MURANGA EAST JOINT MOCK EXAMINATION.

MATHEMATICS FORM FOUR

121/1

NAME.....MARKING..... **INDEX NO** .....SCHEME.

SIGNATURE..... **DATE**.....

INSTRUCTION TO CANDINDATES

a. Write your name and index number in the spaces provided.

b. This paper consist of two sections, section 1 and section 2.

C. Answer all Questions in section 1, and any Five questions in Section 2.

d. Show all steps in your calculations

e. Marks may be given for correct working even if the answer is wrong.

f. Electronic calculators may be used and KNEC mathematical tables except where stated otherwise

FOR EXAMINER'S USE ONLY

SECTION 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION 2

17	18	19	20	21	22	23	24	TOTAL

1. Without using mathematical table or calculator, evaluate 3MKS

$\frac{1}{2} \times \frac{7}{2} + \frac{3}{2}\left(\frac{11}{6}\right)$

$\frac{7}{4} + \frac{33}{12}$

$= \frac{9}{2}$ M1

$\frac{\frac{1}{2} \text{ of } 3\frac{1}{2} + 1\frac{1}{2}\left(2\frac{1}{2} - \frac{2}{3}\right)}{\frac{3}{4} \text{ of } 2\frac{1}{2} \div \frac{1}{2}}$

$\frac{3}{4} \times \left[\frac{5}{2} \div \frac{1}{2}\right]$

$\frac{3}{4} \times 5 = \frac{15}{4}$ M1

$\frac{9}{2} \times \frac{4}{15} = \frac{6}{5}$

$= 1\frac{1}{5}$ or 1.2 A1

2. A square room is covered by a number of whole rectangular slabs of sides 60cm by 42cm. Calculate the least possible area of the room in square metres. 3mks

L.C.M (60, 42) = 420

4.2 M M1

$A = 4.2 \times 4.2$ M1

$= 17.64 M^2$ A1

3. Two numbers x and y are such that $x^3 \times y^2 = 200$, Find the values of x and y. 3mks

$200 = 8 \times 25$ M1

$= 2^3 \times 5^2$ M1

$\Rightarrow x = 2, y = 5$ A1

4. A Kenyan company received US Dollars 100,000.The money was converted in to Kenyan shillings in bank which buys and sells foreign currencies as follows:

	Buying (Kenyan shillings)	Selling (Kenyan shillings)
1US Dollar	129.20	129.45
1Sterling pound	172.48	172.88

a) Calculate the amount of money, Kenya shillings the company received. 1mks

$129.20 \times 100,000$

$= 12,920,000$ Ksh — B_1

b) The company exchanged the Kenya shillings calculated in (a) above in to sterling pounds to by a car from Britain. Calculate the cost of the car to the nearest sterling pounds 2mks

$\frac{12,920,000}{172.88}$ M_1

$= 74,734$ S.pounds A_1

5.Simplify the expression $\frac{4x2-9}{2x2+x-6}$ 3mks

$\frac{(2x+3)(2x-3)}{(x+2)(2x-3)}$ M_1 M_1

$\frac{2x+3}{x+2}$ A_1

6. Determine the values of x given that the matrix $\begin{bmatrix} 2x & x2 \\ 2 & 1 \end{bmatrix}$ has no inverse 3mks

$2x - 2x^2 = 0$ M_1

$2x(1-x) = 0$ M_1

$x = 0$ or $x = 1$ A_1

7.A triangular plot ABC is such that AB = 72 m, BC = 80m and AC = 84m.Calculate the area of the plot in hectares 4 mks

$s = \frac{72+80+84}{2}$ B1

$s = 118$

$A = \sqrt{118(118-72)(118-80)(118-84)}$ M1

$= 2648.202\ m^2$

$= \frac{2648.202}{10,000}$ M1

$= 0.2648$ to 4SF A1

8.A Straight L_1 whose equation is $y = 2 - \frac{1}{3}x$ meets y – axis at Q. An other straight line L_2 is perpendicular to L_1 at Q. Find the equation of L_2 in the form of $y = mx + c$. 3mks

$y = -\frac{1}{3}x + 2$

$Q = (0, 2)$

$-\frac{1}{3} \times m_2 = -1$ B1

$m_2 = 3$

$\frac{y-2}{x-0} = 3$ M1

$y = 3x + 2$ A1

9.A circle of radius 3cm passes through all the vertices of a regular hexagon. Determine the area of circle that lies outside the hexagon.3mks

$\left(\frac{22}{7} \times 3 \times 3\right) - \left(\frac{1}{2} \times 3 \times 3 \sin 60^\circ\right)6$

M1 M1

$28.29 - 23.38 = 4.906\ cm^2$ A1

10.The following frequency distribution table shows the mass, in Kg, of maize flour sold by 30 traders.

Mass in Kg	10-19	20-29	30-39	40-49	50-59
No of traders	3 (3)	8 (11)	10 (21)	7 (28)	2 (30)

Calculate the median mass of the maize flour sold 3mks

$29.5 + \left(\frac{15-11}{10}\right) \times 10$ M1 | 33.5 A1

$29.5 + 4$

B1 for C.f

11.The table below shows the values of x and some values of y for the curve $y = x^2$ for $0 \leq x \leq 3$.

x	0	0.5	1	1.5	2	2.5	3
y	0	0.25	1	2.25	4	6.25	9

a)Complete the table by filling the values of y. 1mk

B1 (Both values).

b)Use mid ordinate rule with 3 strips to estimate the area bounded by the curve $y = x^2$, the x – axis and the line x = 3 3mks

$y_1 = 0.25$
$y_2 = 2.25$
$y_3 = 6.25$

$A = 1(0.25 + 2.25 + 6.25)$ M1 M1
$= 8.75 \text{ (units)}^2$ A1

12. Use factor method to evaluate the expression below leaving your answer as a product of its prime factors in power form. 3mks

$\sqrt{5184 \times 49}$

$5184 = 2^6 \times 3^4$ M1
$49 = 7^2$ M1

$= 2^3 \times 3^2 \times 7^1$ A1

13. Solve for y in the equation $9^{y} + 3^{2y} - 5 = 49$ 3mks .

$3^{2y} + 3^{2y} = 54$ M1

Let $3^{2y} = x$

$2x = 54$

$x = 27 = 3^{3}$

$3^{2y} = 3^{3}$ M1

$2y = 3$

$y = 1\frac{1}{2}$ or 1.5 A1

14. Solve the inequalities and represent the solution on a number line. 3mks

$\frac{x-3}{-3} < 1$

$3x + 1 > -17$

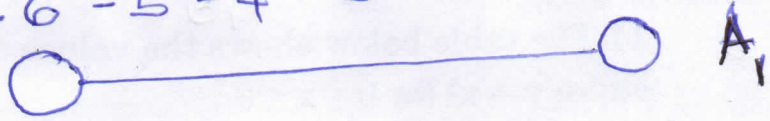
$x - 3 < -3$ M1

$x < 0$

$3x > -18$

$x > -6$ M1

$-6 < x < 0$



A1

15. From the top of a flag post 9m high, the angle of depression of a form 4 student is 56^{0}. Calculate how far the student is from the flag post. 3mks

$\tan 56^{\circ} = \frac{9}{x}$ M1

$x = \frac{9}{\tan 56}$ M1

6.071 M. A1

16. Given the curve $y = x^{3} + 3x - 1$, find the equation of tangent to the curve at point (1,-3) 3mks

$\frac{dy}{dx} = 3x^{2} + 3$ $x = 1$

$\Rightarrow$ Slope $= 6$. B1

$\frac{y+3}{x-1} = 6$ M1

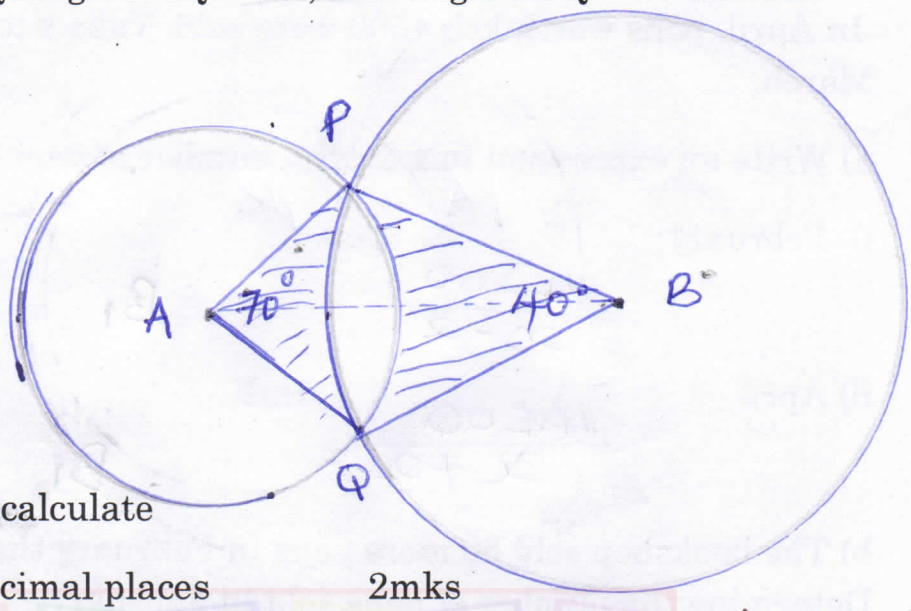
$y + 3 = 6x - 6$.

$y = 6x - 9$ A1

Section 2 50 marks

Answer any five questions in this section

17.The diagram below shows two circles, centres A and B which intersect at P and Q.Angle PAQ = 70^0, and angle PBQ = 40^{0}and PA = AQ = 8cm.



Use the diagram to calculate

a)PQ correct to 2 decimal places 2mks

$\sin 35 = \frac{x}{8}$ | $PQ = 2(8 \times \sin 35°)$ M1

$= 9.177$ cm. A1

b)PB correct to 2 decimal places 2mks

$\sin 20 = \frac{4.589}{PB}$ M1 $PB = 13.42$ cm. A1

c)Area of un shaded region. M1 4 mks

$\left(\frac{70}{360} \times \frac{22}{7} \times 64\right) - \left(\frac{1}{2} \times 64 \times \sin 70\right) + \left(\frac{40}{360} \times \frac{22}{7} \times 180.1\right)$ M1 $- \left(\frac{1}{2} \cdot 180.1 \cdot \sin 40\right)$

$39.11 - 30.07$ M1 $+ 62.89 - 57.88$

$9.04 + 5.01 = 14.05\ cm^2$ A1

d) Area of the shaded region 2 mks

$(30.07 + 57.88) - (14.05)$ M1

$= 73.90 cm^2$ A1

18.The price of a pen in a bookshop changed in the month of February, March and April. The price of a pen was sh2 less in the month of February than the price of a pen in the month of March. In the month of April the price of a pen was sh 2 more than the price of pen in the month of March. The bookshop sold pens worth Ksh 4200 in February .In April, pens worth ksh 4500 were sold. Take x to be price of a pen in March.

a) Write an expression in x for the number of pens sold by bookshop in

i) February 1mk

$\frac{4200}{x-2}$ B1

ii) April 1mk

$\frac{4500}{x+2}$ B1

b) The bookshop sold 50 more pens in February than in April. Determine the number of pens sold in February. 6mks.

$\frac{4200}{x+2} - \frac{4500}{x+2} = 50$ M1

$\frac{4200(x+2) - [4500(x-2)]}{x^2-4} = 50$

$50x^2 + 300x - 17600 = 0$ M1

$x^2 + 6x - 352 = 0$

$x = \frac{-6 \pm \sqrt{36 - (4 \times 1 \times -352}}{2}$

$x = \frac{-6 \pm 38}{2}$ M1

$x = \frac{-6+38}{2} = 16$ A1

or

$x = \frac{-6-38}{2} = -22$ ignore.

$\frac{4200}{14} = 300$ pens

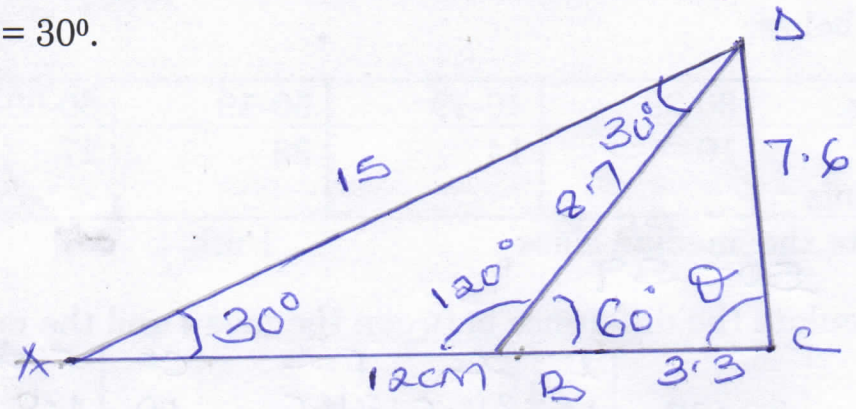
M1 A1

c) Determine the percentage change in the number of pens sold by the bookshop in April compared to the number sold in February. 2mks

$\frac{50}{300} \times 100\% = 16.6\%$. A1

M1

19. In the figure below, AC = 12cm, AD = 15cm and B is a point on AC. <BAD = <ADB = 30°.



Calculate to 1 decimal place:

a) The length of CD 3mks

$CD^2 = 15^2 + 12^2 - 2 \times 12 \times 15 \times 0.8660$ M_1

$= 225 + 144 - 311.76$ M_1

$CD = 7.6$ cm. A_1

b) The length of AB 3mks

$\frac{AB}{\sin 30} = \frac{15}{\sin 120}$ M_1

$AB = \frac{15 \times \sin 30}{\sin 120}$ M_1 $= 8.7$ cm. A_1

c) The area of triangle BCD. 2mks

$\frac{1}{2} \times 3.3 \times 8.7 \sin 60°$ M_1

$= 12.4\ cm^2$ A_1

d) The size of angle BCD 2mks

$\frac{8.7}{\sin\theta} = \frac{7.6}{\sin 60}$ M_1 $\theta = 82.46°$ A_1

OR $\frac{1}{2} \times 3.3 \times 7.6 \times \sin\theta = 12.4$

$\theta = 81.43°$

20.The end term scores of 100 students were recorded as shown in the table below.

scores	30-39	40-49	50-59	60-89	90-99
No of students	10	14	33	27	16

a)State the median class 1 mk.

50 - 59 B1

b)Calculate the difference between the mean and the median score. 4mks

	f	x	fx	CF	F.d
30-39	10	34.5	345	10	1.0
40-49	14	44.5	623	24	1.4
50-59	33	54.5	1798.5	57	3.3
60-89	27	74.5	2011.5	84	0.9
90-99	16	94.5	1512	100	1.6
	100		6290		

B1

$\bar{x} = \frac{6290}{100}$

$= 62.9$ M1

$M = 49.5 + \left(\frac{50-24}{33}\right)10$ M1

$= 57.34$

Diff $= 62.9 - 57.34 = 5.560$ A1

c) i) On the grid provided ,represent the above data using a Histogram. 3mks

ii) Use your histogram to find the number of students who scored marks between 69.5 and 94.5 . 2mks

$= (20 \times 0.9) + (5 \times 1.6)$ M1

$= 26$ students A1

B_1 - correct scale.

B_2 - All Bars Correct.

21.A kite ABCD has vertices at A(1,1) ,B (6,3) ,C(6,6) and D(2,6).

a) On the grid provided draw the ABCD. 1mk

B1 - ABCD

b)On the same axes, draw

i) A'B'C'D' image of ABCD under rotation of 90^0 about the origin. 3mks.

State the coordinates of A'B'C'D'

A'(-1, 1) B'(-2,6) C'(-6,6) D'(-6,2) B1

ii) A"B"C"D" image of A'B'C'D' under reflection in the line y = x. 3mks

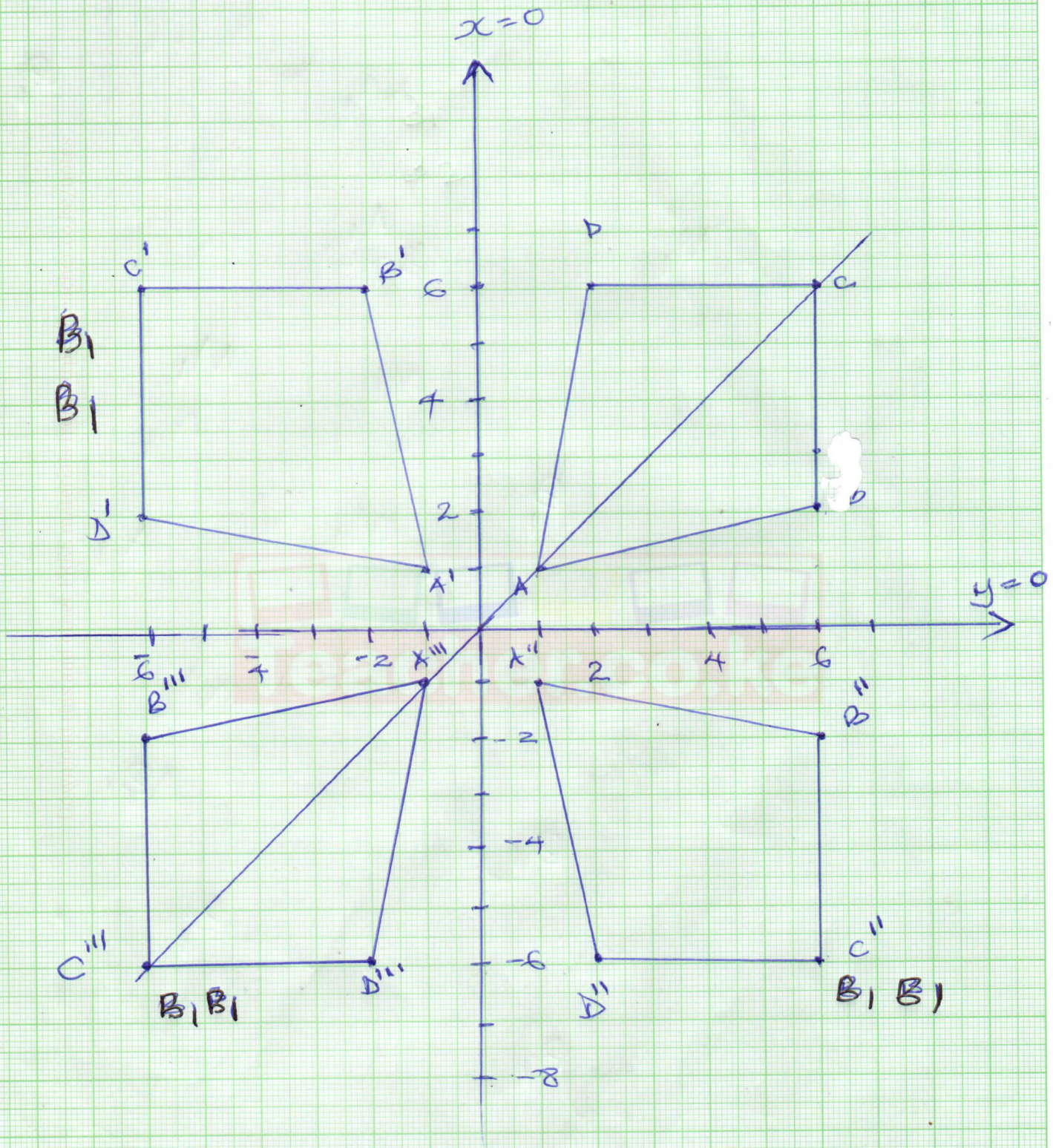
State the coordinates of A"B"C"D".

A"(1,-1) B"(6,-2) C"(6,-6) D"(2,-6) B1

iii) A'"B'"C'"D'" image of the A"B"C"D" under reflection in the line x = 0. 2mks

c) Describe a single transformation that maps A"B"C"D" on to ABCD. 1mk

Reflection in the line y=0 or x-axis. B1



22. Three straight lines L:2x + 3y + 5 = 0 , P:x – 2y – 8 = 0 and M: intersect at point S. Given that the line M is perpendicular to P:

a) Find the coordinates of point S. 3mks

$2x+3y=-5$
$x-2y=8$

$2x+3y=-5$
$2x-4y=16$
$7y=-21$ M_1

$7y=-21$
$y=3$
$2x+9=-5$
$x=2$ A_1
(B or L)

$S(2,-3)$ B_1

b) Find the equation of line M in form y = mx + c, where m and c are constants. 3mks

$2y=x-8$
$y=\frac{1}{2}x-4$
$\frac{1}{2}\times m_2=-1$
$m_2=-2$ B_1

$\frac{y+3}{x-2}=-2$ M_1
$y+3=-2(x-2)$
$y+3=-2x+4$
$y=-2x+1$ A_1

c) An other line K: is parallel to line M: and meets line L: at a point where x = -4, Find x and y intercepts of line K: 4mks

$2(-4)+3y=-5$
$3y=3 \Rightarrow y=1$
$(-4,1)$ B_1
$g=-2$
$\frac{y-1}{x+4}=-2$
$y-1=-2x-8$
$y=-2x-7$ B_1

x-Intercept $y=0$
$x=-3.5$ B_1

y-Intercept, $x=0$
$y=-7$ B_1

23.A trailer left town P at 11.45 am , and travelled towards town Q at an average speed of 60Km/hr. A car left town P at 2.15pm, on the same day and travelled along the same road at an average speed of 100Km/hr. The distance between towns P and Q is 500Km.

a) Calculate the time of the day when the car overtook the trailer. 4mks

$60 \times 2\frac{1}{2} = 150$ M1
150Km
$(100-60) = 40$
40Km/Hr

$\frac{150}{40} = 3\frac{3}{4}$ Hrs M1
3H 45 Min

2:15 M1
+ 3.45
6.00 pm. A1

b)The distance from P when the car overtook the trailer. 3mks

$= 100 \times \frac{15}{4}$ M1
$= 25 \times 15$ M1
$= 375$ Km. A1

OR
$60 \times \frac{15}{4} + 150$ M1
225 + 150 M1
375 KM. A1

c) After overtaking the trailer , both vehicles continued towards Q , at their original speeds. Find how long the car had to wait at town Q , before the trailer arrived. 3mks.

TT $\frac{500-375}{60}$ M1
2Hr 5Min.

TC $\frac{500-375}{100}$ M1
1Hr 15Min

2Hrs 5Min.
- 1Hr 15Min
50Min. A1

or 8:05 pm.
- 7.15 pm.
50Min.

24. The displacement , S , of a [article after t seconds is given by

$S = 40t^3 - t^2 - 3t + 3$. Find the:

a) Velocity of the particle when t = 2 seconds. 3mks

$V = \frac{ds}{dt} = 120t^2 - 2t - 3$ M1

$V = 120(4) - (2 \times 2) - 3$ M1

$V = 473 m/s$. A1

b) Time when the particle is momentarily at rest. 3mks

$120t^2 - 2t - 3 = 0$ M1

$t = 2 \pm \sqrt{(-2)^2 - (4 \times 120 \times -3)}$ M1

240

$t = -0.15$ or $\frac{1}{6}$

$t = \frac{1}{6}$ A1

c) The maximum displacement of the particle 2mks

$S = 40\left(\frac{1}{6}\right)^3 - \left(\frac{1}{6}\right)^2 - 3\left(\frac{1}{6}\right) + 3$ M1

$= 2.657m$ or $2\frac{71}{108} m$ A1

d) Acceleration of the particle when t = 3 seconds. 2mks

$a = \frac{dv}{dt} = 240t - 2$ M1

$a = 240 \times 3 - 2 = 718 m/s^2$ A1