PERTH MODERN SCHOOL
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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)

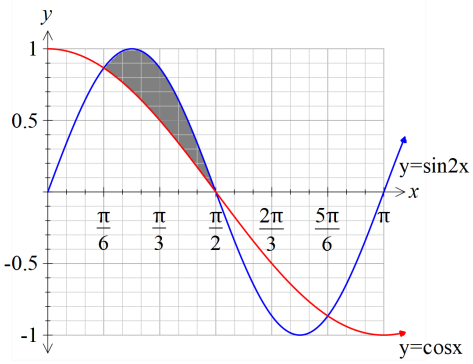
Determine the exact gradient of each of the following at the given point. Show all working.

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

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

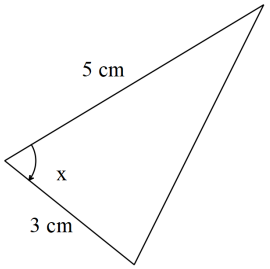
Q2 (3.1.6) (4 marks)

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 pf 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 be 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.

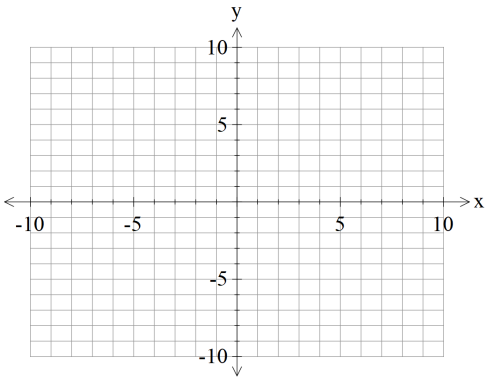
a) Determine the velocity at $t=3.5$ hours.

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

b) Use the result from (a) above to determine $\int_0^3 \ln(1+x)\,dx$ in exact simplified form.