Scheme $F_2$.

NAME.....ADM. NO.....SCHOOL.....

DATE:...../...../ 2021

**URANGA JOINT ASSOCIATION**

**MATHEMATICS**
**FORM TWO**
**TIME: 2½ HRS.**

**INSTRUCTION TO STUDENTS:**

1. *Write your **name**, **admission number** and **class** in the spaces provided above.*
2. *Write the **date** of examination in spaces provided.*
3. *This paper consists of **two** Sections; Section **I** and Section **II**.*
4. *Answer **ALL** the questions in Section **I** and only **five** questions from Section **II**.*
5. *All answers and working must be written on the question paper in the spaces provided below each question.*
6. *Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.*
7. *Marks may be given for correct working even if the answer is wrong.*
8. *KNEC Mathematical tables **may be** used, except where stated otherwise.*
9. *You should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*
10. ***Students 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**

| |
|---|
| |

***Ensure that all the pages are printed and no question(s) are missing***

**SECTION I (50 MARKS)**

**Answer ALL the questions in this section in the spaces provided.**

1. Evaluate (3 Marks)

$$\frac{-12 \div 3 \times 4 - (-15)}{-5 \times 6 \div 2 + (-5)}$$

$\frac{-4 \times 4 + 15}{-15 - 5}$ M1

$\frac{-1}{-20}$ M1

$\frac{1}{20}$ A1

2. The GCD of three numbers is 30 and their LCM is 900. Two of the numbers are 60 and 150. Find the least possible other number (3 Marks)

$\frac{LCM \times GCD}{\text{Max No.}}$ M1

$\frac{30 \times 900}{150}$ M1

180 A1

3. Use logarithms to evaluate. (4 Marks)

$$\sqrt[4]{\frac{43.52 \times 0.08792}{785.3}}$$

all logs M1

| No | Std form | log. |
|---|---|---|
| 43.52 | $4.352 \times 10^{1}$ | 1.6387 |
| 0.08792 | $8.792 \times 10^{-2}$ | $\bar{2}.9441$ |
| | | $\bar{1}.4219$ |
| 785.3 | $7.853 \times 10^{2}$ | 2.8950 |
| | | $\bar{3}.6878 \div 4$ |

$10^{-1} \times 10^{0.42195}$

0.2642 or $2.642 \times 10^{-1}$ A1

4. Find the equation of the $L_1$ in the form $y = mx + c$ which is perpendicular to the line $3y + 2x = 6$ and passes through the point (-3, 4). (3mks)

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

$m_1 = -\frac{2}{3}$.

$m_2 = \frac{3}{2}$ B2

$\frac{y-4}{x+3} = \frac{3}{2}$ M1

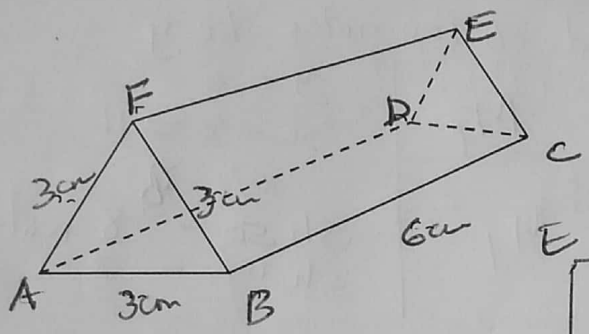
$2(y-4) = 3(x+3)$

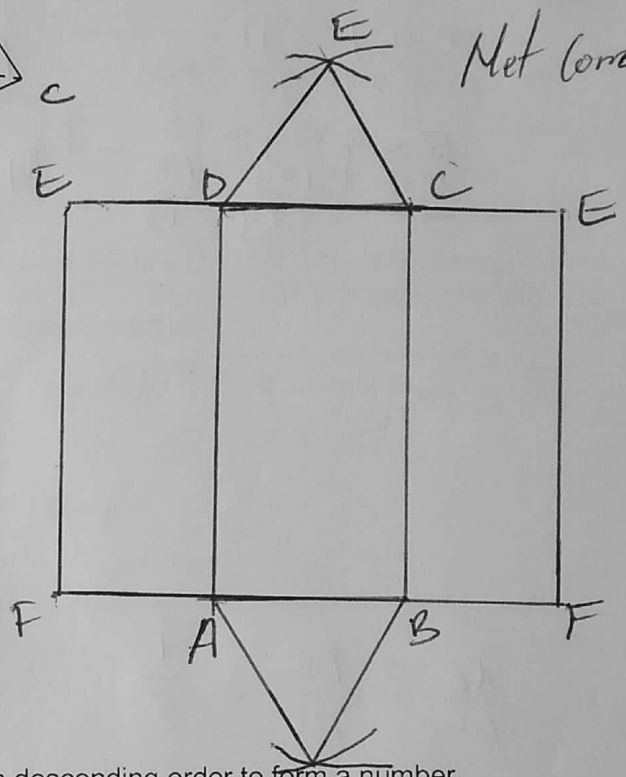
$2y - 8 = 3x + 9$

$2y = 3x + 17$

$y = \frac{3}{2}x + \frac{17}{2}$ A1

5. The diagram below represents a prism of length 6cm whose cross-section is an equilateral triangle of sides 3cm. Draw a well labeled sketch of the net of the prism. (3 Marks)




Net correctly drawn B2

Net correctly labelled B1

6. All prime numbers less than ten are arranged in descending order to form a number.

(a) Write down the number formed. (1 mark)

7532 B1

(b) State the total value and place value of the second digit in the number formed in (a) above (2 mark)

Total value 30 B1

Place value Tens B1

7. Mrs. Musyoka has Sh. 700 in Sh. 50 notes and Sh. 100 notes only. If she has a total of 11 notes find how many notes she has of each denomination. (3mks)

Let sh 50 notes be x and sh 100 notes be y

$x + y = 11$ ---- i) $M_1$

$50x + 100y = 700$

$5x + 5y = 55$

$5x + 10y = 70$ - $M_1$

$5y = 15$

$y = 3$

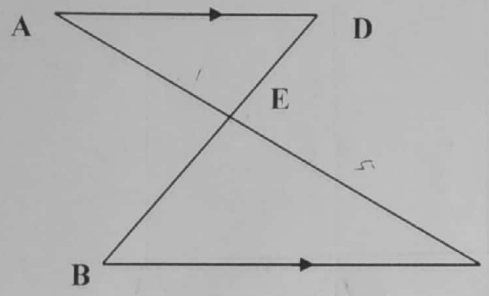
$x + 3 = 11$

$x = 8$.

sh 50 - 8 notes

sh 100 - 3 notes. $A_1$

8. In the figure below AD // BC. AC and BD intersect at E. Given that AE: EC = 1:5 and BD =12 cm, calculate the length of DE.




(3 marks)

$\frac{AE}{EC} = \frac{DE}{BE} = \frac{1}{5}$ ---- $M_1$

$\frac{DE}{12 - DE} = \frac{1}{5}$ -- $M_1$

$5DE = 12 - DE$

$6DE = 12$

$DE = 2cm$ $A_1$

9. Given that $\sin(3x - 35) = \cos(x + 20)$. Find $\tan(x + 10)$ (3mks)

$3x - 35 + x + 20 = 90$ $M_1$

$4x - 15 = 90$

$4x = 105$

$x = 26.25$. $A_1$

$\tan(26.25 + 10) = \tan 36.25$

$0.7332$ ---- $B_1$

10. Without using a mathematical tables or a calculator evaluate $\sqrt{\frac{153\times0.18}{0.68\times0.32}}$ (3mks)

$\sqrt{\frac{153\times0.18\times10000}{0.68\times0.32\times10000}} = \sqrt{\frac{153\times1800}{68\times32}}$ M1

$\sqrt{\frac{9\times225}{16}}$ M1

$\frac{3\times15}{4} = \frac{45}{4} = 11.25$ A1

11. Three bells ring at intervals of 9 minutes, 15 minutes and 21 minutes. The bells will next ring together at 11.00pm. Find the time the bells had last rung together. (3 Marks)

| 3 | 9 | 15 | 21 |
|---|---|---|---|
| 3 | 3 | 5 | 7 |
| 5 | 1 | 5 | 7 |
| 7 | 1 | 1 | 7 |
| | 1 | 1 | 1 |

$3\times3\times5\times7 = 315$ min. M1

5 hrs 15 min

Last rung $\begin{array}{r} 11.00 \\ -\ 5\ 15 \\ \hline 5.45\text{ pm} \end{array}$ M1 A1

12. The surface areas of two similar bottles are $12cm^2$ and $108cm^2$ respectively. If the bigger one has a volume of $810cm^3$. Find the volume of the smaller one. (3 Marks)

A.S.F $= \frac{12}{108} = \frac{1}{9}$

L.S.F $= \sqrt{\frac{1}{9}} = \frac{1}{3}$

V.S.F $= (\frac{1}{3})^3 = \frac{1}{27}$ B1

$\frac{1}{27} = \frac{V}{810}$ M1

$27V = 810$

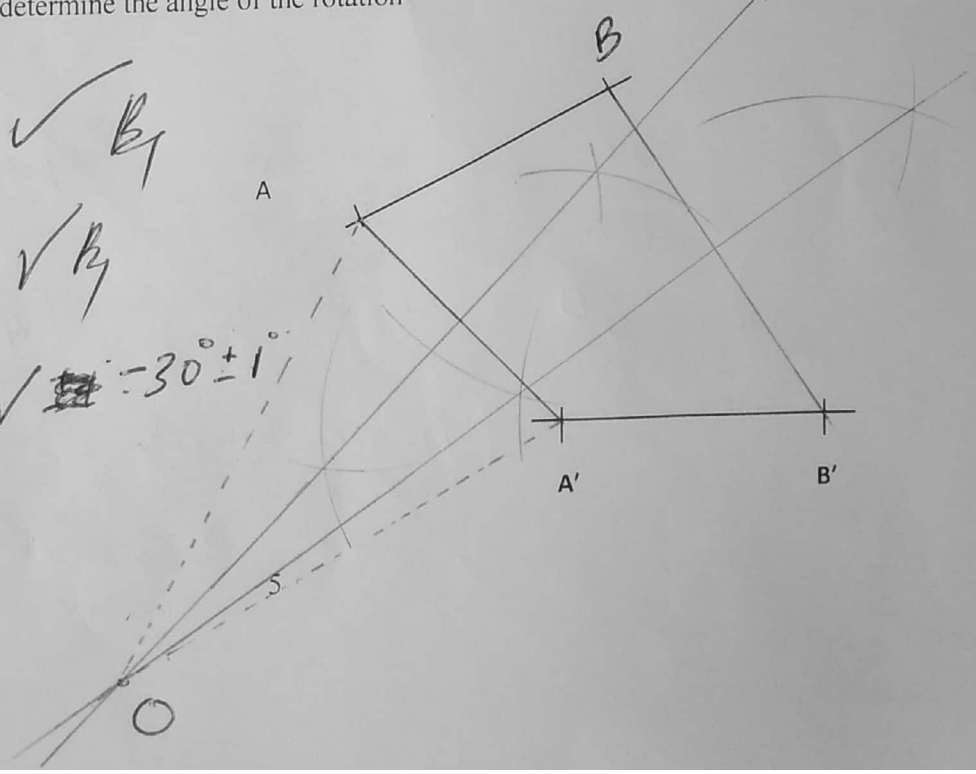
$V = 30cm^3$ A1

13. In the figure below A′B′ is the image of AB under rotation. By construction, find and label the centre O of the rotation. Hence, determine the angle of the rotation (4mks)

Each bisector ✓ B1

Location of O ✓ B1

Angle of rotation ✓ $= 30° \pm 1°$



14. Mr. Ombogo the principal of Chiga secondary would wish to cover the floor of the new administration block using the square tiles. The floor is a rectangle of sides 12.8m by 8.4m. Find the area of each of the largest tiles which can be used to fit exactly without breaking (3mks)

alt method accepted

| | | |
|---|---|---|
| 2 | 1280 | 840 |
| 2 | 640 | 420 |
| 2 | 320 | 210 |
| 5 | 160 | 105 |
| | 32 | 21 |

M1

GCD = 2×2×2×5 = 40cm M1

Area = 40 × 40 = 1600cm² or 0.16m² A1

15. The size of an interior angle of a regular polygon is $(3x)°$ while the exterior angle is $(x + 20)°$. Find the number sides of the polygon (3 Marks)

$3x + x + 20 = 180$ M1

$4x = 160$

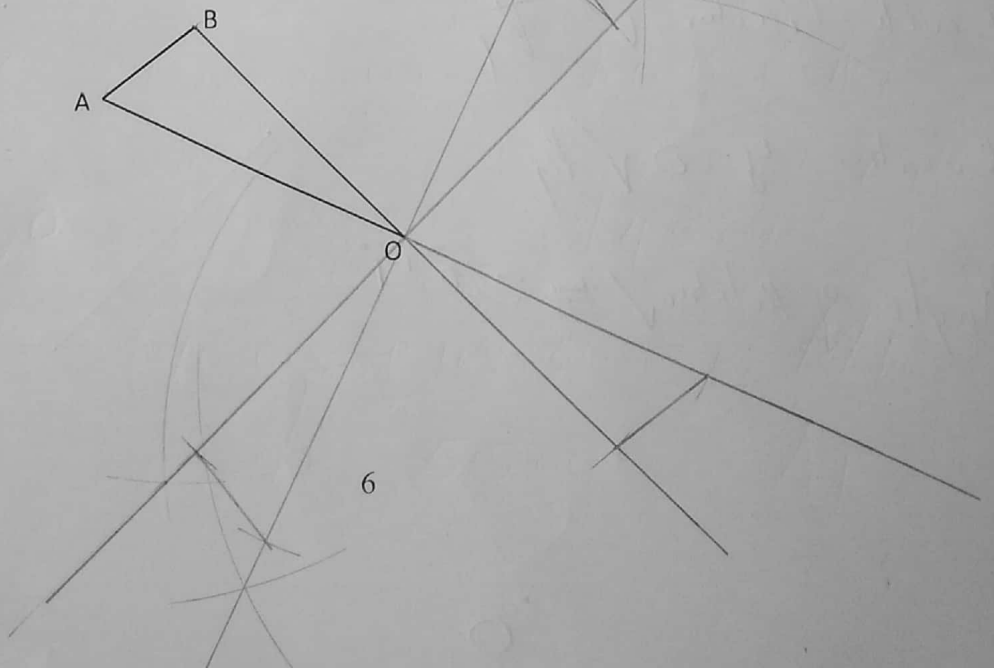
$x = 40°$ A1

$Ext = 60°$ M1

$n = \frac{360}{60} = 6$ sides. A1

16. In the figure below triangle ABO represents a part of a school badge. The badge has as symmetry of order 4 about O. Complete the figure to show the badge. (3mks)

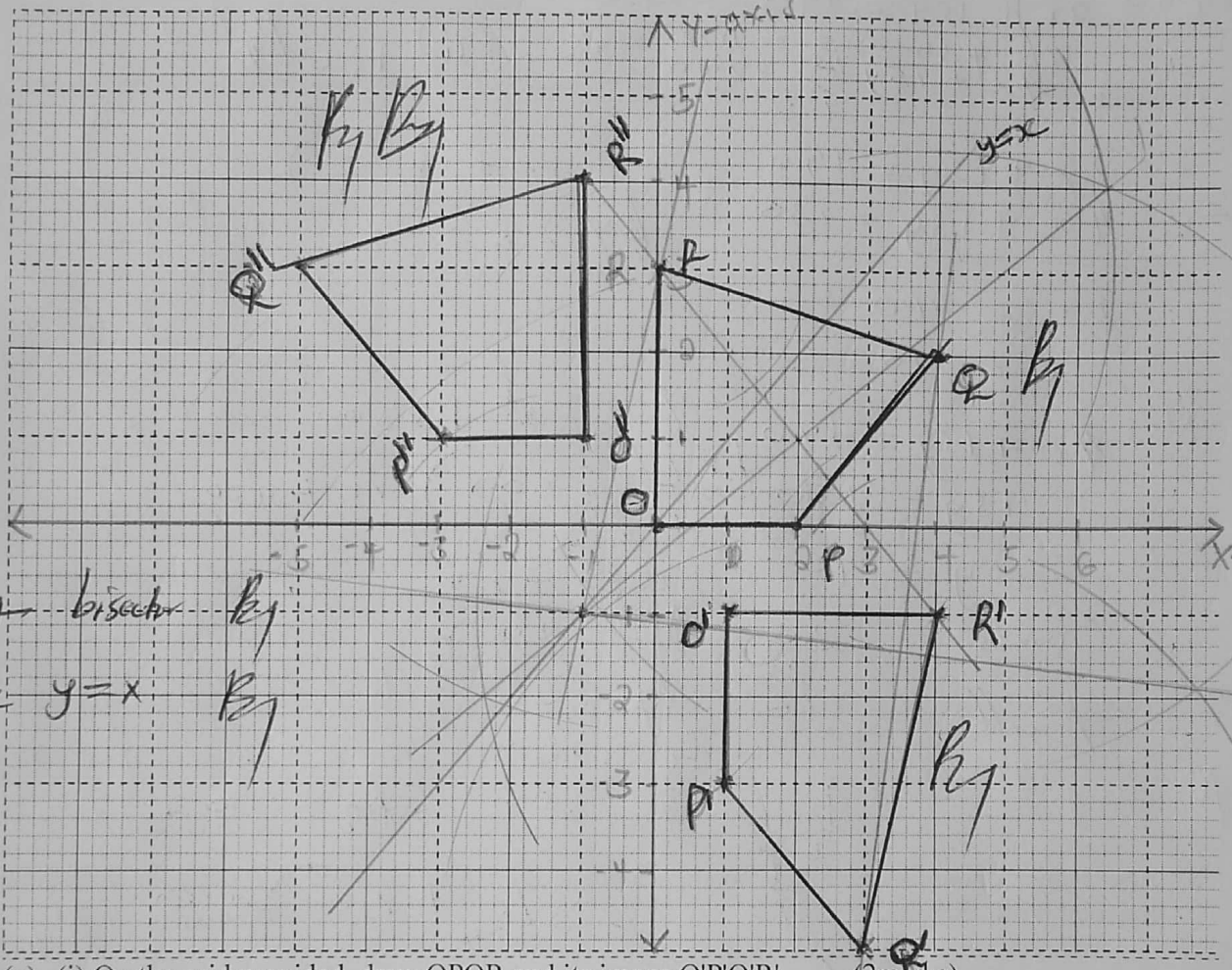
Each part B1



**SECTION II (50MKS)**

**Answer 5 questions only in this section**

17. The vertices of quadrilateral OPQR are O (0, 0), P (2, 0), Q (4, 2) and R (0, 3). The vertices of its image under a rotation are O' (1, -1), P'(1, -3) Q'(3, -5) an R'(4, -1).




(a) (i) On the grid provided, draw OPQR and its image O'P'Q'R' (2marks)

(b) (ii) By construction, determine the centre and angle of rotation. (3marks)

(c) On the same grid as (a) (i) above, draw O''P''Q''R'', the image of O'P'Q'R' under a reflection in the line $y = x$ (3marks)

(d) From the quadrilaterals drawn, state the pairs that are:

(i) Directly congruent; (1marks)

(ii) Oppositely congruent (1marks)

18. A slaughter house bought a number of goats at Sh. 2000 each and a number of bulls at Sh. 15000 each. They paid a total of Sh. 190,000. If they bought twice as many goats and three bulls less, they would have saved Sh. 5000.

(a) If the number of goats and bulls bought were x and y respectively, write down two simplified equations involving the above information. (2mks)

$2000x + 15000y = 190000$ ... i) B1

$2x + 15y = 190$ ------ i)

$4x + (y-3)15 = 185$

$4x + 15y = 230$ ---- ii) B1

(b) Solve the two equations above and hence find the number of each type of animals bought.(4mks)

$2x + 15y = 190$

$-\ 4x + 15y = 230$ M1

$2x = 40$

$x = 20$

$40 + 15y = 190$ M1

$15y = 150$

$y = 10$

Goats = 20 A1

Bulls → 10 A1

(c) The slaughter house sold all the animals at a profit of 25% per goat and 30% per bull. Determine the total profit they made. (4 Marks)

Goat $\frac{25}{100} \times (2000 \times 20)$ = Sh. 10000 M1

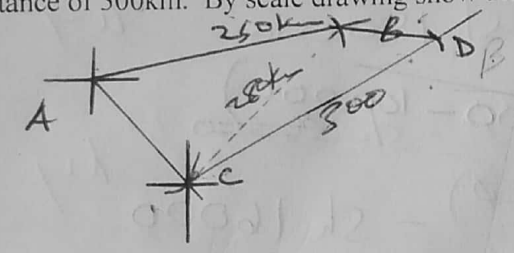
Bull $\frac{30}{100} \times (15000 \times 10)$ = sh 45000 M1

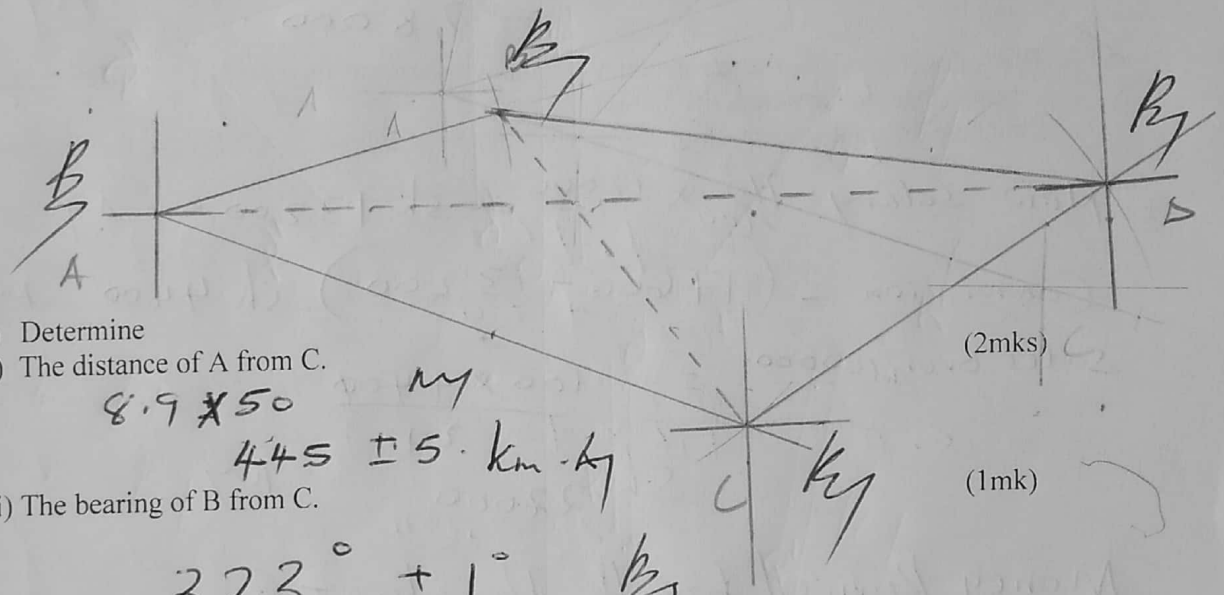
(10 000 + 45 000) M1

Sh: 55000 A1

8

19. a) In a safari rally drivers are to follow route ABCDA. B is 250km from A on a bearing of $075^0$ from A. C is on a bearing of $110^0$ from A and 280km from B. The bearing of D from C is $040^0$ and a distance of 300km. By scale drawing show the position of the point A, B, C and D. (4mks) 1cm 50km




b) Determine

(i) The distance of A from C. (2mks)

8.9 × 50

445 ± 5 km

(ii) The bearing of B from C. (1mk)

323° ± 1°

(iii) The bearing of A from D. (1mks)

273° ± 1°

(iii) The distance A from D (2mks)

13.2 × 50

660 km ± 5

20. A saleswoman is paid a commission of 20% on goods sold worth over Ksh 100,000. She is also paid a monthly salary of Ksh 12,000. In a certain month, she sold 360 handbags at Ksh 500 each.

(i) Calculate the saleswoman's earnings that month. (3 mks)

Handbag sales $(360 \times 500) = Sh\ 180\,000$ M1

Commission $\frac{20}{100} \times (180\,000 - 100\,000) = Sh\ 16\,000$ M1

$\left(\frac{20}{100} \times 80\,000\right) = Sh\ 16000$

Total earnings $(12000 + 16000)$ A1

$= 28000.$

(ii) The following month, the saleswoman's monthly salary was increased by 10%. Her to total earnings that month were Ksh17, 600.
Calculate the total amount of money received from the sales of handbags that month. (5mks)

New Salary $\frac{110}{100} \times 12000 = Sh\ 13,200$ M1

Commission $= (17600 - 13200) = Sh\ 4400$ M1

Sales over Sh 100000 $= \frac{100 \times 4400}{20}$

Sh 22000 M1

Money Received from Handbag sales $= (22000 + 100000)$ M1

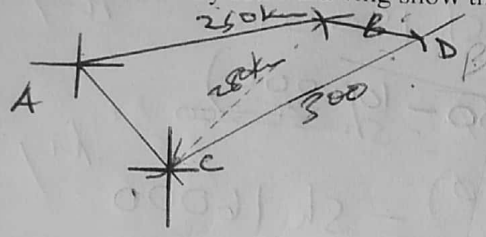
Sh 122 000 A1

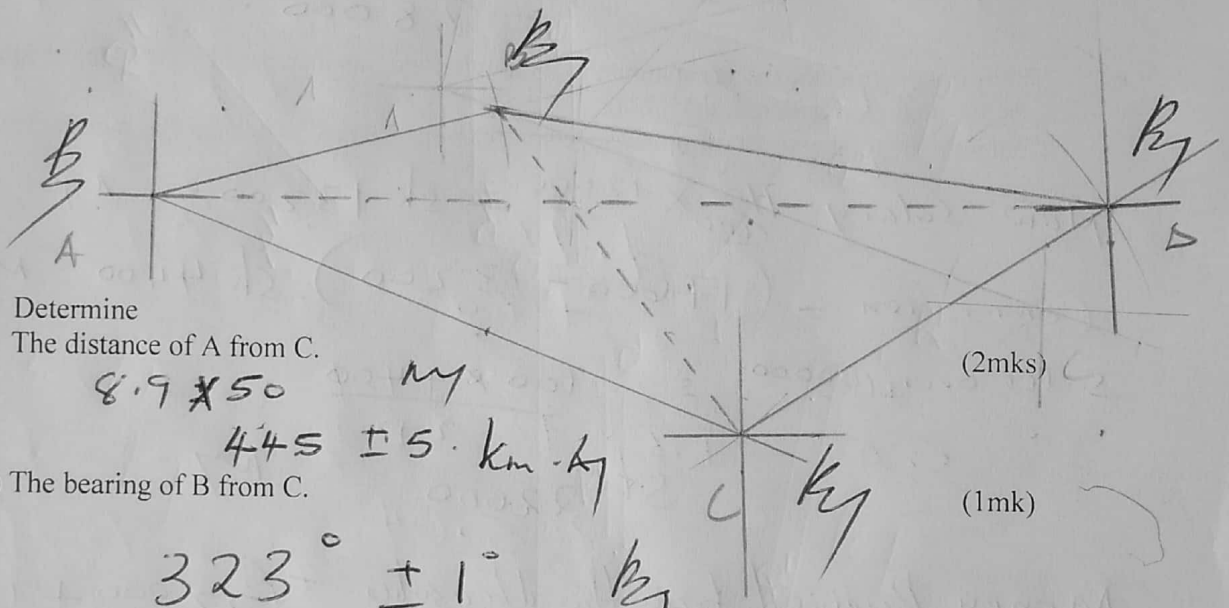
(ii) The number of handbags sold that month. (2 mks)

No of H'bags sold $\frac{122000}{500}$ M1

244 A1

19. a) In a safari rally drivers are to follow route ABCDA. B is 250km from A on a bearing of $075^0$ from A. C is on a bearing of $110^0$ from A and 280km from B. The bearing of D from C is $040^0$ and a distance of 300km. By scale drawing show the position of the point A, B, C and D. (4mks)




b) Determine

(i) The distance of A from C. (2mks)

8.9 × 50

445 ± 5 km

(ii) The bearing of B from C. (1mk)

323° ± 1°

(iii) The bearing of A from D. (1mks)

273° ± 1°

(iii) The distance A from D (2mks)

13.2 × 50

660km ± 5

20.A saleswoman is paid a commission of 20% on goods sold worth over Ksh 100,000.She is also paid a monthly salary of Ksh 12,000.In a certain month, she sold 360 handbags at Ksh 500 each.

(i) Calculate the saleswoman's earnings that month. (3 mks)

Handbag sales $(360 \times 500) = Sh\ 180000$ M1

Commission $\frac{20}{100} \times (180000 - 100000) = Sh\ 16000$ M1

$\left(\frac{20}{100} \times 80000\right) = Sh\ 16000$

Total earnings $(12000 + 16000)$ M1

$= 28000$. A1

(ii) The following month, the saleswoman's monthly salary was increased by 10%.Her to total earnings that month were Ksh17, 600.
Calculate the total amount of money received from the sales of handbags that month.(5mks)

New Salary $\frac{110}{100} \times 12000 = Sh\ 13,200$ M1

Commission $= (17600 - 13200) = Sh\ 4400$ M1

Sales over Sh 100000 $= \frac{100 \times 4400}{24}$

Sh 22000 M1

Money Received from Handbag sales. $= (22000 + 100000)$ M1

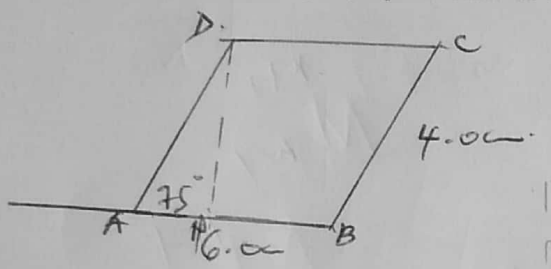
Sh 122 000 A1

(ii) The number of handbags sold that month. (2 mks)

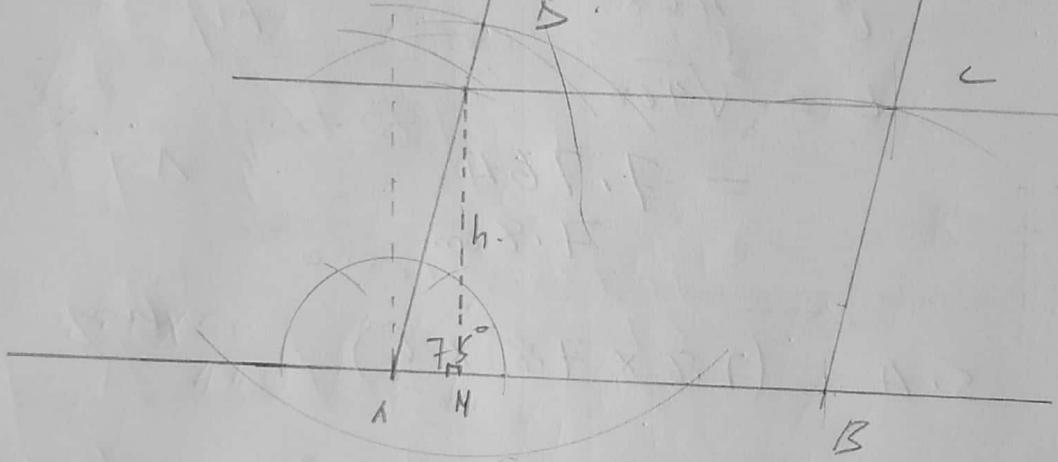
No of handbags sold $\frac{122000}{500}$ M1

244 A1

21. Using a ruler and a pair of compasses only, draw a parallelogram ABCD, such that angle DAB = $75^0$. Length AB = 6.0cm and BC = 4.0cm.
From point D, drop a perpendicular to meet line AB at N. (7 Marks)




Line AB constructed B1
∠ at A Correctly drawn. B1
∠75 " " Constructed B1
point D located B1
" C " B1
Height Correctly drawn B1 B1




(i) Measure length DN. (1 Mark)

3.9 cm B1

(ii) Find the area of the parallelogram. (2 Marks)

$A = b \times h$

$6 \times 3.9$ M1

$= 23.4\ cm^2$ A1

22. Two cubes of length 5cm and 7cm are melted and cast into a single cube.
Determine the:

i. Volume of the new cube (3mks)

$Vol = 5^3 + 7^3$ M1

$125 + 343$ M1

$468\ cm^3$. A1

ii. Length of the new cube correct to 1 decimal place(2mks)

$L^3 = 468$ M1

$L = \sqrt[3]{468}$

$= 7.764$ A1

$7.8\ cm$

iii. Surface area of the new cube (2mks)

$S.A = (7.8 \times 7.8 \times 6)$ M1

$365.04\ cm^2$. A1

b. Suppose that it was instead cast into a cylinder of radius 3.5 cm. what would the height be to the nearest cm? Take $\pi = \frac{22}{7}$,(3 mks)

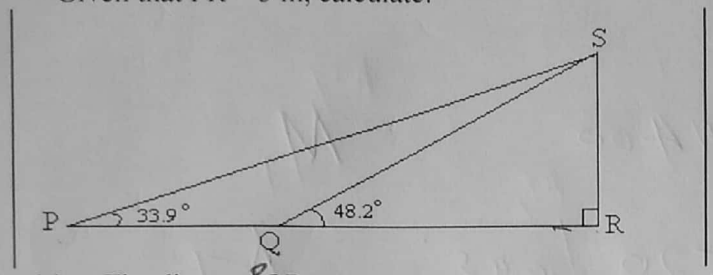
$\pi r^2 h = 468$

$h = \frac{468}{\frac{22}{7} \times 3.5 \times 3.5}$ M1 M1

$h = 12.16\ cm$. A1

$h = 12\ cm$.

23. The diagram below shows vertical telephone pole RS supported by wires SP and SQ pegged at points P and Q respectively on a level ground. Points P and Q are on the same straight line from the base R of the pole. The angles of elevation of S from P and Q are $33.9^0$ and $48.2^0$ respectively. Given that PR = 5 m, calculate:




(a) The distance QR (4 marks)

$\tan 33.9 = \frac{SR}{5}$ ∴

$SR = 5 \tan 33.9 = 3.360\text{m}$ M1

$\tan 48.2 = \frac{3.360}{QR}$

$QR = \frac{3.360}{\tan 48.2}$ $PQ = 5 - 3.004$ M1

$QR = 3.004\text{m}$ $PQ = 1.996\text{M}$ A1

M1

(b) The length of the wires SP and SQ (4 marks)

$SP = \cos 33.9 = \frac{5}{PS}$ M1

$PS = \frac{5}{\cos 33.9} = 6.024\text{ m}$ A1

$SQ \quad \cos 48.2 = \frac{3.004}{QS}$ M1

$SQ = \frac{3.004}{\cos 48.2} = 4.507\text{M}$ A1

(c) If the cost of the pole and labour is sh. 1600 and the cost of 1 meter of the wire is sh. 233. Find the total cost of the installation. (2 marks)

Cost of wire = $(6.024 + 4.507) \times 233$

Sh. 2453.72. M1

Total cost $2453.72 + 1600$

Sh. 4053.72. A1

24. .A private farmer in Mwea produced 14,400bags of rice in 2008. This was a decrease of 20% over the production in 2007. In 2009 he increased production by 30%. In 2010, he managed to produce 12,000 bags of rice.

a) Find the number of bags of rice he produced in;

i) 2007 (2mks)

$\frac{80}{100} \times 14400$ M1

11520 bags A1

ii) 2009 (2mks)

$\frac{130}{100} \times 14400$ M1

18 720 bags A1

b) What was the percentage decrease in production in 2010 over that of previous year? (2mks)

$18720 - 12000$ M1

$\frac{6720}{12000} \times 100$

$= 56\%$ A1

c) Calculate the percentage decrease in production in 2010 over that in 2007 (2mks)

$(12000 - 11520) = 480$ M1

$\frac{480}{12000} \times 100$

4% A1

d) The price per bag of rice was Ksh 3500 in 2010, how much did he get if he sold 65% of the produce in that year. (2mks)

$\left(\frac{65}{100} \times 12000\right) \times 3500$ M1

Sh 27,300 000 A1