Solomon Practice Paper

Core Mathematics 4G

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	6	
2	7	
3	8	
4	9	
5	9	
6	10	
7	11	
8	15	
Total:	75	

How I can achieve better:

- •

- •



July 14, 2025



1. A curve has the equation

 $x^2 + 2xy^2 + y = 4.$

Find an expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$ in terms of x and y.



[7]

perYC.club	Last updated: July 14, 2025	$\langle \rangle$

 $\int x^2 \mathrm{e}^{-x} \,\mathrm{d}x.$

www.CasperYC.club

3. The first four terms in the series expansion of $(1 + ax)^n$ in ascending powers of x are

 $1 - 4x + 24x^2 + kx^3$,

where a, n and k are constants and |ax| < 1.

- (a) Find the values of a and n.
- (b) Show that k = -160.

www.CasperYC.club

Last updated: July 14, 2025

[6] [2]

Total: 8

$$\int_0^3 \mathrm{e}^{\cos(x)} \,\mathrm{d}x,$$

giving your answer to 3 significant figures.

- (b) Use the trapezium rule with four intervals of equal width to find another estimate for the [2] value of the integral to 3 significant figures.
- (c) Given that the true value of the integral lies between the estimates made in parts (a) and [2] (b), comment on the shape of the curve $y = e^{\cos(x)}$ in the interval $0 \le x \le 3$ and explain your answer.

Total: 9

5. A straight road passes through villages at the points A and B with position vectors

 $(9\mathbf{i} - 8\mathbf{j} + 2\mathbf{k})$ and $(4\mathbf{j} + \mathbf{k})$

respectively, relative to a fixed origin.

The road ends at a junction at the point C with another straight road which lies along the line with equation

$$\mathbf{r} = (2\mathbf{i} + 16\mathbf{j} - \mathbf{k}) + \mu(-5\mathbf{i} + 3\mathbf{j}),$$

where μ is a scalar parameter.

(a) Find the position vector of C.

Given that 1 unit on each coordinate axis represents 200 metres,

(b) find the distance, in kilometres, from the village at A to the junction at C.

Total: 9

[5]

[4]

6. A small town had a population of 9000 in the year 2001.

In a model, it is assumed that the population of the town, P, at time t years after 2001 satisfies the differential equation

$$\frac{\mathrm{d}P}{\mathrm{d}t} = 0.05 P \mathrm{e}^{-0.05t}.$$

- (a) Show that, according to the model, the population of the town in 2011 will be 13300 to 3 [7] significant figures.
- (b) Find the value which the population of the town will approach in the long term, according [3] to the model.

Total: 10



7. Figure shows the curve with parametric equations



The shaded region is bounded by the curve, the x-axis and the lines x = 2 and x = 9.

- (a) Find the area of the shaded region.
- (b) Show that the volume of the solid formed when the shaded region is rotated through 2π [3] radians about the x-axis is 12π .
- (c) Find a Cartesian equation for the curve in the form y = f(x).

Total: 11

[5]

[3]



Core Mathematics – Practice Paper 4G

8. (a) Show that the substitution $u = \sin(x)$ transforms the integral

$$\int \frac{6}{\cos(x)(2-\sin(x))} \,\mathrm{d}x$$

 $\int \frac{6}{(1-u^2)(2-u)} \,\mathrm{d}u.$

 $\frac{6}{(1-u^2)(2-u)}$

into the integral

(b) Express

in partial fractions.

(c) Hence, evaluate

$$\int_0^{\frac{\pi}{6}} \frac{6}{\cos(x)(2-\sin(x))} \, \mathrm{d}x,$$

giving your answer in the form $a \ln(2) + b \ln(3)$, where a and b are integers.

Total: 15

www.CasperYC.club

Last updated: July 14, 2025



[4]

[7]

wowVC alub	Last undated: July 14, 2025	