CANDIDATE NAME: ....
INDEX NUMBER: ....
CENTRE CODE: ....
CENTRE NAME: ....
RANDOM NUMBER: ....

121210112025

121/2 Candidate's signature: .... Date: ....

Random Number: 121210112025

THE KENYA NATIONAL EXAMINATIONS COUNCIL

Kenya Certificate of Secondary Education

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

Nov. 2025 – 2 ½ hours

Candidate's signature: .... **Date:** ....

Instructions to candidates:

(a) Confirm that this question paper has your name, name of your school and the correct index number.
(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 answers 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 19 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	

SECTION I (50 marks)

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

1. The first three terms of an arithmetic progression (AP) are $8 - x$, $2x$ and $3x + 2$. Find the value of x and hence the common difference of the AP. (3 marks)

$d = 2x - (8 - x)$
$= 3x - 8$ .... (i)
$d = (3x + 2) - 2x$
$= x + 2$ .... (ii)

$\Rightarrow 3x - 8 = x + 2$
$\Rightarrow 2x = 10$
$\Rightarrow x = 5$ ✓B_1

$d = 3(5) - 8$ ✓m_1
$= 7$ ✓A_1

2. The temperature in a room was measured as 20°C in the morning and 25°C in the afternoon. The difference in the temperature of the room was calculated. Determine the maximum possible error in the calculation. (3 marks)

Absolute Error $= \frac{1}{2} = \pm 0.5$

	MORNING	AFTERNOON
Maximum $\Rightarrow$	$20 + 0.5$	$25 + 0.5$
Minimum $\Rightarrow$	$20 - 0.5$	$25 - 0.5$

Max Error $= 25.5 - 19.5 = 6°C$ ✓m_1
Actual $= 25 - 20 = 5°C$

$\frac{(max) - (min)}{2} = \frac{6 - 4}{2} = 1°C$ ✓m_1 ✓A_1

OR

max − working $= 6 - 5 = 1°C$

OR

$|min - \text{working}| = |4 - 5| = 1°C$

3. Find the values of a and b for which, $\frac{7\sqrt{2}}{5 - 3\sqrt{2}} = a + b\sqrt{2}$. (3 marks)

$\frac{7\sqrt{2}}{5 - 3\sqrt{2}} \times \frac{5 + 3\sqrt{2}}{5 + 3\sqrt{2}}$ ✓m_1

$\frac{7 \times 5\sqrt{2} + 7 \times 3\sqrt{4}}{5^2 - (3\sqrt{2})^2}$

$\frac{35\sqrt{2} + 42}{7}$

$6 + 5\sqrt{2}$ ✓B_1

$a = 6, b = 5$ ✓B_1

4. (a) Expand and simplify the expression $\left(2+\frac{1}{2x}\right)^5$. (2 marks)

$$\left(2^5\left(\frac{1}{2x}\right)^0\right) + 5\left(2^4\left(\frac{1}{2x}\right)^1\right) + 10\left(2^3\left(\frac{1}{2x}\right)^2\right)$$

$$+ 10\left(2^2\left(\frac{1}{2x}\right)^3\right) + 5\left(2^1\left(\frac{1}{2x}\right)^4\right) + \left(2^0\left(\frac{1}{2x}\right)^5\right) \quad \checkmark m_1$$

$$= 32 + \frac{40}{x} + \frac{20}{x^2} + \frac{5}{x^3} + \frac{5}{8x^4} + \frac{1}{32x^5} \quad \checkmark A_1$$

(b) Use the first four terms of the expansion in (a) to estimate the value of $(2.05)^5$. (2 marks)

$$\left(2 + \frac{1}{2x}\right)^5 = (2.05)^5$$

$$2 + \frac{1}{2x} = 2.05$$

$$\frac{1}{2x} = 0.05$$

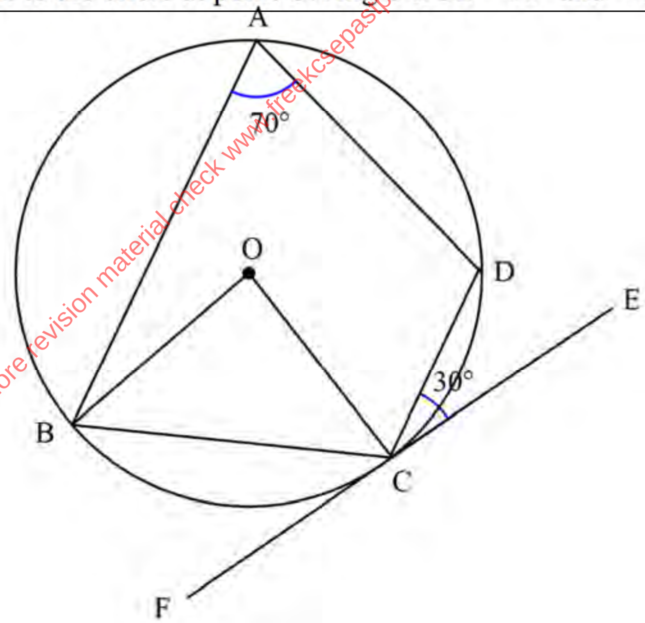
$$\frac{1}{x} = \frac{1}{10} \quad \checkmark m_1$$

$$x = 10$$

$$(2.05)^5 = 32 + \frac{40}{10} + \frac{20}{10^2} + \frac{5}{10^3}$$

$$= 36.205 \quad \checkmark A_1$$

5. In the following figure, A, B, C and D are points on the circumference of a circle centre O. Line FE is a tangent to the circle at point C. Angle DCE = 30° and < BAD = 70°.



Giving reasons at each stage, determine the size of the acute angle BOC. (3 marks)

$< DCO = 60° \Rightarrow$ **Radius and Tangent at 90°** $\checkmark B_1$

$< BCO = 50° \Rightarrow$ **Opposite angles in a cyclic quadrilateral**

$< CBO = 50° \Rightarrow$ **Base angles of an isosceles triangle** $\checkmark B_1$

$< BOC = 80° \Rightarrow$ **Sum of angles in a triangle.** $\checkmark B_1$

6. Two quantities y and x are such that y varies directly as the square of $(x+1)$. Given that $y = 200$ when $x = 4$, determine the equation connecting the two quantities. (3 marks)

$y \propto (x + 1)^2$

$y = k(x^2 + 2x + 1)$ ✓m_1

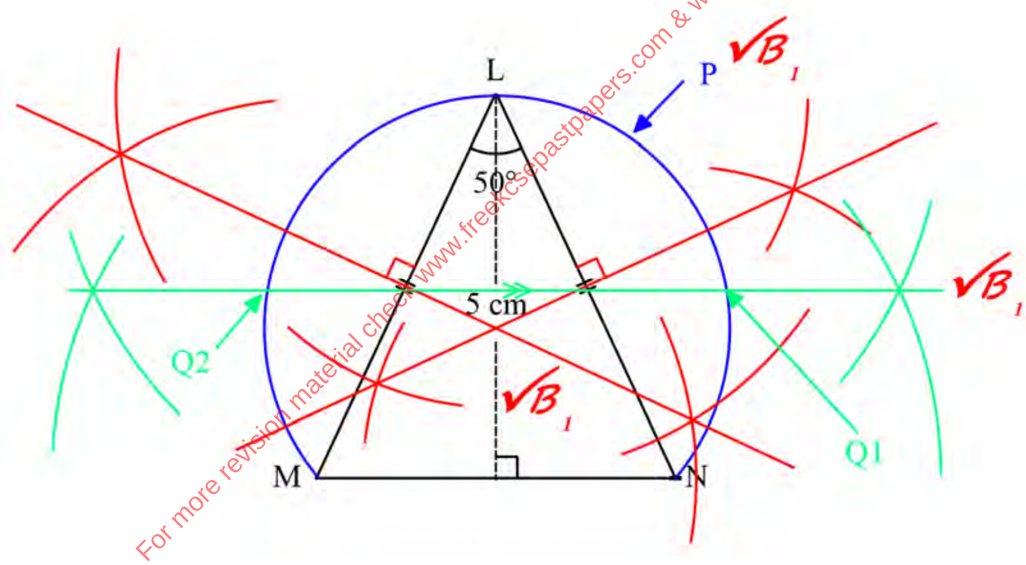
$200 = k(16 + 8 + 1)$

$200 = 25k$

$k = 8$ ✓A_1

$y = 8(x + 1)^2$ ✓B_1

7. The following figure shows an isosceles triangle MLN. The height of the triangle is 5 cm and < MLN = 50°.



On the figure, use a ruler and a pair of compasses only to construct:

(a) The locus of point P such that < MPN = 50°. (2 marks)

(b) Locate point Q such that the area of Δ MQN is half that of Δ MLN and < MQN = 50°. (2 marks)

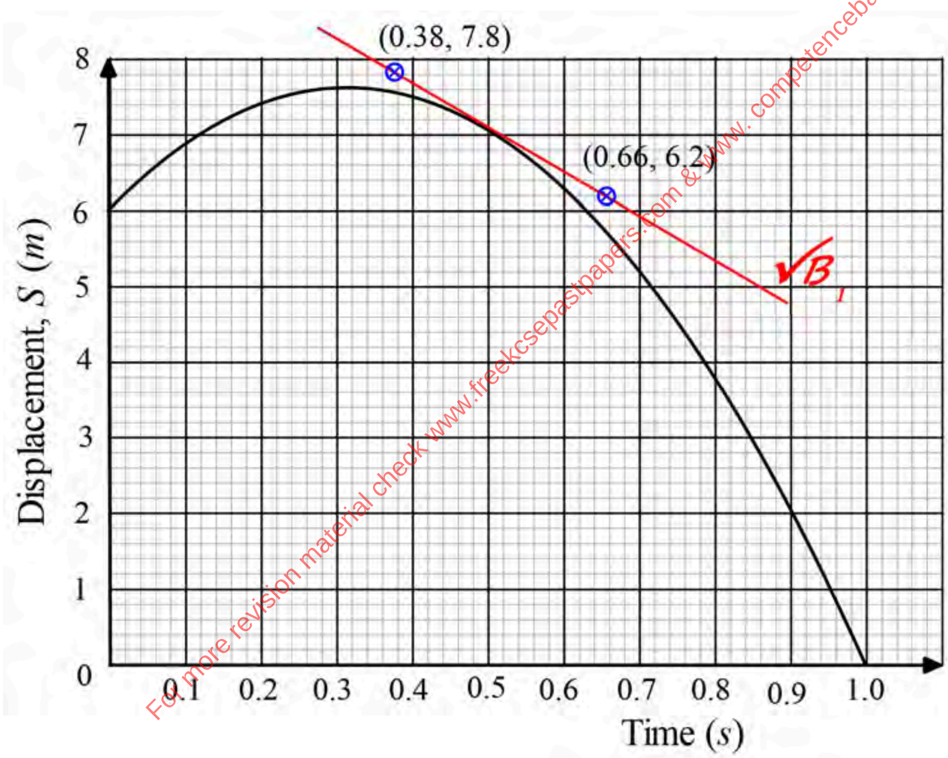
8.	A pint U is 9000 nm to the East of Point T (0°, 50° W). Find the longitude at U.	(3 marks)

$$\theta = \frac{9\,000}{60} = 150° \quad \checkmark m_1 \quad \checkmark A_1$$

$$\text{longitude at } U = 150° - 50°$$

$$= 100° E \quad \checkmark B_1$$

9.	The following graph shows the displacement S metres of a moving particle from a point O after, time t seconds (0 ≤ t ≤ 1).	



Use the graph to determine the rate of change of displacement S at time t = 0.5 seconds.

(3 marks)

$$RATE = \frac{6.2 - 7.8}{0.66 - 0.38} \quad \checkmark m_1$$

$$= -5.714 \quad \checkmark A_1$$

10. The ages of 32 residents at a home for the elderly people are presented in the following frequency distribution table.

Age (years)	70 – 74	75 - 79	80 - 84	85 - 89	90 - 94	95 – 99
No. of residents	5	6	7	8	4	2

Calculate the upper quartile (Q_3) age of the residents. (3 marks)

CLASS	***F***	***c.f***
70 – 74	5	5
75 – 79	6	11
80 – 84	7	18
85 – 89	8	26
90 – 94	4	30
95 - 99	2	32

$$= 84.5 + \left(\frac{(0.75 \times 32) - 18}{8}\right) \times 5 \quad \checkmark m_1 \quad \checkmark m_1$$

$$= 88.25 \quad \checkmark A_1$$

11. A circle, centre (-2,3) and radius 5 units is drawn on a Cartesian plane. Determine the x intercepts of the circle. (3 marks)

Centre (– 2, 3), radius = 5

$$(x + 2)^2 + (y - 3)^2 = 5^2 \quad \checkmark m_1$$

$$(x + 2)^2 + (0 - 3)^2 = 25 \Rightarrow \text{At } x - \text{intercept } y = 0 \quad \checkmark m_1$$

$$x^2 + 4x - 12 = 0$$

$$(x - 2)(x + 6) = 0$$

$$x = 2 \text{ or } x = -6 \quad \checkmark A_1$$

12. An investor deposited Ksh 20 000 in an account that paid compound interest at a rate of 2.5% every 6 months. At the end of the investment period, the interest earned was Ksh 5 600. Determine the duration in years of the investment period. (3 marks)

Amount

$$= 20\,000 + 5\,600 = 25\,600$$

$$25\,600 = 20\,000\left(1 + \frac{2.5}{100}\right)^{2n} \quad \checkmark m_1$$

$$\frac{25\,600}{20\,000} = 1.025^{2n}$$

$$1.28 = 1.0125^{2n}$$

$$2n\log(1.025) = \log(1.28) \quad \checkmark m_1$$

$$n = \frac{\log(1.28)}{2\log(1.025)}$$

$$n = 4.998$$

$$n \approx 5 \text{ years} \quad \checkmark A_1$$

13. Points A(-4, 7), B(4, 1) and C(1 6, - 8) lie on a straight line. Determine the ratio in which B divides AC. (3 marks)

$$\overrightarrow{AB} = k\left(\overrightarrow{AC}\right)$$

$$\begin{pmatrix}4\\1\end{pmatrix} - \begin{pmatrix}-4\\7\end{pmatrix} = k\left(\begin{pmatrix}16\\-8\end{pmatrix} - \begin{pmatrix}-4\\7\end{pmatrix}\right) \quad \checkmark m_1$$

$$\begin{pmatrix}8\\-6\end{pmatrix} = k\begin{pmatrix}20\\-15\end{pmatrix}$$

$$20k = 8$$

$$k = \frac{8}{20} = \frac{2}{5} \quad \checkmark B_1$$

$$\overrightarrow{AB} : \overrightarrow{BC} = \frac{2}{5} : \frac{3}{5}$$

$$\overrightarrow{AB} : \overrightarrow{BC} = 2 : 3 \quad \checkmark B_1$$

14. A transformation matrix $T = \begin{pmatrix} a+1 & 4 \\ 4 & a+1 \end{pmatrix}$ maps a triangle PQR of area 0.5 unit squares onto a triangle P'Q'R' of area 4.5 unit squares. Determine the possible values of *a*. (3 marks)

$$\frac{4.5}{0.5} = ((a + 1)(a + 1) - (4 \times 4)) \quad \checkmark m_1$$

$$9 = a^2 + 2a - 15$$

$$a^2 + 2a - 24 = 0$$

$$(a - 4)(a + 6) = 0 \quad \checkmark m_1$$

$$a = 4 \text{ or } a = -6 \quad \checkmark A_1$$

15. A particle starts from a point O and moves in a straight line. Its velocity V m/s at time *t* seconds is given by V = 4 - *t*. The distance S of the particle from O at time t = 2 seconds is 7 m. Calculate S when t = 4 seconds. (3 marks)

$$S = \int (4 - t)\,dt$$

$$7 = 4t - \frac{t^2}{2} + C \quad \checkmark m_1$$

$$7 = 4(2) - \frac{(2)^2}{2} + C$$

$$C = 1$$

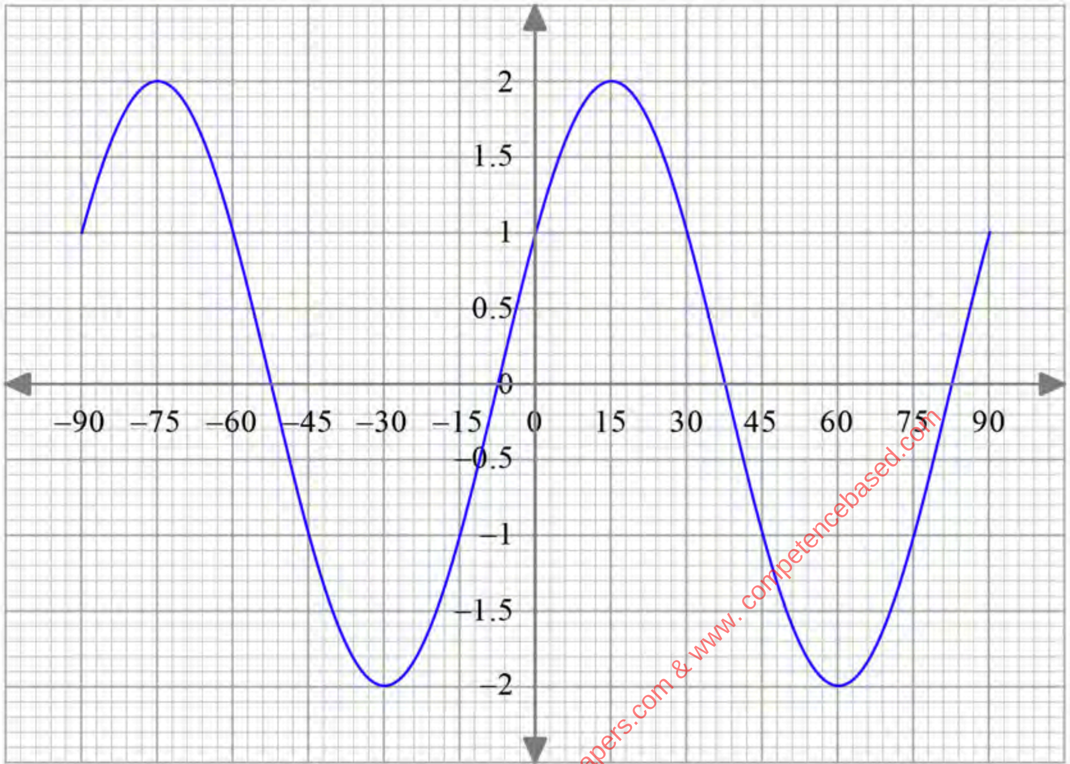
$$S = 4t - \frac{1}{2}t^2 + 1$$

When $t = 4$

$$S = 4 \times 4 - \frac{1}{2}(4)^2 + 1 \quad \checkmark m_1$$

$$S = 9\ m \quad \checkmark A_1$$

16. The following graph represents a wave of the trigonometric function $y = A\sin(\omega x + 30)^\circ$ for $-90^\circ < x < 90$.



Determine the values of scalars A and ω. (3 marks)

$A = 2$ **Units** ✓B1

Period $= 37.5 + 52.5 = 90^\circ$

$\frac{360}{\omega} = 90$ ✓m1

$\omega = \frac{360}{90}$

$\omega = 4$ ✓A1

SECTION II (50 marks)

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

17. Two varieties of ground nuts, type q and type r are sold in a market. Type *q* is sold at Ksh 130 per kg while type *r* is sold at Ksh 180 per kg.

(a) A trader bought 50 kg of type *q* and 75 kg of type *r* from the market. The two varieties bought were then mixed.

(i) Determine the cost price of 1 kg of the mixture; (2 marks)

$$\frac{50 \times 130 + 75 \times 180}{50 + 75} \quad \checkmark m_1$$

$$\frac{6\,500 + 13\,500}{125}$$

$$= \text{Ksh } 160 \quad \checkmark A_1$$

(ii) The trader sold 80% of the mixture at Ksh 170 per kg and the rest at K.sh 180 per kg. Determine the percentage profit made by the trader. (4 marks)

$$\frac{80}{100} \times 125 = 100\ Kg \quad \checkmark m_1$$

$$100 \times 170 = 17\,000$$

$$25 \times 180 = 4\,500 \quad \checkmark m_1$$

$$\%\ \text{Profit} = \frac{21\,500 - 20\,000}{20\,000} \quad \checkmark m_1$$

$$= 7.5\% \quad \checkmark A_1$$

(b) Another trader bought and mixed the two varieties of ground nuts. The trader made a profit of 25% by selling the mixture at Ksh 200 per kg. Determine the ratio in which the trader mixed the two varieties. (4 marks)

$$160 + 160n = 130 + 180n \quad \checkmark m_1$$

$$160n - 180n = 130 - 160$$

$$-20n = -30$$

$$n = \frac{3}{2} \quad \checkmark m_1$$

$$\text{Ratio} \Rightarrow 1 : n$$

$$\Rightarrow 1 : \frac{3}{2}$$

$$\Rightarrow 2 : 3 \quad \checkmark A_1$$

18. Registering for a Music club costs Ksh 7 000 while for a Mathematics club costs Ksh 7 200. The registration cost is shared equally among members of each club. Originally, both clubs had x members each. However, before payment for registration, 5 Music club members switched to Mathematics club.

(a) Write an expression in terms of x for the amount contributed by:

(i) each Music club member after the switch; (1 mark)

$$\frac{7\,000}{x - 5}$$ ✓B_1

(ii) each Mathematics club member after the switch. (1 mark)

$$\frac{7\,200}{x + 5}$$ ✓B_1

(b) Given that a Music club member contributed Ksh 40 more than a Mathematics club member:

(i) form an equation in x and hence determine the value of x; (5 mark)

$$\frac{7\,000}{x - 5} - \frac{7\,200}{x + 5} = 40$$ ✓m_1

$$7\,000 \times (x + 5) - 7\,200 \times (x - 5) = 40(x - 5)(x + 5)$$

$$7\,000x + 35\,000 + 7\,200x + 36\,000 = 40x^2 - 1\,000$$

$$40x^2 + 200x - 72\,000 = 0$$ ✓m_1

$$x + 5x - 1\,800 = 0$$

$$(x + 45)(x - 40) = 0$$ ✓m_1

$$x = 40 \; OR \; -45$$ ✓A_1

x = 40 Members ✓B_1

(ii) determine the percentage increase in the amount contributed by each remaining Music club member due to the switch. (3 marks)

$$\frac{7\,000}{40 - 5} = 200$$

Originally = $\frac{7\,000}{40} = 175$

% Increase = $\frac{200 - 175}{175} \times 100\%$ ✓m_1

$= \frac{25}{175} \times 100\%$ ✓m_1

$= 14.29\%$ ✓A_1

19. The income tax rates of a certain year were as shown in the following table.

Monthly Taxable income in Kenya shillings (Ksh)	**Tax Rates (%)**
0 – 24 000	10
24 001 – 32 333	25
32 334 – 500 000	30
500 001 – 800 000	32.5
Over 800 000	35

In March that year, Judy's monthly earnings were as follows:

Basic salary Ksh 104 644
House allowance Ksh 25 000
Commuter allowance Ksh 12 000

Judy was entitled to a monthly tax relief of Ksh 2 400.

(a) Calculate:

(i) Judy's taxable income that month; (2 marks)

$T.I = 104\,644 + 25\,000 + 12\,000$ ✓m_1

$= \text{Ksh } 141\,644$ ✓A_1

(ii) the tax payable by Judy that month. (5 marks)

$\frac{10}{100} \times 24\,000 = 2\,400$ ✓m_1

$\frac{25}{100} \times 8\,333 = 2\,083.25$ ✓m_1

$\frac{30}{100} \times 109 = 32793.30$ ✓m_1

Gross Tax = 37 276.55

$PAYE = 37\,276.55 - 2\,400$

$= \text{Ksh } 34\,876.55$ ✓A_1

(b) In July that year, Judy's basic salary changed, her allowances and monthly tax relief remaining as before. Her net tax that month was Ksh 39 483.35.
Calculate her new basic salary. (3 marks)

New Gross tax = 39 483.35 + 2 400 = Ksh 41 883.35

Salary increase $\Rightarrow \frac{30}{100} \times x = 41\,883.35 - 37\,276.55$ ✓m_1

$\Rightarrow 0.3x = 4\,606.80$

$\Rightarrow x = \text{Ksh } 15\,356$

New Basic Salary ✓m_1

$= 104\,644 + 15\,356$

$= \text{Ksh } 120\,000$ ✓A_1

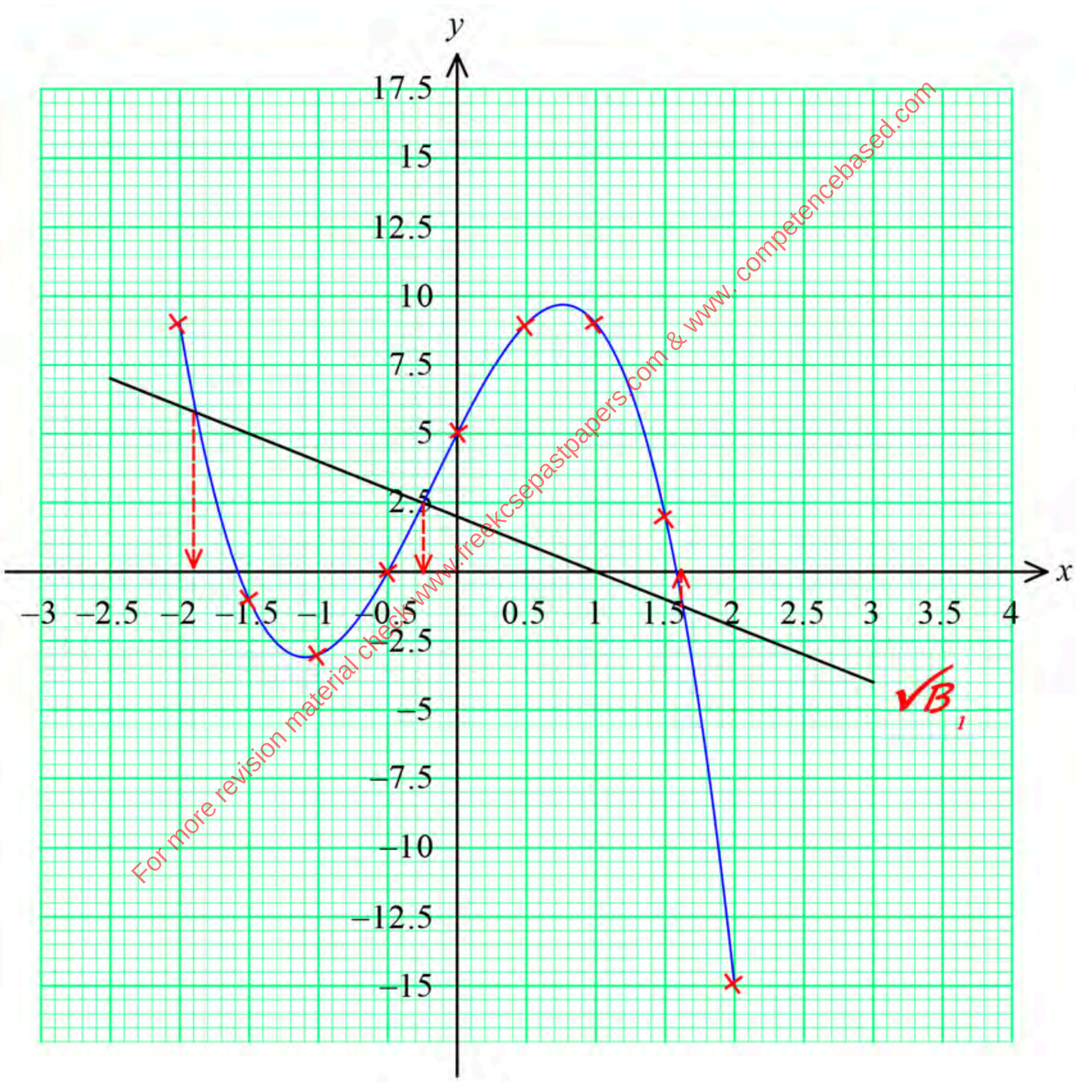
20. (a) The following table shows values of x and some values of y for the curve $y = 5 + 10x - 2x^2 - 4x^3$ for $-2 \leq x \leq 2$.

Complete the table by filling in the missing values of y.

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y	**9**	-1	-3	**0**	5	**9**	9	2	**-15**

√B1 √B1 (2 marks)

(b) On the grid provided, draw the graph of $y = 5 + 10x - 2x^2 - 4x^3$. Use the scale 2 cm to represent 1 unit on x-axis, 2 cm represents 5 units on y-axis. (3 marks)



(c) (i) Use the graph to solve the equation $5 + 10x - 2x^2 - 4x^3 = 0$. (1 mark)

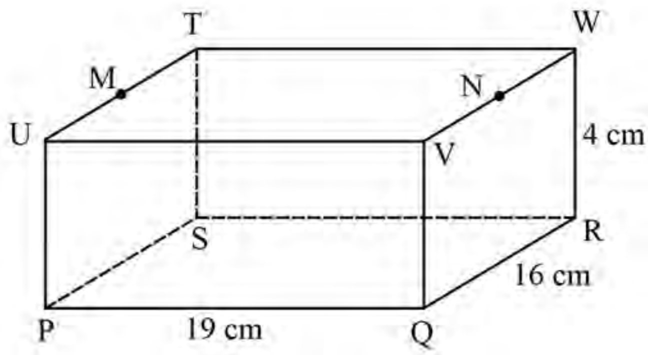
y = 0
x = -1.6, -0.5 or 1.6 ✓B_1 **for all values**

(ii) By drawing a suitable straight line on the graph, solve the equation;
$4x^3 + 2x^2 - 12x - 3 = 0$. (4 marks)

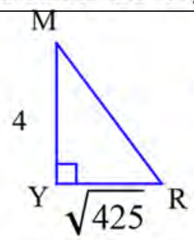
$$y = x^3 + 2x^2 - 12x - 3$$
$$0 = 4x^3 - 2x^2 + 10x + 5 \quad -$$
$$\overline{y = 2 - 2x}$$
✓B_1

x = -1.9, -0.25 or 1.6 ✓B_1 ✓B_1

21. The following figure represents a cuboid **PQRSTUVW.** Line PQ = 19 cm, QR=16 cm and RW= 4 cm. Points **M** and **N** are mid points of lines UT and VW respectively.



(a) Calculate the length of line RM. (2 marks)



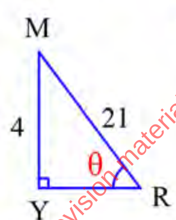
$$RM = \sqrt{4^2 + \left(\sqrt{425}\right)^2}$$ $\checkmark m_1$

$$= \sqrt{441}$$

$$= 21 \text{ cm}$$ $\checkmark A_1$

(b) Calculate correct to 2 decimal places:

(i) the angle between line RM and the plane PQRS; (2 marks)

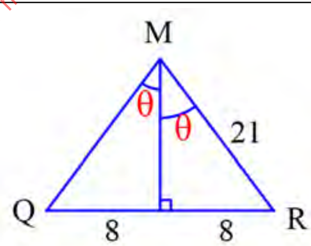


$$\sin\theta = \frac{4}{21}$$ $\checkmark m_1$

$$\theta = \sin^{-1}\left(\frac{4}{21}\right)$$

$$= 10.98°$$ $\checkmark A_1$

(ii) the angle between line RM and MQ; (3 marks)

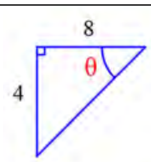


$$\sin\theta = \frac{8}{21}$$ $\checkmark m_1$

$$2\theta = 2\sin^{-1}\left(\frac{8}{21}\right)$$ $\checkmark m_1$

$$= 44.79°$$ $\checkmark A_1$

(iii) the obtuse angle between planes PMNQ and MNWT. (3 marks)



$$\tan\theta = \frac{4}{8}$$ $\checkmark m_1$

$$\theta = \tan^{-1}\left(\frac{4}{8}\right)$$ $\checkmark m_1$

$$= 26.565°$$

Obtuse angle = $180° - 26.565° = 153.43°$ $\checkmark A_1$

22. A bag contains five balls randomly numbered 1 to 5. The balls are identical except for colour.

(a) Two balls are randomly drawn from the bag, one at a time without replacement.

(i) Draw a probability space to show all the possible pairs of numbers on the two balls drawn from the bag. (2marks)

	1	2	3	4	5
1		1, 2	1, 3	1, 4	1, 5
2	2, 1		2, 3	2, 4	2, 5
3	3, 1	3, 2		3, 4	3, 5
4	4, 1	4, 2	4, 3		4, 5
5	5, 1	5, 2	5, 3	5, 4	

√B1 √B1

(ii) Find the probability that both the numbers on the balls drawn from the bag were greater than 3. (1 mark)

$$P(\text{ both are} > 3) = P(5, 4) \text{ OR } P(4, 5)$$
$$= \frac{1}{20} + \frac{1}{20}$$
$$= \frac{1}{10}$$ √B1

(iii) Find the probability that the sum of the two numbers on the balls drawn does not exceed 6. (2marks)

$$P(\text{ Sum} \leq 6) = P(1, 2) \text{ OR } P(1, 3) \text{ OR } P(1, 4) \text{ OR } P(1, 5)$$
$$\text{OR } P(2, 1) \text{ OR } P(2, 3) \text{ OR } P(2, 4) \text{ OR } P(3, 1)$$
$$\text{OR } P(3, 2) \text{ OR } P(4, 1) \text{ OR } P(4, 2) \text{ OR } P(5, 1)$$
$$= 12 \times \left(\frac{1}{20}\right) = \frac{3}{5}$$ √m1 √A1

(b) Three balls in the bag are green in colour and the rest are red. Determine the probability that the two balls drawn in (a) were:

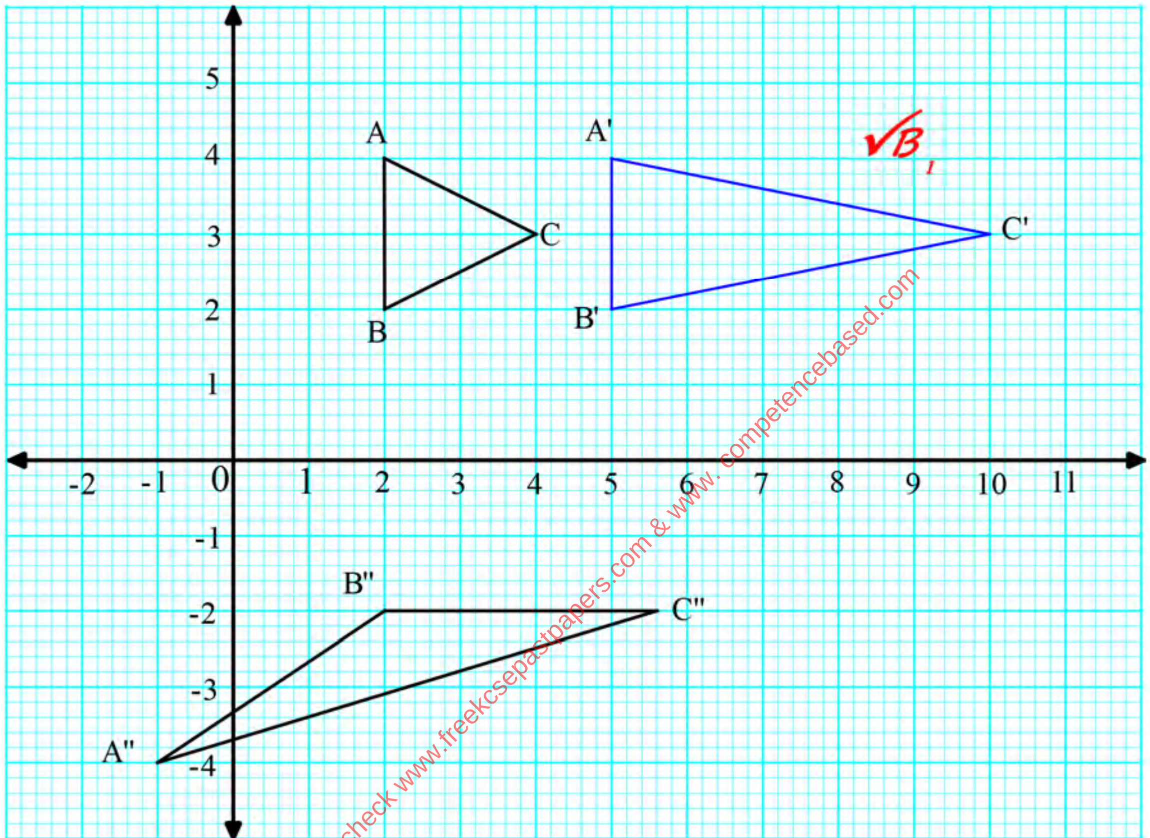
(i) of the same colour; (3 marks)

$$P(\text{ same colour }) = P(GG) \text{ OR } P(RR)$$
$$= \left(\frac{3}{5} \times \frac{2}{4}\right) + \left(\frac{2}{5} \times \frac{1}{4}\right)$$ √m1 √m1
$$= \frac{2}{5}$$ √A1

(ii) of mixed colours. (2 marks)

$$P(\text{ mixed colours }) = P(GR) \text{ OR } P(RG)$$
$$= \left(\frac{3}{5} \times \frac{2}{4}\right) + \left(\frac{2}{5} \times \frac{3}{4}\right)$$ √m1
$$= \frac{3}{5}$$ √A1

23. Triangle A"B"C" is the image of triangle ABC under transformations $T_1 = \begin{pmatrix} 2.5 & 0 \\ 0 & 1 \end{pmatrix}$ followed by $T_2 = \begin{pmatrix} 1 & -1.5 \\ 0 & -1 \end{pmatrix}$. Triangles ABC and A"B"C" are drawn on the following grid.



(a) (i) On the same grid provided, draw Δ A'B'C', the image of Δ ABC under transformation matrix $\boldsymbol{T}_1 = \begin{pmatrix} 2.5 & 0 \\ 0 & 1 \end{pmatrix}$. (3 marks)

T A C C A' B' C'

$$\begin{bmatrix} 2.5 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 2 & 2 & 4 \\ 4 & 2 & 3 \end{bmatrix} = \begin{bmatrix} 5 & 5 & 10 \\ 4 & 2 & 3 \end{bmatrix} \quad \checkmark m_1$$

$A'(5,4)$, $B'(5,2)$, $C'(10,3)$ $\checkmark A_1$

	(ii)	Describe fully the transformation represented by matrix T_1.	(2 marks)

A Stretch parallel to the x – $axis$ with scale factor 2.5 ✓B_1 ✓B_1

(b)	(i)	Find the single transformation matrix that maps Δ ABC onto Δ A"B"C".	(2 marks)

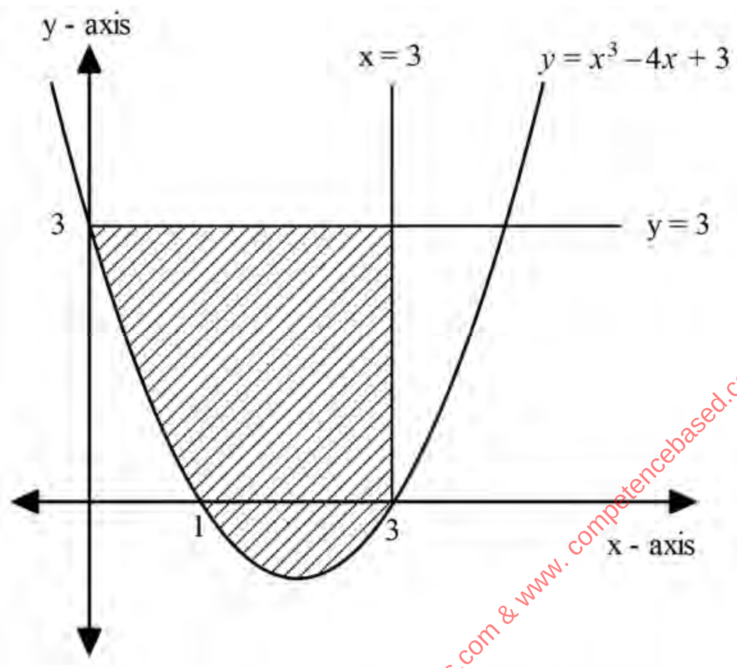
$$\begin{bmatrix} 1 & -1.5 \\ 0 & -1 \end{bmatrix}\begin{bmatrix} 2.5 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 2.5 & -1.5 \\ 0 & -1 \end{bmatrix}$$ ✓B_1 ✓B_1

	(ii)	Determine the area of Δ A"B"C".	(3 marks)

$$\text{Area of Image} = \frac{1}{2} \times 2 \times 2 \times (-2.5)$$ ✓m_1 ✓m_1

$$= 5 \text{ square units}$$ ✓A_1

24. The following figure is a sketch of the curve whose equation is $y = x^2 - 4x + 3$. The y – intercept of the curve is at $y = 3$ while the x- intercepts are at $x = 1$ and $x = 3$. The region bounded by the curve, the line $y = 3$ and the line $x = 3$ is shaded.



(a) (i) Evaluate $\int_0^1 (x^2 - 4x + 3)dx$. (3 marks)

$\left[\frac{1}{3}x^3 - 2x^2 + 3x + C\right]_0^1$ ✓m₁

$\left(\frac{1}{3}(1)^3 - 2(1)^2 + 3(1) + C\right) - \left(\frac{1}{3}(0)^3 - 2(0)^2 + 3(0) + C\right)$ ✓m₁

$= 1\frac{1}{3}$ ✓A₁

(ii) Calculate the area of the shaded region above the *x-axis.* (2 marks)

$(3 \times 3) - 1\frac{1}{3} = 7\frac{2}{3}$ ✓m₁ ✓A₁

(b)	Calculate the area of the shaded region below the x-axis.	(3 marks)
	$\left[\frac{1}{3}(x)^3 - 2(x)^2 + 3(x) + C\right]_1^3$ ✓m1 $\left(\frac{1}{3}(3)^3 - 2(3)^2 + 3(3) + C\right) - \left(\frac{1}{3}(1)^3 - 2(1)^2 + 3(1) + C\right)$ ✓m1 $= -1\frac{1}{3}$ $= 1\frac{1}{3}$ square units ✓A1	
(c)	Calculate the area of the entire shaded region.	(2 marks)
	$A = 7\frac{2}{3} + 1\frac{1}{3}$ ✓m1 $=$ 9 square units ✓A1	

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