Carlingford High School

2016

Year 10 5.3 Term One Examination

Time allowed 55 minutes

Name: .....Answer Sheet.....

Teacher: (Please Circle)

10 5.3.1 (Ms Kellahan) 10 5.3.2 (Ms Wilson/Mrs Young)

10 5.3.3 (Mr Cheng) 10 5.3.4 (Mrs Lego)

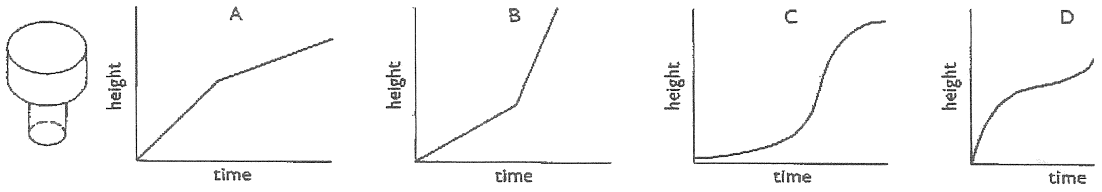
- Marks may be deducted for careless or badly arranged work
- Only calculators approved by the Board of Studies may be used
- All answers are to be completed in blue or black pen except graphs and diagrams
- No lending or borrowing

KELLAHAN WILSON YOUNG

	Non-linear relationships	Surface Area & Volume	Data	Total
	/21	/17	10	/48
Extension	/2	/2	1	/5
	/23	/19	11	/53

Graphs and Non-linear Relationships (23 marks)

1

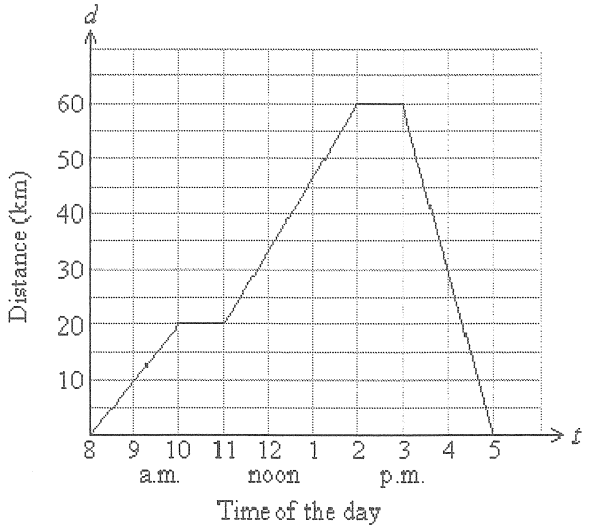


1

A funnel was closed at the base with a stopper, then filled with water at a constant rate. Which graph best shows the change in depth against time?

Answer A

2 The following graph gives the distance of a cyclist from his home.



a What was the total distance travelled by the cyclist? 120km 1

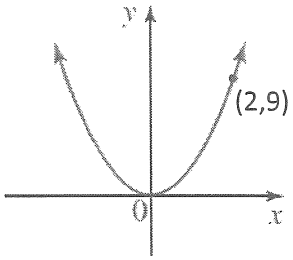
b For how long did the cyclist stop? 2 hours 1

c Between what hours was the cyclist travelling the fastest? 3pm and 5pm 1

d What was the speed travelled by the cyclist between 11am and 2pm? 1

$\frac{40}{3} = 13\frac{1}{3}$ km/h.

3. The curve below is a parabola with equation of the form $y = ax^2$, where **a** is a constant. Find the value of **a** if the point (2,9) lies on the parabola. Hence determine its equation. 2



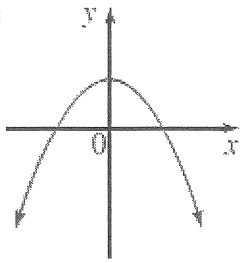
$9 = a(2)^2$

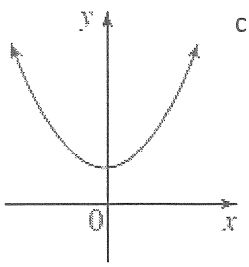
$a = \frac{9}{4}$

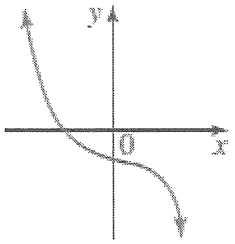
$\therefore y = \frac{9}{4}x^2$

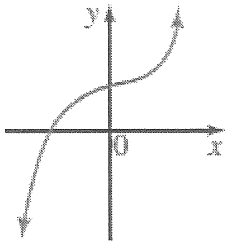
4. Match each of these equations with one of the graphs below. 2

$y = x^2 + 3$ b $y = -x^3 - 2$ c $y = 3 - x^2$ a $y = x^3 + 2$ d

a 

b 

c 

d 

5. a Complete the table of values and graph the parabola, $y = x^2 + 5x + 6$ 2
Number and label your axes. Label your graph.

x	-5	-4	-3	-2.5	-2	-1	0
y	6	2	0	-0.25	0	2	6

b What are the x intercepts?

-3 and -2

c What is the y intercept?

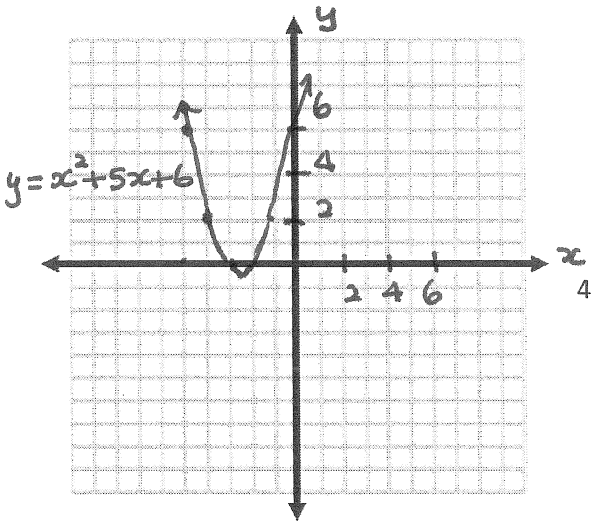
6

d What is the axis of symmetry?

$x = -2.5$

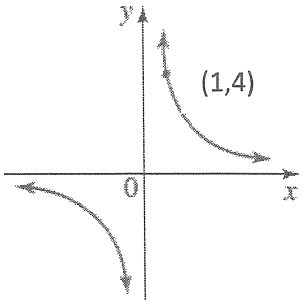
e What is the vertex?

$(-2.5, -0.25)$



4

6. Find the equation of the hyperbola **and** the equations of the asymptotes. 2



$xy = 4$

or $y = \frac{4}{x}$

asymptotes

$x = 0$

$y = 0$

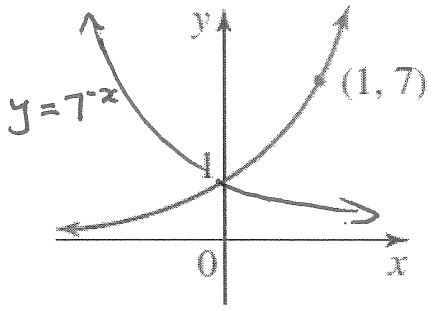
7. Select one description from the list to explain how each of these curves differs from $y = x^4$
(concave down, moved to the left, moved to the right)

a. $y = -x^4$ concave down

2

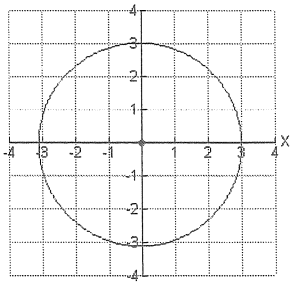
b. $(x-1)^4$ moved to the right

8. This is the graph of $y = 7^x$. On the same number plane sketch $y = 7^{-x}$. 1



9. State the equation of the circle. 1

$x^2 + y^2 = 9$



*10. Find the centre and the radius of the circle given in the equation: 2

$$x^2 + y^2 - 4x + 10y + 14 = 0$$

$x^2 - 4x + 4 + y^2 + 10y + 25 = -14 + 4 + 25$

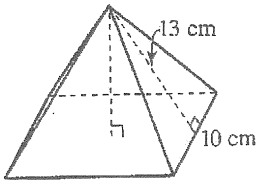
$(x-2)^2 + (y+5)^2 = 15$

centre $(2, -5)$

radius $\sqrt{15}$ units

Surface area and volume (19 marks)

1.



This is a square based pyramid.

a Find the perpendicular height of the pyramid. 1

$h = 13^2 - 5^2$

$= 169 - 25$

$= 144$

height $= 12$cm

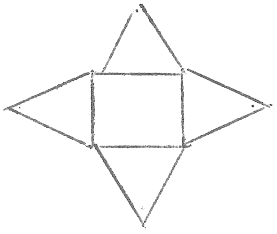
b Find the volume of the pyramid. 1

$V = \frac{1}{3}Ah$

$= \frac{1}{3} \times 10^2 \times 12$

Volume $= 400\,cm^3$

c Using a ruler draw a net of this solid. 1



d Find the surface area of the pyramid 2

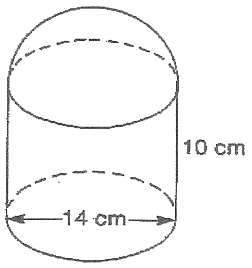
SA = 4 triangles + square

$= 4 \times \frac{1}{2}bh + s^2$

$= 2 \times 13 \times 10 + 10^2$

Surface area $= 360\,cm^2$

2. Find the surface area correct to 2 decimal places. 3



$SA = 2\pi r^2 + 2\pi rh + \pi r^2$

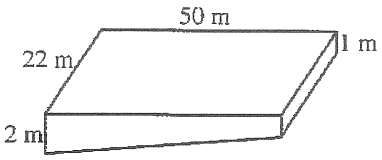
$= 3\pi r^2 + 2\pi rh$

$= 3 \times \pi \times 7^2 + 2 \times \pi \times 7 \times 10$

$= 901.6370916$

surface area $\doteq 901.64\ cm^2$ (2dp)

3. Below is a diagram of an Olympic swimming pool.



a Find the volume of the pool in cubic metres. 2

$V = AH$

$= \frac{1}{2} h (a+b) H$

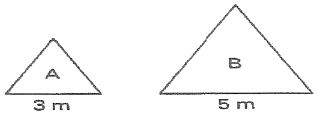
$= \frac{1}{2} \times 50 (1+2) \times 22$

Volume $= 1650\ m^3$

b Find the capacity of the pool in litres. 1

Capacity = 1 650 000 L .

5. Two similar sails for yachts have bases 3m and 5m as shown.



a. Find the ratio of their areas. 1

$9:25$

b. Hence, find the area of the smaller sail, if the larger sail has an area of $15m^2$. 2

$\frac{x}{15} = \frac{9}{25}$

$x = 5.4m^2$

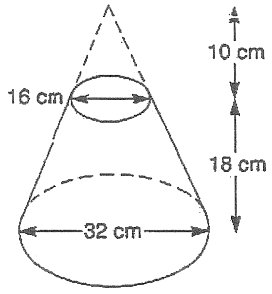
6. The surface areas of two spheres are in the ratio 1:8. Find the ratio of their volumes. 1

ratio of lengths $= 1:\sqrt{8}$

ratio of volumes $= 1:(\sqrt{8})^3$

$= 1:\sqrt{512}$ or $1:16\sqrt{2}$

7. The shape of a lampshade is a truncated cone called a frustrum. Calculate the volume enclosed by the shade, correct to one decimal place. 2



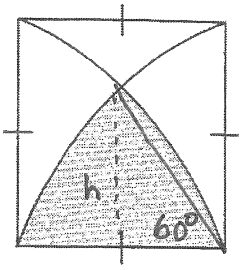
$V = \frac{1}{3}A_1h_1 - \frac{1}{3}A_2h_2$

$= \frac{1}{3}\pi(16)^2.28 - \frac{1}{3}\pi(8)^2.10$

$= 6836.105614$

Volume $= 6836.1\ cm^3$

*8 2



What fraction of the square does the shaded region represent?

shaded region area

= sector + minor segment

$= \frac{\pi r^2}{6} + \frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}r^2$

square area

$= r^2$

$\therefore$ Fraction $= \left(\frac{\pi r^2}{6} + \frac{\pi r^2}{6} - \frac{\sqrt{3}}{4}r^2\right) \div r^2$

$= \frac{\pi}{3} - \frac{\sqrt{3}}{}$

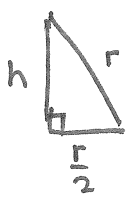
$= \frac{4\pi - 3\sqrt{3}}{12}$

Sector $= \frac{60}{360} \times \pi r^2$

Segment = sector − triangle

$= \frac{\pi r^2}{6} - \frac{1}{2}.r.\frac{\sqrt{3}}{2}r$

NOTE:

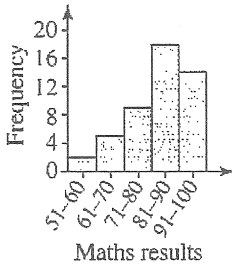


$h^2 = r^2 - \left(\frac{r}{2}\right)^2$

$h = \frac{\sqrt{3}}{2}r$

Investigating Data (11 marks)

1 The distribution on the left shows the results of a Maths Exam at a certain school. The data are: 1



a positively skewed

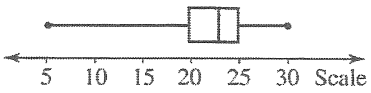
b bimodal

c negatively skewed

d symmetrical

Answer C

2 Consider the box and whisker plot shown:



a What is the range? 30 - 5 = 25 1

b What is the interquartile range? 25 - 20 = 5 1

3 Which measure is always one of the scores in a set of data? Circle the answer. 1

mean median (mode)

4 Consider the results of 2 students in five tests
Sophie 75,80,70,72,78
William 50,95,90,80,55

a Find the mean and standard deviation for each student: 4

Sophie
mean = 75

standard deviation = 3.687817783

William
mean = 74

standard deviation = 18.27566688

b Which results are more consistent? Justify your answer. 2

Sophie's marks are more consistent - lowest standard deviation

5 Consider the scores 5,8,11,15. Give an example of a score that could be added that would increase the mean but lower the standard deviation. 1

Any score between 9.75 and 13.4496

$\bar{x} = 9.75$

$\sigma_n = 3.6996$

-END OF TEST-