

SUNSHINE SECONDARY SCHOOL



FORM 2

MATHEMATICS 121/1

END TERM EXAM – JULY 2019

TIME: 2 ½ HOURS

NAME: Marking Scheme CLASS: ADM. NO:

INSTRUCTIONS TO CANDIDATES

1. Write your Name, Adm. No and Class in the spaces provided on the top of this page.
2. This paper contains two sections: Section I and II.
3. Answer all question in section I and all the 5 questions in section II
4. All answers and workings must be written on the question paper in the spaces provided below each question.
5. Negligence and slovenly work will be penalized.
6. Mathematical tables may be used but not electronic calculators.

For Examiners Use Only.

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	Total

SECTION I Answer all the questions. (50 marks)

1. Evaluate:

(3marks)

$$\frac{-8 \div 2 + 12 \times 9 - 4 \times 6}{56 \div 7 \times 2}$$

Numerator

$$-4 + 108 - 24$$

$$= 80 \checkmark$$

$$\frac{80}{16} = 5 \checkmark$$

Denominator

$$8 \times 2$$

$$= 16 \checkmark$$

2. Use reciprocal and square root tables to evaluate to 4 significant figures the expression

(3mk)

$$\frac{9}{0.03746} + \sqrt{6042}$$

$$3.7468 \times 100 \times 9$$

$$= 0.2678 \times 100 \times 9$$

$$= 260.78 \times 9$$

$$= 241.02 \checkmark$$

$$\sqrt{60.42 \times 100}$$

$$\Rightarrow 77.30 \times 10$$

$$= 77.73 \checkmark$$

$$241.02 + 77.73$$

$$= 318.75 \checkmark$$

3. Given that 3θ is an acute angle and $\sin 3\theta = \cos 2\theta$. Find the value of θ (3marks)

$$3\theta + 2\theta = 90 \checkmark$$

$$5\theta = 90 \checkmark$$

$$\theta = 18^\circ \checkmark$$

4. Solve x in $4^{x+1} = 32$

(3mks)

$$2^{2(x+1)} = 2^5$$

$$2x+2 = 5$$

$$2x = 3$$

$$x = 1.5$$

5. Calculate the area of a triangle with sides 9 cm, 6 cm and 7 cm correct to 2 decimal places

(3Marks)

$$s = \frac{1}{2}(9+6+7)$$

$$= \frac{1}{2} \times 22$$

$$= 11$$

$$= \sqrt{440}$$

$$= 20.98$$

$$A = \sqrt{11(11-9)(11-6)(11-7)}$$

$$= \sqrt{11 \times 2 \times 5 \times 4}$$

6. Use logarithms to evaluate, giving your answer to 4 significant figures. (4 mks)

$$\sqrt[3]{\frac{1.23 \times 0.0089}{79.54}}$$

N ^o	Log	Log working
1.23	0.0899	0.0899
0.0089	3.9494	+ 3.9494
79.54	1.9006	<u>2.0393</u>
	<u>4.1387</u>	<u>1.9006</u>
		<u>4.1387</u>
		<u>-4.2 + 2.1387</u>
		<u>3</u>
		<u>-6 + 0.7129</u>
		<u>3</u>
		<u>2 + 0.7129</u>
		<u>= 2.7129</u>
5.163×10^{-2}		
$= 0.05163$		

7. The exterior angle of a regular polygon is equal to one third of the interior angle. Calculate the number of sides of the polygon and give its name. (3mks)

$$e + \frac{1}{3}e = 180^\circ \quad \textcircled{1}$$

$$\frac{4}{3}e = 180$$

$$e = 180 \times \frac{3}{4}$$

$$e = 135$$

$$180 - 135$$

$$= 45^\circ$$

$$\frac{360}{45}$$

$$= 8$$

9 sides

8. Solve the inequalities $\frac{1}{3}x + 2 < x + 5 > 3x - 1$ and represent the solution on a number line. (3 mks)

$$\frac{1}{3}x + 2 < x + 5$$

$$\frac{1}{3}x - x < 5 - 2$$

$$-\frac{2}{3}x < 3$$

$$x > 3 \times \frac{3}{2}$$

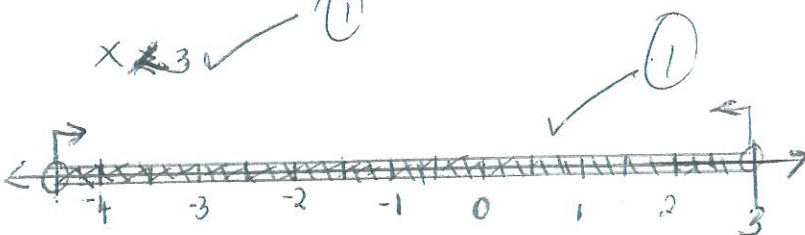
$$x > 4.5$$

$$x + 5 > 3x - 1$$

$$x - 3x > -1 - 5$$

$$-2x > -6$$

$$x < 3$$



9. Simplify $\frac{x^2 + xc + bx + bc}{3x + 3c}$ (3 mks)

$$x(x+c) + b(x+c)$$

$$(x+c)(x+b)$$

$$3(x+c)$$

$$= \frac{x+b}{3}$$

$$3$$

10. Solve the following simultaneous equations. (3mks)

$$\begin{aligned} 4x - 3y &= 1 \\ (x - 2y &= 4) \times 3 \end{aligned}$$

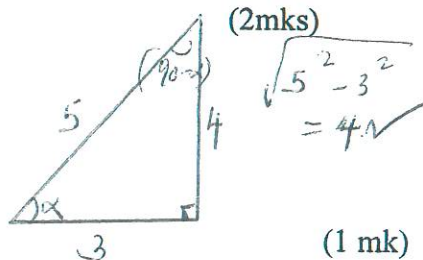
$$\begin{array}{r} 4x - 3y = 1 \\ 4x - 8y = 12 \\ \hline +5y = -15 \\ y = -3 \end{array}$$

$$\begin{aligned} x + 6 &= 4 \\ x &= 4 - 6 \\ &= -2 \end{aligned}$$

11. Given that $\cos \alpha = \frac{3}{5}$ and α is an acute angle, find without using tables or calculators

a) $\sin \alpha$

$$\sin \alpha = \frac{4}{5} \checkmark$$



b) $\tan (90 - \alpha)$

$$\tan(90 - \alpha) = \frac{3}{4} \checkmark$$

(1 mk)

12. The line passing through the points $A(-1, 3k)$ and $B(k, 3)$ is parallel to the line whose equation is $2y + 3x = 9$. Write down the co-ordinates of A and B . (3mks)

$$2y = -3x + 9$$

$$y = -\frac{3}{2}x + \frac{9}{2}$$

$$M_1 = -\frac{3}{2}$$

$$\frac{3 - 3k}{k - (-1)} = -\frac{3}{2}$$

$$\frac{3 - 3k}{k + 1} = -\frac{3}{2}$$

$$2(3 - 3k) = -3(k + 1)$$

$$6 - 6k = -3k - 3$$

$$-6k + 3k = -3 - 6$$

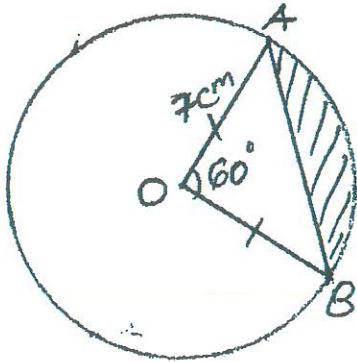
$$-3k = -9$$

$$k = \frac{9}{3}, k = 3 \checkmark$$

$$A(-1, 9) \checkmark$$

$$B(3, 3) \checkmark$$

13. The figure below shows a circle centre O and radius 7cm. sector OAB subtends an angle of 60° at the centre of the circle as shown. Calculate to 2 decimal places the area of the shaded region ($\pi = \frac{22}{7}$). (3 mks)



$$\frac{60}{360} \times \frac{22}{7} \times 7 \times 7$$

$$= \frac{77}{3} = 25.67$$

$$\frac{1}{2} \times \sin 60 \times 7 \times 7$$

$$= 21.22$$

$$25.67 - 21.22$$

$$= 4.45$$

14. Two similar cans have different heights 8cm and the other one is 10cm. If the surface area of the larger can is 480cm^2 , what is the surface area of the smaller can? (3mks)

$$\frac{8}{10} = \frac{4}{5}$$

$$A : S : f = \frac{16}{25}$$

$$\frac{16}{25} = \frac{y}{480}$$

$$y = \frac{480 \times 16}{25}$$

$$= 307.2 \text{ cm}^2$$

15. Expand and simplify

i) $m(4m + n)$

(1mk)

$$4m^2 + mn \checkmark$$

ii) $(4x - 1)^2$

(2 mks)

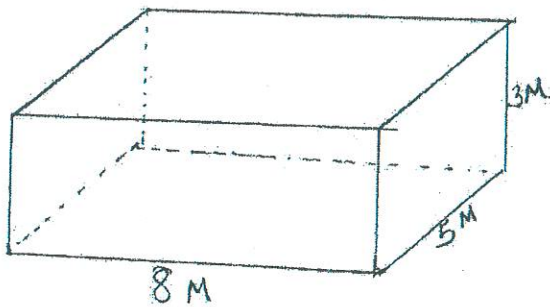
$$(4x - 1)(4x - 1)$$

$$4x(4x - 1) - 1(4x - 1) \checkmark \textcircled{1}$$

$$16x^2 - 4x - 4x + 1$$

$$16x^2 - 8x + 1 \checkmark \textcircled{1}$$

16. Find the total surface area of the figure below, which is completely closed. (3mks)



$$8 \times 5 \times 2 = 80$$

$$5 \times 3 \times 2 = 30$$

$$8 \times 3 \times 2 = 48$$

$$80 + 30 + 48 \checkmark \textcircled{1}$$

$$= 158 \checkmark \textcircled{1}$$

SECTION II : Answer all the question (50 marks)

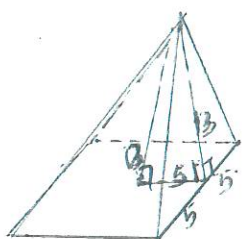
17. A right pyramid of height 12cm stands on a square base ABCD of side 10 cm. Calculate

a). (i). The area of the base (1 mk)

$$10 \times 10$$

$$= 100 \text{ cm}^2.$$

(ii). The height of the slant face of the pyramid (2 mks)



$$\begin{aligned} & \sqrt{12^2 + 5^2} \\ &= \sqrt{144 + 25} \\ &= \sqrt{169} \\ &= 13 \text{ cm.} \end{aligned}$$

(iii). The total area of the slant faces of the pyramid (2 mks)

$$\frac{1}{2} \times 10 \times 13 \times 4$$

$$= 13 \times 20$$

$$= 260 \text{ cm}^2.$$

(iv). The total surface area of the pyramid

(2 mks)

$$260 + 100$$

$$= 360 \text{ cm}^2.$$

(b). The volume of the pyramid correct to 1 d.p.

(3mks)

$$\frac{1}{3} \times 10 \times 10 \times 12$$

$$= 400 \text{ cm}^3.$$

18. a) A model of a building is made using a scale 1:500

- i) Find the height of a room (in metres) in the building which is 5cm long on the model? (3mks)

$$1 \text{ cm rep } 500 \text{ cm}$$

$$5 \text{ cm} - ?$$

$$\frac{5 \times 500}{100} = 25 \text{ m}$$

- ii) A room has a floor area of 36 m^2 . What is the corresponding area on the floor of the model? (2mks)

$$1 \text{ cm rep } 5 \text{ m}$$

$$1 \text{ cm}^2 \text{ rep } 25 \text{ m}^2$$

$$? - 36 \text{ m}^2$$

$$\frac{1 \times 36 \text{ m}^2}{25 \text{ m}^2} = 1.44 \text{ cm}^2$$

$$0.01 \text{ m}^2 = 25 \text{ m}^2$$

$$? = 36 \text{ m}^2$$

$$\frac{0.01 \times 36}{25} = 0.0144$$

- iii) A room has a volume of 120 m^3 . What is the corresponding volume of the model in cm^3 ? (2mks)

$$(1:5)^3$$

$$1:125 \text{ m}^3$$

$$? = 120$$

$$\frac{1 \times 120}{125} = 0.96 \text{ m}^3$$

$$= 0.96 \times 1000000$$

$$= 960,000 \text{ cm}^3$$

- b) The masses of two similar bars of soap are 343 g and 1331 g. If the surface areas of the smaller bar is 196 cm^2 . Calculate the surface area of the larger bar. (3mks)

$$\sqrt[3]{\frac{343}{1331}} = \frac{7}{11}$$

$$\frac{49}{121} = \frac{196}{P}$$

$$P = 484 \text{ cm}^2$$

$$\frac{49P}{49} = \frac{121 \times 196}{49}$$

19. Two men A and B are partners in a company and they invested sh.400,000 and 600,000 capital respectively. During the first year of trading 80% of the profit were placed on a reserve and the remainder was divided between A and B in the ratio of their capital investment. Given that the profit made in the first year was sh.150,000, calculate

- i) the amount placed on reserve (2mks)

$$\frac{80}{100} \times 150,000 = 120,000$$

- ii) the amount received by each partner (4mks)

$$150,000 - 120,000 = 30,000$$

$$400,000 : 600,000$$

$$2 : 3$$

$$\frac{2}{5} \times 30,000 = 12,000 \quad \text{A}$$

$$\frac{3}{5} \times 30,000 = 18,000 \quad \text{B}$$

- iii) At the end of first year B withdrew Shs. 100,000 of his capital investment and a third partner C invested Sh.100,000 in the company. During the second year the profit made was 175,000 and 60% of this was placed on reserves, the remainder of the profit was distributed in the ratio of their investment. Calculate:-

- i) the amount placed on reserve (1mk)

$$\frac{60}{100} \times 175,000 = 105,000$$

- ii) the amount received by each partner (3mks)

$$175,000 - 105,000 = 70,000$$

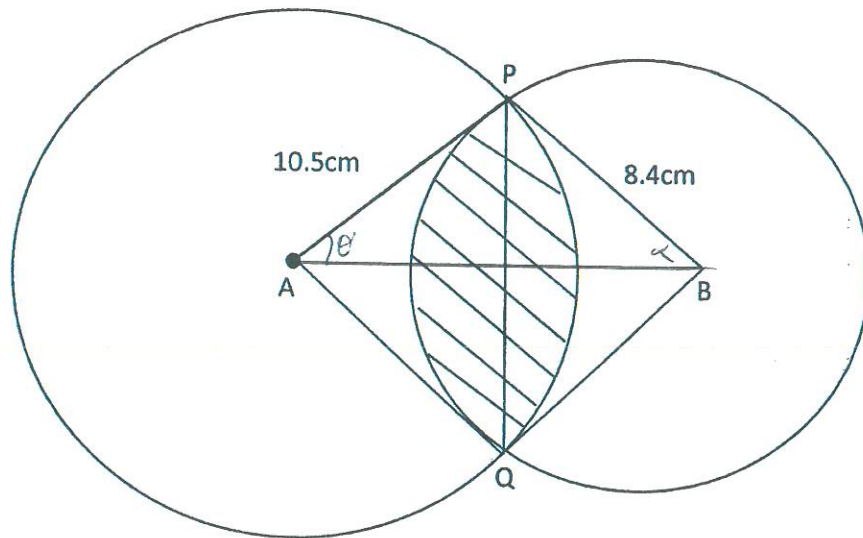
$$\text{Ratio A : B : C} = 3 : 7 : 1$$

$$A = \frac{3}{11} \times 70,000 = 21,000$$

$$B = \frac{7}{11} \times 70,000 = 49,000$$

$$C = \frac{1}{11} \times 70,000 = 6,000$$

20. The figure below shows two circles of radii 10.5 and 8.4cm and with centres A and B respectively. The common chord PQ = 9cm.



- (a) Calculate angle PAQ.

(2 marks)

$$\sin \theta = \frac{4.5}{10.5} \quad \theta = 25.37^\circ$$

$$\angle PAQ = 2 \times 25.37^\circ = 50.74^\circ$$

- (b) Calculate angle PBQ.

(2 marks)

$$\sin \alpha = \frac{4.5}{8.4} \quad \angle PBQ = 32.44^\circ \times 2 = 64.88^\circ$$

- (c) Calculate the area of the shaded part.

(6 marks)

Area of shaded part = Area of sector PAQ + Area of sector PBQ - Area of triangle PAQ - Area of triangle PBQ

$$= \frac{50.74}{360} \times \frac{22}{7} \times 10.5^2 + \frac{64.88}{360} \times \frac{22}{7} \times 8.4^2 - \frac{1}{2} \times 10.5 \times 10.5 \times \sin 50.74^\circ - \frac{1}{2} \times 8.4 \times 8.4 \times \sin 64.88^\circ$$

$$= 48.8373 + 48.84 - 42.68 - 31.94 = 38.16$$

$$3x(x-2) + 4(x-2)$$

21. a) The length of a rectangle is three times its breadth. If the breadth is decreased by 2m and the length increased by 4m, the area of the rectangle is decreased by a third. Find the breadth of the original rectangle. Hence find its area. (4Marks)

$$\text{Original area} = 3x^2 \quad (-4, 2)$$

$$\text{Remaining area} = \frac{2}{3} \times 3x^2 = 2x^2$$

$$(3x+4)(x-2) = 2x^2$$

$$3x^2 - 6x + 4x - 8 = 2x^2$$

$$3x^2 - 2x^2 - 6x + 4x - 8 = 0$$

$$x^2 - 2x - 8 = 0$$

$$S = -2$$

$$P = -8$$

$$x^2 - 4x + 2x - 8 = 0$$

$$x(x-4) + 2(x-4) = 0$$

$$(x-4)(x+2) = 0$$

$$x = 4, x = -2 \text{ (discard)}$$

$$\text{length} = 12 \text{ cm}, \text{ breadth} = 4 \text{ cm}$$

$$\text{Area} = 12 \times 4$$

$$= 48 \text{ m}^2$$

- b). A man is five times as old as his daughter. Six years ago, the product of their ages was 324. Find their present ages. (3marks)

Man daughter

$$5x$$

$$x$$

$$5x-6$$

$$x-6$$

$$(5x-6)(x-6) = 324$$

$$5x(x-6) - 6(x-6) = 324$$

$$5x^2 - 30x - 6x + 36 = 324$$

$$5x^2 - 36x - 288 = 0$$

$$5x^2 + 24x - 60x - 288 = 0$$

$$x(5x+24) - 12(5x+24) = 0$$

$$(5x+24)(x-12) = 0$$

$$5x = -24$$

$$x = -24/5$$

$$x-12=0$$

$$x=12$$

$$\text{Man} = 5 \times 12 = 60 \text{ years}$$

$$\text{daughter} = 12 \text{ years}$$

- c). If $a:b = 4:5$ and $b:c = 6:10$, find the ratio $a:c$ (3marks)

$$a:b = 4:5 \quad \times 6 = 24:30$$

$$b:c = 6:10 \quad \times 5 = 30:50$$

$$24:30:50$$

$$a:c = 24:50$$