

Solomon Practice Paper

Core Mathematics 2K

Time allowed: 90 minutes

Centre: www.CasperYC.club

Name:

Teacher:

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

How I can achieve better:

-
-
-



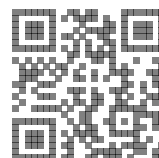
Last updated: May 5, 2023



1. Evaluate

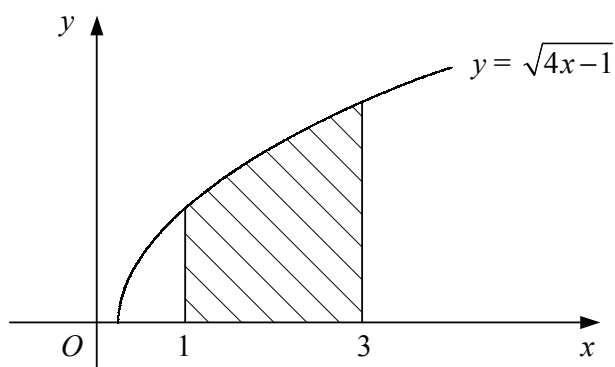
$$\int_1^4 x^2 - 5x + 4 \, dx.$$

[4]

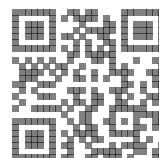


2. Figure shows the curve with equation $y = \sqrt{4x - 1}$.

[4]



Use the trapezium rule with five equally-spaced ordinates to estimate the area of the shaded region bounded by the curve, the x -axis and the lines $x = 1$ and $x = 3$.

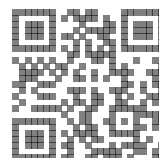


3. (a) Given that $y = \log_2(x)$, find expressions in terms of y for [4]
- i. $\log_2\left(\frac{x}{2}\right)$,
 - ii. $\log_2(\sqrt{x})$.

- (b) Hence, or otherwise, solve the equation [3]

$$2\log_2\left(\frac{x}{2}\right) + \log_2(\sqrt{x}) = 8.$$

Total: 7

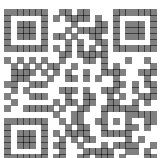


4.

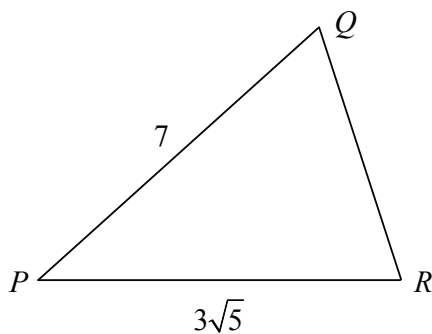
$$f(x) = 2 - x - x^3.$$

- (a) Show that $f(x)$ is decreasing for all values of x . [4]
- (b) Verify that the point $(1, 0)$ lies on the curve $y = f(x)$. [1]
- (c) Find the area of the region bounded by the curve $y = f(x)$ and the coordinate axes. [4]

Total: 9



5. Figure shows triangle PQR in which $PQ = 7$ and $PR = 3\sqrt{5}$.



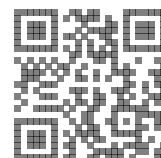
Given that $\sin(\angle QPR) = \frac{2}{3}$ and that $\angle QPR$ is acute,

(a) find the exact value of $\cos(\angle QPR)$ in its simplest form, [2]

(b) show that $QR = 2\sqrt{6}$, [4]

(c) find $\angle PQR$ in degrees to 1 decimal place. [3]

Total: 9



6. The polynomial $p(x)$ is defined by

$$p(x) = 2x^3 + x^2 + ax + b,$$

where a and b are constants.

Given that when $p(x)$ is divided by $(x + 2)$ there is a remainder of 20,

(a) find an expression for b in terms of a .

[2]

Given also that $(x + 3)$ is a factor of $p(x)$,

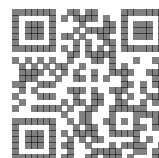
(b) find the values of a and b ,

[4]

(c) fully factorise $p(x)$.

[4]

Total: 10

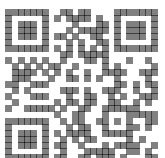


7. (a) Find, to 2 decimal places, the values of x in the interval $0 \leq x < 2\pi$ for which [4]

$$\tan\left(x + \frac{\pi}{4}\right) = 3.$$

- (b) Find, in terms of π , the values of y in the interval $0 \leq y < 2\pi$ for which $2 \sin(y) = \tan(y)$. [6]

Total: 10



8. The point A has coordinates $(4, 6)$.

Given that OA , where O is the origin, is a diameter of circle C ,

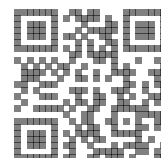
(a) find an equation for C . [4]

Circle C crosses the x -axis at O and at the point B .

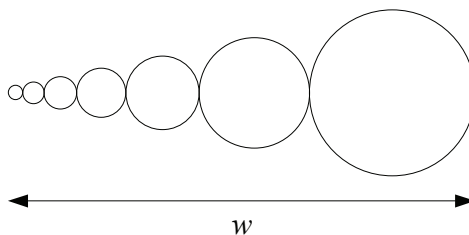
(b) Find the coordinates of B . [2]

(c) Find an equation for the tangent to C at B , giving your answer in the form $ax + by = c$, [5]
where a, b and c are integers.

Total: 11



9. Figure shows part of a design being produced by a computer program.



The program draws a series of circles with each one touching the previous one and such that their centres lie on a horizontal straight line.

The radii of the circles form a geometric sequence with first term 1 mm and second term 1.5 mm. The width of the design is w as shown.

- (a) Find the radius of the fourth circle to be drawn. [2]
- (b) Show that when eight circles have been drawn, $w = 98.5$ mm to 3 significant figures. [4]
- (c) Find the total area of the design in square centimetres when ten circles have been drawn. [5]

Total: 11

