



DEPARTMENT OF  
EDUCATION

UPPER SECONDARY  
SCHOOL  
CERTIFICATE  
EXAMINATIONS

ADVANCE  
MATHEMATICS

Paper 1

Monday

13<sup>th</sup> October 2014

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.

MA<sub>1</sub>

## 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 or B or 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 name and your 10-digit candidate number on the Part B Answer Booklet provided.

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.
9. Graphical Calculators are not permitted.

**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.**

## PART A: 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

$2.3 \times 10^{-6}$  km is equivalent to

- A. 0.00023 m                      B. 0.23 m  
C. 0.0023 m                        D. 2.3 m

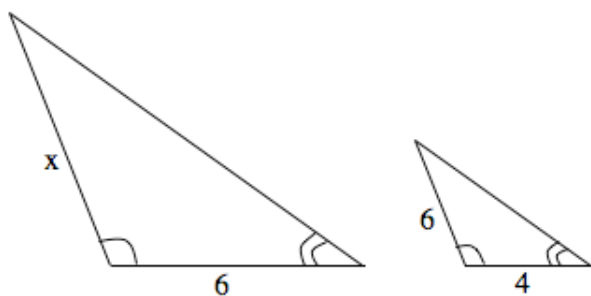
## QUESTION 2

We have three numbers 1, 2 and 3. How many possible combinations of two-digit numbers can we make from these three numbers?

- A. 3                                      B. 6  
C. 4                                      D. 5

## QUESTION 3

Two triangles below are similar and all lengths are in centimetres.



The side marked x is

- A. 6 cm                                B. 4 cm  
C. 9 cm                                D. 5 cm

## QUESTION 4

$(x + y)^5$  is equal to

- A.  $x^5 + 10x^4y + 5x^3y^2 + 5x^2y^3 + 10xy^4 + y^5$   
B.  $x^5 + 5x^4y + 10x^3y^2 + 5x^2y^3 + 10xy^4 + y^5$   
C.  $x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + y^5$   
D.  $x^5 + 5x^4y + 5x^3y^2 + 10x^2y^3 + 10xy^4 + y^5$

## QUESTION 5

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

- A. -8                                    B. -7  
C. -6                                    D. 0

## QUESTION 6

Which of the following statement is **not** true about  $\sin \theta$ , where  $\theta$  is  $\frac{2\pi}{3}$  radians.

- A. It has the same value as  $\sin\left(\frac{8\pi}{3}\right)$   
B. It has the same value as  $\sin 30^\circ$   
C. It has a positive value  
D. It has a negative value

**QUESTION 7**

Express  $\sqrt{32a} - \sqrt{50a} + \sqrt{18a}$  into its simplest surd form.

- A.  $2\sqrt{a}$                       B.  $4\sqrt{2a}$   
 C.  $2\sqrt{2a}$                       D.  $\sqrt{2a}$

**QUESTION 8**

Tom takes 30 minutes to drink his six packs of ice beer. How long will Tom take to drink a carton of ice beer (24 packs), given that he drinks at the same rate?

- A. 15 minutes                      B. 60 minutes  
 C. 240 minutes                      D. 120 minutes

**QUESTION 9**

Express  $2\log_2 x - \frac{1}{3}\log_2 8$  as a single logarithm.

- A.  $\log_2 x^2$                       B.  $\log_2(2x)$   
 C.  $\log_2\left(\frac{x^2}{2}\right)$                       D.  $\log_2(2x^2)$

**QUESTION 10**

Express  $\frac{5}{(x+2)(x+4)} - \frac{4}{(x+2)}$  as a single fraction.

- A.  $\frac{11-4x}{(x+2)(x+4)}$                       B.  $\frac{-(11+4x)}{(x+2)(x+4)}$   
 C.  $\frac{4x-11}{(x+2)(x+4)}$                       D.  $\frac{4x+11}{(x+2)(x+4)}$

**QUESTION 11**

Suppose we toss a coin twice. What is the probability of landing two tails?

- A.  $\frac{1}{2}$                                       B.  $\frac{1}{4}$   
 C.  $\frac{1}{6}$                                       D.  $\frac{1}{8}$

**QUESTION 12**

The centre and the radius of the circle  $(x+1)^2 + (y-2)^2 = 9$  respectively are

- A.  $(1,2)$  and 9                      B.  $(-1,2)$  and 9  
 C.  $(-1,2)$  and 3                      D.  $(1,2)$  and 3

**QUESTION 13**

Let  $U = \{n | n \in \mathbb{Z}, 1 \leq n \leq 10\}$ , be the universal set and let  $A = \{3, 4, 5, 7, 8\}$ ,  $B = \{2, 4, 6, 8, 10\}$ . Then the set  $A \cup B$  in roster (list) form is given by

- A.  $\{3, 4, 5, 6, 7, 8, 10\}$   
 B.  $\{2, 3, 4, 5, 6, 7, 8, 10\}$   
 C.  $\{1, 2, 4, 6, 8, 9, 10\}$   
 D.  $\{2, 6, 10\}$

**QUESTION 14**

The value of  $\sum_{n=1}^{100} (3n-4)$  is

- A. 14, 850                                      B. 14, 851  
 C. 14, 750                                      D. 14, 950

**QUESTION 15**

Given the system of linear equations

$$a_{11}x_1 + a_{12}x_2 = c_1$$

$$a_{21}x_1 + a_{22}x_2 = c_2$$

Using Cramer's Rule, the value of  $x_1$  is given by

A. $x_1 = \frac{\begin{vmatrix} a_{11} & c_1 \\ a_{21} & c_2 \end{vmatrix}}{\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}}$	B. $x_1 = \frac{\begin{vmatrix} c_1 & a_{12} \\ c_2 & a_{22} \end{vmatrix}}{\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}}$
C. $x_1 = \frac{\begin{vmatrix} a_{11} & c_1 \\ c_2 & a_{22} \end{vmatrix}}{\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}}$	D. $x_1 = \frac{\begin{vmatrix} c_1 & a_{12} \\ a_{21} & c_2 \end{vmatrix}}{\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}}$

**QUESTION 16**

Without using your calculators, given that  $\sin \theta = \frac{4}{5}$

when  $0 \leq \theta \leq \frac{\pi}{2}$ , the exact value for  $\cot \theta$  is

- |                  |                  |
|------------------|------------------|
| A. $\frac{4}{3}$ | B. $\frac{5}{3}$ |
| C. $\frac{3}{4}$ | D. $\frac{3}{5}$ |

**QUESTION 17**

The unit vector in the same direction as vector  $\vec{v} = 2\vec{i} - 5\vec{j} + 2\vec{k}$  is

- A.  $\frac{-2}{\sqrt{33}}\vec{i} + \frac{5}{\sqrt{33}}\vec{j} - \frac{2}{\sqrt{33}}\vec{k}$
- B.  $\frac{-\sqrt{33}}{2}\vec{i} + \frac{\sqrt{33}}{5}\vec{j} - \frac{\sqrt{33}}{2}\vec{k}$
- C.  $\frac{\sqrt{33}}{2}\vec{i} - \frac{\sqrt{33}}{5}\vec{j} + \frac{\sqrt{33}}{2}\vec{k}$
- D.  $\frac{2}{\sqrt{33}}\vec{i} - \frac{5}{\sqrt{33}}\vec{j} + \frac{2}{\sqrt{33}}\vec{k}$

**QUESTION 18**

If  $y = 3x^2 + 3\sin x$ ,  $\frac{dy}{dx}$  is equal to

- |                              |                              |
|------------------------------|------------------------------|
| A. $6x + 3\cos x$            | B. $6x - 3\cos x$            |
| C. $\frac{3}{2}x + 3x\cos x$ | D. $\frac{3}{2}x - 3x\cos x$ |

**QUESTION 19**

Given that  $y = 2x^2 + x$ , the value of  $\frac{dy}{dx}$  at the point  $x = 2$  is equal to

- |       |       |
|-------|-------|
| A. 5  | B. 17 |
| C. 12 | D. 9  |



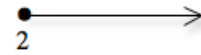

**QUESTION 20**

The value of  $\int_0^1 2x \, dx$  is equal to

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

**QUESTION 21**

The solution of the linear inequality  $2x - 1 \leq 3x + 3$  on a real number line is

- A.  B.   
 C.  D. 

**QUESTION 22**

Fully factorise  $(y + 4)^2 - (y - 2)^2$ .

- A.  $(y + 4)(y - 2)$  B.  $(y + 2)(y + 1)$   
 C.  $12(y + 1)$  D.  $6(y + 1)$

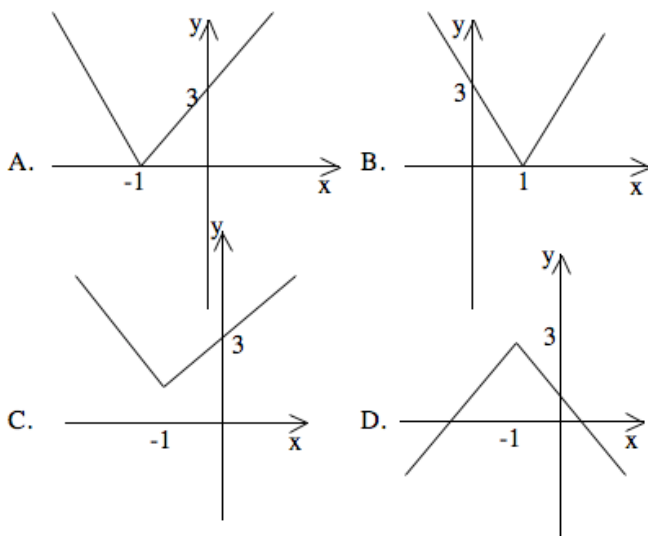
**QUESTION 23**

Find the value of  $a$  if the polynomial  $f(x) = ax^3 - 12x^2 + 11x - 3$  is divisible by  $(2x - 3)$ .

- A.  $a = \frac{3}{2}$  B.  $a = 2$   
 C.  $a = 3$  D.  $a = 4$

**QUESTION 24**

The graph of  $y = |x + 1| + 2$  is best represented by



**QUESTION 25**

Given the frequency table below

Score (x)	Frequency (f)
1	5
2	8
3	5

What is the mean score?

- A. 3.09 B. 2.56  
 C. 2 D. 8

**QUESTION 26**

We have three people James, Mary and Jones. There are two positions vacant to be filled by them, “president” and “vice president”.

How many possible ways can the positions be filled by these three people?

- A. 3 B. 6  
 C. 4 D. 5

**QUESTION 27**

A pole 10 metres high casts a shadow 4 metres long. At the same time, another pole casts a shadow 14 metres long.

What is the height of the other pole?

- A. 36 metres B. 37 metres  
 C. 38 metres D. 35 metres

**QUESTION 28**

A vector of magnitude 10 that is oppositely directed to the vector  $\vec{w} = -3\vec{i} + 4\vec{j}$  is given by

- A.  $-6\vec{i} - 8\vec{j}$  B.  $6\vec{i} - 8\vec{j}$   
 C.  $6\vec{i} + 8\vec{j}$  D.  $-6\vec{i} + 8\vec{j}$



**QUESTION 38**

Consider the contingency table below of 50 women in a group.

Marital Status	Education level		Total
	Educated	Uneducated	
Married	10	20	30
Single	15	35	50
Total	25	55	80

Based on the table, a woman is selected at random.

What is the probability that the woman selected will be an educated woman?

**QUESTION 39**

Consider the frequency table below of students' marks

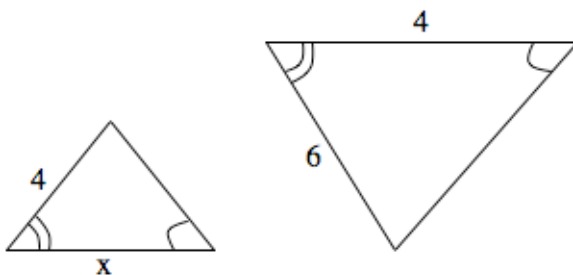
Marks	Tally	Frequency
30 – 39		1
40 – 49		3
50 – 59		5
60 – 69		10
70 – 79		3
80 – 89		2
90 – 99		1

Based on the table what percentage of the students scored marks below 70?

**QUESTION 40**

Given that the two triangles below are similar.

Calculate the side marked x.



**QUESTION 41**

The sector of a circle of radius 5 cm subtends an angle of  $\frac{3\pi}{10}$  rad at the centre.

Calculate the length of the arc.

**QUESTION 42**

Let the universal set U be the set of all integers Z

If  $A = \{x | x \in Z, x \text{ is even}\}$  and

$B = \{x | x \in Z, x \text{ is odd}\}$

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

**QUESTION 43**

Express the 3<sup>rd</sup> term in the binomial expansion of  $(1 + 4x)^7$  in its simplest form.

**QUESTION 44**

Evaluate the ratio of the determinant.

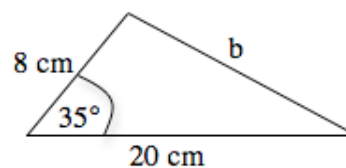
$$\frac{\begin{vmatrix} 2 & 3 \\ -1 & 4 \end{vmatrix}}{\begin{vmatrix} 5 & 1 \\ 6 & 1 \end{vmatrix}}$$

**QUESTION 45**

If  $\cos \theta = 0.58$ , find  $\theta$  given that  $\theta$  lies between  $180^\circ$  and  $360^\circ$ .

**QUESTION 46**

Calculate the value of b to the nearest centimetre.



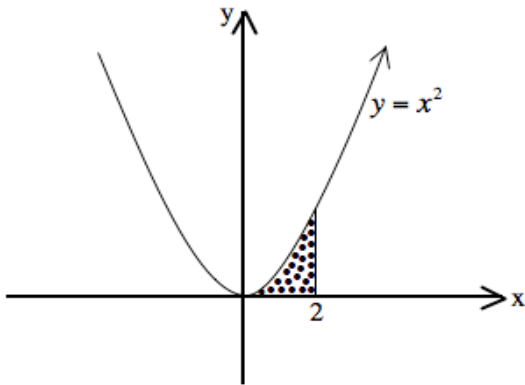
**QUESTION 47**

Given that  $\tilde{a} = 2\tilde{i} + \tilde{j}$  and  $\tilde{b} = -3\tilde{i}$ .

Find  $\tilde{a} + \tilde{b}$ .

**QUESTION 48**

Find the exact area of the shaded region below.

**QUESTION 49**

Given  $y = \sqrt{x}$ , find  $\frac{dy}{dx}$ .

**QUESTION 50**

Find  $\frac{dy}{dx}$  if  $y = 3x^2 - 2\sin x + \frac{1}{2}\cos x$ .

**END OF EXAMINATION**