Solomon Practice Paper

Core Mathematics 1C

Time allowed: 90 **minutes**

Question	Points	Score
1	3	
2	4	
3	6	
4	6	
5	7	
6	7	
7	8	
8	8	
9	12	
10	14	
Total:	75	

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Teacher:

How I can achieve better:

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1. Solve the equation [3]

$$x^2 - 4x - 8 = 0,$$

giving your answers in the form $a + b\sqrt{3}$ where a and b are integers.

2. Find the set of values of x for which [4]

$$(x - 1)(x - 2) < 20.$$

3. The curve with equation $y = \mathrm{f}(x)$ passes through the point $(8, 7)$. Given that [6]

$$\mathrm{f}'(x) = 4x^{\frac{1}{3}} - 5,$$

find $\mathrm{f}(x)$.

4. (a) Evaluate $\left(5\frac{4}{9}\right)^{-\frac{1}{2}}$ [2]

(b) Find the value of x such that [4]

$$\frac{1 + x}{x} = \sqrt{3},$$

giving your answer in the form $a + b\sqrt{3}$ where a and b are rational.

Total: 6

5. Given that

$$y = x + 5 + \frac{3}{\sqrt{x}},$$

(a) find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$, [3]

(b) find $\displaystyle\int y \, \mathrm{d}x$. [4]

Total: 7

6.

$$\mathrm{f}(x) = x^{\frac{3}{2}} - 8x^{-\frac{1}{2}}$$

(a) Evaluate $\mathrm{f}(3)$, giving your answer in its simplest form with a rational denominator. [3]

(b) Solve the equation $\mathrm{f}(x) = 0$, giving your answers in the form $k\sqrt{2}$. [4]

Total: 7

7. The straight line l_1 has gradient 2 and passes through the point with coordinates $(4, -5)$.

(a) Find an equation for l_1 in the form $y = mx + c$. [2]

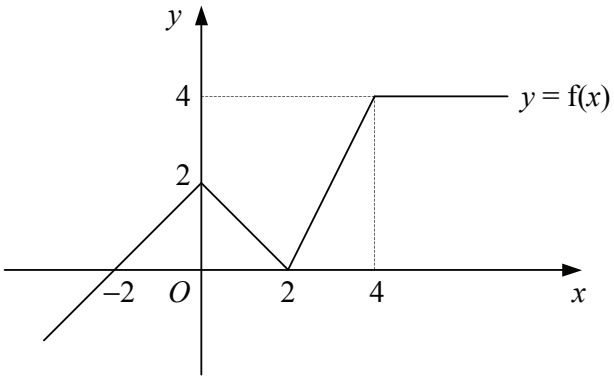
The straight line l_2 is perpendicular to the line with equation $3x - y = 4$ and passes through the point with coordinates $(3, 0)$.

(b) Find an equation for l_2. [3]

(c) Find the coordinates of the point where l_1 and l_2 intersect. [3]

Total: 8

8. Figure shows the graph of $y = \mathrm{f}(x)$.



(a) Write down the number of solutions that exist for the equation [2]

i. $\mathrm{f}(x) = 1$,

ii. $\mathrm{f}(x) = -x$.

(b) Labelling the axes in a similar way, sketch on separate diagrams the graphs of [6]

i. $y = \mathrm{f}(x - 2)$,

ii. $y = \mathrm{f}(2x)$

Total: 8

9. (a) Prove that the sum of the first n terms of an arithmetic series with first term a and common difference d is given by [4]

$$\frac{1}{2}n\left[2a + (n-1)d\right].$$

A novelist begins writing a new book. She plans to write 16 pages during the first week, 18 during the second and so on, with the number of pages increasing by 2 each week.

Find, according to her plan,

(b) how many pages she will write in the fifth week, [2]

(c) the total number of pages she will write in the first five weeks. [2]

(d) Using algebra, find how long it will take her to write the book if it has 250 pages. [4]

Total: 12

10. The curve C has the equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = (x + 2)^3.$$

(a) Sketch the curve C, showing the coordinates of any points of intersection with the coordinate axes. [3]

(b) Find $f'(x)$. [4]

The straight line l is the tangent to C at the point $P(-1, 1)$.

(c) Find an equation for l. [3]

The straight line m is parallel to l and is also a tangent to C.

(d) Show that m has the equation $y = 3x + 8$. [4]

Total: 14