



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2010

**MATHEMATICS: PAPER III**  
**MARKING GUIDELINES**

Time: 2 hours

100 marks

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These marking guidelines were used as the basis for the official IEB marking session. They were prepared for use by examiners and sub-examiners, all of whom were required to attend a rigorous standardisation meeting to ensure that the guidelines were consistently and fairly interpreted and applied in the marking of candidates' scripts.

At standardisation meetings, decisions are taken regarding the allocation of marks in the interests of fairness to all candidates in the context of an entirely summative assessment.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines, and different interpretations of the application thereof. Hence, the specific mark allocations have been omitted.

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**SECTION A**

**QUESTION 1 [LO 1: AS 12.1.3]**

- 1. C
- 2. B
- 3. A

[6]

**QUESTION 2 [LO 4: AS 11.4.2; 12.4.2]**

(a) After eight consecutive correct answers the probability of getting a correct answer will be zero. [on 9<sup>th</sup>] (1)

(b)  $P(\text{correct ; correct}) = 0,8 \times 0,7$   
 $P(\text{incorrect; correct}) = 0,2 \times 0,8$   
 $\therefore$  Probability of getting second answer correct  $= 0,56 + 0,16 = 0,72$

Only option  $0,5 \times 0,7 = 0,56 \left(\frac{3}{6}\right)$

Plus : Evidence of both.  $(P(c ; c) \text{ and } (P1 ; c) \rightarrow \left(\frac{4}{6}\right)$

Only the answer  $0,72 \left(\frac{6}{6}\right)$  (6)

[7]

**QUESTION 3 [LO 4: AS 11.4.2; 12.4.2]**

(a)  $P(A) \times P(B) = P(A \cap B)$  Correct formula  
 $(x + 0,1)0,4 = 0,1$  Substitution  
 $0,4x + 0,04 = 0,1$  Addition on either  
 $0,4x = 0,06$   $x = 0,15$   
 $x = 0,15$   $y = 1 - (A \cup B \text{ values})$   
 $y = 1 - (0,15 + 0,1 + 0,3) = 0,45$  (5)

(b) (i)  $P(\text{person was a female who failed}) = \frac{15}{98}$  or 0,15 (2)

(ii)  $\frac{32}{40} = \frac{4}{5}$  or 0,8 (2)

[9]

**QUESTION 4 [LO 4: AS 11.4.2; 12.4.2]**

(a)  $\frac{7!}{2!} = 2520$                        $\frac{8!}{1!} = 40\,320 \left(\frac{1}{3}\right)$  ;  $7! \times 2! = 10\,080 \left(\frac{2}{3}\right)$                       (3)

$7! = 5\,040 \left(\frac{2}{3}\right)$

(b)  $(AD)(BE)C = 3 \times 2 \times 2! = 24$

Total number of arrangements =  $5! = 120$

concept: switching } evidence of knowledge  
grouping }  
correct number of combination!  
correct total of combinations

$P(\text{Andries and Dumi; Bongani and Emily}) = \frac{24}{120} = 0,2$  final answer

$\frac{3!}{3!} = 0,2 \left(\frac{3}{5}\right)$                       (5)

**[8]**

**QUESTION 5 [LO 4: AS 12.4.3]**

$30 \text{ min} \left(\frac{2}{3}\right)$

(a) (1)  $\bar{x} = 29,875$  Rounding off 29,88 ;  
(3)

$\frac{3585}{120} \left(\frac{1}{3}\right)$

(2)  $\frac{4+5+18+36}{120} = \frac{63}{120} = 52,5\%$

$\bar{x} = 30,38 \left(\frac{2}{3}\right)$

(2)

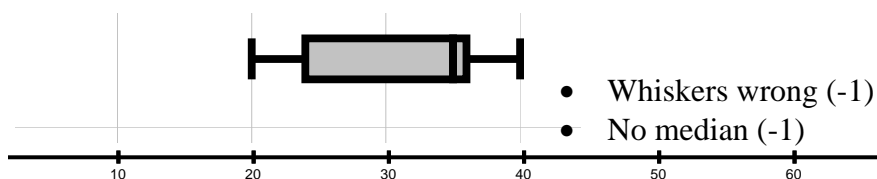
(3)  $\sigma = 7,79$     $\sigma = 12,9 \left(\frac{1}{3}\right)$     $\sigma = 13,69 \left(\frac{1}{3}\right)$

$\bar{x} = 27,875$     $x$     $27,88 \left(\frac{2}{3}\right)$

(3)

$\sigma = 7,82 \left(\frac{3}{3}\right)$  if  $\bar{x} = 30,395$  or  $\bar{x} = 27,875$

(b) (1)



(2)

(2) (a) The range of A (40) is much wider than that of B(20), but their inter-quartile range width is identical (12) which means that the middle 50 percent of clients are clustered between a very similar time duration.                      (2)

(b) A is slightly positively skewed but B is very negatively skewed with 50% of the clients taking between 35 and 40 minutes or  $Q_3 - Q_2 < Q_2 - Q_1$ .                      (2)

**[14]**

**QUESTION 6 [LO 1: AS 12.4.1 and 11.4.3]**

We have no idea how many total flights there were in 2007 or in 2008. We need to know the total number of flights in each year in order to know what percentage of the total the numbers 756 and 898 constitute. Some indication of sample size concerning flights/ traffic controllers out of how many?

(2)  
[2]

**QUESTION 7 [LO 4: AS 12.4.1]**

(a)  $A = 2,68$   
 $B = 0,62 \quad \therefore y = 0,62x + 2,68$

$$y = \frac{2}{3}x + 2\frac{2}{2}$$

(b)  $r = 0,63$  [r = 0,6284740731]

$$r = 0,62 \left(\frac{1}{2}\right); 0,6 \left(\frac{2}{2}\right)$$

(c)  $\hat{y} = 0,62(21) + 2,68$  subst.

$$\hat{y} = 15,7 \text{ about 16 seconds} \quad \hat{y} = 16 \left(\frac{1}{2}\right) \text{ but evident on graph } \left(\frac{1}{2}\right)$$

$$\hat{y} = 15 + \left(\frac{0}{2}\right) \text{ unless it is clearly on the graph; } \left[21\hat{y} 15 \left(\frac{1}{2}\right)\right] (2)$$

(d) Would indicate a stronger correlation as the point G is now clustered closer to the line – where before it was quite far – and so the correlation would get stronger.

OR

By putting in new data get  $r = 0,6806685476$  and this is closer to 1 and so the correlation is stronger.

(3)  
[11]

**QUESTION 8 [LO 4: AS 12.4.1]**

E

(2)  
[2]

**QUESTION 9 [LO 3: AS 11.3.2]**

(a)  $GA = 72$  units

(1)

(b)  $\frac{GH}{GA} = \frac{DF}{DA}$  Any ratio in  $\Delta AGD$  involving GH correctly

$$\frac{GH}{HA} = \frac{DF}{FA}$$

$$\frac{GH}{HA} = \frac{24}{40}$$

Use the answer from (a)  $\frac{GH}{72} = \frac{24}{64}$  subs of correct values in correct place

$GH = 27$  from (a) above or using incorrect values

$$\frac{GH}{72 - GH} = \frac{24}{40} \quad (3)$$

need 72 for mark

(c)

$$\begin{aligned} \text{Area}\Delta\text{AHF} &= \frac{1}{2}(\text{AH})(\text{AF})\sin A \quad \text{for area rule on either} && \text{A } \frac{1}{2} b.h \\ &= \frac{1}{2}(45)(40)\sin A && \text{with some working} \\ \text{Area}\Delta\text{ACD} &= \frac{1}{2}(144)(64)\sin A && \text{calculating an Angle } \hat{A} \\ &&& \text{incorrectly but used in both } \Delta \text{'s} \\ \therefore \text{Area}\Delta\text{AHF}:\text{Area}\Delta\text{ACD} &= 25:128 && \frac{3}{4} \quad (4) \\ &&& \text{on ratio} \end{aligned}$$

**OR**

$$\begin{aligned} \text{AH} : \text{AG} & \\ 5 : 8 & \\ \text{Area } \Delta\text{AHF} : \text{Area } \Delta\text{AGD} & \\ 5^2 : 8^2 & \quad \text{squaring} \\ \text{Area } \Delta\text{AHF} : \text{Area } \Delta\text{ACD} & \\ 5^2 : 8^2 \times 2 & \quad \text{doubling} \\ 25 : 128 & \quad \quad \quad [8] \end{aligned}$$

**QUESTION 10 [LO 3: AS 12.3.2]**

(a)  $\hat{L}_1 = 76^\circ$  angles same seg Picture/Bow tie (2)

(b)  $\hat{O}_1 = 76^\circ$  corres. angles ON//LM can have 11 lines (2)  
 must have both

(c)  $\hat{M}_4 = 38^\circ$  angle at centre  $2 \times$  angle at circum (2)  
 if use  $\hat{L}_1$

(d)  $\hat{N}_1 + \hat{N}_2 = 104^\circ$  opp angles cyclic quad (2)

(e)  $\hat{K}_1 + \hat{K}_2 = 52^\circ$  angles of isos  $\Delta\text{OKN}$   
 $\hat{M}_1 = 52^\circ$  ext angle of cyclic quad KNML

OR  $\hat{M}_2 + \hat{M}_3 = 90^\circ$  [angle in semi-circle] 2 for justifications (4)  
 $\therefore \hat{M}_1 = 52^\circ$  L's on straight line 2 for angles

(f)  $\hat{M}_2 + \hat{M}_3 = 90^\circ$  angle in semicircle can have proven above (4)  
 $\hat{G}_3$  or  $\hat{G}_2$  with reason for mark  
 $\text{OG} \perp \text{KM}$  or  $\text{OGM} = 90^\circ$  corresponding angles ON//LM  
 $\therefore \text{KG} = \text{GM}$  line from centre perp. to chord  
 (will not accept line from centre of midpoint of chord)

**OR**

KO = OL radius  
 $\text{OG} \parallel \text{ML}$   
 $\therefore \text{KG} = \text{GM}$  line  $\parallel$  to one side

**[16]**

**QUESTION 11 [LO 3: AS 12.3.2]**

- (a) In  $\triangle CUE$  and  $\triangle EUT$  P1 for no reasons  
P1 for no subscripts  
 $\hat{U}_1 = 90^\circ$  angle semi-circle need both  
 $\hat{C} = \hat{E}_2$  tan chord theorem with reason  $\hat{U}_2 = \hat{U} 90^\circ$  L on straight line (do not need justification)  
 $\hat{E}_1 = \hat{T}$  3rd angle of triangles – don't need  
 $\therefore \triangle CUE \sim \triangle EUT$  AAA if they don't have this,  
must have aaa (4)
- (b)  $\triangle CUE \sim \triangle CET$  order does not matter (1)
- (c)  $EU^2 = CU \times UT$  proportion or as a product  
 $EU^2 = 8 \times 4$  (similar triangles)  
 $EU = \sqrt{32}$  or  $4\sqrt{2} = 5,66$  Using  $45^\circ$   
 $ET^2 = (4\sqrt{2})^2 + 4^2$  Theorem of Pythag  $ET = 5,66$   
 $ET = \sqrt{48}$  or  $4\sqrt{3}$   $\frac{B}{D} = \frac{2}{5}$
- $\therefore$  perimeter of  $\triangle EUT = 4 + \sqrt{48} + \sqrt{32} = 16,59$  cm. adding three answers  
 No penalty for rounding if write down  $UT + EU + ET$  (5)  
**[10]**

**QUESTION 12 [LO 3: AS 12.3.2 and LO 3: AS 11.3.2]**

- (a)  $\hat{O}_1 = 360^\circ - x$  angle at point Go straight to  $\hat{B} = \frac{360^\circ - x}{2} = \frac{2}{3}$   
 $\hat{B} = 180^\circ - \frac{x}{2}$  on  $\hat{O}_1$  angle at centre  $2 \times$  angle at circ (3)  
every minute  $6^\circ$
- (b) Each segment is  $\frac{360^\circ}{12} = 30^\circ$  but the hour hand has moved  $\frac{1}{5}$  th of the way towards the 11 so that segment is only  $24^\circ$ , add on  $12^\circ$  for the two minutes past 10  
 $x = 3 \times 30^\circ + 24^\circ + 12^\circ \xrightarrow{\text{adding}} 126^\circ$  (4)  
 $\therefore \hat{B} = 117^\circ$   
on (a) above **[7]**

**Total: 100 marks**