

NAME \_\_\_\_\_  
SCHOOL \_\_\_\_\_

INDEX NO. \_\_\_\_\_  
SIGNATURE \_\_\_\_\_  
DATE \_\_\_\_\_

**121/2**  
**MATHEMATICS ALT A**  
**PAPER 2**  
JUNE/JULY, 2017  
**TIME: 2½ HOURS**

# FORM FOUR TERM I JOINT EVALUATION TEST 2017

## Kenya Certificate of Secondary Education (K.C.S.E)

121/2  
MATHEMATICS ALT A  
PAPER 2  
TIME: 2½ HOURS

### INSTRUCTIONS TO CANDIDATES

- (a) Write your name, admission and class in the spaces provided at the top of this page.
- (b) Sign and Write the date of examination in the spaces provided above.
- (c) This paper consists of **TWO** Sections; **Section I** and **Section II**.
- (d) Answer **ALL** the questions in **Section I** and only **five** questions from **Section II**.
- (e) **Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.**
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) **Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.
- (h) **This paper consists of 14 printed pages.**
- (i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing**
- (j) **Candidates should answer the questions in English.**

### FOR EXAMINER'S 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	22	23	24	TOTAL

#### GRAND TOTAL

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**SECTION I (50 MARKS)**

*Answer ALL questions in the spaces provided.*

1. Use logarithm tables, evaluate;

$$\sqrt{\frac{96.31 \times 0.003425}{\log 3.428}}$$

(4 marks)

2. Make  $t$  the subject of the formula.  $V\sqrt{t} = \sqrt{\frac{tv^2 - w}{m}}$

(3 marks)

3. Find the integral values that satisfy the following simultaneous inequalities  $4x + 2 \geq 2x + 3 \geq 5x - 6$ .

(3 marks)

4. (a) Find the inverse of  $\begin{pmatrix} 3 & 4 \\ 4 & 5 \end{pmatrix}$  (1 mk)

(b) Hence find the point of intersection of the line  $6x + 8y = 10$  and the line  $5y + 4x = 2$ . (3 marks)

5. Find the centre and the radius of a circle whose equation is  $4x^2 + 4y^2 - 16x + 40y - 80 = 0$  (3 marks)

6. (a) Use binomial expansion to expand  $(x - \frac{1}{2}y)^3$  (2 marks)

(b) Hence use the first three terms in your expansion to find the value of  $9.95^3$  (2 marks)

7. Solve for x in  $2\log_2 x + \log_3 27 = \log_2 5x + 5$  (3 marks)

8. An arc of a circle of length  $4.4\text{cm}$  subtends an angle of  $1.1^\circ$ . Find the radius of this circle. (2 marks)

9. Simplify  $\frac{\sqrt{2}}{\sqrt{2}-\sqrt{3}} - \frac{\sqrt{3}}{\sqrt{2}+\sqrt{3}}$  (3 marks)

10. On July 2015, the cash price of a radio at Nakuru radio centre was Ksh. 5,000. Mr. Ken bought the same radio on hire purchase by paying a down payment of Ksh. 2,000 followed by a six monthly instalment of Ksh. 1,000. Calculate percentage rate charged as a carrying charge. (4 marks)

11. A point T divides a line AB externally in the ratio 3:2. Given that A is (-1,3) and B is (4,5). Find the coordinates of T. (4 marks)

12. Grade x and grade y of sugar cost sh 100 and sh 160 per kilogram respectively. Mr. Mjoro sold the hybrid he made by mixing the two grades of sugar at Ksh 155 there by making a profit of 25%. In what proportion were the two grades be mixed by Mr. Mjoro? (4 marks)

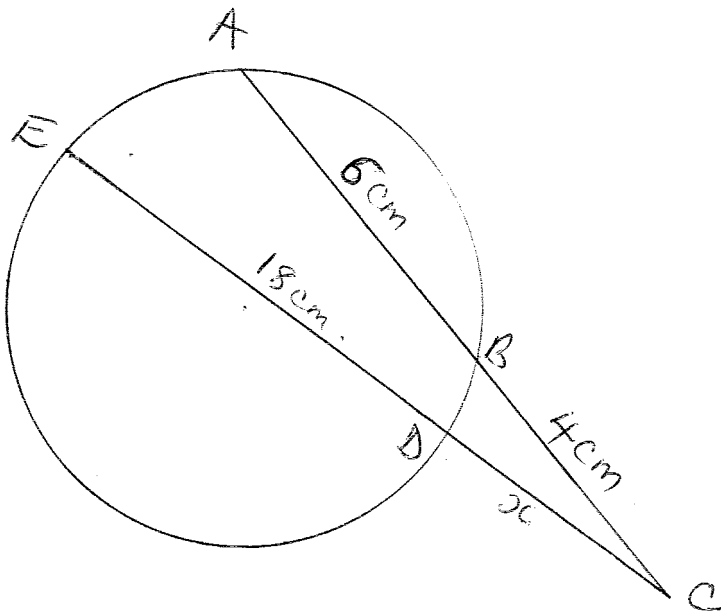
13. Given that  $\sin\theta = \cos 2\theta$ , Without using the calculator or the mathematical tables find the values of  $\tan\theta$  leaving your answer in surd form. (3 marks)

14. A two digit number is made by combining any of the two digits 2,3,5,6 and 7 at random.

- a) Make an array of possible combinations (2 marks)


- b) Find the probability that the number formed is composite number. (1 mark)

15. In the circle given below, not drawn to scale;  $AB = 6\text{cm}$ ,  $BC = 4\text{cm}$  and  $ED = 18\text{cm}$ . Find the distance  $DC$ .  
(3 marks)



16. Mombasa and Nairobi are 650 Km. Apart. A Bus left Mombasa for Nairobi travelling at 80 Km/h at 6:30am. A Nissan Matatu travelling at 120 Km/hr left Mombasa for Nairobi using the same route at 9:00am. How far from Nairobi did the Nissan Matatu overtake the bus?  
(3 marks)

**SECTION II (50 MARKS)**

Answer ANY FIVE questions from this question.

17. The table below shows the rate at which income tax is charged for all income earned in the year 2016.

<b>Taxable Income p.m (K£)</b>	<b>Rate in % per (K£)</b>
1 -236	10%
237 -472	15%
473 -708	20%
709 – 944	25%
945 and over	30%

Mr. Rono found that on the month of June the year 2016, a total of Ksh. 16,816 was deducted from his salary. Mr. Rono is entitled to a house allowance of Ksh. 5,200 and a person relief of Ksh. 1064 month. Every month through the check off system, he pays the following.

- (i) Electricity bill shs.920
- (ii) Water bill shs. 580
- (iii) Co-operative shares shs. 1400
- (iv) Loan repayment Ksh. 4500

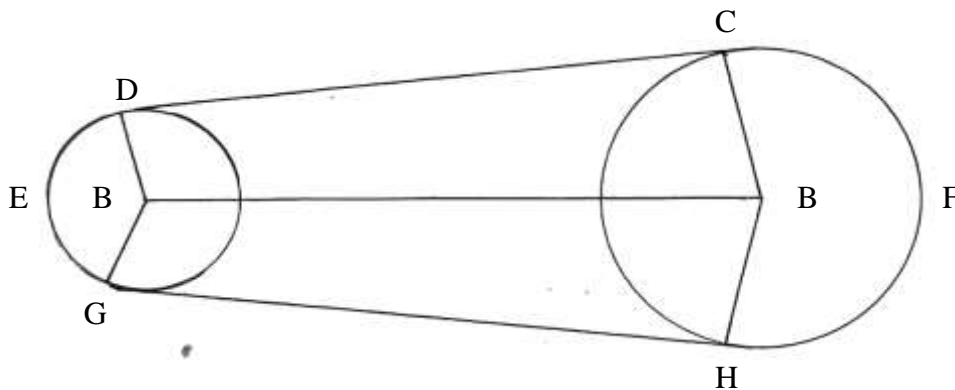
(a) Calculate his P.A.Y.E (2mrks)

(b) Calculate his monthly taxable income. (6mrks)

(c) Calculate his basic salary per month (2mrks)



18. The diagram below shows a design model of a race course drawn to scale of 1:500,000. It consists of two circles centre A and B radii 3.5 cm and 14 cm respectively and the distance between their centres is 17.5 cm



Calculate in km:

- (i) The length of leg CD (2mks)

- (ii) The length of the leg DEG ( $\pi = \frac{22}{7}$ ) (3mks)

- (iii) The length of the leg HFC ( $\pi = \frac{22}{7}$ ) (3mks)

- (iv) During a race, the course is manned by race officials placed 500m apart and each is paid Kshs.250/= per day. How much is needed to pay race officials for one day event (2mks)

19. a) Fill the table below.

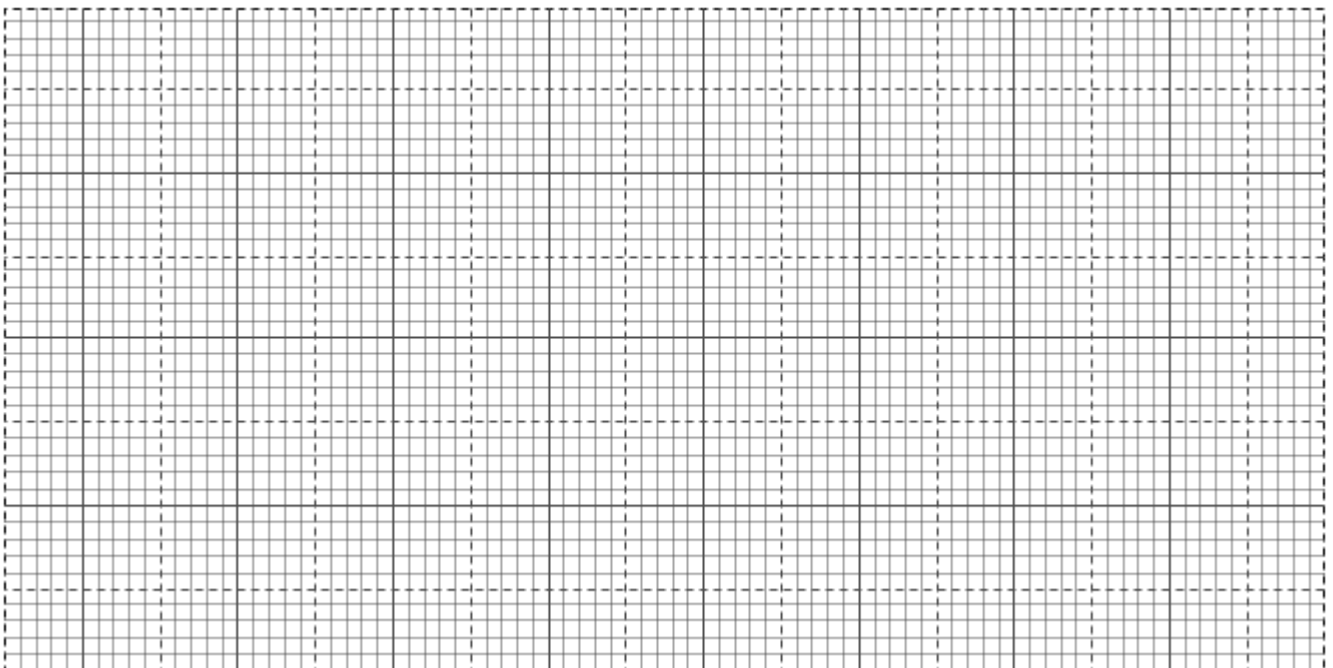
(2 marks)

x	0	15	30	45	60	75	90	105	120	135	150	165	180
$\sin x + 1$	1		1.5		1.87	1.97	2	1.97		1.71		1.26	
$1 - \cos x$	0	0.03	0.13	0.29	0.5		1		1.5		1.87		2

b) Using the same axis draw the graph of  $y = \sin x + 1$  and

$y = 1 - \cos x$  for  $0^\circ \leq x \leq 180^\circ$

(5 marks)



c) Use your graph to solve the equations:

i)  $\sin x + \cos x = 0$

(2 mark)

ii)  $\sin x = 0$

(1 mark)

20. The probability of Mary, Esther and Joan scoring a goal in a football penult shootout are  $\frac{1}{3}$ ,  $\frac{1}{2}$  and  $\frac{1}{4}$  respectively. Each of these football players took a penult shot once.

a) Draw a tree diagram to show the possible outcomes of their penult shots. (2 marks)

b) Calculate the probability that:

i) All the three players scored. (2 marks)

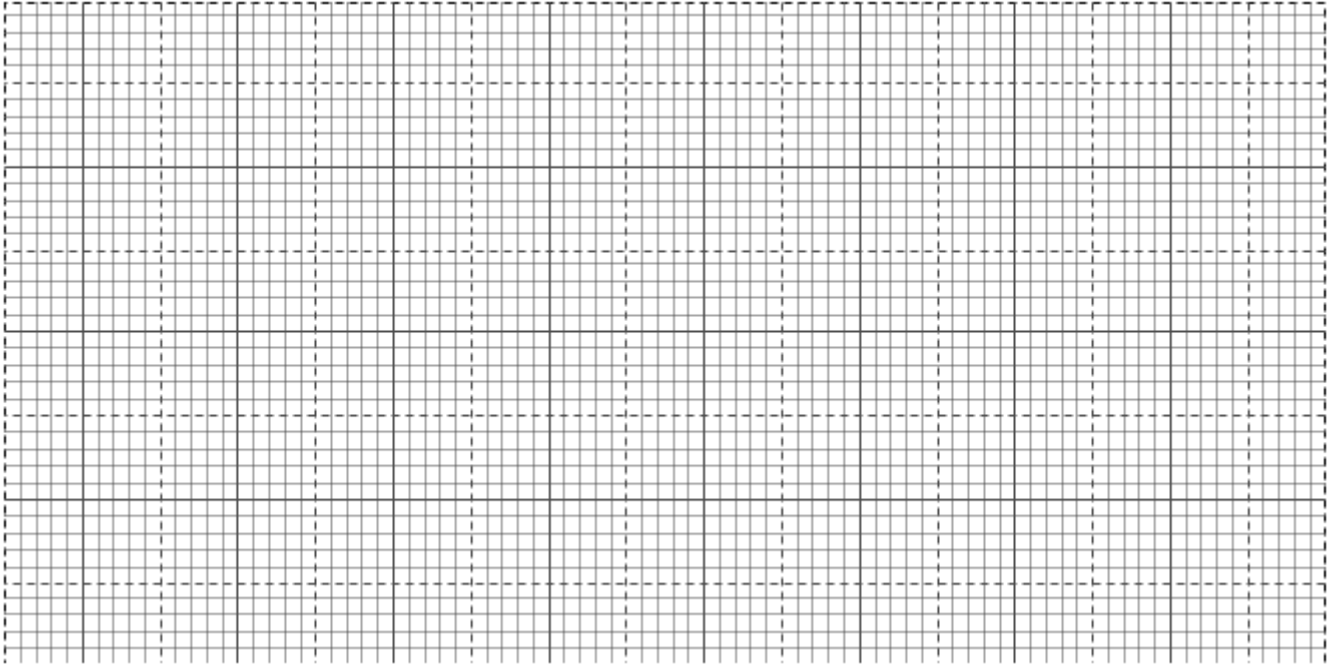
ii) All except Esther scored. (2 marks)

iii) At least one scored a goal. (2 marks)

iv) At most two players scored a goal. (2 marks)

21. The vertices of a rectangle are A(1,1) B(5,1) and C(3,4).

(a) On the grid provided, draw the rectangle and its image  $A_1B_1C_1D$  under a transformation whose matrix is  $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$  (4mks)



(b)  $A_2, B_2, C_2, D_2$  is the image of  $A_1, B_1, C_1, D_1$  under a transformation matrix  $P = \begin{pmatrix} \frac{1}{2} & 1 \\ 0 & \frac{1}{2} \end{pmatrix}$

(i) Determine the co-ordinates of  $A_2B_2C_2D_2$  (2mks)

(ii) On the same grid draw the quadrilateral  $A_2B_2C_2D_2$  (1mk)

(c) Find the area of  $A_2B_2C_2D_2$  (3mks)

22. The table below shows the masses in kilograms of 50 form 4 students in a school.

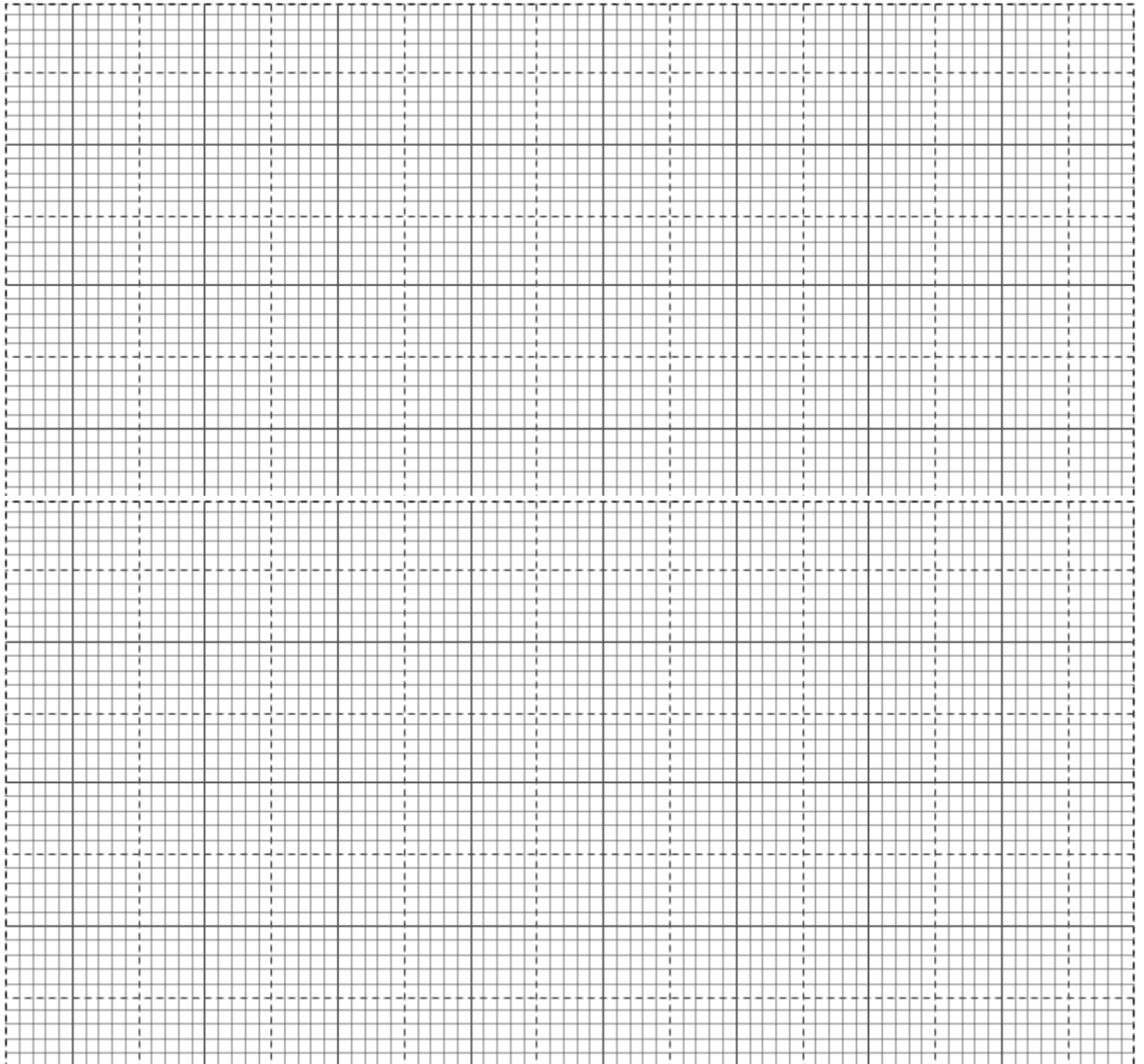
Mass	1-10	11-20	21-30	31-40	41-50	51-60	61-70
No. of students	3	8	14	14	8	2	1

(a) State the modal frequency.

(1mrk)

(b) Draw a cumulative frequency curve of the data.

(2mrks)



(c) Use your graph to estimate

(i) The median

(1mrk)

(ii) The quartile deviation

(3mrks)

(iii) The 9<sup>th</sup> decile

(1mrk)

23. An arithmetic progression has the first term 4 and the common difference  $d$ .

(a) Write down the second, fifth and fourteenth terms of the progression.

(1 Marks)

(b) The progression is increasing and second, fifth and fourteenth terms form the first three consecutive terms of a geometric progression.

Calculate

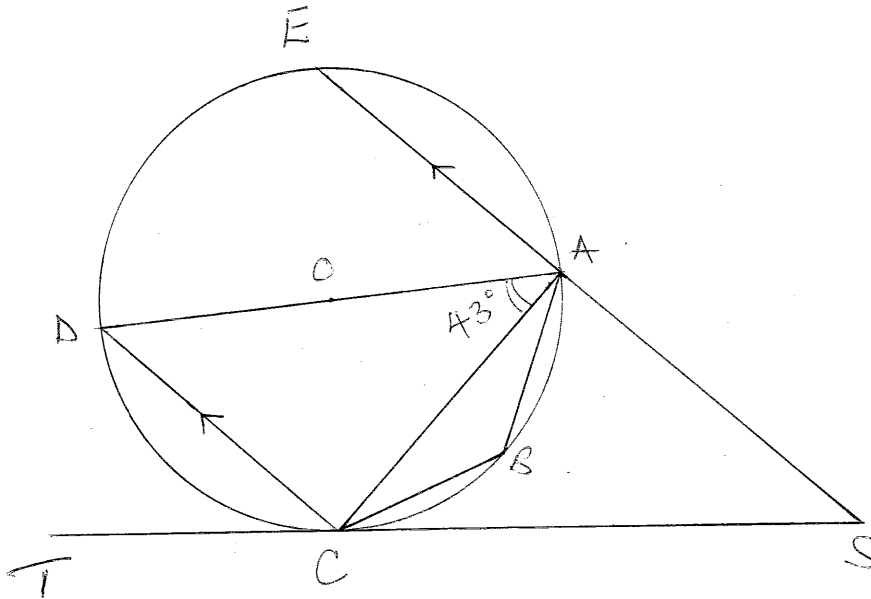
(i) The first term and the common ratio of the geometric progression.

(6 Marks)

(ii) The sum of the first six terms of the geometric progression

(3 Marks)

24. In the figure below DA is a diameter of the circle ABCDE centre O and radius 10cm. TCS is a tangent to the circle at C,  $AB = BC$  and  $\angle DAC = 43^\circ$ .



- a) Find the size of the angle;
- ACS (2 marks)
  - BCA (2 marks)
  - BAS (2 marks)
  - SCE (2 marks)
- b) Calculate the length of AC. (2 marks)