DEPARTMENT OF EDUCATION

UPPER SECONDARY SCHOOL CERTIFICATE EXAMINATIONS

ADVANCE MATHEMATICS

Paper 1

Monday

14th October 2013

Time allowed:

2 hours and 30 minutes

(8:00am – 10:30 am)

NO EXTRA TIME

(NO OTHER TIME)

Candidates are advised to fully utilise the allocated time.

MA1

INSTRUCTIONS TO CANDIDATES

To be read by the external invigilator to all candidates.

1. The subject code for Advance Mathematics is **3.**
2. There are **8** printed pages in the question booklet.
3. An Electronic Answer Sheet for Part A, 2 pages Part B Answer Booklet and a 1 page formula sheet are inserted in the question booklet.
4. There are two parts in this paper. Answer all questions.

Part A: Multiple Choice (Questions 1-30) 30 Marks

This part will be electronically marked.

All answers to the Multiple Choice Part MUST be answered on the ELECTRONIC ANSWER SHEET provided.

Carefully following the instructions, fill in your Candidate Information and Subject Information.

Choose A, B, C or D from the alternatives given and use a HB pencil to shade in the correct letter to each question on the Electronic Answer Sheet.

If you make a mistake, rub the shading out completely using an eraser and shade in your correct alternative clearly.

Part B: Short Answers (Questions 31- 50) 20 Marks

Write your name, your school and complete your 10-digit candidate number on the Answer Booklet provided for Part B.

5. You are required to write only the correct answer in the space provided on the Answer Sheet.
6. Calculators may be used.
7. Answer all questions on the answer sheet. Answers on any other paper including rough work paper and the question paper will not be marked.
8. Correction fluid is not allowed. Where you have made an error, cross out all the working and start on a new line.

Penalty For Cheating Or Assisting To Cheat In National Examinations Is Non-Certification.

DO NOT TURN OVER THE PAGE AND DO NOT WRITE UNTIL YOU ARE TOLD TO START.

PARTA: MULTIPLE CHOICE (QUESTIONS 1 to 30) 30 MARKS

Answer each question by shading in with HB pencil the circle directly under the correct alternative A, B, C or D. If you make a mistake, rub it out completely using an eraser rubber and shade the correct answer on the Electronic Answer Sheet.

QUESTION 1

What is 1.08772 correct to four significant figures?

A. 1. 088 B. 1. 090

C. 1. 0877 D. 1. 0880

QUESTION 2

The quadratic equation $x^2 - 4x + 3 = 0$ has roots α and β. What is the value of $\alpha + \beta$?

A. -1 B. -3

C. 4 D. -4

QUESTION 3

Express $\frac{x^5 - 4x}{x^2 + 2}$ in its simplest form.

A. $\frac{x}{x^2 + 2}$ B. $\frac{x^2 + 2}{x}$

C. $x\left(x^2 - 2\right)$ D. $x\left(x^2 + 2\right)$

QUESTION 4

The expression $2\log_2 x^3 - \log_2 x^2$ is equivalent to

A. $\log_2 x$ B. $4\log_2 x$

C. $\log_2 x^5$ D. $\log_2\left(\frac{1}{x}\right)$

QUESTION 5

The parabola $y = x^2 - 3x - 1$ intersect the line $y = 3$ at the point

A. $x = -4$ and $x = 1$ B. $x = 1$ and $x = 2$

C. $x = -1$ and $x = 2$ D. $x = 4$ and $x = -1$

QUESTION 6

The domain of the logarithm function $y = \log(2x + 1)$ is

A. $x > -\frac{1}{2}$ B. $x > 0$

C. $0 \leq x \leq \frac{1}{2}$ D. $-\frac{1}{2}x < x < 0$

QUESTION 7

What is the probability of picking a diamond card from a deck of 52 cards?

A. $\frac{1}{3}$ B. $\frac{1}{2}$

C. $\frac{1}{4}$ D. $\frac{1}{52}$

QUESTION 8

What is the average for a set of results given below?

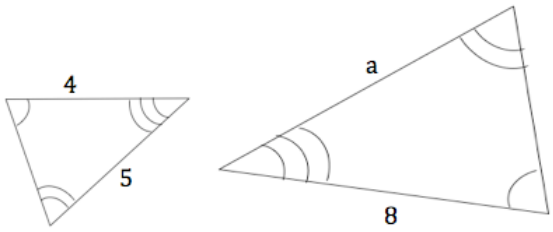
10, 14, 15, 16, 20

A. 12 B. 13

C. 15 D. 18

QUESTION 9

The figure below gives two similar triangles.



What is the value of **a**?

A. 3 B. 6

C. 8 D. 10

QUESTION 10

The value of the determinant $\begin{vmatrix} 1 & 2 & 3 \\ -1 & 2 & 3 \\ -2 & -4 & -6 \end{vmatrix}$ is

equal to _____.

A. 24 B. 0

C. -12 D. -24

QUESTION 11

The total number of subsets of the set $\{\ \alpha,\ \beta,\ a,\ b\ \}$ is

A. 4 B. 6

C. 8 D. 16

QUESTION 12

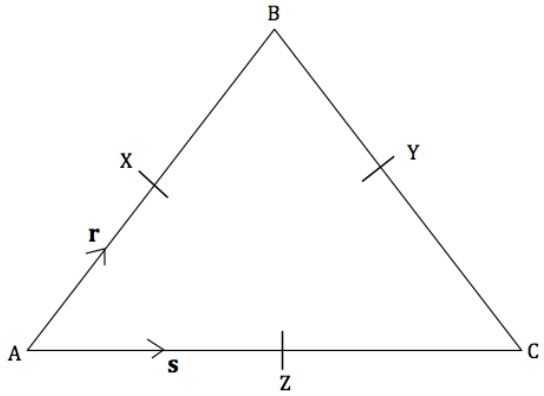
Given $\cos\theta = \frac{4}{5}$ and θ is in the 1st quadrant. Find the angle equivalent to θ between 0 and 360 degrees.

A. 36.86° B. 143.14°

C. 216.86° D. 323.14°

QUESTION 13

In the diagram below, X, Y, Z are mid points of AB, BC and CA respectively.



If $\overrightarrow{AX} = r$ and $\overrightarrow{AZ} = s$.

Find $\overrightarrow{AY}$.

A. $s + r$ B. $s - r$

C. $r - s$ D. $\frac{1}{2}s + r$

QUESTION 14

The value of $\int x^2\,dx$ is

A. $\frac{1}{2}x^2 + c$ B. $\frac{1}{3}x^3 + c$

C. $x^3 + c$ D. $2x + c$

QUESTION 15

Given that $y = 2x^3 - \cos x$, $\frac{dy}{dx}$ is equal to

A. $\frac{1}{2}x^4 - \sin x$ B. $\frac{1}{2}x^4 + \sin x$

C. $6x^2 - \sin x$ D. $6x^2 + \sin x$

QUESTION 16

Evaluate $\left(\frac{571}{2\pi}\right)^{\frac{1}{3}}$ correct to four significant figures.

A. 0. 4496 B. 4. 496

C. 44.96 D. 4496

QUESTION 17

The solution to the inequality $-2x - \frac{1}{2} \leq -x - 2$ is

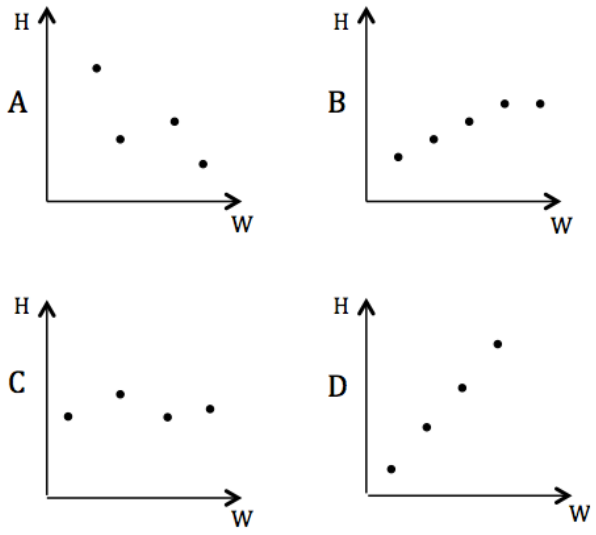
A. $x \leq -\frac{3}{2}$ B. $x \geq \frac{3}{2}$

C. $x \leq \frac{3}{2}$ D. $x \geq -\frac{3}{2}$

QUESTION 18

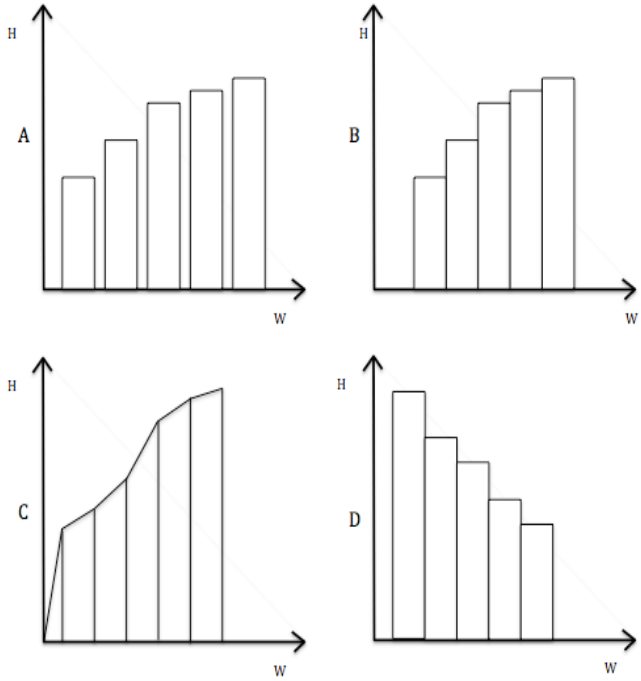
What would a scatter graph for the relationship of height versus weight look like for the given data?

Weight (kg)	15	30	45	60	75
Height (cm)	75	100	110	160	170



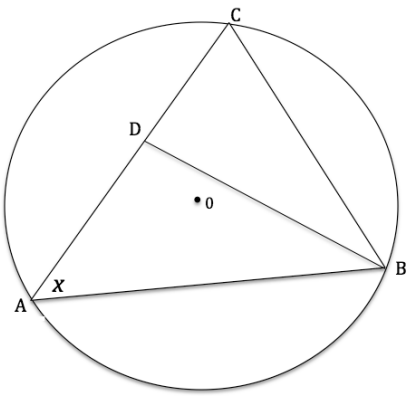
QUESTION 19

What would a cumulative-histogram of the relationship in ***Question 18*** look like?



QUESTION 20

In the diagram, the vertices of ΔABC lie on the circle with centre 0. The point D lies on AC such that ΔABD is isosceles and ∠BAC = x .



What is ∠BDC in terms of x?

A. x B. $90 - x$

C. $180 - x$ D. $2x$

QUESTION 21

Kapi is making a pattern using triangular tiles. The pattern has 3 tiles in the first row, 5 tiles in the second row and each successive row has 2 more tiles than the previous row.

How many tiles would Kapi use altogether to make the first 50 rows?

A. 2, 600 B. 2, 400

C. 2, 500 D. 3, 000

QUESTION 22

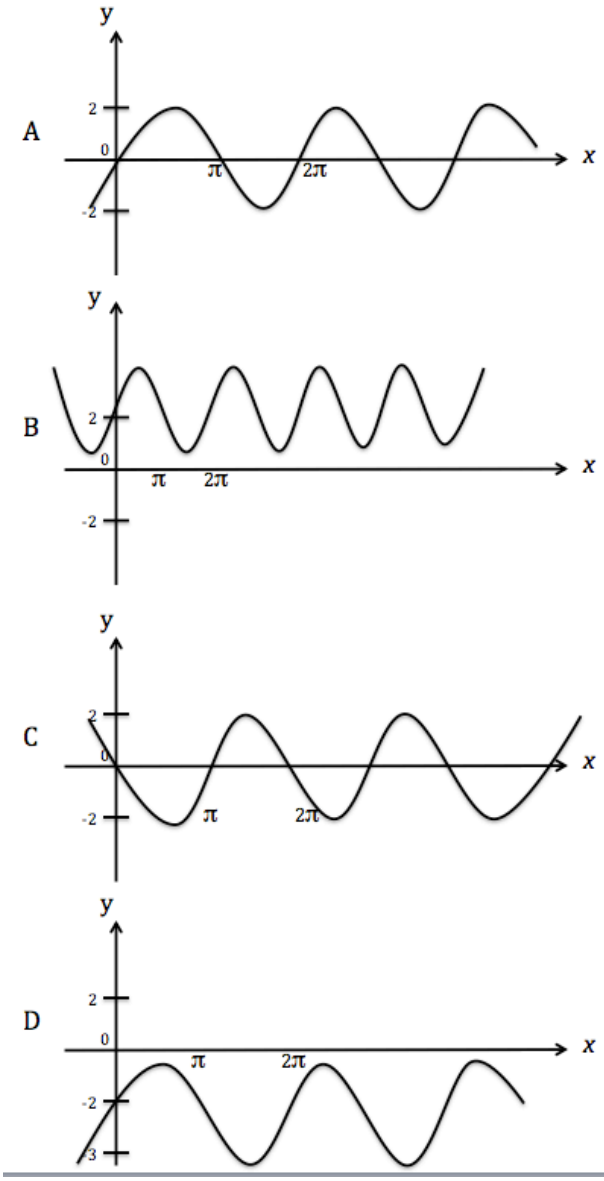
The 4th term of the expansion $\left(2x - 3y^2\right)^{10}$ is

A. 414, 720 x^6y^7 B. -414, 720 x^7y^6

C. -414, 720 x^6y^7 B. 414, 720 x^7y^6

QUESTION 23

The sketch of the function $f(x) = 2 + \sin x$ is given by



QUESTION 24

What is the value of θ in radians, given $\sin\theta + \frac{1}{2} = 1$

A. π B. $\frac{\pi}{6}$

C. $\frac{\pi}{3}$ D. $\frac{\pi}{2}$

QUESTION 25

Given that $\int \cos(\beta x)dx = \frac{1}{\beta}\sin(\beta x) + c$.

The exact value of $\int_0^{\pi/4} \cos 2x\, dx$ is

A. 0 B. $-\frac{1}{2}$

C. $\frac{1}{2}$ D. -1

QUESTION 26

A pmv bus uses 30 litres of diesel to travel 210 km. If diesel costs K3.00 per litre, how much would it cost the bus operator on diesel to travel 300 km? (*Assume fuel consumption rate is constant)*.

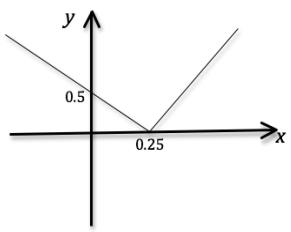
A. K50. 00 B. K128. 57

C. K210. 00 D. K90. 00

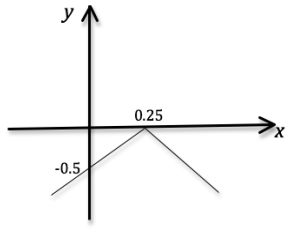
QUESTION 27

The graph of the absolute value function $y = \left|2x - \frac{1}{2}\right|$ is given by

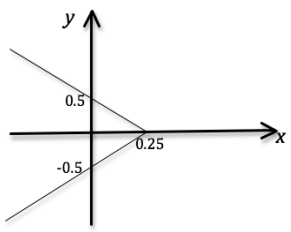
A



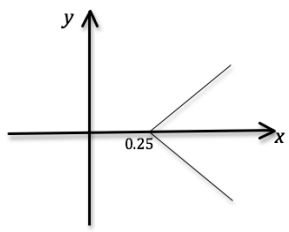
B



C



D



QUESTION 28

How many 3-digit even numbers can you make from the values 2, 3 and 4? *You are to use them once*.

A. 1 B. 2

C. 3 D. 4

QUESTION 29

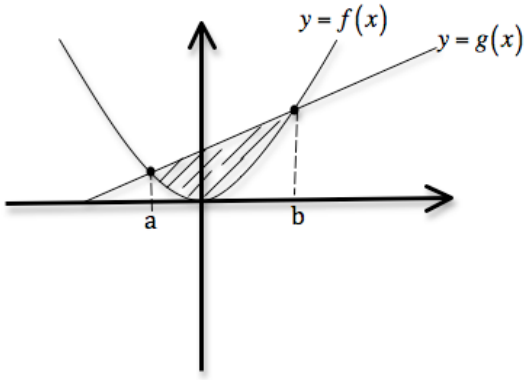
A regular polygon of *n* sides has a sum of 1260. Find *n*?

A. 6 B. 8

C. 9 D. 12

QUESTION 30

What is the expression of the area between these curves?



A. $\int_a^b [g(x) - f(x)]dx$

B. $\int_a^b [f(x) - g(x)]dx$

C. $\int_b^a [g(x) - f(x)]dx$

D. $-\int_b^a [f(x) - g(x)]dx$

PART B: SHORT ANSWERS 20 MARKS

Write your answers on the Answer Sheet provided.

QUESTION 31

Express the recurring decimal $0.11\dot{1}$ as a fraction.

QUESTION 32

The speed of a particle is 100 metres per second. What is this speed in km/ hr?

QUESTION 33

Find the exact distance between the points (5, -5) and (1, 1).

QUESTION 34

What is the solution to the linear inequality, $-5x-3<2+x$?

QUESTION 35

The function $f(x)=|2x-3|$ can be expressed as

$$f(x)=\begin{cases} 3-2x, & x<\frac{3}{2} \\ -3+2x, & t \end{cases}$$

Find t, the domain of $(-3+2x)$

QUESTION 36

Express the logarithmic function $f(x)=\log_e e^x-2\log_e e^{x^2}$ in its equivalent form without the log function.

QUESTION 37

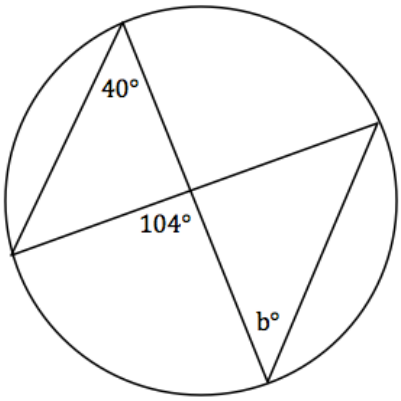
A bag contains 3 yellow, 2 red and 5 blue marbles. The first marble drawn out of the bag was <u>not</u> blue. If the marble was not placed back into the bag, what would be the probability of drawing out a blue marble in the second pick?

QUESTION 38

From question 37, if the marbles are to be placed back into the bag, what is the probability of picking a yellow and then a blue?

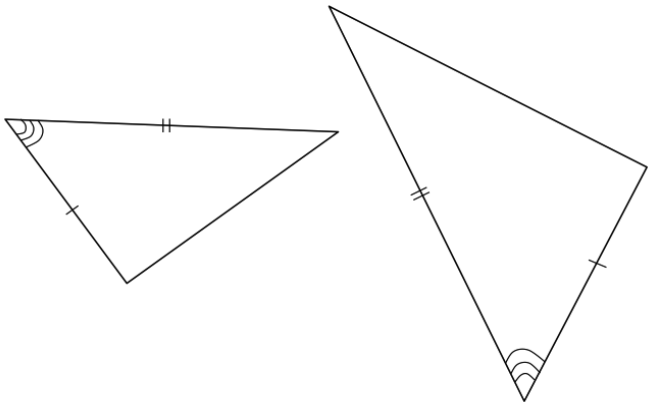
QUESTION 39

Find the value of "b" given in the diagram below.



QUESTION 40

What test is used to show that these two triangles are congruent?



QUESTION 41

What is the equation of a circle of radius 5, with centre at (3, 4)?

QUESTION 42

Given that sets;

$A = \{x \in z : x \text{ is even}\}$

$B = \{1,2,3,4,5,6,7,8,9,10\}$

$C = \{x \in z : -5 \leq x < 9\}$

Determine the set $A \cap B \cap C$.

QUESTION 43

Find the sum of the first 40 terms of a geometric series with first term -3 and common ratio $\frac{1}{2}$.

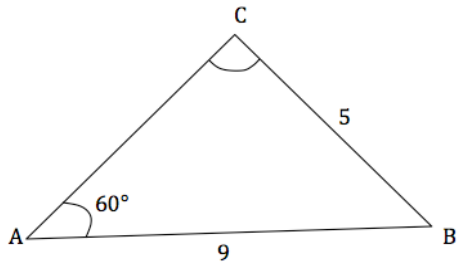
QUESTION 44

Evaluate the determinant.

$$\begin{vmatrix} x & 1 & 2 \\ -3 & -2x & 1 \\ 0 & \frac{1}{x} & 2 \end{vmatrix}$$

QUESTION 45

Find the angle $\angle ACB$ of the given triangle with sides AB = 9 cm and BC = 5 cm. (Give your answer to the nearest degree).



QUESTION 46

Find $2\mathbf{u} - \mathbf{v}$, if $\mathbf{u} = -\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ and $\mathbf{v} = -2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$

QUESTION 47

Find the unit vector of $\mathbf{v} = 3\mathbf{i} + 4\mathbf{j}$

QUESTION 48

Evaluate $\int 2x\,dx$.

QUESTION 49

What is the gradient of the curve $y = \sin x$ at the point where $x = \frac{\pi}{3}$?

QUESTION 50

At what point is the slope of the tangent line to the curve $y = e^x$ equal to one?

END OF EXAMINATION