SULIMO MOCK EXAMINATION

Kenya Certificate of Secondary Education

121/2 **MATHEMATICS Alt. A** **Paper 2**

July 2025 - $2\frac{1}{2}$ hours

S Name: .... Index Number: ....

Candidate's Signature............... SCHOOL: .... Date: ....

Instructions to Candidates

(a) Write your name and index number in the spaces provided above.
(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 calculations, giving your answers at each stage in the spaces below each question.**
(f) **Non-programmable** silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
(g) **This paper consists of 15 printed pages.**
(h) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
(i) **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

Turn over

SECTION I (50 marks)

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

1. A coffee trader buys two grades of coffee at Ksh.80 and Ksh.100 per packet. Find the ratio at which she should mix them so that by selling the mixture at Ksh.120, a profits of 25% is realized. (3 marks)

B.P. of mixture $= \frac{100}{125} \times$ Ksh $120 =$ Ksh96 ✓M1

80   100

96 ✓M1

4   16

$4:16$

$= 1:4$ ✓A1

03

2. The base and height of a right-angled triangle are 30 cm and 40 cm respectively. If there is an error of 10% in the base and 5% in the height, calculate the percentage error in finding the area of the triangle. (3 marks)

Base $= 30$cm

Error $= \frac{10}{100} \times 30 = 3$

27 | 30 | 33

Height $= 40$cm

Error $= \frac{5}{100} \times 40 = 2$

38 | 40 | 42

Max. area $= \frac{1}{2} \times 33 \times 42 = 693$

Min area $= \frac{1}{2} \times 27 \times 38 = 513$

Actual area $= \frac{1}{2} \times 30 \times 40 = 600$

A.E $= \frac{693 - 513}{2} = 90$ ✓M1 ✓M1

%tage error $= \frac{90}{600} \times 100\% = 15\%$. ✓A1

03

3. Make t the subject of the formula: $S = ut + \frac{1}{2}at^2$. (3 marks)

$2s = 2ut + at^2$

$at^2 + 2ut - 2s = 0$ ✓M1

$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$t = \frac{-2u \pm \sqrt{(2u)^2 - 4 \times a \times (-2s)}}{2a}$

$t = \frac{-2u \pm \sqrt{4u^2 + 8as}}{2a}$ ✓M1

$t = \frac{-2u \pm \sqrt{4(u^2 + 2as)}}{2a}$

$t = \frac{-2u \pm 2\sqrt{u^2 + 2as}}{2a}$.

$\therefore t = \frac{-u \pm \sqrt{u^2 + 2as}}{a}$. ✓A1

03

4. If $\frac{1}{3-\sqrt{5}} - \frac{2+2\sqrt{5}}{3+\sqrt{5}} = a + b\sqrt{c}$, find the values of a, b and c. (3 marks)

$$\frac{1(3+\sqrt{5}) - (2+2\sqrt{5})(3-\sqrt{5})}{(3-\sqrt{5})(3+\sqrt{5})} \quad \checkmark M_1$$

$$\frac{3+\sqrt{5} - (6 - 2\sqrt{5} + 6\sqrt{5} - 10)}{3^2 - (\sqrt{5})^2}$$

$$\frac{3+\sqrt{5} + 4 - 4\sqrt{5}}{9-5}$$

$$= \frac{7 - 3\sqrt{5}}{4} \quad \checkmark M_1$$

$$= \tfrac{7}{4} - \tfrac{3}{4}\sqrt{5}$$

$\therefore a = \tfrac{7}{4}, b = -\tfrac{3}{4}, c = 5$ ✓A1

03

5. Use the expansion of $(x-y)^5$ to evaluate 1.02^5 correct to 4 decimal places. (3 marks)

$$1x^5(-y)^0 + 5x^4(-y)^1 + 10x^3(-y)^2 + 10x^2(-y)^3 + 5x^1(-y)^4 + 1x^0(-y)^5$$

$$x^5 - 5x^4y + 10x^3y^2 - 10x^2y^3 + 5xy^4 - y^5 \quad \checkmark M_1$$

$$(x-y)^5 = 1.02^5$$

$$(x-y)^5 = (1+0.02)^5$$

$x = 1$

$-y = 0.02$

$y = -0.02$

$$1^5 - 5(1)^4(-0.02) + 10(1)^3(-0.02)^2 - 10(1)^2(-0.02)^3 + 5(1)(-0.02)^4 - (-0.02)^5 \quad \checkmark M_1$$

$= 1.1041$ ✓A1

03

6. Evaluate, without using mathematical tables or a calculator, the expression below. (3 marks)

$$2\log_{10} 5 - 0.5\log_{10} 4^2 + 2\log_{10}\sqrt{1600}$$

100	1600
4	16
4	4
	1

$1600 = 100 \times 4^2$

$\sqrt{1600} = \sqrt{100} \times \sqrt{4^2}$

$= 10 \times 4$

$= 40$.

$\log_{10} 5^2 - 0.5\log_{10} 16 + 2\log_{10} 40$

$\log_{10} 25 - \log_{10} 16^{0.5} + \log_{10} 40^2$

$\log_{10} 25 - \log_{10}\sqrt{16} + \log_{10} 1600$

$\log_{10} 25 - \log_{10} 4 + \log_{10} 1600$ ✓M1

$\log_{10}\left(\frac{25}{4} \times 1600\right)$ ✓M1

$\log_{10}(25 \times 400)$

$\log_{10}(10000)$

$\log_{10} 10^4$

$4\log_{10} 10$

$4 \times 1 = 4$ ✓A1

03

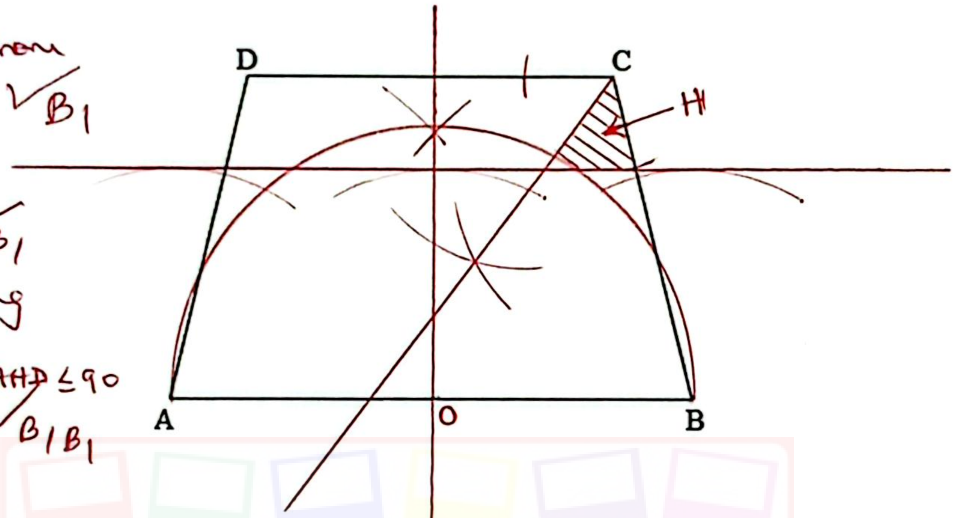
7. Figure ABCD below represents a trapezium plot. A chicken house H is to be constructed inside the plot such that;
   - (i) It is nearer to CB than CD.
   - (ii) It is at least 3 cm from AB.
   - (iii) Angle AHD $\leq 90^0$.

   Shade region H within the plot where the chicken house is likely to be located. (4 marks)

Line equidistant from CD constructed ✓B1

Parallel line 3cm from AB drawn accurately ✓B1

Correctly identifying and shading the region where $\angle AHD \leq 90$ ✓B1B1



(04)

8. Y varies as X and inversely as the square root of Z. Calculate the percentage change in Y when X is increased by 8% while Z reduced by 19%. (3 marks)

$Y \propto \frac{X}{\sqrt{Z}}$

$Y = \frac{KX}{\sqrt{Z}}$ ----(i) ✓M1

$X_1 = \frac{108}{100}X = 1.08X$

$Z_1 = \frac{81}{100}Z = 0.81Z$

$Y_1 = \frac{K(1.08X)}{\sqrt{0.81Z}}$

$Y_1 = \frac{1.08KX}{0.9\sqrt{Z}}$

$Y_1 = \frac{1.2KX}{\sqrt{Z}}$ ----(ii) ✓M1

Increase $= 1.2 - 1$
$= 0.2$

%tage increase
$= \frac{0.2}{1} \times 100\%$
$= 20\%$ ✓A1

9. The following are the recorded masses of five objects in kilograms: 0.9, 0.7, k, 0.8 and 0.5. If 0.9 kg was taken as the assumed mean and that $\sum d = -0.5$, determine the value of k. (2 marks)

x	$d = x - 0.9$
0.9	0
0.7	-0.2
K	$K - 0.9$
0.8	-0.1
0.5	-0.4
	$\Sigma f = K - 1.6$
	✓M1

$K - 1.6 = -0.5$

$K = 1.1$ ✓A1

(02)

10. In 100 metres race there are three main competitors, namely Nadia, Ondiek and Amos. Nadia is three times likely to win as Ondiek, while Ondiek is twice as likely to win as Amos.
Find the probability that

(a) Ondiek wins the race; (2 marks)

Nadia	Ondiek	Amos	Total
$6x$	$2x$	x	$9x$ ✓B1

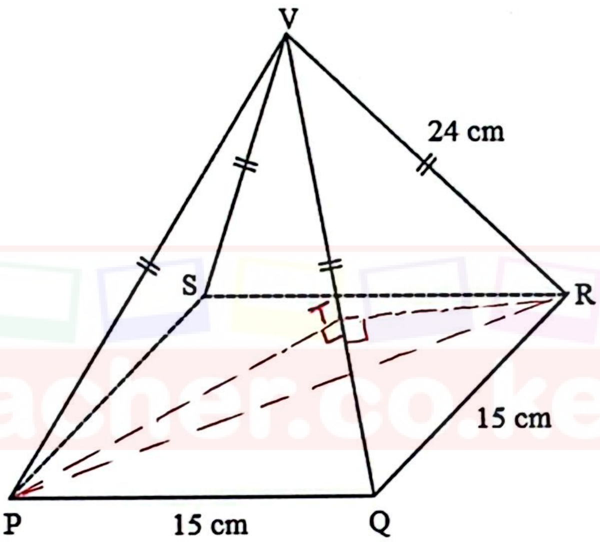
$P(\text{Ondiek wins}) = \frac{2x}{9x}$

$= \frac{2}{9}$ ✓A1

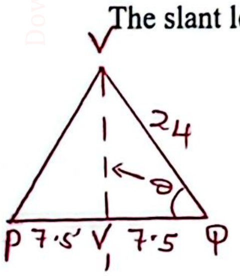
(b) Either Nadia or Amos wins the race. (1 mark)

$P(\text{Either Nadia or Amos wins}) = 1 - \frac{2}{9} = \frac{7}{9}$ ✓B1

11. A right pyramid has a square base PQRS of sides 15 cm.

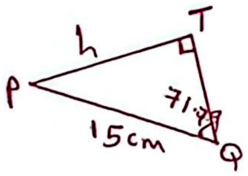


The slant lengths VP = VQ = VR = VS = 24 cm. Find the angle between planes VPQ and VQR. (4 marks)



$\cos\theta = \frac{7.5}{24}$ ✓M1

$\theta = \cos^{-1}\left(\frac{7.5}{24}\right) = 71.79°$



$\sin 71.79° = \frac{h}{15}$

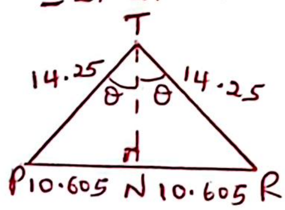
$h = 15\sin 71.79°$

$h = 14.25$ cm ✓M1

$PR = \sqrt{15^2 + 15^2}$

$= \sqrt{450}$

$= 21.21$ cm



$\sin\theta = \frac{10.605}{14.25}$ ✓M1

$\theta = \sin^{-1}\left(\frac{10.605}{14.25}\right) = 48.09°$

$\therefore \angle PTR = 2 \times 48.09$

$= 96.18°$ ✓A1

04

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12. Find the rate of interest per annum at which Ksh. 20,000 triples after being invested for 10 years compounded semi-annually. (3 marks)

$P = \text{Ksh } 20{,}000$

$A = 3 \times \text{Ksh } 20{,}000$

$= \text{Ksh } 60{,}000$

$T = 10\text{yrs}, n = 10 \times 2 = 20$

Rate $= x\%$ p.a

Rate semi-annually $= 0.5x$

$A = P\left(1 + \frac{r}{100}\right)^n$

$60000 = 20000\left(1 + \frac{0.5x}{100}\right)^{20}$

$\frac{60000}{20000} = \left(1 + \frac{0.5x}{100}\right)^{20}$

$3 = \left(1 + \frac{0.5}{100}x\right)^{20}$

$\sqrt[20]{3} = 1 + \frac{0.5x}{100}$

$1.056 = 1 + \frac{0.5x}{100}$

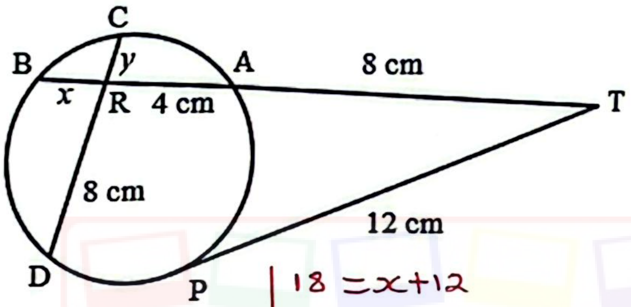
$0.056 = \frac{0.5x}{100}$

$0.5x = 5.6$

$x = \frac{5.6}{0.5} = 11.2\%$ ✓A1

03

13. In the figure below TP is a tangent. Calculate the value of x and y. (3 marks)



$12^2 = 8(x+12)$ ✓M1

$144 = 8(x+12)$

$\frac{144}{8} = x + 12$

$18 = x + 12$

$x = 18 - 12 = 6\text{cm}$ ✓

$y \times 8 = 6 \times 4$

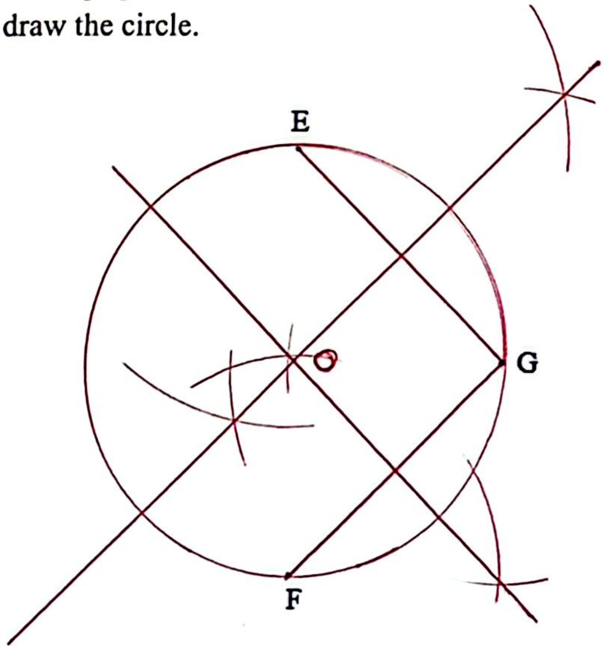
$8y = 24$

$y = \frac{24}{8} = 3\text{ cm}$ ✓

03

14. A circle centre O passes through points E, G and F as shown below.

(a) By construction, draw the circle. (2 marks)



Drawing bisectors to identify centre ✓B1

Drawing circle ✓B1

02

(b) If the centre is O(3,1) and the radius is a whole number, write down the equation of the circle in (a) above in the form $(x - a)^2 + (y - b)^2 = r^2$. (1 mark)

$r = 2.8$ cm

$r = 3$ cm.

$(x-3)^2 + (y-1)^2 = 3^2$ ✓B1

01

15. Solve the equation $sin^2x = \frac{1+\cos x}{2}$ for $0^0 \leq x \leq 360^0$. (4 marks)

$2\sin^2 x = 1 + \cos x$

$\sin^2 x + \cos^2 x = 1$

$\sin^2 x = 1 - \cos^2 x$

$2(1-\cos^2 x) = 1 + \cos x$ ✓ M1

$2 - 2\cos^2 x = 1 + \cos x$

$-2\cos^2 x - \cos x + 1 = 0$ ✓

$2\cos^2 x + \cos x - 1 = 0$ M1

Let $\cos x = y$

$2y^2 + y - 1 = 0$

$2y^2 + 2y - y - 1 = 0$

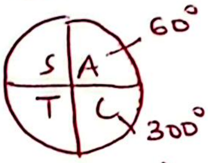
$2y(y+1) - 1(y+1) = 0$

$2y - 1 = 0$ or $y + 1 = 0$

$2y = 1$ $\quad y = -1$

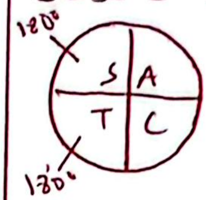
$y = 0.5$ ✓ A1

$\cos x = 0.5$



$x = \cos^{-1}(0.5) = 60°$

$\cos x = -1$



$x = \cos^{-1}(1)$

$x = 0°$

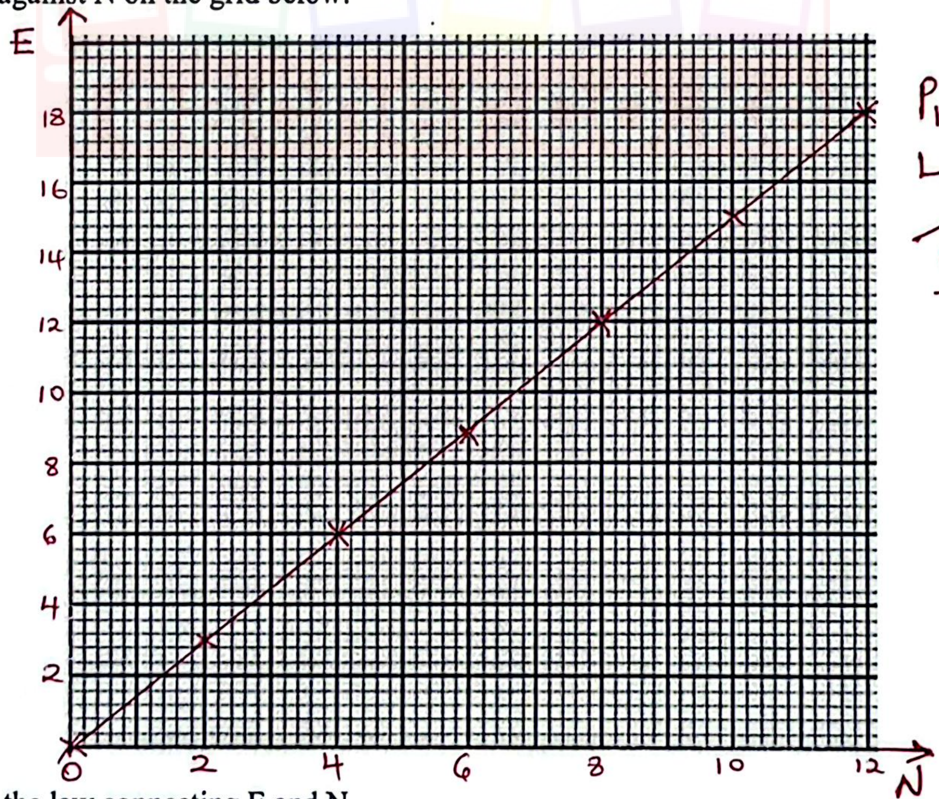
$\therefore x = 60°, 180°, 300°$ ✓ B1

04

16. The extension E (cm) on a spiral spring when it is pulled by a force of N Newtons is found experimentally and tabulated as follows:

Force N (Newtons) x	0	2	4	6	8	10	12
Extension E (cm) y	0	3.0	6.0	8.8	12.0	15.0	18.0

(a) Plot E against N on the grid below. (2 marks)



P1

L1

/02

(b) Obtain the law connecting E and N. (1 mark)

Gradient $= \frac{18-0}{12-0} = 1.5$ | $E = 1.5N$ ✓ B1

SECTION II (50 marks)

Answer only five questions from this section in the spaces provided.

17. The table below shows the income tax rates for the year 2022.

Monthly taxable income in Kenya shillings	Percentage tax rate in each shilling
1 – 15,000	10
15,001 – 25,500	15
25,501 – 36,000	20
36,001 – 46,500	25
Over 46,500	30

During a certain month, Wendy paid a total of Ksh 35,420. She received a monthly house allowance of Ksh 30,000 and a commuter allowance of Ksh 20,000. Wendy also had a life insurance policy for which she paid Ksh 10,000 per month, and she was entitled to a relief of 15% on the premium paid. In addition, she qualified for a personal relief of Ksh 1,500 per month.

(a) Determine gross tax per month. (2 marks)

Gross tax $= 35420 + (\frac{15}{100} \times 10000 + 1500)$ ✓M1

$= \text{Ksh } 38420$ ✓A1

02

(b) Determine Wendy's basic monthly salary. (5 marks)

Let taxable income $= x$

1st band $= \frac{10}{100} \times 15000 = 1500$

2nd band $= \frac{15}{100} \times 10500 = 1575$

3rd band $= \frac{20}{100} \times 10500 = 2100$ +

4th band $= \frac{25}{100} \times 10500 = \underline{2625}$ 7800 ✓M1

5th band $= \frac{30}{100} \times (x - 46500) = 38420 - 7800$

$= 0.3(x - 46500) = 30620$ ✓M1

$x - 46500 = \frac{30620}{0.3}$

$x - 46500 = 102,066.67$

$x = \text{Ksh } 148,566.67$ ✓M1

$148566.67 = B.S + 30000 + 20,000$ ✓M1

$148566.67 = BS + 50000$

$\therefore$ Basic Salary $= \text{Ksh } 98,566.67$ ✓A1

(c) The following deductions were also made on Wendy's salary:

- SHIF of Ksh 1,700
- Cooperative loan repayment of Ksh 16,800
- Housing Levy of 3% of the basic salary.

Determine her net monthly salary. (3 marks)

Total Deductions $= 35420 + 10000 + 1700 + 16800 + \frac{3}{100} \times 98566.67$ ✓M1

$= 66877.00$ ✓M1

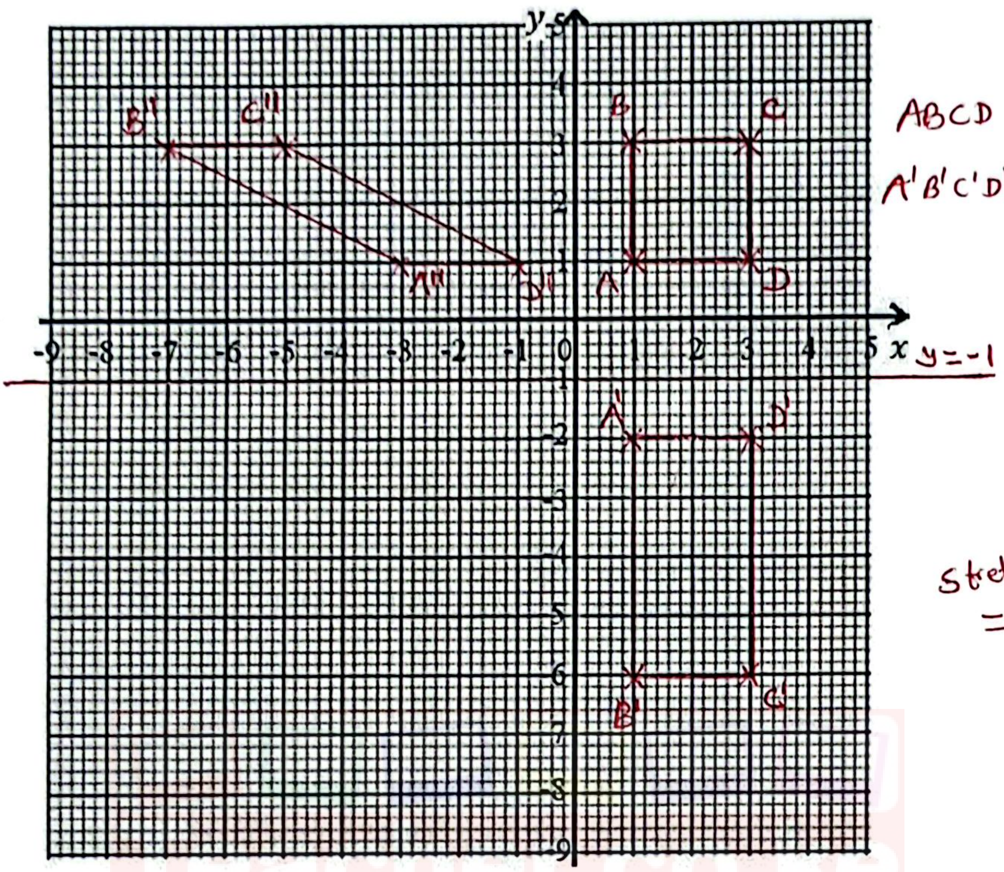
Total income $= 148566.67$

Net salary $= 148566.67 - 66877.00 = \text{Ksh } 81689.67$ ✓A1

03

18. The vertices of a square ABCD are A(1, 1), B(1, 3), C(3, 3) and D(3, 1). The vertices of its image under a transformation T are A′(1, −2), B′(1, −6), C′(3, −6) and D′(3, −2).

(a) On the grid provided, draw ABCD and its image A′B′C′D′ under T. (2 marks)



ABCD drawn ✓B1

A'B'C'D' drawn ✓B1

Stretch factor
$= \frac{-4}{2}$
$= -2$.

(b) Describe the transformation T fully. (3 marks)

Stretch ✓B1 parallel to y-axis ✓B1 with x-axis invariant stretch factor −2. ✓B1

03

(c) Determine the matrix representing the transformation T. (2 marks)

stretch factor $= \frac{-4}{2} = -2$. ✓B1

$T = \begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$ ✓B1

02

(d) On the same grid above, draw the image of the square ABCD under shear with line $y = -1$ invariant and C(3, 3) is mapped onto C″(−5, 3). (3 marks)

Shear factor $= \frac{-8}{4} = -2$

A″
$-2 = \frac{x}{2}$
$x = -4$
$\therefore A''(-3, -1)$

B″
$-2 = \frac{y}{4}$
$y = -8$
$B''(-7, 3)$

D″
$-2 = \frac{w}{2}$
$w = -4$
$D(-1, 1)$.

Shear factor obtained ✓B1

A″B″C″D″ drawn ✓B1

Coordinates stated ✓B1

10

19.

(a) An arithmetic sequence has 15 terms. Its first term is 4 while the last is −24. Determine;

(i) the common difference (2 marks)

$T_n = a + (n-1)d$

$-24 = 4 + (15-1)d$ ✓ M_1

$-28 = 14d$

$d = \frac{-28}{14} = -2$ ✓ A_1

02

(ii) the sum of the terms of the sequence. (2 marks)

$S_{15} = \frac{15}{2}(4 + -24)$ ✓ M_1

$= 7.5(-20)$

$= -150$ ✓ A_1.

02

(iii) the twentieth term of the sequence. (2 marks)

$T_{20} = 4 + (20-1) \times -2$ ✓ M_1

$= 4 + 19 \times -2$

$= 4 + -38$

$= -34$ ✓ A_1

02

(b) Below is a geometric sequence.

$-20\frac{1}{4}, 13\frac{1}{2}, -9, \ldots$

(i) Find the tenth term. (2 marks)

$r = \frac{-9}{13\frac{1}{2}} = -\frac{2}{3}$ ✓ M_1

$T_{10} = -20\frac{1}{4} \times \left(-\frac{2}{3}\right)^{10-1}$

$= \frac{128}{243}$ ✓ A_1

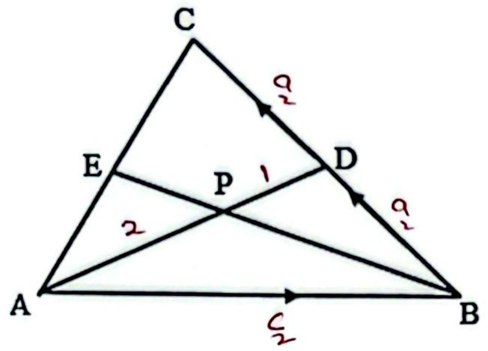
02

(ii) Find the sum of the first 10 terms of this sequence to the nearest unit. (2 marks)

$S_{10} = \frac{-20\frac{1}{4}\left(1 - \left(-\frac{2}{3}\right)^{10}\right)}{1 - -\frac{2}{3}}$ ✓ M_1

$S_{10} = -12$ ✓ A_1

20. In the figure below **AB** = $\boldsymbol{c}$ and **BC** = $2\boldsymbol{a}$. D is the midpoint of BC, while P divides AD in the ratio 2:1



(a) Express in terms of $\boldsymbol{a}$ and $\boldsymbol{c}$;

(i) **AD** $= AB + BD$ (1 mark)

$= c + a$ ✓ B_1 (01)

(ii) **AP** $= \frac{2}{3}AD$ (1 mark)

$= \frac{2}{3}(c + a) = \frac{2}{3}c + \frac{2}{3}a$ ✓ B_1 (01)

(iii) **BP** $= BA + AP$ (1 mark)

$= -c + \frac{2}{3}c + \frac{2}{3}a$ (01)

$= \frac{2}{3}a - \frac{1}{3}c$ ✓ B_1

(b) Given that **BE** = m**BP** and **AE** = n**AC**

Find two expressions for **AE** in terms of $\boldsymbol{a}$, $\boldsymbol{c}$ and the parameters m and n. (3 marks)

$AE = nAC$

$= n(AB + BC)$

$= n(c + 2a)$

$= nc + 2na$ ✓

$AE = AB + BE$

$= c + mBP$

$= c + m(\frac{2}{3}a - \frac{1}{3}c)$ ✓

$= c + \frac{2}{3}ma - \frac{1}{3}mc$

$= c(1 - \frac{1}{3}m) + \frac{2}{3}ma$ ✓

(c) Find the values of m and n, hence state the ratio in which E divides AC. (4 marks)

$AE = AE$ ✓ M_1

$nc + 2na = c(1 - \frac{1}{3}m) + \frac{2}{3}ma$

$nc = c(1 - \frac{1}{3}m)$

$n = 1 - \frac{1}{3}m$ --- (i)

$2na = \frac{2}{3}ma$

$2n = \frac{2}{3}m$ ✓ M_1

$n = \frac{1}{3}m$

$n = n$

$1 - \frac{1}{3}m = \frac{1}{3}m$

$1 = \frac{2}{3}m$

$m = 1.5$

$n = \frac{1}{3}(1.5)$

$n = \frac{1}{2}$ ✓ A_1

$AE = \frac{1}{2}AC$

$\frac{AE}{AC} = \frac{1}{2}$

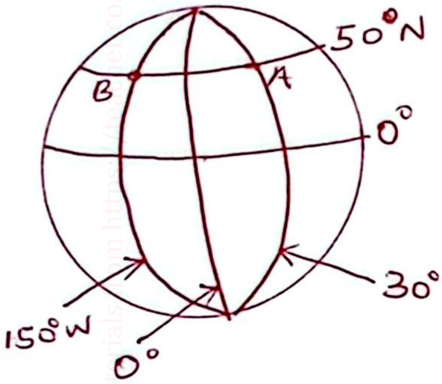
$AE : EC = 1 : 1$ ✓ B_1

(04)

21. **A** and **B** are two points on the latitude 50^0N. The two points lie on the longitudes 30^0E and 150^0W respectively.

(a) Calculate the:

(i) distance in kilometres from **A** to **B** along a parallel of latitude. (Take$\pi = \frac{22}{7}$ and R= 6370 km) (3 marks)



$D = \frac{\theta}{360} 2\pi R \cos \text{latitude}$

$\theta = 30° + 150° = 180°$ ✓M1

$D = \frac{180°}{360°} \times 2 \times \frac{22}{7} \times 6370 \cos 50°$ ✓M1 03

$D = 12{,}868.61$ Km. ✓A1

(ii) Shortest distance from A to B along a great circle in nautical miles. (3 marks)

$D = 60\theta$.

$\theta = (90-50) + (90-50) = 80°$. ✓M1

$D = 60 \times 80°$ ✓M1 03

$= 4800$ nm ✓A1

(b) An aircraft takes 54 hours to fly between the two points **A** and **B** along the great circle. Calculate its speed in km/hr. (4 marks)

$D = \frac{80°}{360°} \times 2 \times \frac{22}{7} \times 6370$ ✓M1

$= 8897\frac{7}{9}$ Km. ✓M1 04

$S = \frac{8897\frac{7}{9}}{54}$ ✓M1

$S = 164.77$ Km/h ✓A1

10

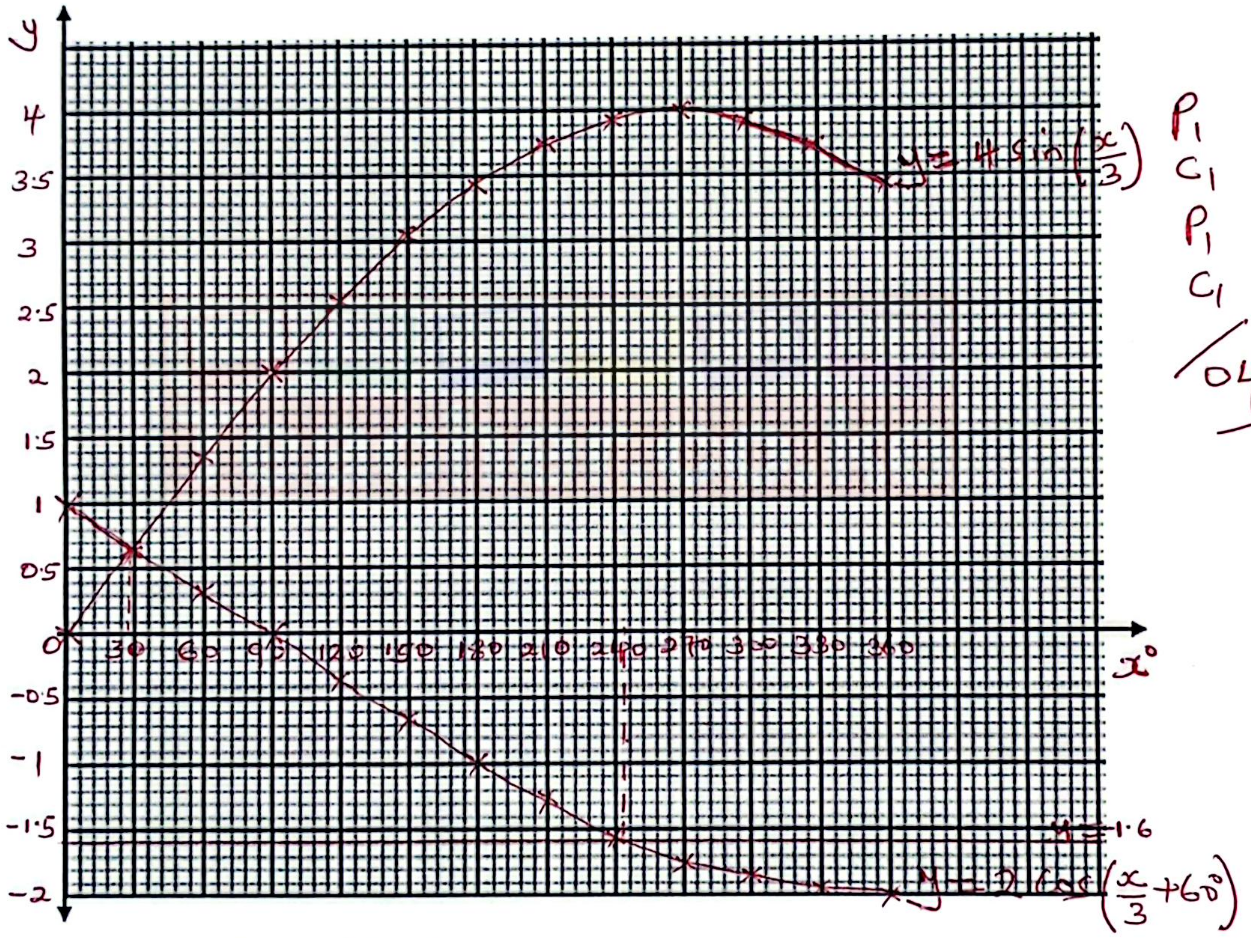
22.

(a) Complete the table below giving your values correct to 2 decimal places. (2 marks)

x^0	0	30	60	90	120	150	180	210	240	270	300	330	360
$y = 4\sin\left(\frac{x}{3}\right)$	0.00	0.69	1.37	2.00	2.57	3.06	3.46	3.76	3.94	4.00	3.94	3.76	3.46
$y = 2\cos\left(\frac{x}{3} + 60^0\right)$	1.00	0.68	0.34	0.00	-0.35	-0.68	-1.00	-1.29	-1.53	-1.73	-1.88	-1.97	-2.00

B2

(b) Taking 1 cm represent 30^0 on the x – axis and 2 cm to represent 1 unit on the y – axis, draw the graphs of $y = 4\sin\left(\frac{x}{3}\right)$ and $y = 2\cos\left(\frac{x}{3} + 60^0\right)$, for $0^0 \leq x \leq 360^0$. (4 marks)



P1
C1
P1
C1
/04

(c) Use your graphs to solve the following;

(i) $4\sin\left(\frac{x}{3}\right) - 2\cos\left(\frac{x}{3} + 60^0\right) = 0.$ (1 mark)

$27^\circ \pm 3^\circ$

(ii) $\cos\left(\frac{x}{3} + 60^0\right) = -0.8$ 2 (2 marks)

Line $y = -1.6$ drawn ✓

$2\cos\left(\frac{x}{3} + 60^0\right) = -1.6$

$y = -1.6$

$x = 243^\circ \pm 3^\circ$ ✓B1

02

(d) State the amplitude of $y = 4\sin\left(\frac{x}{3}\right)$. (1 mark)

Amplitude $= 4$ ✓B1

/10

23.

(a) Find the value of a if $\int_a^3 (2x+4)dx = 25$ (3 marks)

$x^2+4x+c\Big|_a^3$ ✓M1

$(3^2+4(3)+c)-(a^2+4a+c)=25$

$21+c-a^2-4a-c=25$

$-a^2-4a-4=0$

$a^2+4a+4=0$ ✓M1

$a=\frac{-4\pm\sqrt{4^2-4\times1\times4}}{2\times1}$

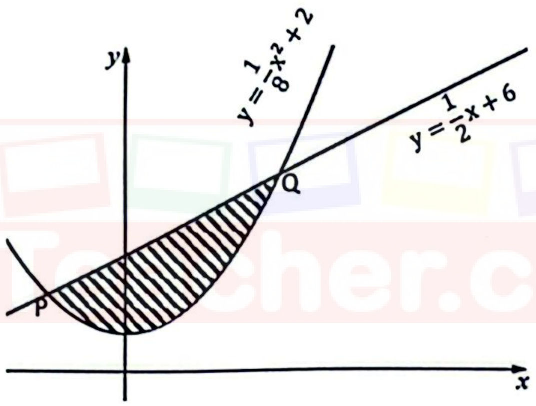
$a=\frac{-4\pm\sqrt{0}}{2}$

$a=\frac{-4\pm0}{2}$

$a=-2$ ✓A1

03

(b) In the figure below, the shaded region is bounded by the straight line $y=\frac{1}{2}x+6$ and the curve $y=\frac{1}{8}x^2+2$. The straight line intersects the curve at points P and Q.



(i) Determine the coordinates of points P and Q. (3 marks)

$\frac{1}{2}x+6=\frac{1}{8}x^2+2$ ✓M1

$-\frac{1}{8}x^2+\frac{1}{2}x+4=0$

$\frac{1}{8}x^2-\frac{1}{2}x-4=0$

$x^2-4x-32=0$

$x^2-8x+4x-32=0$ ✓M1

$x(x-8)+4(x-8)=0$

$(x+4)(x-8)=0$

$x+4=0$ or $x-8=0$

$x=-4$ or $x=8$

$P(-4,y)$, $Q(8,y)$

$y=\frac{1}{2}(-4)+6=4$

$P(-4,4)$

$y=\frac{1}{2}\times8+6=10$

$Q(8,10)$ ✓A1

03

(ii) Find the exact area of the shaded region. (4 marks)

$y=(\frac{1}{2}x+6)-(\frac{1}{8}x^2+2)$

$y=\frac{1}{2}x+6-\frac{1}{8}x^2-2$

$y=\frac{1}{2}x+4-\frac{1}{8}x^2$

$A=\int_{-4}^{8}(\frac{1}{2}x+4-\frac{1}{8}x^2)dx$ ✓M1

$\frac{1}{4}x^2+4x-\frac{1}{24}x^3+c\Big|_{-4}^{8}$ ✓M1

$A=(\frac{1}{4}(8)^2+4(8)-\frac{1}{24}(8)^3+c)-(\frac{1}{4}(-4)^2+4(-4)-\frac{1}{24}(-4)^3+c)$ ✓M1

$=(26\frac{2}{3}+c)-(-9\frac{1}{3}+c)$

$=36$ sq units ✓A1

04

10

24. Kamau buys and sells goats and sheep. On a certain day, he bought x goats and y sheep. The number of goats he bought was more than 25 but not more than 40. The total number of animals he bought did not exceed 70. Each goat costs Ksh.30 to de-worm, and each sheep costs Ksh.60. He spent at least Ksh.1,200 on de-worming,

(a) Write the inequalities that represent the above information. (4 marks)

$25 < x \leq 40$ B1 B1

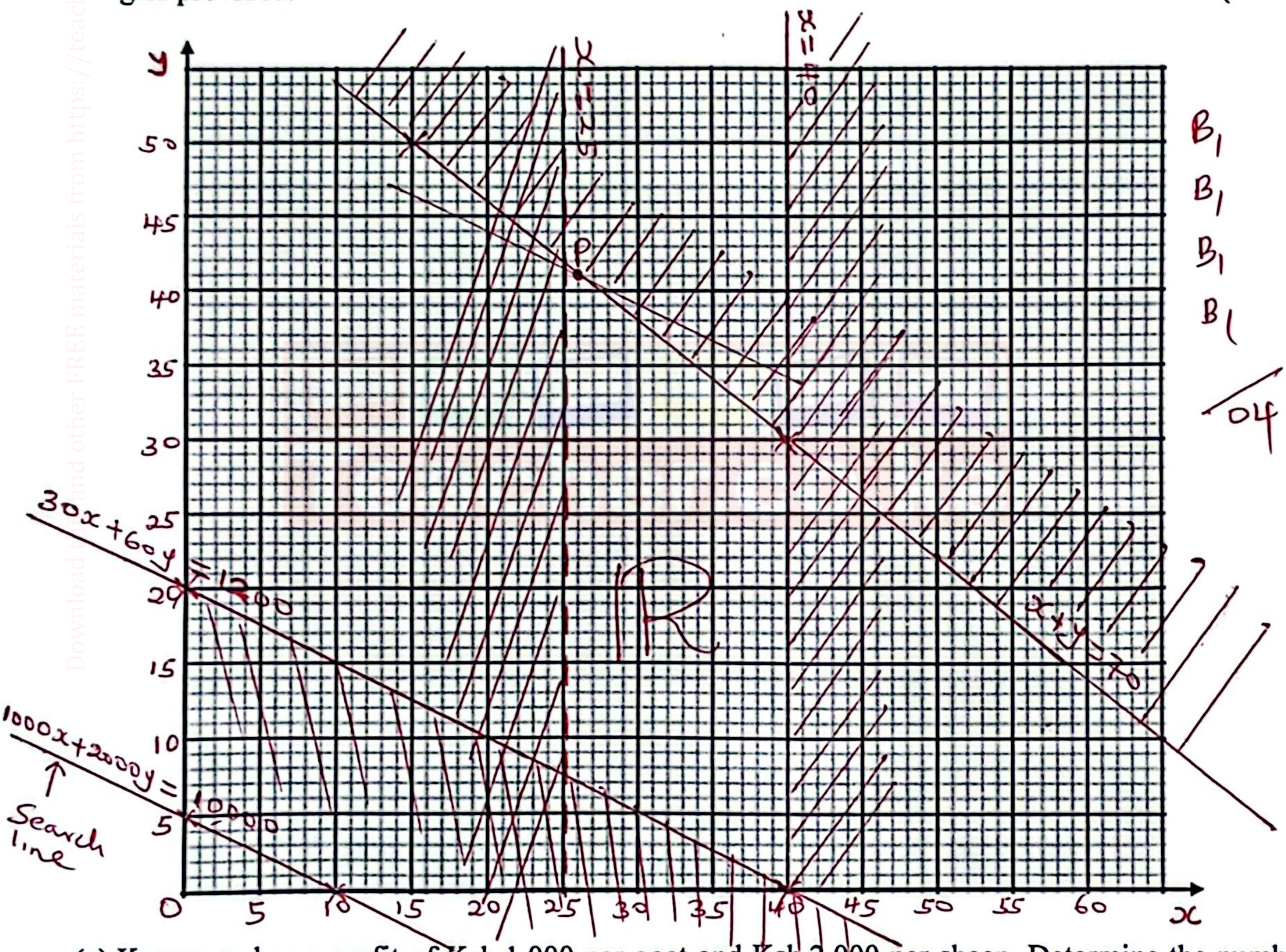
$x + y \leq 70$ B1

$30x + 60y \geq 1200$ B1

Accept $x > 25$ B1

$x \leq 40$ B1

(b) Using a scale of 1 cm represent 5 units on both axes, represent the inequalities in (a) above on the grid provided. (4 marks)



(c) Kamau makes a profit of Ksh.1,000 per goat and Ksh.2,000 per sheep. Determine the number of goats and sheep he must have bought to attain the maximum profit. (2 marks)

$1000x + 2000y = 10000$

$P(26, 41)$

Goats = 26 ✓

Sheep = 41 ✓

02

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10