Solomon Practice Paper

Core Mathematics 2F

Time allowed: 90 **minutes**

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

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Name:

Teacher:

How I can achieve better:

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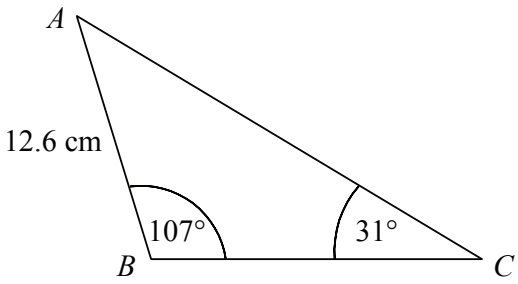
Last updated: May 5, 2023

1. Figure shows triangle ABC in which $AB = 12.6$cm, $\angle ABC = 107°$ and $\angle ACB = 31°$.



Find, to 3 significant figures,

(a) the length BC, [3]

(b) the area of triangle ABC. [2]

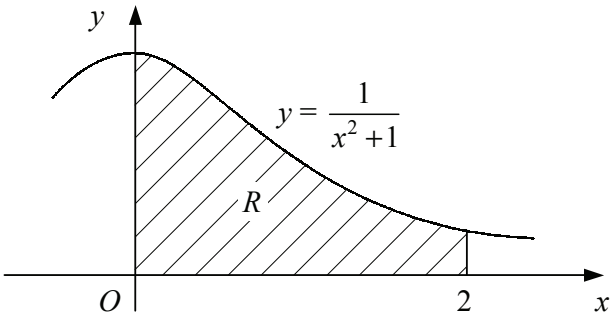
Total: 5

2. Show that [6]

$$\int_2^3 6\sqrt{x} - \frac{4}{\sqrt{x}}\,\mathrm{d}x = k\sqrt{3},$$

where k is an integer to be found.

3. Figure shows the curve with equation $y = \frac{1}{x^2+1}$.



The shaded region R is bounded by the curve, the coordinate axes and the line $x = 2$.

(a) Use the trapezium rule with four strips of equal width to estimate the area of R. [5]

The cross-section of a support for a bookshelf is modelled by R with 1 unit on each axis representing 8 cm. Given that the support is 2 cm thick,

(b) find an estimate for the volume of the support. [2]

Total: 7

4. (a) Expand $(2+y)^6$ in ascending powers of y as far as the term in y^3, simplifying each coefficient. [4]

   (b) Hence expand $(2 + x - x^2)^6$ in ascending powers of x as far as the term in x^3, simplifying each coefficient. [3]

Total: 7

5. (a) Given that [3]

$$8\tan(x) - 3\cos(x) = 0,$$

show that

$$3\sin^2(x) + 8\sin(x) - 3 = 0.$$

(b) Find, to 2 decimal places, the values of x in the interval $0 \leq x \leq 2\pi$ such that [5]

$$8\tan(x) - 3\cos(x) = 0.$$

Total: 8

6. (a) Given that $y = 3^x$, find expressions in terms of y for [4]

   i. 3^{x+1},

   ii. 3^{2x-1}.

   (b) Hence, or otherwise, solve the equation [5]

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

giving non-exact answers to 2 decimal places.

Total: 9

7. The circle C has centre $(5, 2)$ and passes through the point $(7, 3)$.

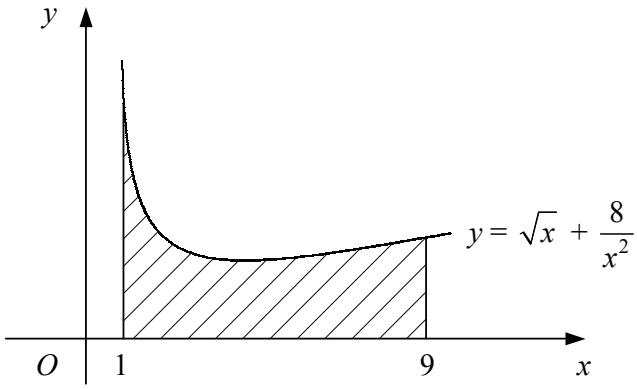
   (a) Find the length of the diameter of C. [2]

   (b) Find an equation for C. [2]

   (c) Show that the line $y = 2x - 3$ is a tangent to C and find the coordinates of the point of contact. [5]

Total: 9

8. Figure shows the curve with equation $y = \sqrt{x} + \frac{8}{x^2}, x > 0$.



(a) Find the coordinates of the minimum point of the curve. [7]

(b) Show that the area of the shaded region bounded by the curve, the x-axis and the lines $x = 1$ and $x = 9$ is $24\frac{4}{9}$. [5]

Total: 12

9. The first three terms of a geometric series are $(x-2), (x+6)$ and x^2 respectively.

   (a) Show that x must be a solution of the equation [3]

   $$x^3 - 3x^2 - 12x - 36 = 0. \qquad (\star)$$

   (b) Verify that $x = 6$ is a solution of equation $(\star)$ and show that there are no other real solutions. [6]

   Using $x = 6$,

   (c) find the common ratio of the series, [1]

   (d) find the sum of the first eight terms of the series. [2]

Total: 12