NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2011

MATHEMATICS: PAPER III

MARKING GUIDELINES

Time: 2 hours | 100 marks

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.

SECTION A

QUESTION 1 [LO 1: AS 12.1.3]

(a) (1) $T_8 = 2^8 - 1 = 255$ (2)

(2) $T_{k+1} = 2 \times T_k + 1$ with $k \in Z$; $k \geq 1$; $T_1 = 1$

or $T_{k+1} = T_k + 2^k$ with $k \in N$ *or* Z; $k \geq 1$; $T_1 = 1$ (3)

(b) $T_2 = \dfrac{3x+2}{2-1} = 3x+2$

$T_3 = \dfrac{3x+2+2}{3-1} = \dfrac{3x+4}{2}$ (4)

[9]

QUESTION 2 [LO 4: AS 11.4.2; 12.4.2]

(a) $3 \times 6 \times 5 \times 4 = 360$ (3)

(b) $\dfrac{7}{10} \times \dfrac{3}{9} + \dfrac{3}{10} \times \dfrac{3}{10}$ or P (R ; W) + P (W ; W) + P (G ; W)

$= \dfrac{97}{300} = 0{,}32$ $= \left(\dfrac{5}{10} \times \dfrac{3}{9}\right) + \left(\dfrac{3}{10} \times \dfrac{3}{10}\right) + \left(\dfrac{2}{10} \times \dfrac{3}{9}\right)$ (6)

$= 0{,}32$

(c) (1) $8!$ or 40320 (1)

(2) $3! \times 6! = 4320$ (3)

(3) $\dfrac{5!}{8!} = \dfrac{1}{336}$ or $= 2{,}97 \times 10^{-3}$ (3)

[16]

QUESTION 3 [LO 4: AS 11.4.2; 12.4.2]

(a) (1) P (CUF)' $= \dfrac{48}{150}$ (2) $\dfrac{4+8+11}{150}$

$= \dfrac{8}{25}$ $\dfrac{23}{150}$

or 0,32 or 0,1533 (5)

(b) $P(C) = \dfrac{50}{150}$

$P(F) = \dfrac{71}{150}$

$P(C) \times P(F) = \dfrac{50}{150} \times \dfrac{71}{150}$

$= 0{,}1577$

$P(C \cap F) = \dfrac{19}{150} = 0{,}1267$

these are not equal and so events A and B are not independent. (5)

[10]

QUESTION 4 [LO 4: AS 12.4.1]

(a) Negative As households with single parents increase, mean number of children decreases. (1)

(b) (1) A = –1 159,2558
B = 0,2652
r = 0,9175 (6)

(2) y = 0,2652 (15 000) – 1 159,2558
= 2 818,7442
= 2 819 (2)

(3) No, even although the correlation coefficient is strong and good, this value for the independent variable x is well outside of the data values used – extrapolation – so I would be wary, not that reliable. (2)

[11]

QUESTION 5 [LO 1: AS 12.4.1 and 11.4.3]

(a) It is an increase in one person out of 1000 which is 0,1% not 100% (1)

(b)
- Women stopped taking the contraceptive
- Resulted in more unwanted pregnancies
- Resulted in more abortions (1)

[2]

QUESTION 6 [LO 4: AS 12.4.3]

(a)

Class Interval	Midpoint of Interval	Frequency
0 – 10	5	5
10 – 20	15	15
20 – 30	25	25

(1)

(b) 42,1538 (3)

(c) 21,7763 (2)

(d) (1) FALSE
(2) TRUE
(3) FALSE
(4) FALSE (4)

[10]

QUESTION 7

$0,34 + 0,34 + 0,136 = 0,816$

$0,816 \times 200$

$= 163$

[3]

QUESTION 8 [LO 3: AS 11.3.2] [LO 3: AS 12.3.2]

(a) $\Delta ABF /// \Delta DEF$ (1)

(b) AF = 9 since AD = 15 and FD = 6 OR $AB = DC$ (opposite sides of parm)

$\frac{AB}{DE} = \frac{AF}{DF} = \frac{BF}{FE} = \frac{9}{6}$ Similar triangles $\therefore \frac{DC}{DE} = \frac{2}{3}$

$\frac{BF}{FE} = \frac{DC}{DE} = \frac{3}{2}$ Line parallel one side in Δ (4)

(c) Area $\Delta BEC = 172,6$

$\frac{1}{2} \times 15 \times BE \times \sin 67^{o} = 172,6$

$BE = \frac{172,6 \times 2}{15 \times \sin 67^{o}} = 25,0008$

$\therefore FE = \frac{2}{5} \times 25 = 10$ (3)

[8]

QUESTION 9 [LO 3: AS 12.3.2]

(a) $\hat{N}_1 = 65°$ tan chord theorem

$\hat{Y}_2 = 65°$ tan chord theorem or tangents from same point

$\hat{S}_1 = 65°$ Corresponding angles AN //SV (6)

(b) $\hat{S}_1 = \hat{N}_1 = 65°$ proved above

$\therefore$ VYSN is a cyclic quadrilateral Converse angles same segment. (2)

(c) $\hat{V}_1 + \hat{V}_2 = 50°$ angles of a triangle

$\hat{S}_3 = 50°$ exterior angle of cyclic quad VYSN

$\therefore \hat{N}_3 = 65°$ sum angles of a triangle

$\therefore \Delta ASN$ is isosceles sides opposite equal angles (3)

or $\hat{S}_2 = \hat{Y}_2 = 65°$ VYSN is cyclic proved

$\therefore \hat{S}_3 = 50°$ supplementary angles straight line

$\therefore \hat{N}_3 = 65°$ sum $\angle$s of a triangle

$\therefore \Delta$ ASN is isosceles sides opposite equal angles

[11]

QUESTION 10 [LO 3: AS 12.3.2] [LO 3: AS 11.3.2]

(a) rad $\perp$ tang (1)

(b) co-interior angles EN//RQ (1)
line from centre $\perp$ to chord (1)

(c) $\hat{V} = \hat{E}_3$ angles same segment

$\hat{E}_3 = \hat{Q}_1$ alternate angles EU //RQ

$\therefore \hat{V} = \hat{Q}_1$

$\hat{N} = 90^o = \hat{E}_5$ given

$\therefore \hat{U}_4 = \hat{R}$ Third angle of triangle

$\therefore \Delta VNU /// \Delta QER$ AAA (4)

(d) $\frac{VN}{QE} = \frac{NU}{ER}$ similar triangles

but NU = EN proved

so $\frac{EN}{ER} = \frac{VN}{EQ}$ (2)

(e) $\frac{12}{EQ} = \frac{6}{4}$

$\therefore$ EQ = 8

Now in ΔERQ: $RQ^2 = 8^2 + 4^2$ Theorem Pythag $RQ = 4\sqrt{5}$ units (4)

[13]

QUESTION 11 [LO 3: AS 11.3.2]

(a) Area of $1 = \frac{1}{2}ac$

Area of $2 = \frac{1}{2}a(c+2c) = \frac{1}{2}a.c \times 3$

Area of $3 = \frac{1}{2}a(2c+3c) = \frac{1}{2}a.c \times 5$

Area of $4 = \frac{1}{2}a(3c+4c) = \frac{1}{2}a.c \times 7$

$\therefore \quad \text{Area1} : \text{Area2} : \text{Area3} : \text{Area4} = 1:3:5\ :7$

OR

Let Area of 1 = x

Then Area of 1 + Area of 2 = 4x

Area of 1 + Area of 2 + Area of 3 = 9x

Area of 1 + Area of 2 + Area of 3 + Area of 4 = 16x

$\therefore$ Area of 1 : Area of 2 : Area of 3 : Area of 4 = x : 3x : 5x : 7x = 1 : 3 : 5 :7 (5)

(b) Area of $3 = \frac{5}{16} \times 1200$ OR

$= 375\text{mm}^2$

Area of 1 = $\frac{1}{16} \times 1200$

$= 75\ \text{mm}^2$

So Area of 3 = $5 \times 75 = 375\ \text{mm}^2$ (2)

[7]

Total: 100 marks