

5001

Name \_\_\_\_\_

Index No. \_\_\_\_\_

1704/102

MATHEMATICS I AND PHYSICAL SCIENCE

June/July 2015

Time: 3 hours

Candidate's Signature \_\_\_\_\_

Date \_\_\_\_\_



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**CRAFT CERTIFICATE IN BUILDING TECHNOLOGY  
MODULE I**

MATHEMATICS I AND PHYSICAL SCIENCE

3 hours

**INSTRUCTIONS TO CANDIDATES**

*Write your name and index number in the spaces provided above.*

*Sign and write the date of the examination in the spaces provided above.*

*You should have mathematical tables/Calculator for this examination*

*This paper consists of EIGHT questions in TWO sections; A and B.*

*Answer FIVE questions choosing TWO questions from Section A, TWO questions from Section B and ONE question from either section in the spaces provided in this question paper.*

*All questions carry equal marks.*

*Maximum marks for each part of a question are as shown.*

*Candidates should answer the questions in English.*

**For Examiner's Use Only**

Section	Question	Maximum Score	Candidate's Score
A		20	
		20	
		20	
		20	
B		20	
		20	
		20	
		20	
Total Score			

**This paper consists of 16 printed pages.**

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

## SECTION A: MATHEMATICS

Answer at least TWO questions from this section in the spaces provided.

1. The data below shows the marks scored by 40 students in mathematics exam:

52	61	59	75	69	55	77	81	88	80
66	65	67	72	81	71	78	83	85	65
46	54	69	75	83	86	89	74	82	57
84	72	70	84	49	58	73	80	70	62

- (a) Make a frequency distribution table starting 45 - 49, 50 - 54,  
 (b) Calculate the mean.  
 (c) State the modal class.  
 (d) Calculate the median.  
 (e) Draw a histogram.

(20 marks)

2. (a) Simplify

(i)  $3^2 \times 81 + 9$

(2 marks)

(ii)  $\log_7 5 + 2 \log_7 7 - 3$

(5 marks)

- (b) Solve

(i)  $5^{3x-2} = 7^{2x-3}$

(4 marks)

(ii)  $5^{2x} - 6 \times 5^x + 5 = 0$

(5 marks)

(iii)  $\log(x+5) = \log 4 - \log(x+2)$

(4 marks)



3. (a)

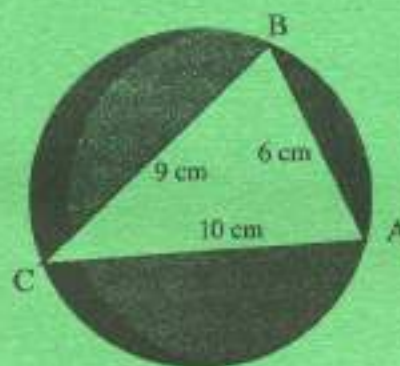


Fig. 1

Figure 1 above shows a triangle ABC inscribed in a circle.  $AB = 6$  cm,  $BC = 9$  cm and  $AC = 10$  cm. Calculate the:

- (i) radius of the circle  
 (ii) area of the shaded part.

(12 marks)

(b) A triangle PQR is such that  $PQ = 36$  cm,  $QR = 40$  cm and  $PR = 42$  cm. Calculate the:

- (i) area of the triangle  
 (ii) angles PQR and PRQ.

(8 marks)

4. Draw the graph  $y = 4x^2 - 4x - 3$ , then use the graph to solve the following:

- (i)  $4x^2 - 4x - 3 = 0$   
 (ii)  $4x^2 - 4x - 5 = 0$   
 (iii)  $4x^2 = 7x + 4$

(20 marks)

### SECTION B: PHYSICAL SCIENCE

Answer at least **TWO** questions from this section in the spaces provided.

5. (a) Define the following terms:

- (i) Stress ( $\delta$ );  
 (ii) Strain ( $\epsilon$ );  
 (iii) modulus of Elasticity (E);  
 (iv) Ultimate stress.



(4 marks)

(b) A metal wire is 2.5 mm diameter and 2 m long. a force of 12 N is applied to it and it stretches 0.3 mm. Assuming the material is elastic, calculate the following:

- (i) the stress in the wire ( $\delta$ );  
 (ii) the strain in the wire ( $\epsilon$ ).

(4 marks)

(2 marks)

(c) Find the modulus of elasticity of steel if a bar 3 m in length, 40 mm in diameter, stretches 1 mm under a load of 800 kg.

(10 marks)

6. (a) Differentiate between static and kinetic friction.

(4 marks)

(b) A robot attempts to move a 65 kg block with a horizontal force of 140 N. If the coefficient of static friction  $\mu_s = 0.2$  and that of sliding friction  $\mu_k = 0.15$ , determine:

- (i) if the block will move;  
 (ii) the acceleration of the block.

(5 marks)

(4 marks)

(c) A student pushes a fridge at a constant velocity with a force 720 N along a horizontal floor. The fridge weighs 1200 N. Find the mass of the fridge and the coefficient of friction between fridge and the floor.

(5 marks)

(d) State any two application of frictional force.

(2 marks)

7. (a) Define the following terms:
- (i) mass;
  - (ii) weight;
  - (iii) density;
  - (iv) relative density. (4 marks)
- (b) A piece of iron has a mass of 0.078 kg. When it is submerged in water, it has an apparent weight of 0.666 N. Determine its:
- (i) volume; (8 marks)
  - (ii) density. (2 marks)
- (c) A load of 200 kg is suspended stationary on the end of a wire rope. Determine the tension in the rope. (6 marks)
8. (a) Define the following terms:
- (i) displacement;
  - (ii) speed;
  - (iii) velocity;
  - (iv) acceleration. (4 marks)
- (b) A car starts from rest and is accelerated uniformly at the rate of  $2 \text{ m/s}^2$  for 6 seconds. It then maintains a constant speed for half a minute. The breaks are then applied and the vehicle uniformly retarded to rest in 5 seconds. Find the maximum speed reached in km/h and the total distance covered in metres. (10 marks)
- (c) A stone is thrown vertically upwards with an initial velocity of 14 m/s. Neglecting air resistance, calculate:
- (i) the maximum height reached;
  - (ii) the time taken before it reaches the ground. (6 marks)

