Solomon Practice Paper

Core Mathematics 1K

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

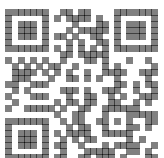| Question	Points	Score
1	3	
2	4	
3	6	
4	6	
5	6	
6	7	
7	7	
8	9	
9	13	
10	14	
Total:	75	

How I can achieve better:

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Last updated: May 5, 2023

1. Find the value of y such that [3]
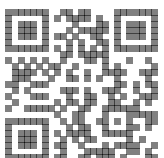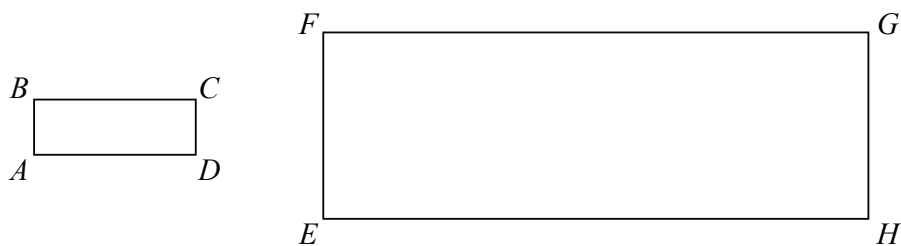
$$4^{y+3} = 8.$$

2. Find [4]

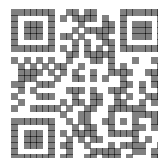$$\int 3x^2 + \frac{1}{2x^2} \, \mathrm{d}x.$$

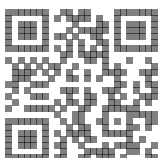3. Figure shows the rectangles $ABCD$ and $EFGH$ which are similar. [6]

Given that $AB = (3 - \sqrt{5})$ cm, $AD = \sqrt{5}$ cm and $EF = (1 + \sqrt{5})$ cm, find the length EH in cm, giving your answer in the form $a + b\sqrt{5}$ where a and b are integers.

4. (a) Sketch on the same diagram the curves $y = x^2 - 4x$ and $y = -\frac{1}{x}$. [4]

   (b) State, with a reason, the number of real solutions to the equation [2]
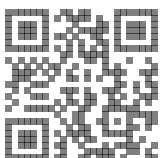
   $$x^2 - 4x + \frac{1}{x} = 0.$$

   Total: 6

5. (a) By completing the square, find in terms of the constant k the roots of the equation [4]

$$x^2 + 2kx + 4 = 0.$$

(b) Hence find the exact roots of the equation [2]

$$x^2 + 6x + 4 = 0.$$

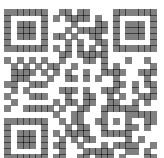Total: 6

6. (a) Evaluate [3]

$$\sum_{r=1}^{50} 80 - 3r.$$

(b) Show that [4]

$$\sum_{r=1}^{n} \frac{r+3}{2} = kn(n+7),$$

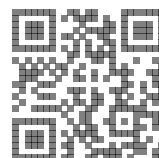where k is a rational constant to be found.

Total: 7

7. Solve the simultaneous equations [7]

$$x - 3y + 7 = 0$$
$$x^2 + 2xy - y^2 = 7$$
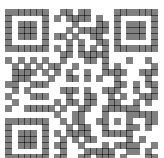
8. Given that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{x^3 - 4}{x^3}, \quad x \neq 0,$$

(a) find $\dfrac{\mathrm{d}^2 y}{\mathrm{d}x^2}$. [3]

Given also that $y = 0$ when $x = -1$,

(b) find the value of y when $x = 2$. [6]

Total: 9

9. A curve has the equation $y = \left(\sqrt{x} - 3\right)^2, x \geq 0.$

   (a) Show that [4]
   $$\frac{\mathrm{d}y}{\mathrm{d}x} = 1 - \frac{3}{\sqrt{x}}.$$

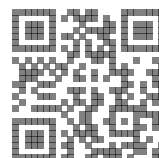   The point P on the curve has x-coordinate 4.

   (b) Find an equation for the normal to the curve at P in the form $y = mx + c$. [5]

   (c) Show that the normal to the curve at P does not intersect the curve again. [4]

   Total: 13

10. The straight line l has gradient 3 and passes through the point $A(-6, 4)$.

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

    The straight line m has the equation $x - 7y + 14 = 0$.
    Given that m crosses the y-axis at the point B and intersects l at the point C,

    (b) find the coordinates of B and C, [4]

    (c) show that $\angle BAC = 90°$, [4]

    (d) find the area of triangle ABC. [4]

    Total: 14