INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

MARKSCHEME

May 2001

MATHEMATICAL STUDIES

Standard Level

Paper 1

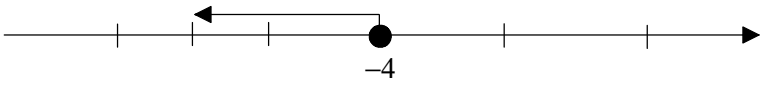
11 pages

1. (a) $2x + 3 \leq -5$

$2x \leq -8$ ***(M1)***

$x \leq -4$ ***(M1)***

Note:	Award ***(M1)*** for subtracting 3 correctly, ***(M1)*** for dividing by 2 correctly. Must be in this order. Award ***(A1)*** for the value –4 if there is no working, no inequality given or the inequality is incorrect.

(b) 

(A2)

Note:	Allow follow through from part (a). Award ***(A1)*** for closed circle on –4 (must have both), ***(A1)*** for arrow in the correct direction.

[4 marks]

2. (a) Mode = 2 ***(A1)***

(b) (i)

x	f	fx
0	6	**0**
1	3	**3**
2	10	**20**
3	1	**3**
Total	20	26

(A1)

Note:	Award ***(A1)*** for three or more correct bold entries.

(ii) Mean $= \frac{26}{20}$ ***(M1)***

Note:	Award (M1) for dividing fx total by 20.

$= 1.3$ ***(A1)***

OR

Mean = 1.3 ***(C2)***

[4 marks]

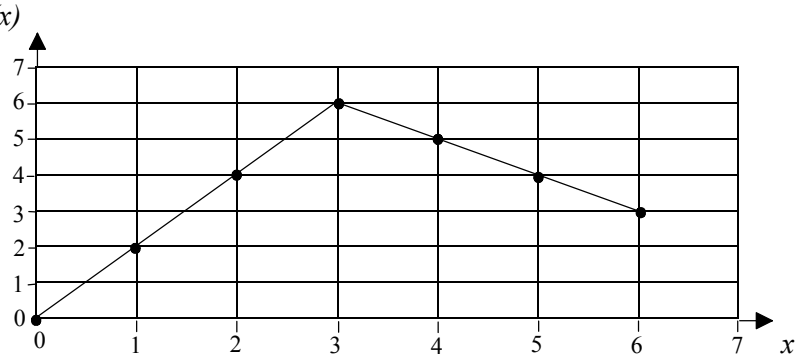
3. (a)

x	0	1	2	3	4	5	6
$f(x)$	0	2	**4**	**6**	**5**	**4**	3

(A2)

Note: Award ***(A2)*** for 4 correct bold entries, ***(A1)*** for 2 or 3 correct and ***(A0)*** for 1 or 0 correct.

(b)



(A2)

Notes: Award ***(A1)*** for points plotted correctly, ***(A1)*** for correct lines. Allow **ft** from (a), accept lines continued to (7, 2)

[4 marks]

4. (a) $\text{Area} = \frac{1}{2} \times 14 \times 8 \sin 110^\circ$ ***(M1)***

$= 52.62278676 \text{ m}^2$

$= 52.6 \text{ m}^2$ (3 s.f.) ***(A1)***

(b) $\frac{\sin C}{8} = \frac{\sin 110^\circ}{18}$ (or equivalent) ***(M1)***

$\sin C = \frac{8 \times \sin 110^\circ}{18}$

$C = 24.68575369$

$C = 24.7^\circ$ (3 s.f.) ***(A1)***

Note: Accept all answers obtained from all appropriate methods, given to the correct degree of accuracy.

[4 marks]

5. (a)

p	q	$p \Leftrightarrow q$	$(p \Leftrightarrow q) \wedge p$	$[(p \Leftrightarrow q) \wedge p] \Rightarrow q$
T	T	**T**	**T**	**T**
T	F	**F**	**F**	**T**
F	T	**F**	**F**	**T**
F	F	**T**	**F**	**T**

(A3)

Note: Award ***(A1)*** for each completely correct bold column.

(b) It is a tautology (or equivalent). The statement is valid. ***(A1)***

[4 marks]

6. (a) $A = 1.70\left(1+\frac{4.5}{100}\right)^3$ ***(M1)***

$= \$1.939982413$

$= \$1.94$ (3 s.f.) ***(A1)***

(b) $40000 = C\left(1+\frac{4.5}{100}\right)^2$ ***(M1)***

$\frac{40000}{1.045^2} = C$

$\$36629.19805 = C$

$\$37000 = C$ (to the nearest thousand dollars) ***(A1)***

Note: Accuracy is specified in the question, therefore this is not a paper accuracy penalty.

[4 marks]

7. (a) $0^\circ \le x \le 450^\circ$ ***(A2)***

Note: Award ***(A1)*** for $x \ge 0^\circ$, ***(A1)*** for $x \le 450^\circ$.
Award ***(A1)*** for 0° and 450° if the inequalities are incorrect.

(b) $1 \le y \le 5$ ***(A2)***

Note: Award ***(A1)*** for $y \ge 1$, ***(A1)*** for $y \le 5$.
Award ***(A1)*** for 1 and 5 if the inequalities are incorrect.

Note: Award ***(A2)*** if the candidates have the range and domain reversed, that is,
(a) $1 \le y \le 5$
(b) $0^\circ \le x \le 450^\circ$

[4 marks]

8. (a) 19 or 20 people ***(A1)***

(b) Median salary $= 15000$ GBP ***(A1)***

(c) 80% of 200

$= 160$ ***(M1)***

23000 ± 500 ***(A1)***

[4 marks]

9. (a) $M(2, 2\frac{1}{2}, 1\frac{1}{2})$ ***(A2)***

Note: Award ***(A2)*** for all 3 correct, ***(A1)*** for 2 correct, otherwise ***(A0)***.

(b) $CM = \sqrt{2^2 + 2.5^2 + 1.5^2}$ ***(M1)***

$= 3.535533906$

$= 3.54$ (3 s.f.) ***(A1)***

[4 marks]

10. (a) $18x + 9y$ ***(A1)***

(b)

(x, y)	Profit $= 18x + 9y$
(0, 4)	36
(2, 4)	72
(5, 1)	99
(5, 0)	90

(M2)

Note: Award ***(M2)*** for all 4 correct, ***(M1)*** for 2 or 3 correct.

Therefore, Hank should make 5 wallets and 1 picture frame. ***(R1)***

OR

5 wallets and 1 picture frame. ***(C3)***

[4 marks]

11. (a) For the line (AB), $m = \frac{9-3}{4-2}$

$= \frac{6}{2}$

$= 3$ ***(A1)***

(b) $m = -\frac{1}{3}$ ***(A1)***

(c) $2x + by - 12 = 0$

$y = -\frac{2}{b}x + \frac{12}{b}$

Therefore, $-\frac{1}{3} = -\frac{2}{b}$ ***(M1)***

$6 = b$ ***(A1)***

[4 marks]

12. (a) (i) *If the number ends in zero then it is divisible by 5* ***(A1)***

(ii) *If the number is divisible by 5 then it ends in zero* ***(A1)***

(b) (i) $\neg p \Rightarrow \neg q$ ***(A1)***

(ii) $\neg q \Rightarrow \neg p$ ***(A1)***

[4 marks]

13. (a) $x = -\dfrac{b}{2a}$

$2 = -\dfrac{4}{2 \times a}$ ***(M1)***

$a = -1$ ***(A1)***

(b) **Note:** Answers to (b) must be written as coordinates.

(i) $\mathrm{M}(0, -3)$ ***(A1)***

(ii) $y = -1 \times 2^2 + 4 \times 2 - 3$

$= 1$

N is $(2, 1)$ ***(A1)***

[4 marks]

14. (a) 10 years ***(A1)***

(b)

Age Interval	Frequency	Frequency Density
0 – 19	8	**0.4**
20 – 29	**28**	2.8
30 – 39	24	2.4
40 – 49	20	2.0
50 – 89	**12**	0.3

(A2)

Note: Award ***(A2)*** for 3 correct bold entries, ***(A1)*** for 1 or 2 correct bold entries.

(c) 2.2 ***(A1)***

[4 marks]

15. $\sin 28^\circ = \dfrac{\mathrm{BE}}{8}$ ***(M1)***

$8 \times \sin 28^\circ = \mathrm{BE}$

$\mathrm{F\hat{B}C} = 28^\circ$ ***(M1)***

$\cos 28^\circ = \dfrac{\mathrm{BF}}{5}$ ***(M1)***

$5 \cos 28^\circ = \mathrm{BF}$

Altitude of $\mathrm{C} = 8 \sin 28^\circ + 5 \cos 28^\circ$

$= 8.170510467$

$= 8.17$ cm (3 s.f.) ***(A1)***

[4 marks]