

# Solomon Practice Paper

## Core Mathematics 1E

Time allowed: 90 minutes

Centre: [www.CasperYC.club](http://www.CasperYC.club)

Name:

Teacher:

Question	Points	Score
1	4	
2	4	
3	5	
4	6	
5	7	
6	8	
7	9	
8	10	
9	10	
10	12	
Total:	75	

How I can achieve better:

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1. (a) Express  $\frac{18}{\sqrt{3}}$  in the form  $k\sqrt{3}$ . [2]  
 (b) Express  $(1 - \sqrt{3})(4 - 2\sqrt{3})$  in the form  $a + b\sqrt{3}$  where  $a$  and  $b$  are integers. [2]

Total: 4

2. Solve the equation [4]

$$3x - \frac{5}{x} = 2.$$

3. The straight line  $l$  has the equation  $x - 5y = 7$ . [5]  
 The straight line  $m$  is perpendicular to  $l$  and passes through the point  $(-4, 1)$ .  
 Find an equation for  $m$  in the form  $y = mx + c$ .

4. A sequence of terms is defined by

$$u_n = 3^n - 2, \quad n \geq 1.$$

- (a) Write down the first four terms of the sequence. [2]

The same sequence can also be defined by the recurrence relation

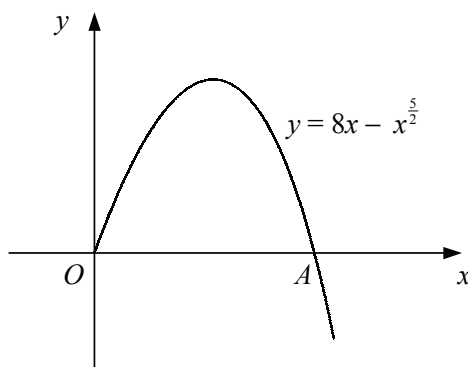
$$u_{n+1} = au_n + b, \quad n \geq 1, \quad u_1 = 1,$$

where  $a$  and  $b$  are constants.

- (b) Find the values of  $a$  and  $b$ . [4]

Total: 6

5. Figure shows the curve with equation  $y = 8x - x^{\frac{5}{2}}$ ,  $x \geq 0$ .



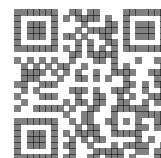
The curve meets the  $x$ -axis at the origin,  $O$ , and at the point  $A$ .

- (a) Find the  $x$ -coordinate of  $A$ . [3]  
 (b) Find the gradient of the tangent to the curve at  $A$ . [4]

Total: 7

- 6.

$$f(x) = 2x^2 - 4x + 1.$$



- (a) Find the values of the constants  $a$ ,  $b$  and  $c$  such that [4]

$$f(x) = a(x + b)^2 + c.$$

- (b) State the equation of the line of symmetry of the curve  $y = f(x)$ . [1]

- (c) Solve the equation  $f(x) = 3$ , giving your answers in exact form. [3]

Total: 8

7.

$$f(x) \equiv \frac{(x - 4)^2}{2x^{\frac{1}{2}}}, \quad x > 0.$$

- (a) Find the values of the constants  $A$ ,  $B$  and  $C$  such that [3]

$$f(x) = Ax^{\frac{3}{2}} + Bx^{\frac{1}{2}} + Cx^{-\frac{1}{2}}.$$

- (b) Show that [6]

$$f'(x) = \frac{(3x + 4)(x - 4)}{4x^{\frac{3}{2}}}$$

Total: 9

8. (a) Describe fully the single transformation that maps the graph of  $y = f(x)$  onto the graph of  $y = f(x - 1)$ . [2]

- (b) Showing the coordinates of any points of intersection with the coordinate axes and the equations of any asymptotes, sketch the graph of  $y = \frac{1}{x - 1}$ . [3]

- (c) Find the  $x$ -coordinates of any points where the graph of  $y = \frac{1}{x - 1}$  intersects the graph of  $y = 2 + \frac{1}{x}$ . Give your answers in the form  $a + b\sqrt{3}$ , where  $a$  and  $b$  are rational. [5]

Total: 10

9. A store begins to stock a new range of DVD players and achieves sales of £1500 of these products during the first month.

In a model it is assumed that sales will decrease by  $\mathcal{L}x$  in each subsequent month, so that sales of  $\mathcal{L}(1500 - x)$  and  $\mathcal{L}(1500 - 2x)$  will be achieved in the second and third months respectively.

Given that sales total £8100 during the first six months, use the model to

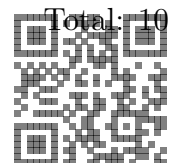
- (a) find the value of  $x$ , [4]

- (b) find the expected value of sales in the eighth month, [2]

- (c) show that the expected total of sales in pounds during the first  $n$  months is given by  $kn(51 - n)$ , where  $k$  is an integer to be found. [3]

- (d) Explain why this model cannot be valid over a long period of time. [1]

Total: 10



10. The curve  $C$  with equation  $y = f(x)$  is such that

$$\frac{dy}{dx} = 3x^2 + 4x + k,$$

where  $k$  is a constant.

Given that  $C$  passes through the points  $(0, -2)$  and  $(2, 18)$ ,

- (a) show that  $k = 2$  and find an equation for  $C$ , [7]
- (b) show that the line with equation  $y = x - 2$  is a tangent to  $C$  and find the coordinates of the point of contact. [5]

Total: 12

