Master Coaching
Ph:1800 TUITION
www.mastercoaching.com

Year 12 2 Unit Advanced

Test #2

Trial Half Year Examination

MATHEMATICS Yr 12 2 Unit

Time allowed - two hours *(Plus 5 minutes reading time)*

Directions to candidates :

* Attempt ALL questions.

* ALL questions are of equal value.

* All necessary working should be shown in every question.
  Marks will be deducted for careless or badly arranged work.

* Board approved calculators may be used.

* Each question attempted is to be returned on a separate sheet of paper
  clearly marked question 1, question 2, etc. at the top of the page.

Master Coaching
Ph:1800 TUITION
www.mastercoaching.com

Year 12 2 Unit Advanced

Test #2

2U Yr 12 Test 02

QUESTION 1 *(Start a new page).*

a Find, correct to two decimal places, the value of $\dfrac{(2\cdot42)^2}{6\cdot18-3\cdot45}$

b Factorise $2a^2-5a+2$

c Solve the simultaneous equations $y=4x-3$, $6x-2y+2=0$

d Ollistown Council raised Mr. Jones' Council rates by 15% to a new rate of $644. What was the the old rate before the price increase ?

e Meg buys 10 tickets in a raffle in which 200 tickets are sold. There is a first and second prize. Find the probability that Meg wins both prizes.

QUESTION 2 *(Start a new page).*

a Differentiate : **i** $5\left(3x^2-2x\right)^3$ **ii** x^2e^x **iii** $\dfrac{2x}{1+x^2}$

b Find correct to two decimal places **i** $\int_{0\cdot5}^{1}\left(\dfrac{3}{5x^2}+1\right).dx$ **ii** $\int_{-2}^{5}|2x-4|.dx$

c Sketch the curve $y=f(x)$ in the vicinity of $x=1$, given that $f(1)=3$, $f'(1)<0$ and $f(1)''>0$

QUESTION 3 *(Start a new page).*

a **i** On a number plane mark the origin O and the points A(1, 2) and B(5, 7).

ii Show that the equation of AB is $5x-4y+3=0$

iii Find the value of the acute angle θ between AB and the y axis. Mark θ on your diagram.

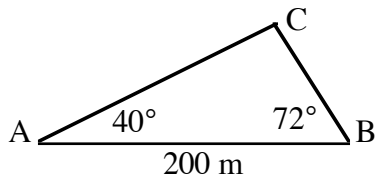
iv If AB cuts the y axis at C, write down the coordinates of C and mark C on your diagram.

v The line $x=5$ passes through B and cuts the x axis at D. Write down the coordinates of D and mark D on your diagram.

vi Name the geometrical shape BCOD and find its area.

vii Write down a set of inequalities which completely defines the interior of BCOD.

b



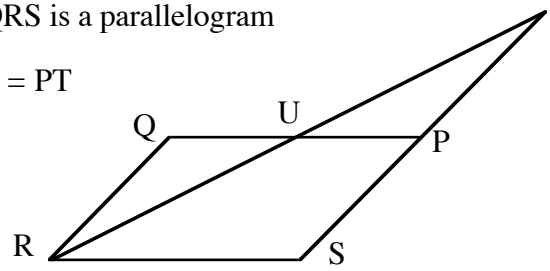
Find the length of CB to the nearest metre.

QUESTION 4 *(Start a new page).*

a Use the Trapezoidal rule with five function values to evaluate $\int_0^2 \frac{x}{x+1}.dx$ correct to 2 decimal places

b PQRS is a parallelogram

SP = PT



i Prove that $\Delta RQU \equiv \Delta TPU$

ii If the area of $\Delta RQU = 4$ units find the area of PQRS. Give reasons for your answer.

c Peter throws two fair dice. Find the probability that at least one of the numbers is a six.

QUESTION 5 *(Start a new page).*

a $400 is invested at an interest rate of 6% p.a. into a fund which compounds the interest annually. Find the value of the investment at the end of ten years.

b At the beginning of each year, for ten years, Joan invests $400 into a super fund paying 6% p.a. interest compounded annually. Find the value of the fund at the end of the tenth year.

c A timber worker is stacking logs.
The logs are stacked in layers, where each layer contains one log less than the layer below.
There are five logs in the top layer, six logs in the next layer, and so on.
There are *n* layers altogether.

i Write down the number of logs in the bottom layer.

ii Show that there are $\frac{1}{2}n(n+9)$ logs in the stack.

QUESTION 6 *(Start a new page).*

a Consider the curve given by $f(x) = 3x^4 - 4x^3 + 2$

i Find any turning points and determine their nature.

ii Find any points of inflexion.
iii Sketch the curve for $-1 \le x \le 2$ indicating where the curve crosses the y axis.
iv For what values of x is the curve concave down?

b Solve for $0° \le \theta \le 360°$: $2\sin 3\theta + 2 = 1$

QUESTION 7 *(Start a new page).*

a The quadratic $2x^2 + 4x - 5$ has roots α and β

Find the value of : **i** $\alpha + \beta$ **ii** $\alpha\beta$ **ii** $\frac{1}{\alpha} + \frac{1}{\beta}$

iv Write down the equation which has roots $\alpha + 1$ and $\beta + 1$

b Solve the inequality $\frac{6}{3-y} \le 3$ and plot the solution on a number line.

c Without attempting to draw the triangle explain why the cosine rule fails in trying to find the largest angle in a triangle with sides 8cm., 4cm., and 3cm.

Standard Integral Sheet

$$\int (ax+b)^n \, . \, dx = \frac{1}{a(n+1)} (ax+b)^{n+1} + c \quad ; \quad n \neq -1 \, , \, ax+b \neq 0 \text{ if } n<0$$

$$\int \frac{1}{(ax+b)} \, . \, dx = \frac{1}{a} \ln(ax+b) + c \quad ; \quad ax+b>0$$

$$\int e^{ax} \, . \, dx = \frac{1}{a} e^{ax} + c$$

$$\int \cos ax \, . \, dx = \frac{1}{a} \sin ax + c$$ .... please note that all angles are radians

$$\int \sin ax \, . \, dx = -\frac{1}{a} \cos ax + c$$

$$\int \sec^2 ax \, . \, dx = \frac{1}{a} \tan ax + c$$

$$\int \sec ax . \tan ax \, . \, dx = \frac{1}{a} \sec ax + c$$

$$\int \frac{1}{x^2+a^2} \, . \, dx = \frac{1}{a} \tan^{-1} \frac{x}{a} + c$$

$$\int \frac{1}{\sqrt{1-a^2x^2}} \, . \, dx = \frac{1}{a} \sin^{-1} ax + c$$

$$\int \frac{1}{\sqrt{x^2-a^2}} \, . \, dx = \ln\left(x+\sqrt{x^2-a^2}\right) + c \quad ; \quad x>0 \, , \, |x|>|a|$$

$$\int \frac{1}{\sqrt{x^2+a^2}} \, . \, dx = \ln\left(x+\sqrt{x^2+a^2}\right) + c \quad ; \quad x>0$$