Solomon Practice Paper

Core Mathematics 2L

Time allowed: 90 **minutes**

Question	Points	Score
1	4	
2	5	
3	6	
4	6	
5	7	
6	9	
7	11	
8	13	
9	14	
Total:	75	

Centre: www.CasperYC.club

Name:

Teacher:

How I can achieve better:

-
-
-

CC BY NC ND

Last updated: May 5, 2023

1. A geometric series has first term 75 and second term -15.

   (a) Find the common ratio of the series. [2]

   (b) Find the sum to infinity of the series. [2]

Total: 4

2. A circle has the equation

$$x^2 + y^2 + 8x - 4y + k = 0,$$

where k is a constant.

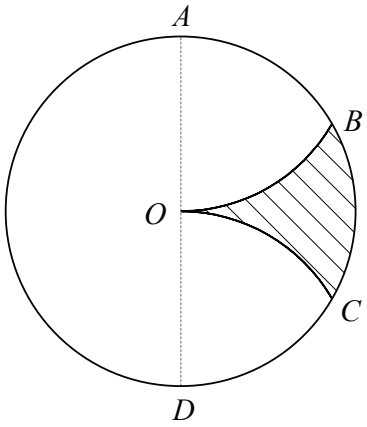
(a) Find the coordinates of the centre of the circle. [2]

Given that the x-axis is a tangent to the circle,

(b) find the value of k. [3]

Total: 5

3. Figure shows a circle of radius r and centre O in which AD is a diameter. [6]



The points B and C lie on the circle such that OB and OC are arcs of circles of radius r with centres A and D respectively.

Show that the area of the shaded region OBC is $\frac{1}{6}r^2\left(3\sqrt{3}-\pi\right)$.

4. (a) Sketch on the same diagram the graphs of $y = \sin(2x)$ and $y = \tan\left(\frac{x}{2}\right)$ for x in the interval $0 \leq x \leq 360°$. [4]

   (b) Hence state how many solutions exist to the equation [2]

$$\sin(2x) = \tan\left(\frac{x}{2}\right)$$

for x in the interval $0 \leq x \leq 360°$ and give a reason for your answer.

Total: 6

5. (a) Find the value of a such that [3]

$$\log_a(27) = 3 + \log_a(8).$$

(b) Solve the equation [4]

$$2^{x+3} = 6^{x-1},$$

giving your answer to 3 significant figures.

Total: 7

6. (a) Expand $(2+x)^4$ in ascending powers of x, simplifying each coefficient. [4]

   (b) Find the integers A, B and C such that [2]

$$(2+4)^4 + (2-x)^4 \equiv A + Bx^2 + Cx^4.$$

   (c) Find the real values of x for which [3]

$$(2+4)^4 + (2-x)^4 = 136.$$

Total: 9

7.

$$\mathrm{f}(x) = 2x^3 - 5x^2 + x + 2.$$

(a) Show that $(x - 2)$ is a factor of $\mathrm{f}(x)$. [2]

(b) Fully factorise $\mathrm{f}(x)$. [4]

(c) Solve the equation $\mathrm{f}(x) = 0$. [1]

(d) Find the values of θ in the interval $0 \leq \theta \leq 2\pi$ for which [4]

$$2\sin^3(\theta) - 5\sin^2(\theta) + \sin(\theta) + 2 = 0,$$

giving your answers in terms of π.

Total: 11

8. The curve C has the equation

$$y = 3 - x^{\frac{1}{2}} - 2x^{-\frac{1}{2}}, \quad x > 0.$$

(a) Find the coordinates of the points where C crosses the x-axis. [4]

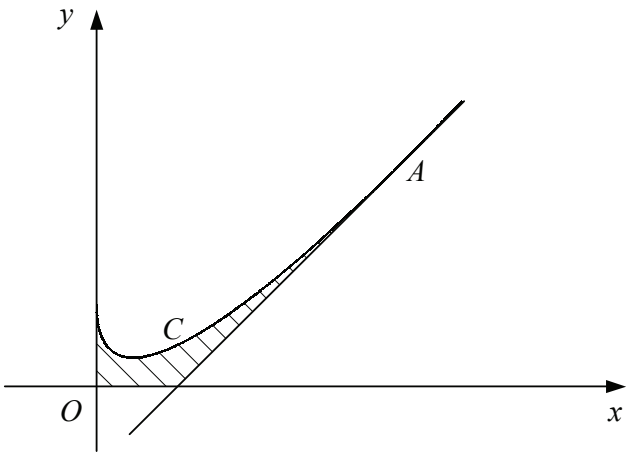
(b) Find the exact coordinates of the stationary point of C. [5]

(c) Determine the nature of the stationary point. [2]

(d) Sketch the curve C. [2]

Total: 13

9. Figure shows the curve C with equation $y = 3x - 4\sqrt{x} + 2$ and the tangent to C at the point A.



Given that A has x-coordinate 4,

(a) show that the tangent to C at A has the equation $y = 2x - 2$. [6]

The shaded region is bounded by C, the tangent to C at A and the positive coordinate axes.

(b) Find the area of the shaded region. [8]

Total: 14