



STAGE 5.1-5.3 MATHEMATICS

Year 10 Final Examination

November 8, 2012

General instructions

- Working time – 100 minutes.
- Write your answers on the paper supplied.
- Marks may be deducted for careless or poorly arranged work.
- Write using blue or black pen. Where diagrams are to be sketched, these may be done in pencil.
- Board approved calculators may be used.
- All necessary working should be shown in every question.
- Attempt **all** questions.
- At the conclusion of the examination, bundle the sheets used in the correct order within this paper and hand to examination supervisors.

Class (please ✓)

- 10M1 – Mrs Juhn
- 10M2 – Mr Lowe
- 10M3 – Mr Lucas
- 10M4 – Mr Ireland
- 10M5 – Mr Fletcher

NAME: **# SHEETS USED:**

Marker's use only.

SECTION	1	2	3	4	5	6	7	8	9	10	11	Total	%
MARKS	$\overline{16}$	$\overline{10}$	$\overline{12}$	$\overline{12}$	$\overline{5}$	$\overline{9}$	$\overline{6}$	$\overline{9}$	$\overline{9}$	$\overline{6}$	$\overline{15}$	$\overline{109}$	

Question 1 (16 Marks)	Commence a NEW page.	Marks
(a) Fully simplify: $3\sqrt{12} - 2\sqrt{108}$.		2
(b) Rewrite with a rational denominator:		
i. $\frac{5\sqrt{2}}{3\sqrt{3}}$.		1
ii. $\frac{3 - \sqrt{2}}{4 - 3\sqrt{3}}$.		2
(c) Solve the following equations, giving answers as exact values:		
i. $2x^2 + 16x = 0$.		2
ii. $x^2 + x - 8 = 0$.		2
(d) For the parabola with equation $y = -x^2 + 4x + 21$,		
i. Find the equation of the axis of symmetry.		1
ii. Find the coordinates of the vertex.		1
iii. Find the y intercept.		1
iv. Find any x intercepts.		2
v. Sketch the parabola using the above information.		2

- Question 2** (10 Marks) Commence a NEW page. **Marks**
- (a) Write the exact value of the following:
- i. $\sin 330^\circ$. **2**
 - ii. $\tan 210^\circ$. **2**
- (b) If $\tan x = \frac{4}{5}$, $\cos x < 0$, find the exact value of $\sin x$. **2**
- (c) A geologist in the outback drives 20 km from the point A on a bearing of 150° to point B , then drives 40 km on a bearing of 020° to point C .
- i. Draw a diagram representing the information given. **1**
 - ii. Find the size of $\angle ABC$. **1**
 - iii. Find the distance that the geologist is from his original location, correct to one decimal place. **2**

- Question 3** (12 Marks) Commence a NEW page. **Marks**
- (a) If $A(-2, 3)$ and $B(4, 6)$ and $C(1, 0)$,
- i. Show that $\triangle ABC$ is isosceles. **2**
 - ii. Find the equation of the perpendicular bisector of AC . **3**
 - iii. Show that the perpendicular bisector of AC passes through B . **1**
- (b) The line ℓ makes an angle of 135° with the positive x axis.
- i. Explain why the gradient of the line ℓ is -1 . **1**
 - ii. If the line ℓ cuts the x axis at $(-3, 0)$, find the equation of the line in general form. **2**
- (c) Find the centre and radius of the circle, given its equation is **3**

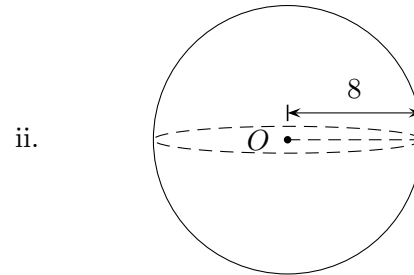
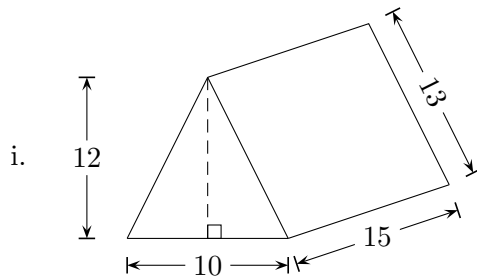
$$x^2 + 4x + y^2 - 8y = 10$$

Question 4 (12 Marks)

Commence a NEW page.

Marks

- (a) Find the surface area and volume of the following figures. All measurements are in centimetres. *Give answers as exact values.* **8**



- (b) A rectangular pyramid has base $20\text{ m} \times 30\text{ m}$ with the edge length 40 m .
- Find the perpendicular height of the pyramid, correct to one decimal place. **2**
 - Find the volume of the pyramid. **2**

Question 5 (5 Marks)

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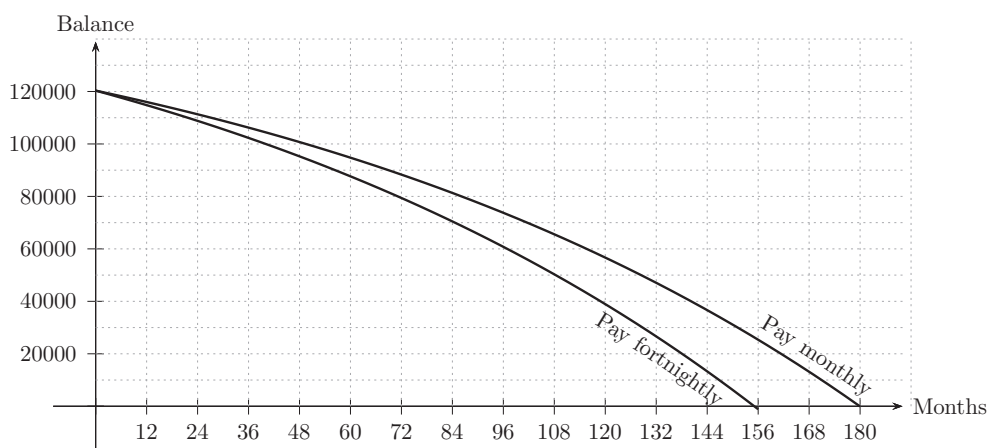
Marks

- (a) Peter invested \$3 400 at 12% p.a. for seven months, with interest calculated monthly. Find the value of his investment after seven months. **2**
- (b) Chris and Bob each took out a \$120 000 loan from the same bank.

Chris paid \$1 147 per month, knowing it would take 15 years to repay the entire loan.

Bob decided to pay \$573.50 each fortnight instead.

Refer to the graph and the information given to answer the following parts:



- After how many months did Chris owe twice as much as Bob? **1**
- How much money did Bob save by paying off his loan every fortnight instead of each month? **2**

Question 6 (9 Marks)

Commence a NEW page.

Marks

- (a) At a shopping centre car park there are 10 buses, 250 cars and 20 motorbikes. If all have an equal chance of leaving at the same time, find the probability that the first vehicle to leave
- i. is a bus? **1**
- ii. will not be a car? **2**
- (b) Sam and Steven are two of eight competitors in a running race. If all competitors have an equal chance of winning, what is the probability that Steven will come first, and Sam will come second? **2**
- (c) An unbiased die is thrown twice. What is the probability of obtaining a “4” in the first throw and a combined total of more than 8? **2**
- (d) At the beginning of the cricket season, Team *A* was given a 70% chance of reaching the final, and Team *B* was given a 20% chance of reaching the final. What is the probability that neither team reaches the final? **2**

Question 7 (6 Marks)

Commence a NEW page.

Marks

- (a) Three classes sat the same topic test in Mathematics. The mean marks in each of the three classes were 60, 75 and 76.5. The number of students in each class were 22, 18 and 20 respectively. **2**

What was the overall mean for the three classes?

- (b) Given the following frequency distribution table, find the

x	f
11	5
12	4
13	1
14	6
15	4

- i. mean **1**
- ii. standard deviation **1**
- (c) A student sat for two tests. On Test 1, the class mean was 60.8% with standard deviation 4.7%. On Test 2, the mean was 72.6% and standard deviation was 4.8%. **2**

If the student scored 64% in Test 1 and 73% in Test 2, which was the better performance? Justify your answer with calculations and reasons.

- Question 8** (9 Marks) Commence a NEW page. **Marks**
- (a) If $\log_a 2 = x$, $\log_a 3 = y$ and $\log_a 5 = z$, find the value of $\log_a \frac{18}{25}$ in terms of x , y and z . **2**
- (b) Solve the following equations:
- i. $2 \log_{10} x + 3 = 5 \log_{10} x$. **2**
- ii. $\log_x 3 = \frac{1}{2}$. **1**
- (c) Solve $25^{x-1} = 125^{2-x}$. **2**
- (d) Find the value of x , correct to 3 decimal places: $3^{x+1} = 15$. **2**

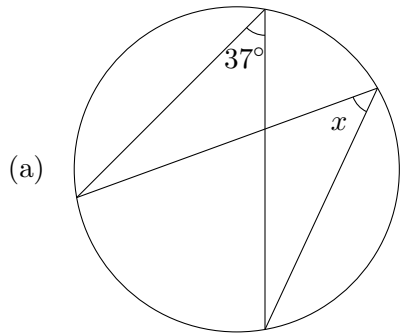
- Question 9** (9 Marks) Commence a NEW page. **Marks**
- (a) On separate diagrams, sketch the following graphs, showing all important features.
- i. $y = x^2 - 8x + 15$. **2**
- ii. $y = -\frac{3}{x}$. **2**
- iii. $(x - 3)^2 + (y - 4)^2 = 25$. **2**
- (b) Find all points of intersection of the parabola $y = x^2$ with the line $y = 2x + 18$. **3**

Question 10 (6 Marks)

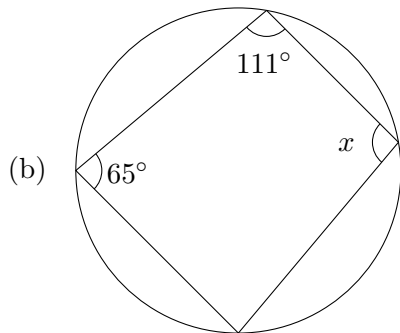
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Marks

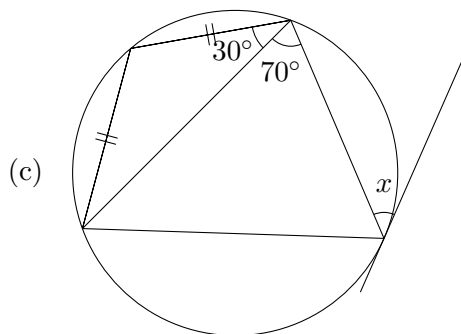
Find the value of the pronumerals:



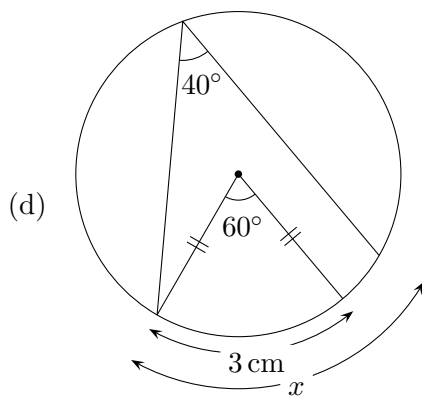
1



1



2



2

- Question 11** (15 Marks) Commence a NEW page. **Marks**
- (a) If $f(x) = 3x^2 - 2x + 5$ and $g(x) = 2x^2 + 3x - 1$, for what values of x is $f(x) = g(x)$? **3**
- (b) State the domain and range of the following relations:
- i. $x^2 + y^2 = 36$. **2**
- ii. $y = 2^x$. **2**
- iii. $y = \frac{1}{x + 3}$. **2**
- (c) Which of the curves in the previous part are functions? **2**
- (d) If $f(x) = x^2 + \sqrt{x}$, evaluate $f(1) + f(4)$. **2**
- (e) Find the inverse function of $y = \frac{2x + 1}{x - 3}$. **2**

End of paper.