



PERTH MODERN SCHOOL
Exceptional schooling. Exceptional students.
Independent Public School

Course ____ **Methods_Test 3_** **Year** __12____

Student name: _____ **Teacher name:** _____

Date: Monday 3 August

Task type: _____ **Response**

Time allowed for this task: ____45____ mins

Number of questions: ____9____

Materials required: Calculator with CAS capability (to be provided by the student)

Standard items: Pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: Drawing instruments, templates, notes on one unfolded sheet of A4 paper, and up to three calculators approved for use in the WACE examinations

Marks available: ____46____ marks

Task weighting: ____10____%

Formula sheet provided: Yes

Note: All part questions worth more than 2 marks require working to obtain full marks.

Q1 (3.1.6)

(3 & 3 = 6 marks)

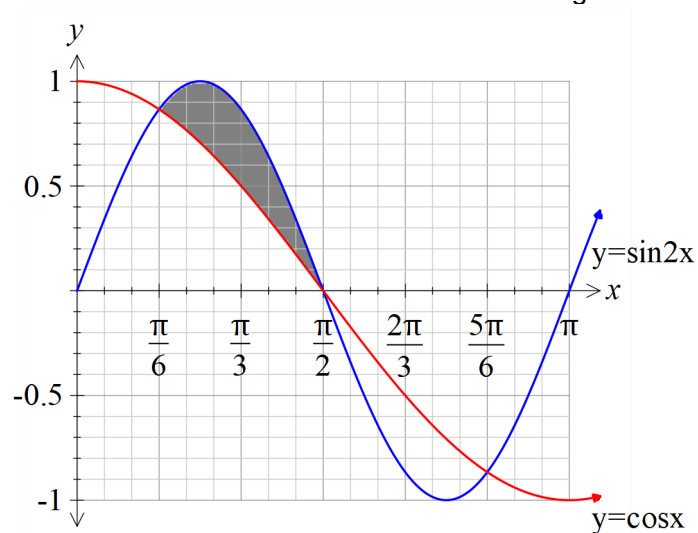
Determine the exact gradient of each of the following at the given point. Show all working.

a) $y = \cos 3x$ at the point $\left(\frac{\pi}{3}, -1\right)$

b) $y = 5\cos^2 x$ at the point $\left(\frac{\pi}{6}, \frac{15}{4}\right)$

Q2 (3.1.6)

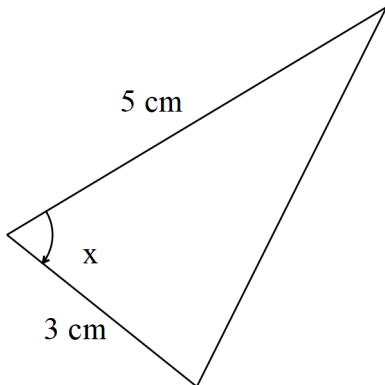
(4 marks)

Determine the exact area shaded in the diagram below **without the use of a classpad**.

Q3 (3.1.6/3.1.10)

(3 & 3 = 6 marks)

Consider the triangle drawn below with angle x radians and fixed length sides 5 & 3 cm. Let A represent the area of the triangle in cm^2 .



a) Determine $\frac{dA}{dx}$ when $x = \frac{\pi}{4}$.

b) Using the increments formula, determine the approximate change in the area when the angle changes from $\frac{\pi}{4}$ to $\frac{\pi}{4} + 0.01$ radians.

Q4 (3.3.1)

(4 marks)

The expected value of the discrete probability distribution, X given below, is $3\frac{2}{3}$. Determine the values of the constants p & q and the variance of X to 3 decimal places.

x	1	2	3	4	5
$P(X = x)$	0.1	p	0.1	q	0.3

Q5 (3.3.13)

(3 marks)

A binomial distribution has a mean of 6 and a standard deviation of 1.9. Determine the values of n & p , the number of trials and the probability of a success.

Q6 (3.3.7)

(4 marks)

A teacher needs to scale the results of her class by first multiplying by a constant and then adding a second constant. The original mean was 72 with a standard deviation of 21, the teacher needs the scaled results to have a mean of 60 and a standard deviation of 15. Determine the values of a & b .

Q7 (4.1.11)

(3 & 3 = 6 marks)

The displacement of a car moving in straight line is given by $s(t)$ km at t hours, where $s(t) = 55 + t \ln(31t^2)$.

The following questions require full working and answers only given by the classpad will not receive full marks.

a) Determine the velocity at $t = 3.5$ hours.

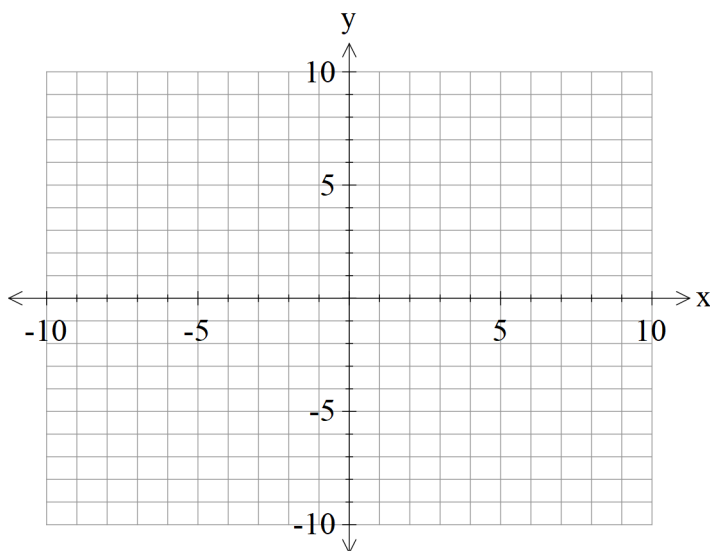
b) Determine the time that the acceleration will be 0.2 km/h^2 .

Q8 (4.1.6)

(3 & 3 = 6 marks)

Consider the function $f(x) = \ln(x - 2) + 3$.

a) Sketch the function on the axes below showing all major features.



b) In terms of the constants p & q , determine the x intercept of the function $f(x + 2p) - q$.

Q9 (4.1.11/3.2.16)

(3 & 4 = 7 marks)

This question must be answered without **the use of a classpad** to receive full marks.

a) $\frac{d}{dx}[(x+1)\ln(1+x)]$ (Simplify)

b) Use the result from (a) above to determine $\int \ln(1+x) dx$ in exact simplified form.

