Education Bureau
Territory-wide System Assessment 2009
Secondary 3 Mathematics
Marking Scheme

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

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

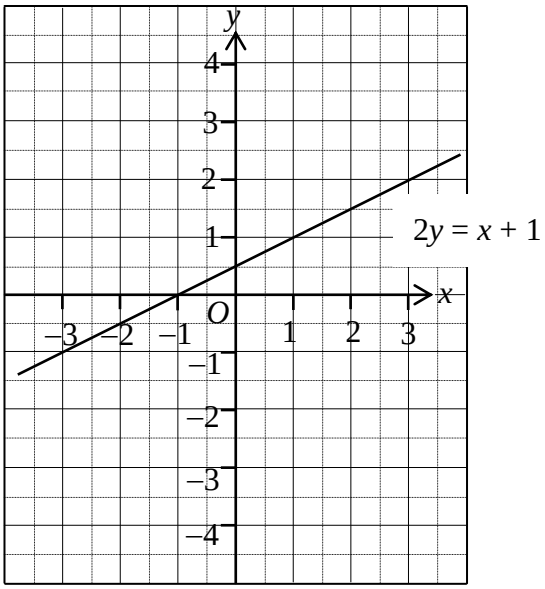
Steps that may be skipped are shown in shade.

Alternative suggested answers are shown in boxes.

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

1. A (9ME2-1)
2. C (9ME2-2)
3. C (9ME4-2)
4. B
5. B
6. C
7. C
8. A
9. C
10. C
11. B (9ME2-11)
12. B (9ME2-12)
13. B (9ME4-12)
14. A
15. C
16. D
17. D
18. A
19. B
20. D
21. B (9ME2-21)

Section B – Sub-paper 1 (9ME1)

Question Number	Suggested Answers	Notes	Marks
22. (i) (ii) (9ME2-22)	+ 4，4 – 5	Must be all correct	1
23. (9ME4-22)	19		1
24. (i) (ii)	Ratio Rate	Must be all correct	1
25.	$4n$		1
26.	$4x^2 + 7x + 3$	Expansion	1
27.	$(x-5)(x+3)$	Factorization	1
28.			1
29.	$\frac{9}{2}$		1
30.	$x \leq -5$		1
31. (9ME2-31)	1252		1
32. (9ME2-32)	$\angle PRQ$ ，$\angle QRP$		1
33. (9ME4-32)	5		1
34.	$x = 8$ ； $y = 7$	Must be all correct	1
35.	*AH* or *BE* or *CF* or *DG* or their permutations		1
36.	30 square units		1

Question Number	Suggested Answers	Notes	Marks
37.	$(-3,-1)$		1
38. (a)	7 staff members of this accounting firm have age between 35 and 40.		1 (38a)
(b)	3 staff members of this accounting firm have age above 45.		1 (38b)
(c)	There are 23 staff members in this accounting firm.		1 (38c)
39.	The empirical probability of getting "opening sideway" is 0.8.		1

Section C – Sub-paper 1 (9ME1)

Question Number	Suggested Answers	Marks	Notes
40. (9ME2-41)	$1200 \div 15\%$ $= 8000$ The amount of school grant was \$8000.	1 (40-1) 1* (40-2) 1** (40-3)	set up
41. (9ME2-42)	$4000 \times (1+3\%)^3$ $= 4370.908$ ≈ 4371 The amount that Ben would receive is \$4371.	1 (41-1) 1* (41-2) 1** (41-3)	set up r.t. 4371
42. (9ME4-42)	$\dfrac{x^5}{x^3 y^{-4}}$ $= \dfrac{x^2}{y^{-4}}$ $= x^2 y^{-(-4)}$ $= x^2 y^4$	1 (42-1) 1 (42-2) 1 (42-3)	using $\dfrac{x^m}{x^n} = x^{m-n}$ or $\dfrac{x^m}{x^n} = \dfrac{1}{x^{n-m}}$ or (when no work is shown) the final answer contains x^2 using $\dfrac{1}{a^{-k}} = a^k$ or $a^{-k} = \dfrac{1}{a^{-(-k)}}$ of (when no work is shown) the numerator of final answer contains y^4 Correct final answer (getting marks 1 1 1)
43.	The area of the sector is $\left(\dfrac{60°}{360°}\right)\pi(8^2)$ ≈ 33.5103 $= 33.5 \text{ cm}^2$ （correct to the nearest 0.1 cm^2）	1 (43-1) 1* (43-2) 1** (43-3)	set up r.t. 33.5
44. (a)	13 m to 16 m are acceptable	1 (44a)	Must have explanation
(b)	In the figure, the building is about 9 cm tall, and the boy is about 1 cm tall. So, the height of the building is about $9 \times 1.6 = 14.4$ m.	1 (44b)	Or other reasonable explanation (such as using the diagram)

Question Number	Suggested Answers	Marks	Notes
45. (9ME4-45)	$x + 20° + x + 100° = 180°$ $\therefore x = 30°$ $y = 20° + x$ $\therefore y = 50°$	 1* (45-1) 1* (45-2)	
46.	$\because AB = BD = DA$ $\therefore \angle ABD = 60°$ $\therefore x = 120°$ $\because BC = BD$ $\therefore \angle BCD = \angle BDC = y$ $y + y = 60°$ $\therefore y = 30°$	 1* (46-1) 1 (46-2) 1* (46-3)	 Any correct methods Can be absorbed
47.	$\frac{x}{5} = \tan 47°$ $\therefore x = 5\tan 47°$ ≈ 5.3618 $= 5.36$ （correct to 2 decimal places） $\frac{5}{y} = \cos 47°$ $\therefore y = \frac{5}{\cos 47°}$ ≈ 7.3314 $= 7.33$ （correct to 2 decimal places）	1 (47-1) 1* (47-2) 1 (47-3) 1* (47-4)	Related and correct set up r.t. 5.36 Related and correct set up (Pythagoras Thm may be used) r.t. 7.33
48.	Let the height be y m, $\tan 16° = \frac{y}{570}$ $y = 570\tan 16°$ ≈ 163.4449 ≈ 163 $\therefore$ The height of the top of power station from the sea level is 163 m (correct to the nearest m).	 1 (48-1) 1* (48-2) 1** (48-3)	 r.t. 163

<table>
<tr><th>Question Number</th><th>Suggested Answers</th><th>Marks</th><th>Notes</th></tr>
<tr><td>49.</td><td>
<table>
<tr><td colspan="2">Table 1</td></tr>
<tr><td>Weights of school bags (kg)</td><td>Frequency</td></tr>
<tr><td>0.0 – 1.9</td><td>3</td></tr>
<tr><td>2.0 – 3.9</td><td>4</td></tr>
<tr><td>4.0 – 5.9</td><td>3</td></tr>
<tr><td>6.0 – 7.9</td><td>3</td></tr>
<tr><td>8.0 – 9.9</td><td>4</td></tr>
<tr><td>10.0 – 11.9</td><td>3</td></tr>
</table>
<table>
<tr><td colspan="2">Table 2</td></tr>
<tr><td>Weights of school bags (kg)</td><td>Frequency</td></tr>
<tr><td>0.0 – 2.9</td><td>7</td></tr>
<tr><td>3.0 – 5.9</td><td>3</td></tr>
<tr><td>6.0 – 8.9</td><td>3</td></tr>
<tr><td>9.0 – 11.9</td><td>7</td></tr>
</table>
</td><td>1 (49-1)

1 (49-2)</td><td>Must be all correct

Must be all correct</td></tr>
</table>

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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. C (9ME1-2)
3. C (9ME3-2)
4. D (9ME3-3)
5. D (9ME4-4)
6. A
7. B
8. D
9. C
10. A
11. B (9ME1-11)
12. B (9ME1-12)
13. C (9ME3-12)
14. B (9ME3-13)
15. D (9ME4-15)
16. C
17. D
18. D
19. C
20. D
21. B (9ME1-21)

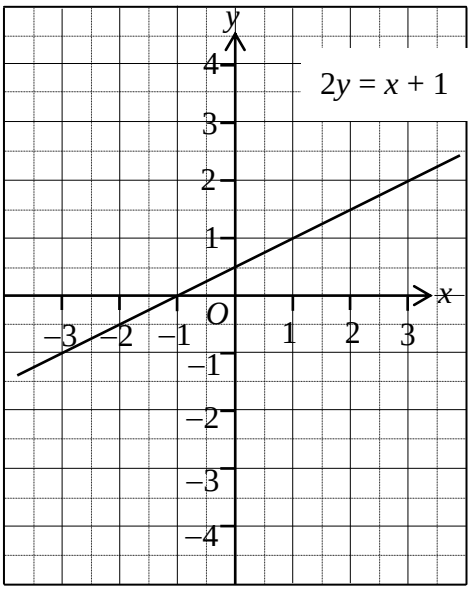
Section B – Sub-paper 2 (9ME2)

Question Number	Suggested Answers	Notes	Marks
22. (i) (ii) (9ME1-22)	$+4$，$\boxed{4}$ -5	Must be all correct	1
23. (i) (ii) (9ME3-22)	Exact value Estimated value	Must be all correct	1
24. (9ME3-23)	160		1
25. (9ME4-24)	$b = 3$ $c = \frac{9}{2}$	Must be all correct	1
26.	$\frac{5}{3}$	r.t. 1.67	1
27.	$4x^3 + 4x^2 - 5x - 3$		1
28.	$(2x+3)(x-2)$	Factorization	1
29.	$x = 3$ ， $y = -1$	Must be all correct	1
30.	$x = \frac{10}{w-2}$		1
31. (9ME1-31)	1252		1
32. (9ME1-32)	$\angle PRQ$ ，$\boxed{\angle QRP}$		1
33. (9ME3-32)	A 、C	Must be all correct	1
34. (a) (b) (9ME3-33)	14 40		1 (34a) 1 (34b)
35. (a) (b)	$\frac{1}{4}$ -5		1 (35a) 1 (35b)
36. (9ME4-34)	120		1
37.	$\angle EAD$ ，$\boxed{\angle DAE}$		1
38.	$(3, 210°)$		1
39.	$\frac{1}{2}$		1
40.	6 students used more than 70 s to finish the race.		1

Section C – Sub-paper 2 (9ME2)

<table>
<tr><th>Question Number</th><th>Suggested Answers</th><th>Marks</th><th>Notes</th></tr>
<tr><td>41.
(9ME1-40)</td><td>$1200 \div 15\%$
$= 8000$
The amount of school grant was $8000.</td><td>1 (41-1)
1* (41-2)
1** (41-3)</td><td>set up</td></tr>
<tr><td>42.
(9ME1-41)</td><td>$4000 \times (1+3\%)^3$
$= 4370.908$
≈ 4371
The amount that Ben would receive is $4371.
(correct to the nearest dollars)</td><td>1 (42-1)

1* (42-2)
1** (42-3)</td><td>set up

r.t. 4371</td></tr>
<tr><td>43.
(9ME3-43)</td><td><table><tr><td>x</td><td>-3</td><td>0</td><td>3</td></tr><tr><td>y</td><td>-1</td><td>0.5</td><td>2</td></tr></table> 
</td><td>1 (43-1)

1 (43-2)</td><td>Must be all correct

If the table was incorrect, student may still use those values to draw a straight line.</td></tr>
</table>

Question Number	Suggested Answers	Marks	Notes
44. (a)	$x + y = 122$ and $90x + 70y = 10200$	1 (44a)	Must be all correct
(b) (9ME3-44)	$90(122 - y) + 70y = 10200$	1 (44b-1)	Method: Getting a linear equation in x or y only from equations in (a)
	Solving to get $y = 39$.	1* (44b-2)	
	$\therefore$ There were 39 children on the ferry.	1** (44b-3)	
	$90x + 70(122 - x) = 10200$	1 (44b-1)	
	$x = 83$		
	$83 + y = 122$		Finding x before finding y
	$y = 39$	1* (44b-2)	
	Without (a), (b) can be calculated directly :		
	$90(122 - y) + 70y = 10200$	1 (44b-1)	Obtaining $122 - y$ and $90x + 70y$
	Solving to get $y = 39$.	1* (44b-2)	
	$\therefore$ There were 39 children on the ferry.		Correct answer Unit/presentation
45. (a)	$\pi r^2 = 256\pi$	1 (45a-1)	Using correct method
	getting $r = 16$	1* (45a-2)	
(b) (9ME4-44)	Circumference $= 2\pi r$		
	$= 2\pi \times 16$	1 (45b-1)	Using correct method
	$= 32\pi$	1* (45b-2)	
	The circumference of the circle is 32π cm.	1** (45-3)	Parts (a) & (b)
46.	The total surface area of the pyramid is		
	$\frac{(8)(5)}{2} \times 4 + (8)(8)$	1 (46-1)	
	$= 144$ cm^2	1* (46-2)	
		1** (46-3)	

<table>
<tr><th>Question Number</th><th>Suggested Answers</th><th></th><th>Marks</th><th>Notes</th></tr>
<tr><td>47.</td><td>$\angle ADC = \angle BAD = 40°$

$\angle CDG = 90° - \angle ADC = 50°$

$\because \angle CDG = \angle DGH = 50°$
$\therefore CE // FH$

or

$\angle ADE = 180° - \angle BAD = 140°$

$\angle EDG = 360° - 90° - \angle ADE = 130°$

$\because \angle EDG + \angle DGH = 130° + 50° = 180°$
$\therefore CE // FH$</td><td>Alt $\angle$s $AB // CE$

Alt $\angle$s equal

Int $\angle$s $AB // CE$

$\angle$s at a point

Int $\angle$s supp</td><td>1 (47-1)

1 (47-2)

1 (47-3)

1 (47-1)

1 (47-2)

1 (47-3)</td><td>Use correct reasoning to find the value of alt $\angle$

Use correct method to find $\angle CDG$ or $\angle EDG$

Proof is completely correct

Use correct reasoning to find the value of int $\angle$

Use correct method to find $\angle CDG$ or $\angle EDG$

Proof is completely correct</td></tr>
<tr><td>48.</td><td>$AB = \sqrt{(20-(-15))^2 + (7-(-5))^2}$

$= \sqrt{35^2 + 12^2}$

= 37 units</td><td></td><td>1*</td><td></td></tr>
<tr><td>49.</td><td><table><tr><th>Stem (10 hours)</th><th>Leaf (1 hour)</th></tr><tr><td>1</td><td>3 3 5 8</td></tr><tr><td>2</td><td>5 5 5 5 7</td></tr><tr><td>3</td><td>5 6 8</td></tr><tr><td>4</td><td>6</td></tr><tr><td>5</td><td>1 1</td></tr></table></td><td></td><td>1 (49-1)

1 (49-2)

1 (49-3)</td><td>Correct stem

Correct leaves (before sorting)

All correct (including lengths of rows of data)</td></tr>
</table>

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

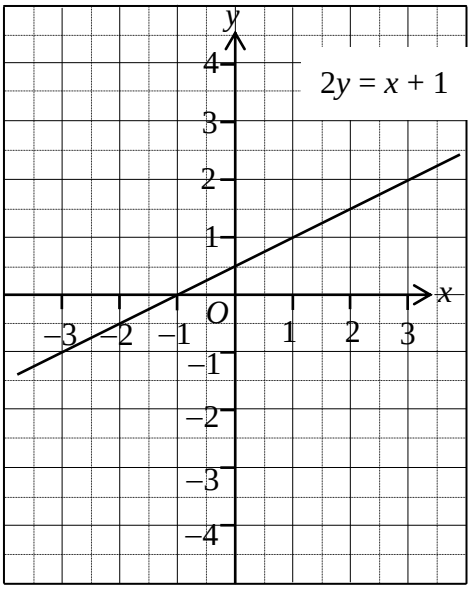
1. A
2. C (9ME2-3)
3. D (9ME2-4)
4. B
5. C (9ME4-5)
6. D
7. C
8. B
9. D
10. C
11. D
12. C (9ME2-13)
13. B (9ME2-14)
14. B
15. D (9ME4-16)
16. B
17. A
18. B
19. C (9ME4-18)
20. A

Section B – Sub-paper 3 (9ME3)

Question Number	Suggested Answers	Notes	Marks
21.	$A = -5$ $B = -1$ $C = 2$ $\boxed{C = +2}$	Must be all correct	1
22. (i) (ii) (9ME2-23)	Exact value Estimated value	Must be all correct	1
23. (9ME2-24)	160		1
24. (9ME4-25)	$x = 21$ $y = 34$	Must be all correct	1
25.	22		1
26.	$x^3 - x^2 + 8x$		1
27.	$2x^2(1+4x^2)$	Factorization	1
28.	-10		1
29.	$9x^2 + 6x + 1$	Expansion	1
30. (i) (ii)	$-100 \boxed{>} -200$ $-0.1 \boxed{<} -0.01$	Must be all correct	1
31.	A、C、E	Must be all correct	1
32. (9ME2-33)	A、C	Must be all correct	1
33. (a) (b) (9ME2-34)	14 40		1 (33a) 1 (33b)
34.	34.9°	Reference value 34.9152° r.t. 34.9°	1
35.	93		1
36.	DF，$\boxed{FD}$		1
37.	$(-2,-4)$		1
38.	(3) → (2) → (4) → (1)		1
39.	The mean number of raffle tickets bought per person was 3.13.		1

Section C – Sub-paper 3 (9ME3)

Question Number	Suggested Answers	Marks	Notes
40.	(Student needs to estimate the sailing distances in 5 days.)	0 (40-1) 0 (40-2) No evidence of using any estimation strategies	eg. ◆ Give estimate only after exact calculation ◆ Exact calculation only
	Each day from Monday to Friday he sails for $4.9 + 12.85 + 9.9$ $\approx 5 + 13 + 10$ $= 28$ km $\therefore$ The total sailing distance per week is $28 \times 5 = 140$ km.	1 (40-1) 0 (40-2) Partial evidence of using estimation strategies, but the solution is incomplete or has errors	eg. ◆ Estimated the sailing distance for one day only ◆ Gave a reasonable estimate without explanation ◆ Minor error occurred in estimation but otherwise correct
		1 (40-1) 1 (40-2) Estimated reasonably with appropriate reason	◆ Need not consider units / presentation
41.	$360 \div 3 \div 2\%$ $= 6000$ The principal was \$6000.	1 (41-1) 1* (41-2) 1** (41-3)	set up
42.	$6500 \times (1 - 40\%)^3$ $= 1404$ The value of the computer after three years is \$1404. or $6500 \times 0.6 = 3900$ $3900 \times 0.6 = 2340$ $2340 \times 0.6 = 1404$ The value of the computer after three years is \$1404.	1 (42-1) 1* (42-2) 1** (42-3) 1 (42-1) 1* (42-2) 1** (42-3)	set up correct method (multiply 0.6 three times)

Question Number	Suggested Answers	Marks	Notes
43. (9ME2-43)	x | -3 | 0 | 3 y | -1 | 0.5 | 2  	1 (43-1) 1 (43-2)	Must be all correct If the table was incorrect, student may still use those values to draw a straight line.
44. (a) (b) (9ME2-44)	$x + y = 122$ and $90x + 70y = 10200$ $90(122 - y) + 70y = 10200$ Solving to get $y = 39$. $\therefore$ There were 39 children on the ferry. $90x + 70(122 - x) = 10200$ $x = 83$ $83 + y = 122$ $y = 39$ Without (a), (b) can be calculated directly : $90(122 - y) + 70y = 10200$ Solving to get $y = 39$.	1 (44a) 1 (44b-1) 1* (44b-2) 1** (44b-3) 1 (44b-1) 1* (44b-2) 1 (44b-1) 1* (44b-2)	Must be all correct Getting a linear equation in x or y only Finding x before finding y Obtaining $122 - y$ and $90x + 70y$

Question Number	Suggested Answers	Marks	Notes
45.	The length of arc $\overset{\frown}{ACB}$ is $\left(\frac{100°}{360°}\right)\pi(2)(3)$ ≈ 5.23599 $= 5.2$ cm (correct to the nearest 0.1 cm)	1 (45-1) 1* (45-2) 1** (45-3)	 r.t. 5.2
46.	The surface area of the Fit ball is $(4\pi)(\frac{50}{2})^2$ ≈ 7853.9816 $= 7854$ cm^2 (correct to the nearest cm^2)	1 (46-1) 1* (46-2) 1** (46-3)	Set up r.t. 7854
47.	$x = 180° - 110°$ $\therefore x = 70°$ $x + 90° + y = 180°$ $\therefore y = 20°$ $z = y$ $\therefore z = 20°$	 1* (47-1) 1* (47-2) 1* (47-3)	
48.	$\frac{AB}{RP} = \frac{5}{7.5} = \frac{2}{3}$ $\frac{BC}{PQ} = \frac{4}{6} = \frac{2}{3}$ $\frac{CA}{QR} = \frac{6}{9} = \frac{2}{3}$ $\because \frac{AB}{RP} = \frac{BC}{PQ} = \frac{CA}{QR} = \frac{2}{3}$ $\therefore \Delta ABC \sim \Delta RPQ$ 3 sides proportional	1 (48-1) 1 (48-2) 1 (48-3)	Write out one of the ratios Matching corresponding line segments Proof is completely correct
49. (9ME4-48)	The statement of Thomas is misleading. It is because the arithmetic mean of his score was affected by extreme values of the 4th and 9th matches. It is because the score was below 5 in 8 of the matches.	1 (49-1) 1 (49-2) 1 (49-2)	Attempt to explain Explanation Explanation

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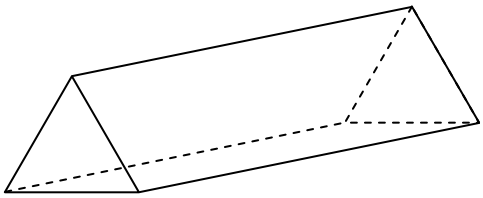
Section A – Sub-paper 4 (9ME4) (1 mark each)

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

Section B – Sub-paper 4 (9ME4)

Question Number	Suggested Answers	Notes	Marks
21. (a) (b)	6 –5		1 (21-a) 1 (21-b)
22. (9ME1-23)	19		1
23.	2.4×10^4	Scientific notation	1
24. (9ME2-25)	$b = 3$ $c = \frac{9}{2}$	Must be all correct	1
25. (9ME3-24)	$x = 21$ $y = 34$	Must be all correct	1
26.	$3x^3 - 2x^2 + x$	Expansion	1
27.	$(2x+3)^2$ $(2x+3)(2x+3)$	Factorization	1
28.	5		1
29.	$x^2 - 9$	Expansion	1
30.	$x > -3$		1
31.		Any correct triangular prisms	1
32. (9ME1-33)	5		1
33.	70		1
34. (9ME2-36)	120		1
35.	*PQWT* or its permutation, or *SRVU* or its permutation, or *PSWV* or its permutation, or *QRTU* or its permutation, or *STVQ* or its permutation, or *PUWR* or its permutation.		1
36.	*A*、*C*	Must be all correct	1
37.	50°		1
38.	22.6°	Reference value 22.61986° r.t. 22.6°	1
39.	The weighted mean of unit prices of stocks is $6.		1

Section C – Sub-paper 4 (9ME4)

Question Number	Suggested Answers	Marks	Notes
40.	$110 \times (1-5\%)$ $= 104.5$ Tim paid \$104.5.	1 (40-1) 1* (40-2) 1** (40-3)	set up
41.	$2000 \times 0.063 \times 90$ $= 11340$ The weight of one stack of A4 paper is 11340 g.	1 (41-1) 1* (41-2) 1** (41-3)	set up
42. (9ME1-42)	$\frac{x^5}{x^3 y^{-4}}$		
	$= \frac{x^2}{y^{-4}}$	1 (42-1)	using $\frac{x^m}{x^n} = x^{m-n}$ or $\frac{x^m}{x^n} = \frac{1}{x^{n-m}}$ or (when no work is shown) the final answer contains x^2
	$= x^2 y^{-(-4)}$	1 (42-2)	using $\frac{1}{a^{-k}} = a^k$ or $a^{-k} = \frac{1}{a^{-(-k)}}$ of (when no work is shown) the numerator of final answer contains y^4
	$= x^2 y^4$	1 (42-3)	Correct final answer (getting marks 1 1 1)
43.	$\begin{cases} 2x - y = 78 & ...(1) \\ 4x + y = 114 & ...(2) \end{cases}$ $(1) + (2)$:		
	$6x = 192$	1 (43-1)	Method (eliminating one of the variables)
	$x = 32$	1* (43-2)	First correct root (either x or y)
	Substitute $x = 32$ into (2)		
	$4(32) + y = 114$	1 (43-3)	Method (using the value of the first root to get the second root)
	$y = -14$	1* (43-4)	Both roots are the correct answers

題號	答案		分額	註
44. (a)	$\pi r^2 = 256\pi$		1 (44a-1)	Using correct method
	getting $r = 16$		1* (44a-2)	
(b)	Circumference = $2\pi r$			
(9ME2-45)	$= 2\pi \times 16$		1 (44b-1)	Using correct method
	$= 32\pi$		1* (44b-2)	
	The circumference of the circle is 32π cm.		1** (44-3)	Parts (a) & (b)
45.	$x + 20° + x + 100° = 180°$			
(9ME1-45)	$\therefore x = 30°$		1* (45-1)	
	$y = 20° + x$			
	$\therefore y = 50°$		1* (45-2)	
46.	$\angle CBA = \angle CDE$	Given	1 (46-1)	The two "Given" parts
	$BC = DC$	Given		
	$\angle BCA = \angle DCE$	Vert Opp $\angle$s	1 (46-2)	Correct reason needed
	$\therefore \Delta ABC \cong \Delta EDC$	ASA	1 (46-3)	The proof is completely correct
47.	Let θ be the angle,			
	$\tan\theta = \dfrac{55.86}{3.9}$		1 (47-1)	
	$\therefore \theta = 86°$			
	$\therefore$ The angle between the tower and the horizontal is 86°.		1* (47-2) 1** (47-3)	r.t. 86°
48. (9ME3-49)	The statement of Thomas is misleading.		1 (48-1)	Attempt to explain
	It is because the arithmetic mean of his score was affected by extreme values of the 4^{th} and 9^{th} matches.		1 (48-2)	Explanation
	It is because the score was below 5 in 8 of the matches.		1 (48-2)	Explanation