.

d) The ratio of volumes for two similar cylinders is 1 : 5 3

i) What is the ratio of their radii? (answer to 2 dec. places)

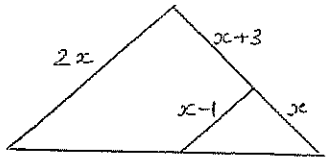
1 : 1.71

ii) The surface area of the smaller cylinder is 50 cm^2. Find the larger surface area (answer to 1 dec. place)

$\frac{1^2}{1.71^2} = \frac{50}{A}$

$A = 146.2 cm^2$

e) The two triangles are similar. Find the value of x. 2



$\frac{x}{2x+3} = \frac{x-1}{x}$

$2x^2 = 2x^2 - 2x + 3x - 3$

$x - 3 = 0$

$x = 3$

f) Two similar cones have surface areas 90 cm^2 and 100 cm^2. If the volume of the larger cone is 500 cm^3, find the smaller volume (1 dec. place). 2

$\frac{(\sqrt{90})^3}{(\sqrt{100})^3} = \frac{V}{500}$

$V = \frac{500 \times 853.815}{1000}$

$= 426.9 cm^3$

g) Find the mean number of children per family in Question 12b) 2

$\bar{x} = \frac{0+15+10+30+20}{40}$

$= \frac{75}{40}$

$= 1.875$

h) The mean of n scores is m. When a new score k is added, the mean changes to y. 1

What is the new score k?

$\frac{mn+k}{n+1} = y$

$mn + k = yn + y$

$\therefore k = yn + y - mn$

-------- END OF TEST --------