PERTH MODERN SCHOOL
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Perth Modern School
Semester One Examination, 2012
Question/Answer Booklet

MATHEMATICS 3A/3B

Section One: Calculator-free

Student Name _____

Teachers Name _____

Year _____

Student Number: In figures | | | | | | | | |

In words _____

_____

Time allowed for this section

Reading time before commencing work: 5 minutes
Working time for this section: 50 minutes

Material required/recommended for this section

To be provided by the supervisor

This Question/Answer Booklet
Formula Sheet

To be provided by the candidate

Standard items: pens, pencils, pencil sharpener, eraser, correction fluid, ruler, highlighters
Special items : nil

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One Calculator-free	7	7	50	50	
Section Two Calculator-assumed	13	13	100	100	
			Total	150	100

Instructions to students

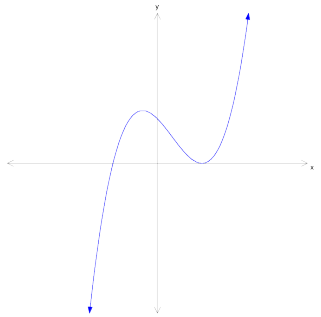
1 Write your answers in the spaces provided in this Question/Answer Booklet. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer. If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued. i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

2 **Show all your working clearly**. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

3 It is recommended that you **do not use pencil**, except in diagrams.

Question 7 (continued)

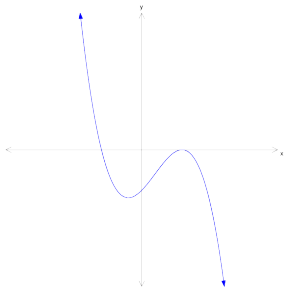
(b) The graph of $y=f(x)$ has been plotted below



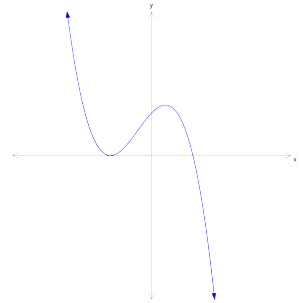
On the next 3 pairs of axes A, B, C are graphs of $y=f(-x)$, $f(x-1)$, $-f(x)$ in some order. Say which corresponds to which graph.

(3)

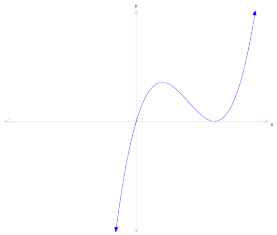
A



B



C



Function	Graph
$y = f(-x)$	
$y = f(x - 1)$	
$y = -f(x)$	

Section One: Calculator-free (50 marks)

This section has **seven (7)** questions. Answer all questions. Write your answers in the spaces provided.

Working time: 50 minutes

Question 1 **(5 marks)**

The marks in Mr Green's Chemistry test are normally distributed. The mean is 100 and the standard deviation is 10.

(i) Jon's mark is 115. What is his Z-score? (1)

(ii) Christopher has a Z-score of -2. What mark did he achieve in the test? (1)

(iii) What percentage of marks lies between 80 and 110? (3)

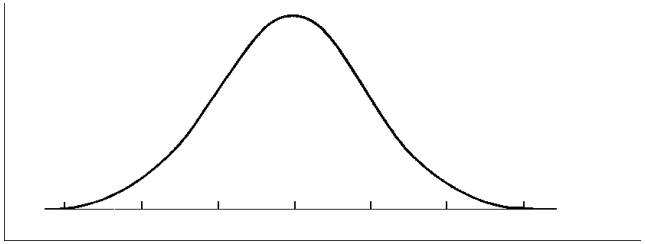
You may assume the following:
68% of marks have Z-scores between -1 and 1
95% of marks have Z-scores between -2 and 2
99.7% of marks have Z-scores between -3 and 3

Question 7 **(8 Marks)**

(a) The weight (W) in grams of individual Yoghurt Muesli Bars in a batch was measured to investigate their weight distribution.

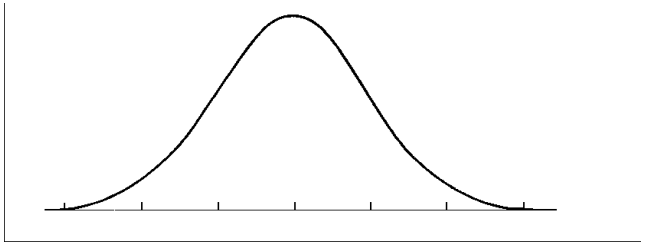
(i) Using the normal distribution curve below with mean μ and standard deviation σ illustrate the meaning of $\mu - 2\sigma = 34.7$

(1)



(ii) Using the normal distribution curve below, illustrate the meaning of $P(w \geq \mu + \sigma) = 0.1587$

(2)



(iii) The following linear equations for the mean μ and the standard deviation σ were determined for the distribution of the weights of individual Yoghurt Muesli Bars:

$\mu + \sigma = 35.15$ and $\mu - 2\sigma = 34.7$

Use the equations to find the mean weight and standard deviation of Yoghurt Muesli Bars.

(2)

Question 6 (continued)

(c) solve for what values of n is (3)

$$\frac{6^{3n} \times 9^{n+1}}{8^n} = 1$$

(d) simplify and express with positive indices. (2)

$$\frac{-3a^{-2}b^3}{8a^2b^{-3}} \times \frac{-6a^{-3}b^{-4}}{-9a^{-3}b^2}$$

Question 2 **(8 marks)**

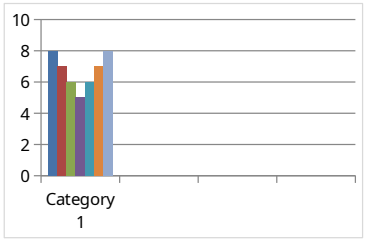
(a) Jonathon used the 'capture-recapture' technique to estimate the number of yabbies living in a dam.

* He caught, tagged and released 20 yabbies.
* Later he caught 36 yabbies at random from the same dam.
* He found that 8 of these 36 yabbies had been tagged.

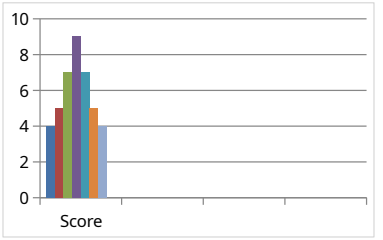
Estimate the total number of yabbies living in this dam. (3)

(b) Which of the following frequency histograms shows data that could be normally distributed? (1)

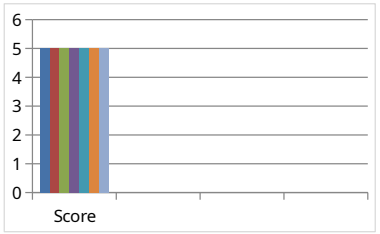
(A)



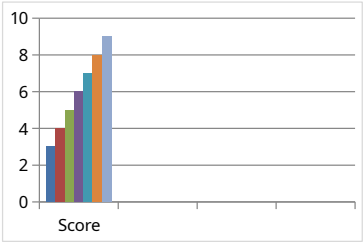
(B)



(C)



(D)



Question 6 **(9 marks)**

Use the laws of indices to

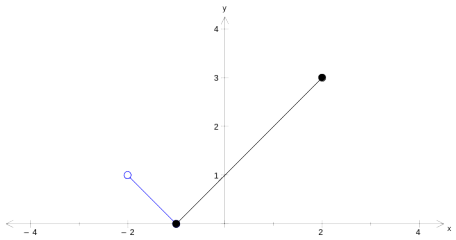
(a) evaluate $\left(\frac{1}{32}\right)^{-\frac{2}{5}}$ (2)

(b) solve the equation, showing all working steps

$3^{3x+1}=243$ (2)

Question 5 **(8 marks)**

(a) State the domain and range (in set notation) for the function y = *f(x)* drawn below. (3)



(b) Given that g*(x)* = x^2 - *x* find

(i) *g*(-2) (1)

(ii) *g*(2x+1) (2)

(iii) *x* if *g(x)*=0 (2)

Question 2 (continued)

(c) Radar checks were carried out on the speed driven by drivers on two days, on a stretch of Spencer Road. The results are tabled below.

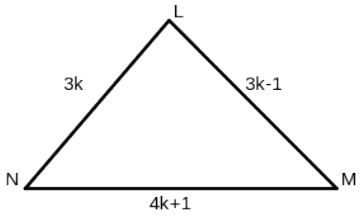
Days	Mean	Standard deviation	Number of drivers
Wednesday	60	10	100
Thursday	70	5	100

On which day would you expect there to be more drivers exceeding 85km/h? Explain your answer.
(2)

(d) The height of students in Mrs Smith's class range from 150cm to 175cm. Their heights were measured one day and it was found that the mean height was 160cm. Two students were absent on the day when the measurement was taken. When the heights of the absent students were included in the data, the mean height did not change. What are the possible heights of the two absent students?
(2)

Question 3 **(5 marks)**

ΔLMN is drawn with LN = 3k units, MN = (4k+1) units and LM = (3k-1) units with k>0.

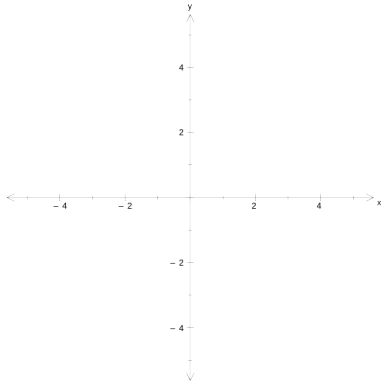


(i) Which side of ΔLMN is the longest side? (1)

(ii) If ΔLMN is a right-angled triangle calculate the value(s) of k. (4)

Question 4 **(7 marks)**

(a) Sketch the graph of $f(x)=2(x-1)^2$. Show all intercepts. (3)



(b) Indicate on the graph where you would read off the values for x if

$4 = 2(x-1)^2$ (1)

(c) Use your graph to solve $2x^2 - 4x + 6 = 0$. Justify your answer. (3)