

**MATHEMATICAL STUDIES SL**  
**ALGEBRA PRACTICE**

1. (a)  $300 \times 3600$  (M1)  
 $= 1080000$  (A1)
- (b) (i) 1100000 (A1)
- (ii)  $1.08 \times 10^6$  or  $1.1 \times 10^6$  (A1)
- [4]**

2.

- (a)  $144.75 \left( = \frac{579}{4} \right)$  (A1) (C1)
- Note: Accept 145*

- (b)  $1.4475 \times 10^2$  (A1)(ft)(A1)(ft) (C2)
- Note: Accept 1.45  $10^2$*

- (c) (i) Area =  $96\text{m}^2$  (A1)  
 (UP)

(ii) % error =  $\frac{(96-90)}{90} \times 100$  (M1)

$$= \frac{6 \times 100}{90}$$

$$= \frac{20}{3} \% \text{ or } 6.67\%$$

(A1)(ft) (C3)

**[6]**

3. (a)  $x^2 = (3.1 \times 10^4)^2$  or  $31000 \times 31000$  (M1)  
 $= 9.61 \times 10^8$  (A1) (C2)

- (b)  $\frac{x}{y} = \frac{3.1 \times 10^4}{2.4 \times 10^{-7}}$
- $= 1.29 \times 10^{11}$  (3 s.f.) (A2) (C2)

*Note: Award (A1) for  $10^{11}$ , (A1) for 1.29*

**[4]**

4. (a)  $V = \pi 4.26^2 (21.58 - 14.35)$  (M1)  
 $412.1994(123)$  (A1) (C2)
- (b) 412.20 (A2) (C2)
- (c) 410 (A2) (C2)
- (d)  $4.10 \times 10^2$  (A1)(A1) (C2)

*Note: Award (A1) for 4.10 and (A1) for  $10^2$ .*

**[8]**

5. (a)  $r = \frac{1}{\sin(86^\circ) - \sin(85^\circ)}$   
 (= 730.2723312) = 730 to 3 s.f. (A2) (C2)

(b)  $r_A = \frac{1}{0.998 - 0.996}$  (M1)(A1)  
 $= \frac{1}{0.002} = 500.$  (A1) (C3)

(c)  $E = \frac{100(730 - 500)}{730}$  (M1)(A1)  
 $= 31.5\%$  (to 3 s.f.) (A1) (C3)

[8]

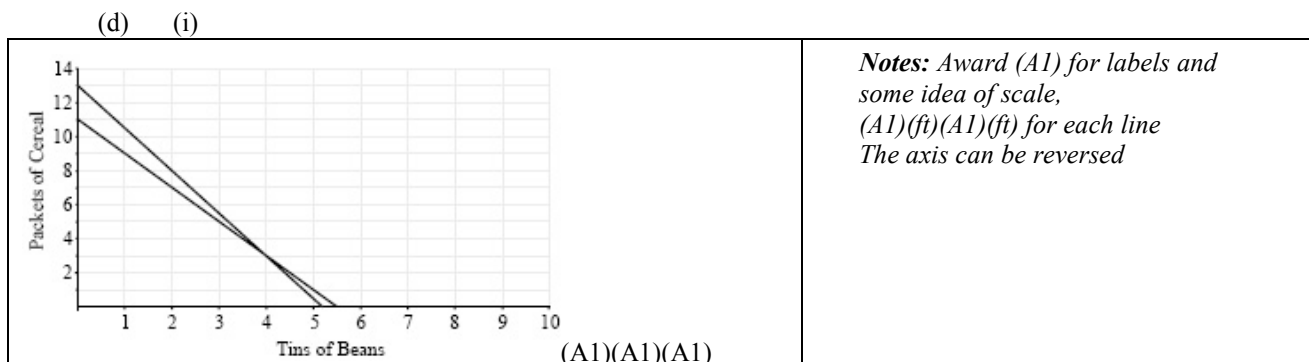
6. (a)  $6C + 3V = 163.17$  (A1)  
 $9C + 2V = 200.53$  (A1) (C2)  
*Note: If both addition signs missing, award (A0)(A1)(ft)*

(b) *GDC use is expected.*  
 Solve simultaneously to find  $V = \$17.69$  (\$17.7) (M1)(A1)(ft) (C2)  
 $\$18.35$  here receives (A0)  
*Note: A reasonable attempt to solve on paper without the GDC can receive (M1).*

(c)  $9 \times 18.35 = 165.15$  (M1)  
 $180 - 165.15$   
 $= \$14.85$  (\$14.9) (A1)(ft) (C2)  
*Note: If C and V are reversed in (b) and (c) all the marks can be treated as (ft) in (c), however, if the same wrong answer for C appears in both (b) and (c) then (c) can receive at most (M1)(A0). In the former case the answers are \$159.21 and \$20.79 respectively.*

[6]

7. (a)  $50b + 20c = 260$  (A1) 1  
 (b)  $12b + 6c = 66$  (A1) 1  
 (c) Solve to get  $b = 4$  (M1)(A1)(ft)(G2) 2  
*Note: (M1) for attempting to solve the equations simultaneously*



(ii) (4, 3) or (3, 4) (A1)(ft) 4  
 Accept  $b = 4, c = 3$

[8]

8. (a)  $220 = 2(W + x)$  (M1)  
 Therefore  $W = \frac{220 - 2x}{2}$  or  $110 - x$  (A1)
- (b) Area =  $x(110 - x)$  (allow follow through from part (a)) (A1)
- (c) Area =  $70(110 - 70) = 2800 \text{ m}^2$  (allow follow through from part (b)) (A1)
- [4]
9. (a)  $l = 5 + 2x$  (A1) 1
- (b) Area of picture plus frame =  $(5 + 2x)^2$   
 Therefore  $A = (5 + 2x)^2 - 5^2$   
**OR**  
 Area of picture plus frame =  $49 \text{ cm}^2$  (M1) 2  
 Since it is a square, length of one side = 7 cm (M1)  
 $(2x + 5) = 7 \text{ cm}$  (M1)  
 $x = 1 \text{ cm}$  (A1)
- (c)  $(5 + 2x)^2 - 5^2 = 24$  (M1)  
 $25 + 20x + 4x^2 - 25 = 24$   
 $4x^2 + 20x - 24 = 0$  (M1)  
 $x^2 + 5x - 6 = 0$   
 $(x - 1)(x + 6) = 0$  (A1)  
 $x = 1$  or  $x = -6$   
 The width is 1 cm (A1) 4
- Note: For  $4x^2 + 20x - 24 = 0$  correctly solved with no work shown and  $x = 1$  give full marks.*
- [7]
10. (a)  $(2x - 5)(x + 1)$  (A1)(A1)
- (b)  $x = \frac{5}{2} = 2.5$  or  $-1$  (A1)(A1)
- [4]
11. (a)  $A = x^2 + x$  or any equivalent unsimplified expression (A1)(A1) (C2)  
*Note: Award (A1) for each term.*
- (b)  $x^2 + x = 30$  or  $x^2 + x - 30 = 0$  (C1)  
*Note: The answer must be an equation.*
- (c)  $(x - 5)(x + 6) = 0$  or reasonable attempt to use formula. (M1)(M1)  
*Note: Award (M1) for both signs wrong or one error in quadratic formula (if used).*  
 $x = 5$  or  $x = -6$  (A1)(A1) (C4)  
*Note: Award (A2) if  $x = 5$  seen with no other working.*
- (d)  $x = 5$  because **length** must be positive (must have reason for the mark.) (C1)

12. (a)  $(x - 5)(x - 5)$  (M1)(A1)(A1) (C3)
- (b)  $(x - 4)(x - 1)$  (M1)(A1)(A1) (C3)
- (c)  $x = 4$  (A1)  
 $x = -1$  (A1) (C2)

[8]

13. Unit penalty (UP) is applicable where indicated.

- (a) P (rectangle) =  $2x + 2(x + 2) = 4x + 4$  cm (A1) (C1)  
 (UP)
- (b) Side of square =  $(4x + 4)/4 = x + 1$  cm (A1)(ft) (C1)  
 (UP)
- (c) (i)  $2x^2 + 4x + 1 = 49$  or equivalent (M1)  
 $(x + 6)(x - 4) = 0$   
 $x = -6$  and  $4$  (A1)  
*Note: award (A1) for the values or for correct factors*  
 Choose  $x = 4$  (A1)(ft) (C3)  
*Note: Award (A1)(ft) for choosing positive value.*
- (ii) Area of square =  $5 \times 5 = 25 \text{ cm}^2$  (A1)(ft) (C1)  
*Note: Follow through from both (b) and (c)(i).* (UP)

[6]