Education Bureau
Territory-wide System Assessment 2013
Secondary 3 Mathematics
Marking Scheme

Note (for Section B and C of each sub-paper):

*Mark for Answer:

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(3) If the work shown is poorly presented but there is a correct answer, the Mark for Answer may be given.

**Mark for Presentation:

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(4) The Mark for Presentation may include overall work such as mathematical expressions, units, written explanations, usage of symbol, etc.

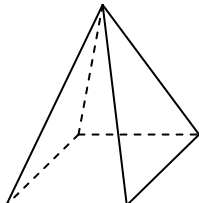r.t. *xxx* means "accept answers which can be rounded to *xxx*".

Steps that may be skipped are shown in shade.

Alternative suggested answers are shown in boxes.

Section A – Sub-paper 1 (9ME1) (1 mark each)

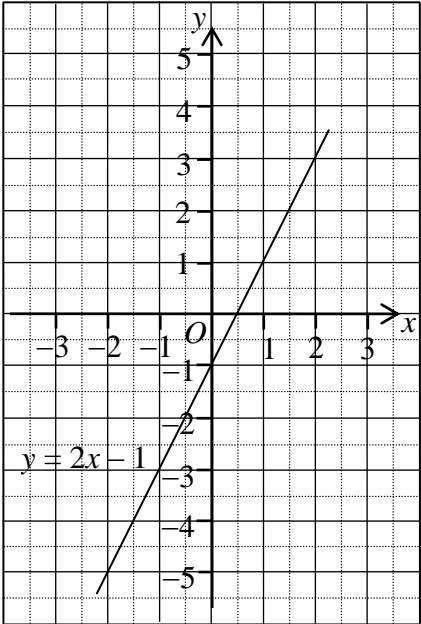1.   A (9ME2-1)
2.   B
3.   B
4.   C (9ME2-4)
5.   B (9ME4-5)
6.   D
7.   A
8.   A (9ME4-16)
9.   C
10.   A
11.   D
12.   B
13.   A
14.   D
15.   C
16.   D
17.   C
18.   C
19.   B
20.   D (9ME2-20)

Section B – Sub-paper 1 (9ME1)

Question Number	Suggested Answers	Marks	Notes
21. (9ME2-21)	(i) $+350$ ╱ $\boxed{350}$ (ii) -300	1	Must be all correct
22. (9ME2-22)	-3	1	
23. (9ME4-22)	The ratio of the number of girls to the number of boys = $\underline{\ 23\ }$: $\underline{\ 37\ }$	1	Accept $1:\dfrac{37}{23}$ ╱ $\dfrac{23}{37}:1$
24.	$3+n$ ╱ $n+3$	1	Or equivalent
25.	The polynomial is $\underline{-x^4+3x^2-6x+5}$.	1	
26.	y^2+y-2	1	Expansion
27.	$(3x+1)(3x-1)$	1	Factorization
28.	$x=\underline{\ \ 5\ \ }$	1	
29.	x^2-6x+9	1	Expansion
30. (9ME4-30)	$x=3y-1$	1	- For putting x on one side - Or equivalent
31.	$x\geq-3$	1	
32. (9ME2-32)	Area of the figure is $\underline{\ 50\pi\ }$ cm^2.	1	
33. (9ME4-32)	$\angle BAC$ ╱ $\angle CAB$	1	$\angle A$ is not accepted
34.		1	Or other correct answers
35.	(a) $x=5$ (b) $y=18$	1 (35a) 1 (35b)	Unit may not be considered

3

Question Number	Suggested Answers	Marks	Notes
36.	*BDEG*	1	Or its correct permutation
37.	*AB* = __7.8__ cm	1	
38.	The coordinates of point *P* are (2 , 1).	1	Must be all correct and in order
39.	*x* = __90__	1	Unit may not be considered
40. (9ME4-40)	(2) → (1) → (4) → (3)	1	Must be all correct and in order
41.	The required empirical probability is $\dfrac{17}{100}$.	1	Or 0.17

Section C – Sub-paper 1 (9ME1)

Question Number	Suggested Answers	Marks	Notes
42.	$\pi \times 5^2 \times h = 175\pi$ $h = 7$	1 (42-1) 1* (42-2)	
43. (9ME2-43)	Profit % $= \dfrac{7280 - 5600}{5600} \times 100\%$ $= 30\%$	1 (43-1) 1* (43-2) 1** (43-3)	
44.	Number of games drawn $= 76 \times \dfrac{3}{11 + 5 + 3}$ $= 12$	1 (44-1) 1* (44-2) 1** (44-3)	
45.	Area of the sector $= \left(\dfrac{80°}{360°}\right)\pi\left(7^2\right)$ ≈ 34.20845333 $= 34.2 \text{ cm}^2$ (corr. to 3 sig. fig.)	1 (45-1) 1* (45-2) 1** (45-3)	r.t. 34.2 cm^2
46. (9ME3-47)	$\begin{array}{\|c\|c\|c\|c\|} \hline x & -2 & 0 & 2 \\ \hline y & -5 & -1 & 3 \\ \hline \end{array}$ $y = 2x - 1$	1* (46-1) 1 (46-2) 1* (46-3)	Must be all correct In case the data in the above table is incorrect, students can still use the ordered pairs to draw a straight line. The line must meet (2, 3) and the range of value of x must include -2 to 2. Correct straight line (include: correct position, use ruler to draw the line, pass through the 3 points and extend two ends of the line) If the data in the table is correct but not complete and the graph is correct, (0, 1, 1) can be given.

Question Number	Suggested Answers	Marks	Notes
47.	(a)	1* (47-a)	Must be all correct

(a)

Waiting time less than (min)	20.5	40.5	60.5	80.5	100.5	120.5	140.5
Cumulative frequency	0	4	6	**16**	**19**	**34**	**35**

(b)

Waiting time of 35 patients

	Marks	Notes
	1 (47b-1)	Plot the points on the graph according to the table in (a). The trend of cumulation must be shown
	1* (47b-2)	Correct cumulative frequency polygon (including the line segments joining the points)

Question Number	Suggested Answers	Marks	Notes
48.	The total surface area of the cone		
	$= \pi \times 9 \times 15 + \pi \times 9^2$	1 (48-1)	
	$= 216\pi\,\text{cm}^2$	1* (48-2)	
		1** (48-3)	

Question Number	Suggested Answers	Marks	Notes
49. (9ME3-49)	$\begin{cases} 3x - y = 20 & ...(1) \\ 2x + y = 15 & ...(2) \end{cases}$ (1) ＋ (2)： $5x = 35$ $x = 7$ Substitute $x = 7$ into (2) $2(7) + y = 15$ $y = 1$	 1 (49-1) 1* (49-2) 1 (49-3) 1* (49-4)	 Eliminating one of the variables Correct value of x (or y) Correct method Both values are correct
50. (9ME3-50)	(Students must find the approximation for the unit price of each item. The total amount must not exceed $100) Total amount required $= 19.8 \times 2 + 14.7 + 9.6 \times 3$ $\approx 20 \times 2 + 15 + 10 \times 3$ $= 40 + 15 + 30$ $= 85$ ∴ Jacky had enough money to pay for the items. OR Round up the prices $19.8, $14.7 and $9.6 to $20, $15 and $10 respectively. The total amount required is $85. ∴ Jacky had enough money to pay for the items.	0　0　No evidence of using estimation strategies nor giving reasonable justification 1　0　Partial evidence of using estimation strategies, but the solution is incomplete or contains errors 1　1　Estimate with reasonable justification	◆ Exact calculation only ◆ The estimate is given only after exact calculation ◆ Round down the prices of all items ◆ Give one correct approximation only ◆ Give correct approximations only, without estimate the total amount ◆ Give correct approximations, but the total amount exceeds $100 ◆ Correct method used, but minor errors occurred ◆ No need to consider unit/presentation ◆ Accept using '≤' instead of '≈' ◆ The conclusion must be correct and aligned with a reasonable explanation

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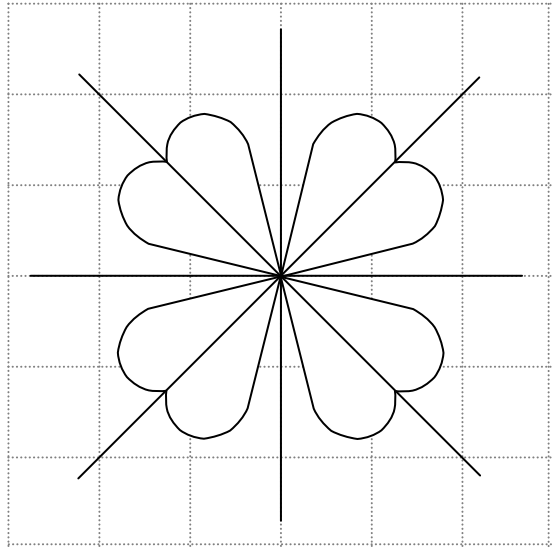
Steps that may be skipped are shown in shade.

Alternative suggested answers are shown in boxes.

Section A – Sub-paper 2 (9ME2) (1 mark each)

1.   A   (9ME1-1)
2.   B   (9ME3-2)
3.   D
4.   C   (9ME1-4)
5.   A
6.   C   (9ME4-6)
7.   B   (9ME4-7)
8.   D
9.   B   (9ME3-9)
10.   A
11.   C
12.   D
13.   A
14.   B
15.   C   (9ME4-14)
16.   B
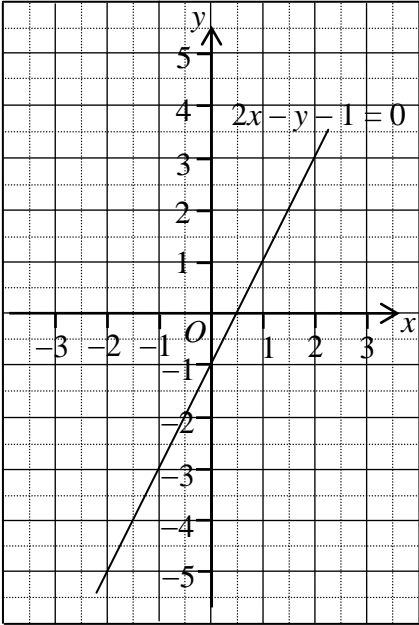17.   A
18.   C   (9ME3-18)
19.   D
20.   D   (9ME1-20)

Section B – Sub-paper 2 (9ME2)

Question Number	Suggested Answers	Marks	Notes
21. (9ME1-21)	(i) $+350$ ╱ $\boxed{350}$ (ii) -300	1	Must be all correct
22. (9ME1-22)	-3	1	
23. (9ME3-22)	$\underline{3\times10^{-6}}$ m	1	
24. (9ME3-23)	The number of medals won by Germany was $\underline{\ 44\ }$.	1	
25. (9ME4-24)	$x = \underline{\quad 21 \quad}$	1	
26.	$9a-7b$ ╱ $-7b+9a$	1	
27.	$(x+3)(x+4)(x+5)$	1	
28. (9ME4-28)	$(x-2)(x+4)$	1	Factorization
29.	$x = \underline{\ -3\ }$	1	
30.	$\dfrac{3}{4y}$	1	
31.	(i) -99 $\boxed{>}$ -100 (ii) $\dfrac{1}{99}$ $\boxed{>}$ $\dfrac{1}{100}$	1	Must be all correct
32. (9ME1-32)	Area of the figure is $\underline{\ 50\pi\ }$ cm^2.	1	
33.	The volume of the pyramid is $\underline{\ 864\ }$ cm^3.	1	
34. (9ME3-33)	Q, S	1	Must be all correct
35. (9ME4-33)		1	Must be all correct

Question Number	Suggested Answers	Marks	Notes
36.	$x =$ ___87___	1	Unit may not be considered
37.	*EG ╱ GE*	1	
38.	*D, F*	1	Must be all correct
39.	The coordinates of *M'* are (–4 , –2).	1	Must be all correct and in order
40.	$x =$ ___23.7___	1	r.t. 23.7
41.	The median weight of the eggs is ___54___ g.	1	

Section C － Sub-paper 2 (9ME2)

Question Number	Suggested Answers	Marks	Notes
42.	**Table 1** 	Number of users	Frequency	 1 – 20 | 3 21 – 40 | 9 41 – 60 | 8 **Table 2** Number of users | Frequency 1 – 12 | 0 13 – 24 | 6 25 – 36 | 4 37 – 48 | 6 49 – 60 | 4	1* (42-1) 1* (42-2)	
43. (9ME1-43)	Profit % $= \dfrac{7280 - 5600}{5600} \times 100\%$ $= 30\%$	1 (43-1) 1* (43-2) 1** (43-3)	
44.	$P(1 + 4\%)^2 = 6760$ $P = 6250$	1 (44-1) 1* (44-2) 1** (44-3)	Other correct methods
45. (9ME4-45)	Total surface area $= \dfrac{12 \times 5}{2} \times 2 + 12 \times 8 + 5 \times 8 + 13 \times 8$ $= 300 \text{ cm}^2$	1 (45-1) 1* (45-2) 1** (45-3)	

Question Number	Suggested Answers	Marks	Notes
46. (9ME4-46)	(a) $x^2 \cdot x^5$ $= x^7$	1* (46a)	
	(b) $\dfrac{y^{-3}}{x^2 \cdot x^5}$ $= \dfrac{y^{-3}}{x^7}$ $= \dfrac{1}{x^7} \cdot \dfrac{1}{y^3}$ $= \dfrac{1}{x^7 y^3}$	1 (46b-1) 1* (46b-2)	using $y^{-3} = \dfrac{1}{y^3}$ Correct final answer (getting marks 1 1)
47. (9ME4-47)	<table><tr><td>x</td><td>-2</td><td>0</td><td>2</td></tr><tr><td>y</td><td>-5</td><td>-1</td><td>3</td></tr></table>	1* (47-1) 1 (47-2) 1* (47-3)	Must be all correct In case the data in the above table is incorrect, students can still use the ordered pairs to draw a straight line. The line must meet (2, 3) and the range of value of x must include -2 to 2. Correct straight line (include: correct position, use ruler to draw the line, pass through the 3 points and extend two ends of the line) If the data in the table is correct but not complete and the graph is correct, (0, 1, 1) can be given.
48.	Mean waiting time $= \dfrac{13 \times 8 + 18 \times 28 + 23 \times 14}{50}$ $= 18.6$ min	1 (48-1) 1* (48-2) 1** (48-3)	

Question Number	Suggested Answers	Marks	Notes
49. (9ME4-49)	(a) $\cos\theta = \dfrac{16}{18}$ $\theta \approx 27.26604445°$ $\therefore \theta = 27°$ (correct to the nearest degree) (b) $50° + 27°$ $= 77°$ (correct to the nearest degree) $\therefore$ The compass bearing of C from A is N77°E.	1 (49a-1) 1* (49a-2) 1* (49b) 1** (49-4)	r.t. 27°
50.	The original amount of the medicine $\approx (10 \times 5 \times 3)$ mL $= 150$ mL	1 (50-1) 1 (50-2)	Any reasonable explanation Acceptable range: 150 mL to 200 mL Must have explanation

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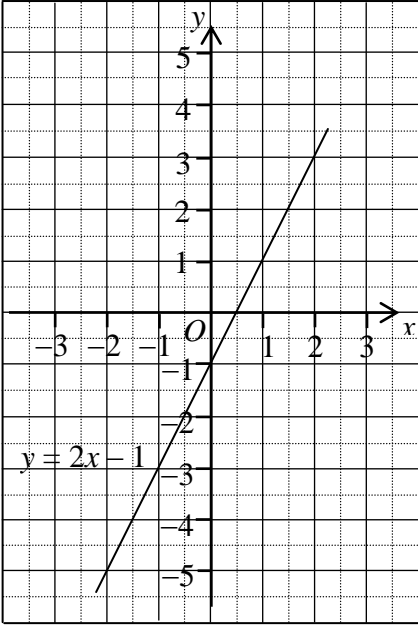Section A – Sub-paper 3 (9ME3) (1 mark each)

1. C
2. B (9ME2-2)
3. B
4. D
5. A
6. A
7. B
8. A (9ME4-8)
9. B (9ME2-9)
10. C
11. A
12. D (9ME4-12)
13. A (9ME4-13)
14. C
15. B
16. D
17. C
18. C (9ME2-18)
19. D
20. D

Section B – Sub-paper 3 (9ME3)

Question Number	Suggested Answers	Marks	Notes
21.	$A = -6$ $B = -1$ $C = 2$	1	Must be all correct
22. (9ME2-23)	$\underline{3 \times 10^{-6}}$ m	1	
23. (9ME2-24)	The number of medals won by Germany was $\underline{44}$.	1	
24.	$h = \underline{\ 5\ }$	1	
25. (9ME4-25)	The value of the 7th term of the sequence is $\dfrac{13}{\underline{10}}$.	1	Or 1.3
26.	$-2x^3 + 6x$ ／ $6x - 2x^3$	1	Expansion
27.	$(a+3)(h+k)$	1	Factorization
28.	$(x+1)(3x+1)$	1	Factorization
29.	Q and S	1	- Accept $Q(0 , -3)$ and $S(4 , 2)$ ／ $(0 , -3)$ and $(4 , 2)$ - Must be all correct
30.	$S = \underline{\ 104\ }$	1	
31. (9ME4-31)	$x < -16$	1	
32.	The total surface area of the cuboid is $\underline{\ 656\ }$ cm².	1	
33. (9ME2-34)	Q, S	1	Must be all correct
34.	4	1	
35. (9ME4-34)	$k = \underline{\ 24\ }$	1	Unit may not be considered
36.	$x = \underline{\ 68\ }$	1	Unit may not be considered
37.	$\angle ABC$ ／ $\angle CBA$ ／ $\angle EFD$ ／ $\angle DFE$	1	
38.	The area of the figure $ABCDEF$ is $\underline{\ 21\ }$ sq. units.	1	
39.	$\theta = \underline{\ 69.4°\ }$	1	r.t. 69.4° Unit may not be considered
40.	The vertical distance AC is $\underline{\ 27\ }$ m.	1	
41.	The modal class of the lifetime of the 50 batteries is $\underline{\ 31\ }$ h – $\underline{\ 33\ }$ h.	1	

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Section C – Sub-paper 3 (9ME3)

Question Number	Suggested Answers	Marks	Notes
42.	$4y + 120° + 20° = 180°$ $4y = 40°$ $y = 10°$	1 (42-1) 1* (42-2)	
43.	Let the cost price of the wardrobe be $\$x$. $x(1 - 25\%) = 2700$ $x = 3600$ $\therefore$ The cost price of the wardrobe is $\$ 3\ 600$.	1 (43-1) 1* (43-2) 1** (43-3)	
44.	Volume of the sphere $= \dfrac{4}{3}\pi\left(\dfrac{10}{2}\right)^3$ ≈ 523.5987756 $= 524\ \text{cm}^3$ (correct to the nearest cm^3)	1 (44-1) 1* (44-2) 1** (44-3)	r.t. 524 cm^3
45.	Length of $\overarc{AB}$ $= \left(\dfrac{126°}{360°}\right)(2)(24)\pi$ ≈ 52.77875658 $= 52.8\ \text{cm}$ (corr. to the nearest 0.1 cm)	1 (45-1) 1* (45-2) 1** (45-3)	r.t. 52.8 cm
46.	(a) There are __30__ students in 3B. (b) The median of the test marks is __54__ . (c) The required percentage is __60__ %.	1* (46a) 1* (46b) 1* (46c)	

M3

Question Number	Suggested Answers	Marks	Notes
47. (9ME1-46)	 x: -2, 0, 2 y: -5, -1, 3 $y = 2x - 1$	1* (47-1) 1 (47-2) 1* (47-3)	Must be all correct In case the data in the above table is incorrect, students can still use the ordered pairs to draw a straight line. The line must meet (2, 3) and the range of value of x must include -2 to 2. Correct straight line (include: correct position, use ruler to draw the line, pass through the 3 points and extend two ends of the line) If the data in the table is correct but not complete and the graph is correct, (0, 1, 1) can be given.
48.	Let r cm be the radius of B. $2\pi r = 6\pi + 8\pi$ $2\pi r = 14\pi$ $r = 7$ $\therefore$ The radius of B is 7 cm.	1 (48-1) 1* (48-2) 1** (48-3)	Or other correct method
49. (9ME1-49)	$\begin{cases} 3x - y = 20 & ...(1) \\ 2x + y = 15 & ...(2) \end{cases}$ (1) + (2) : $5x = 35$ $x = 7$ Substitute $x = 7$ into (2) $2(7) + y = 15$ $y = 1$	 1 (49-1) 1* (49-2) 1 (49-3) 1* (49-4)	 Eliminating one of the variables Correct value of x (or y) Correct method Both values are correct

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5

Question Number	Suggested Answers	Marks	Notes
50. (9ME1-50)	(Students must find the approximation for the unit price of each item. The total amount must not exceed $100) Total amount required $= 19.8 \times 2 + 14.7 + 9.6 \times 3$ $\approx 20 \times 2 + 15 + 10 \times 3$ $= 40 + 15 + 30$ $= 85$ $\therefore$ Jacky had enough money to pay for the items. OR Round up the prices $19.8, $14.7 and $9.6 to $20, $15 and $10 respectively. The total amount required is $85.	0 0 No evidence of using estimation strategies nor giving reasonable justification	• Exact calculation only • The estimate is given only after exact calculation • Round down the prices of all items
		1 0 Partial evidence of using estimation strategies, but the solution is incomplete or contains errors	• Give one correct approximation only • Give correct approximations only, without estimate the total amount • Give correct approximations, but the total amount exceeds $100 • Correct method used, but minor errors occurred
	$\therefore$ Jacky had enough money to pay for the items.	1 1 Estimate with reasonable justification	• No need to consider unit/presentation • Accept using '$\leq$' instead of '$\approx$' • The conclusion must be correct and aligned with a reasonable explanation

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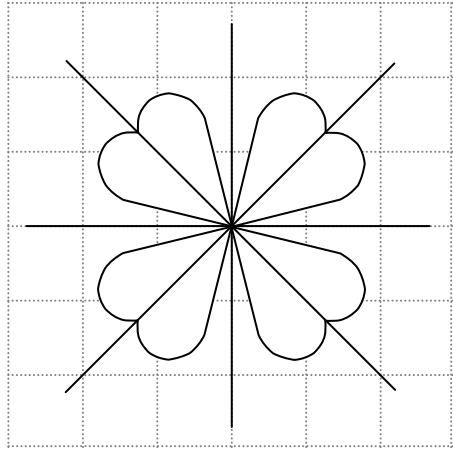r.t. *xxx* means "accept answers which can be rounded to *xxx*".

Steps that may be skipped are shown in shade.

Alternative suggested answers are shown in boxes.

Section A – Sub-paper 4 (9ME4) (1 mark each)

1. D
2. A
3. C
4. B
5. B (9ME1-5)
6. C (9ME2-6)
7. B (9ME2-7)
8. A (9ME3-8)
9. D
10. D
11. B
12. D (9ME3-12)
13. A (9ME3-13)
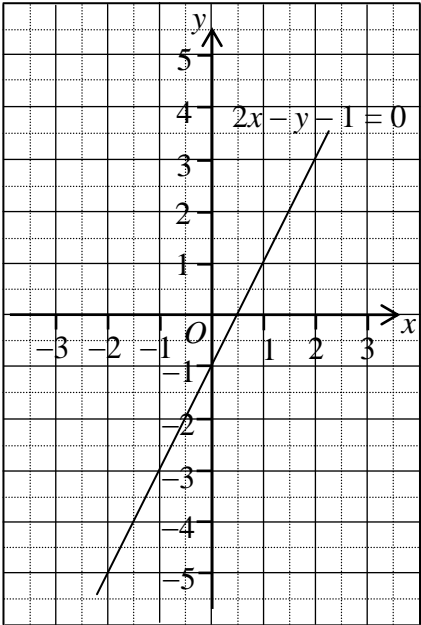14. C (9ME2-15)
15. B
16. A (9ME1-8)
17. D
18. C
19. A
20. C

Section B – Sub-paper 4 (9ME4)

Question Number	Suggested Answers	Marks	Notes
21.	130	1	
22. (9ME1-23)	The ratio of the number of girls to the number of boys = __23__ : __37__	1	Accept $1:\dfrac{37}{23}$ / $\dfrac{23}{37}:1$
23.	The required amount is $ _1080_ .	1	
24. (9ME2-25)	$x =$ __21__	1	
25. (9ME3-25)	The value of the 7th term of the sequence is $\dfrac{13}{10}$.	1	Or 1.3
26.	$x^2 - xy + x$	1	Expansion
27.	$(x+5)^2$ / $(x+5)(x+5)$	1	Factorization
28. (9ME2-28)	$(x-2)(x+4)$	1	Factorization
29.	$x^2 - y^2$	1	Expansion
30. (9ME1-30)	$x = 3y - 1$	1	- For putting x on one side - Or equivalent
31. (9ME3-31)	$x < -16$	1	
32. (9ME1-33)	$\angle BAC$ / $\angle CAB$	1	$\angle A$ is not accepted
33. (9ME2-35)		1	Must be all correct
34. (9ME3-35)	$k =$ __24__	1	Unit may not be considered
35.	$\triangle ABC \sim \triangle DEF$ Ratios of 2 sides, included angles	1	Must be all correct
36.	$x =$ __104__	1	Unit may not be considered
37.	$\angle ACF$ / $\angle FCA$	1	

3

Question Number	Suggested Answers	Marks	Notes
38.	The polar coordinates of point *A* are (_3_ , _330°_).	1	Must be all correct and in order
39.	Slope of *L* is _3_ .	1	
40. (9ME1-40)	(2) → (1) → (4) → (3)	1	Must be all correct
41.	The weighted mean mark of Andy is _78.6_ .	1	

Section C – Sub-paper 4 (9ME4)

Question Number	Suggested Answers	Marks	Notes
42.	(a) 		S	E	N	D
---	---	---	---	---
T	TS / ST	TE	TN / NT	TD
O	OS	OE / EO	ON	OD / DO | (b) The probability that the two letters chosen are 'T' and 'S' is $\dfrac{1}{8}$.	1* (42a) 1* (42b)	Must be all correct Or 0.125
43.	Interest $= 6800 \times 3\% \times 4$ $= \$816$	1 (43-1) 1* (43-2) 1** (43-3)	
44.	$2160 \div (1+50\%)^3$ $= 640$ The number of bacteria three hours ago was 640. OR $\boxed{2160 \div 1.5 = 1440}$ $\boxed{1440 \div 1.5 = 960}$ $\boxed{960 \div 1.5 = 640}$ $\boxed{\text{The number of bacteria three hours ago was 640.}}$	1 (44-1) 1* (44-2) 1** (44-3) $\boxed{1\ (44\text{-}1)}$ $\boxed{1^*\ (44\text{-}2)}$ $\boxed{1^{**}\ (44\text{-}3)}$	$\boxed{\text{Correct method (divided by 1.5 three times)}}$
45. (9ME2-45)	Total surface area $= \dfrac{12 \times 5}{2} \times 2 + 12 \times 8 + 5 \times 8 + 13 \times 8$ $= 300 \text{ cm}^2$	1 (45-1) 1* (45-2) 1** (45-3)	

Question Number	Suggested Answers	Marks	Notes
46. (9ME2-46)	(a) $x^2 \cdot x^5$ $= x^7$ (b) $\dfrac{y^{-3}}{x^2 \cdot x^5}$ $= \dfrac{y^{-3}}{x^7}$ $= \dfrac{1}{x^7} \cdot \dfrac{1}{y^3}$ $= \dfrac{1}{x^7 y^3}$	1* (46a) 1 (46b-1) 1* (46b-2)	 using $\quad y^{-3} = \dfrac{1}{y^3}$ Correct final answer (getting marks 1 1)
47. (9ME2-47)	<table><tr><td>x</td><td>-2</td><td>0</td><td>2</td></tr><tr><td>y</td><td>-5</td><td>-1</td><td>3</td></tr></table> 	1* (47-1) 1 (47-2) 1* (47-3)	Must be all correct In case the data in the above table is incorrect, students can still use the ordered pairs to draw a straight line. The line must meet (2, 3) and the range of value of x must include -2 to 2. Correct straight line (include: correct position, use ruler to draw the line, pass through the 3 points and extend two ends of the line) If the data in the table is correct but not complete and the graph is correct, (0, 1, 1) can be given.
48.	$\because AB = AD$ $\angle ABC = 40°$ $40° + 40° + 75° + x = 180°$ $x = 25°$	 1 (48-1) 1 (48-2) 1* (48-3)	 Can be absorbed Or other correct method

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Question Number	Suggested Answers	Marks	Notes
49. (9ME2-49)	(a) $\cos\theta = \dfrac{16}{18}$ $\theta \approx 27.26604445°$ $\therefore \theta = 27°$ (correct to the nearest degree) (b) $50° + 27°$ $= 77°$ (correct to the nearest degree) $\therefore$ The compass bearing of C from A is N77°E.	1 (49a-1) 1* (49a-2) 1* (49b) 1** (49-4)	r.t. 27°
50.	There are 6 photo frames which are more than $80. OR There are only 2 photo frames which are less than $80. $\therefore$ I **disagree** with the shopkeeper's claim.	1 (50-1) 1 (50-1) 1 (50-2)	Reasonable Explanation Reasonable Explanation Reasonable attempt to explain