

# Solomon Practice Paper

## Core Mathematics 2E

Time allowed: 90 minutes

Centre: [www.CasperYC.club](http://www.CasperYC.club)

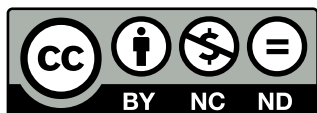
Name:

Teacher:

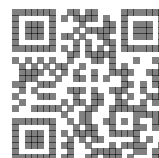
Question	Points	Score
1	4	
2	5	
3	6	
4	8	
5	9	
6	9	
7	10	
8	12	
9	12	
Total:	75	

How I can achieve better:

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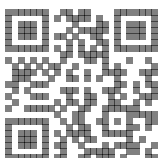
Last updated: *May 5, 2023*



1. Evaluate

$$\int_2^4 2 - \frac{1}{x^2} dx.$$

[4]

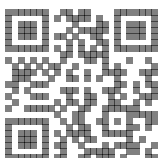


2.

[5]

$$f(x) = x^3 + 4x^2 - 3x + 7.$$

Find the set of values of  $x$  for which  $f(x)$  is increasing.



3. Given that  $p = \log_2(3)$  and  $q = \log_2(5)$ , find expressions in terms of  $p$  and  $q$  for

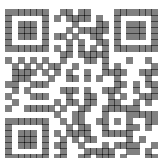
(a)  $\log_2(45)$ .

[3]

(b)  $\log_2(0.3)$ .

[3]

Total: 6



4. The coefficient of  $x^2$  in the binomial expansion of  $(1 + kx)^7$ , where  $k$  is a positive constant, is 525.

(a) Find the value of  $k$ . [3]

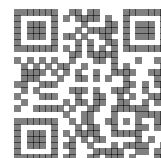
Using this value of  $k$ ,

(b) show that the coefficient of  $x^3$  in the expansion is 4375, [2]

(c) find the first three terms in the expansion in ascending powers of  $x$  of [3]

$$(2 - x)(1 + kx)^7.$$

Total: 8



5. (a) Write down the exact value of  $\cos(\pi/6)$ . [1]

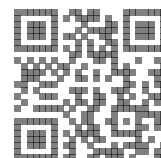
The finite region  $R$  is bounded by the curve  $y = \cos^2(x)$ , where  $x$  is measured in radians, the positive coordinate axes and the line  $x = \frac{\pi}{3}$ .

- (b) Use the trapezium rule with three equally-spaced ordinates to estimate the area of  $R$ , giving your answer to 3 significant figures. [5]

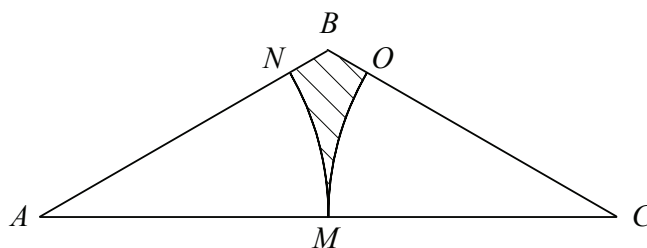
The finite region  $S$  is bounded by the curve  $y = \sin^2(x)$ , where  $x$  is measured in radians, the positive coordinate axes and the line  $x = \pi/3$ .

- (c) Using your answer to part (b), find an estimate for the area of  $S$ . [3]

Total: 9



6. Figure shows triangle  $ABC$  in which  $AC = 8$  cm and  $\angle BAC = \angle BCA = 30^\circ$ .

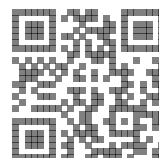


(a) Find the area of triangle  $ABC$  in the form  $k\sqrt{3}$ . [5]

The point  $M$  is the mid-point of  $AC$  and the points  $N$  and  $O$  lie on  $AB$  and  $BC$  such that  $MN$  and  $MO$  are arcs of circles with centres  $A$  and  $C$  respectively.

(b) Show that the area of the shaded region  $BNMO$  is  $\frac{8}{3}(2\sqrt{3} - \pi)$  cm<sup>2</sup>. [4]

Total: 9



7. The circle  $C$  has the equation

$$x^2 + y^2 + 10x - 8y + k = 0,$$

where  $k$  is a constant.

Given that the point with coordinates  $(-6, 5)$  lies on  $C$ ,

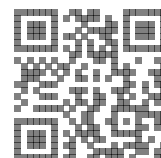
(a) find the value of  $k$ , [2]

(b) find the coordinates of the centre and the radius of  $C$ . [3]

A straight line which passes through the point  $A(2, 3)$  is a tangent to  $C$  at the point  $B$ .

(c) Find the length  $AB$  in the form  $k\sqrt{3}$ . [5]

Total: 10





8. Amy plans to join a savings scheme in which she will pay in £500 at the start of each year. One scheme that she is considering pays 6% interest on the amount in the account at the end of each year.

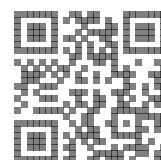
For this scheme,

- (a) find the amount of interest paid into the account at the end of the second year, [3]
- (b) show that after interest is paid at the end of the eighth year, the amount in the account will be £5246 to the nearest pound. [4]

Another scheme that she is considering pays 0.5% interest on the amount in the account at the end of each month.

- (c) Find, to the nearest pound, how much more or less will be in the account at the end of the eighth year under this scheme. [5]

Total: 12



9. The polynomial  $f(x)$  is given by

$$f(x) = x^3 + kx^2 - 7x - 15,$$

where  $k$  is a constant.

When  $f(x)$  is divided by  $(x + 1)$  the remainder is  $r$ .

When  $f(x)$  is divided by  $(x - 3)$  the remainder is  $3r$ .

- (a) Find the value of  $k$ . [5]
- (b) Find the value of  $r$ . [1]
- (c) Show that  $(x - 5)$  is a factor of  $f(x)$ . [2]
- (d) Show that there is only one real solution to the equation  $f(x) = 0$ . [4]

Total: 12

