(1.) Evaluate: (3marks)

$$\frac{(1\frac{3}{7} - \frac{5}{8}) \times \frac{2}{3}}{\frac{3}{4} + 1\frac{5}{7} \div \frac{4}{7} \text{ of } 2\frac{1}{3}}$$

Numerator

$\frac{10}{7} - \frac{5}{8} = \frac{45}{56}$

$\frac{45}{56} \times \frac{3}{28} = \frac{15}{28}$ ✓M1

Denominator

$\frac{4}{7} \times \frac{7}{3} = \frac{4}{3}$

$\frac{12}{7} \div \frac{4}{3} = \frac{3}{7} \times \frac{3}{4} = \frac{9}{7}$

$\frac{3}{4} + \frac{9}{7} = \frac{57}{28}$ ✓M1

$\frac{\frac{15}{28}}{\frac{57}{28}} = \frac{15}{28} \times \frac{28}{57}$

$= \frac{15}{57}$ ✓A1

(2.) A line passing through points P (4, a) and Q (3, 2) is perpendicular to the line 3y + x + 3 = 0. Find the value of a and write down equation of line PQ. (4 marks)

$3y = -x - 3$

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

$m_1 m_2 = -1$

$m_2 = -1 \times -3$ M1

$= 3$ ✓

$3 = \frac{a-2}{4-3}$ B1

$3 = \frac{a-2}{1}$

$3 = a - 2$ M1

$a = 5$ ✓A1

$3 = \frac{5-y}{4-x}$

$12 - 3x = 5 - y$

$y = 3x + 5 - 12$

$y = 3x - 7$ A1

(3.) Use reciprocal tables to find the value of $(0.325)^{-1}$ hence evaluate ($\frac{\sqrt[3]{0.0000125}}{0.325}$), give answer to 4 s.f. (3marks)

0.325^{-1}

$\frac{1}{3.25 \times 10^{2}} = 3.0769$ ✓M1

$\sqrt[3]{0.00000125}$

$= (12.5 \times 10^{-6})^{1/3} = 5/100$ ✓M1

$= 3.0769 \times 5/100 = 0.1538$ ✓A1

(4.) Solve for x in the equation (3marks)

$\frac{x-3}{4} - \frac{x+3}{6} = \frac{x}{3}$)12

$3x - 9 - 2x - 6 = 4x$ ✓M1

$x - 15 = 4x$ ✓B1

$3x = -15$ ✓M1

$x = -5$ ✓A1

(5.) Using the three quadratic identities only factorize and simplify: (4marks)

$$\frac{(x-y)^2-(x+y)^2}{(x^2+y^2)^2-(x^2-y^2)^2}$$

$(x-y)^2 = (x+y)(x-y)$

$x^2-2xy+y^2-x^2-2xy-y^2$

Num $= -4xy$ ✓M1

Denom. $= x^2+2x^2y^2+y^4-x^2+2x^2y^2+y^4$

$= 4x^2y^2$ ✓M1

$$\frac{-4xy}{4x^2y^2} = -\frac{1}{xy}$$ ✓A1

(6.) In a regular polygon, the exterior angle is $^1/_3$ of its supplement. Find the number of sides of this polygon. (3marks)

$\frac{1}{3}x$ | x

$\frac{1}{3}x + x = 180^\circ$

$\frac{4}{3}x = 180^\circ$

$x = 180^\circ \times \frac{3}{4}$

$= 135^\circ$ ✓M1

Exterior $= 135^\circ \times \frac{1}{3} = 45^\circ$ ✓M1

$n = \frac{360^\circ}{45^\circ}$

$= 8$ sides ✓A1

(7.) Find the area of a segment of a circle whose arc subtends an angle of $22^1/_2$ on the circumference of a circle, radius 10cm. (3marks)

$= \frac{\theta}{360^\circ}\pi r^2$

$= \frac{22.5}{360^\circ} \times \frac{22}{7} \times 10^2$ ✓M1B1

$= 19.63\ cm^2$ ✓A1

(8.) Mr. Onyangos piece of land is in a form of triangle whose dimensions are 1200m, 1800m and 1500m respectively. Find the area of this land in ha.(give your answer to the nearest whole number) (3marks)

$A = \sqrt{s(s-a)(s-b)(s-c)}$

$s = \frac{1500+1800+1200}{2}$ M1

$s = 2250$ ✓

$A = \sqrt{2250(2250-1500)(2250-1200)(2250-1800)}$ M2

$= \sqrt{2250 \cdot 750 \cdot 450 \cdot 1050}$

$= 892941.2675\ m^2$

$\left(\frac{892941.26}{10000}\right)ha = 9ha$ A1

8.9ha

(9.) Two men each working for 8hours a day can cultivate an acre of land in 4 days. How long would 6men, each working 4hours a day take to cultivate 4 acres? (3marks)

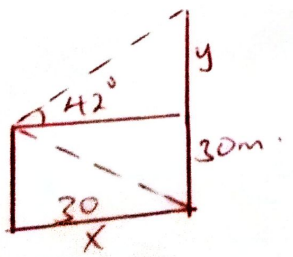
M	hrs	A	Day
2	8	1	4
	4	4	

$= \left(\frac{2 \times 8 \times 1 \times 4}{6 \times 4}\right)4$ M1B1

$= 10.6$ days

$= 11$ days A1

(10.) From a viewing tower 30metres above the ground, the angle of depression of an object on the ground is 30^0 and the angle of elevation of an aircraft vertically above the object is 42^0.Calculate the height of the aircraft above the ground. (3marks)



$x = \frac{30}{\tan 30^\circ} = 51.96$ M1

$y = 51.96 \times \tan 42 = 46.79$ M1

$= 79.79$ m A1

(11.) Solve the following inequality and show your solution on a number line. (3marks)

$4x - 3 \leq \frac{1}{2}(x + 8) < x + 5$

$4x - 3 \leq \frac{1}{2}(x+8)$

$3\frac{1}{2}x \leq 7$ ✓

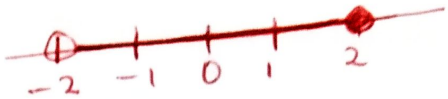
$x \leq 2$

$\frac{1}{2}x + 4 < x + 5$

$-1 < \frac{1}{2}x$ ✓

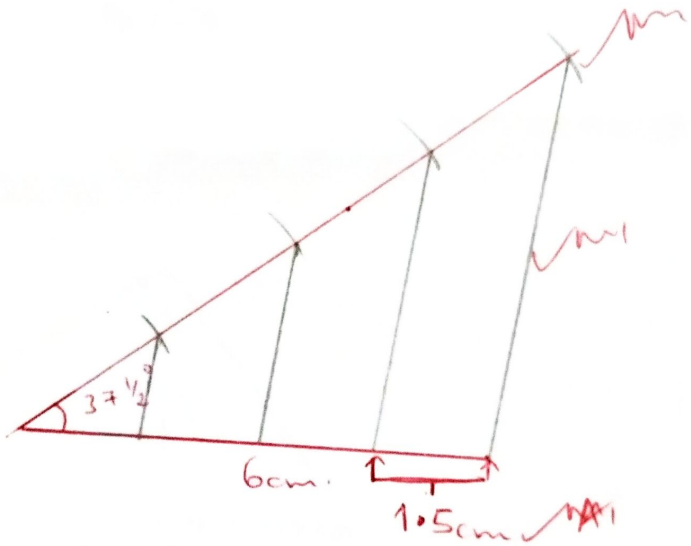
$-2 < x$

$-2 < x \leq 2$ ✓



(12.) Using a ruler, a pair of compasses only and (proportional) a set square, construct on the upper side division of line **BC**, a line **BD** such that $\angle$ **DBC** = 37.5°. Use the line **BD** to divide **BC** into 4 equal portions. (3marks)

BC = 6cm.



(13). A Kenyan bank buys and sells foreign currency as shown below.

	Buying Ksh	Selling Ksh
1 US dollar ($)	103.00	106.20
1 UK pound (£)	145.00	149.95

A tourist arrived in Kenya with £9600 which he converted into Kshs at a commission of 5%. He later used ¾ of the money before changing the balance of dollars at no commission calculate; to the nearest dollar, the amount he received. (3marks)

$\frac{95}{100} \times 9600 \times 145 =$ Ksh 1,322,400 M1.

money left $= 1 - \frac{3}{4} = \frac{1}{4}$

$\frac{1}{4} \times 1,322,400 = 330,600$ M1

into $\$ = \frac{330,600}{106.20} = \$\ 3,112.99$

$= \$3,113$ A1

(14.) A map is drawn to scale of 1:50,000. Find the area in cm^2 on the map of a field with an actual area of 60,000m^2. (3marks).

$1^2 cm = (50{,}000 \times 50{,}000)\ m^2$ M1

$= 250{,}000\ m^2$ M1

$\frac{60{,}000}{250{,}000} = 0.24\ cm^2$ A1

(15.) Two similar solids have surface areas of 48cm^2 and 108cm^2 respectively. Find the volume of the smaller solid if the bigger one has a volume of 162cm^3. (3marks).

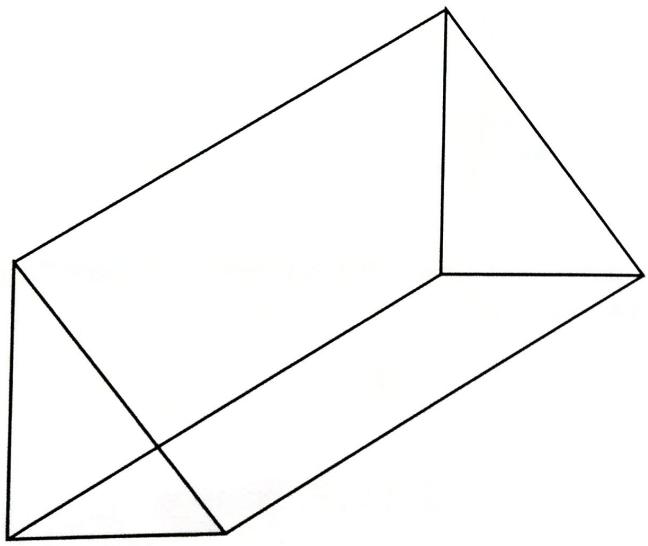
L.S.F $= \sqrt{\frac{48}{108}} = \sqrt{\frac{x}{162}}$

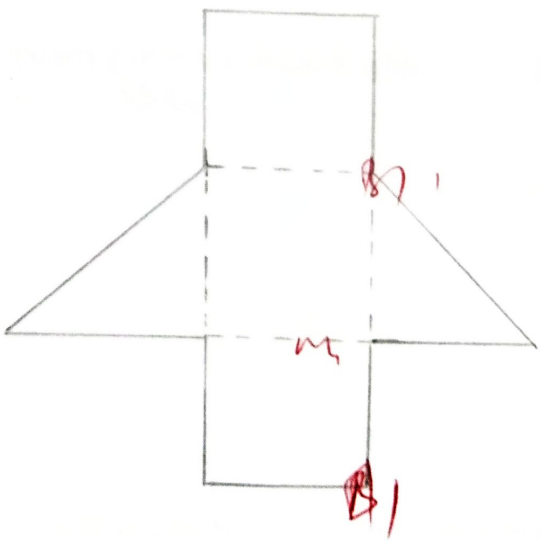
$= (2/3)^3 = \frac{x}{162}$ M1

$x = (2/3)^3 \times 162$ M1

$= 48\ cm^3$ A1

(16.) The diagram below represents a prism whose cross section is a right angled triangle. Draw a labeled sketch of the net of the prism.
(3marks).





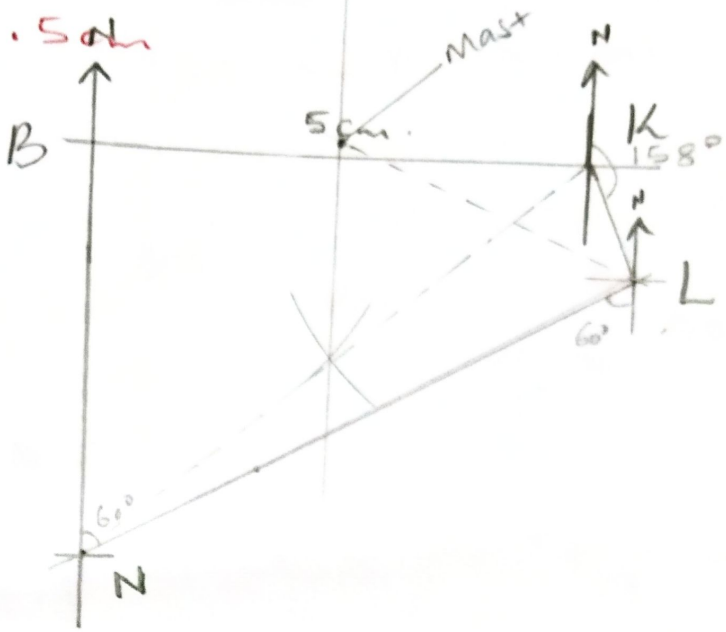
Section II. Answer any five questions.

17. Four schools: Lihanda, Kagito, Bar-Sari and Ndori are such that Lihanda is 6km from Kagilo on a bearing of 158°, Bar-Sauri is to the west of Kagilo and 20km away while Ndori is to the South of Bar-sauri on a bearing of 240° from Lihanda.

a) Using a scale of 1:400,000 draw a scale diagram showing the relative positions of the four schools (5mark)

20km = 5cm.

6 = 1.5cm



b) Using your diagram determine the distance and bearing of Ndori from Kagilo. (2 marks)

NK = 7.8cm ± 0.1cm = 4000m = 4km.

= 7.8 x 4 M1

= 31.2 km A1

c) **A mast is to be erected so that it is equidistant from Kagilo and Bar-sauri and 20km from Ndori. On the same diagram show the position of the mast and find its distance from Lihanda. (3marks)**

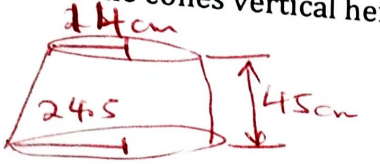
* 3.9cm ± 0.1 M1

= 3.9 x 4 M1

= 15.6 km A1

18. A commemorative stone is sculptured in a shape of a frustum of a cone with the diameters of the top and bottom faces being 28cm and 49cm respectively. If the vertical distance between the faces is 45cm, find:

i) Find the cones vertical height. (2marks)



$\frac{R}{r} = \frac{H}{h}$.

$\frac{24.5}{14} = \frac{45+h}{h}$ M1

$24.5h = 14h + 630$

$10.5h = 630$

$h = 60$ cm.

$H = 60 + 45$

$= 105$ cm A1.

(ii) Find the volume of the stone. (3 marks)

$= \frac{1}{3}\pi r^2 h$.

$= \frac{1}{3}\pi (24.5^2 \times 105 - 14^2 \times 60)$ B1 M1

$= 53,685.89$ cm^3 A1

ii) Surface area of the stone. (5 marks)

curved part.

$\frac{1}{2}\pi rL$ $= \frac{1}{3}\pi (107.8 \times 24.5 - 14 \times 61.61)$.

$= 1,862.50$ M1

$14^2 + 60^2 = L^2$

$L^2 = 61.61$

$\frac{L}{61.61} = \frac{105}{60}$

$L = \frac{105 \times 61.61}{60}$ M1.

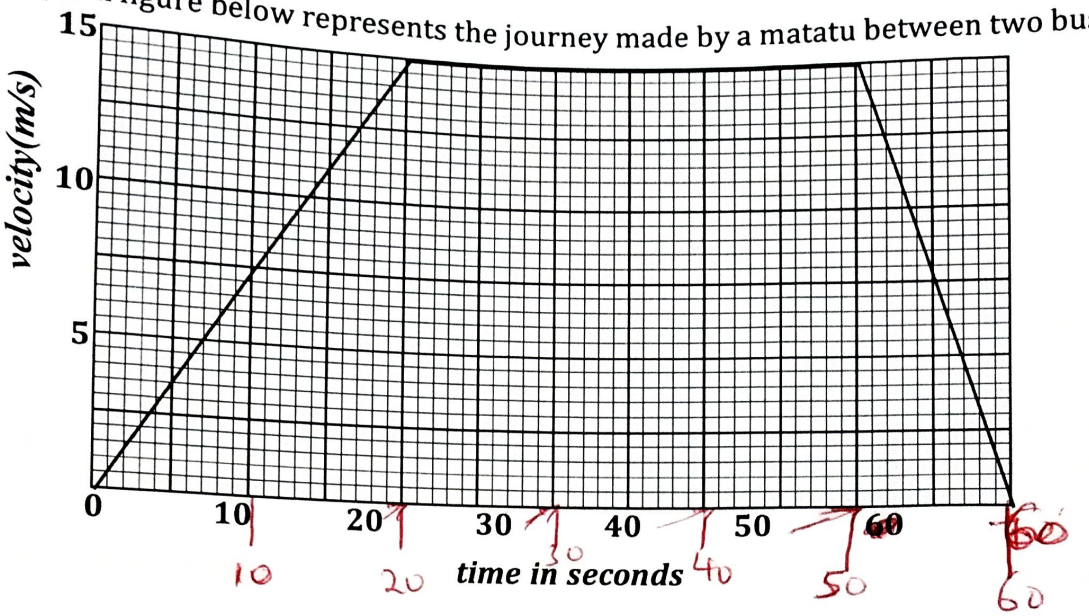
$= 107.8$

Area $C_1 = 14 \times 14 \times \frac{22}{7} = 615.75$ M1

$C_2 = 24.5^2 \times \frac{22}{7} = 1885.74$ +

$4,363.99$ cm^2 A1

20. The graph in figure below represents the journey made by a matatu between two bus stops.



a) What is the acceleration of the matatu? (2 marks)

$a = \frac{15-0}{20-0} = 0.75 m/s^2$ M1

$= 0.75 m/s^2$ A1

b) Calculate the deceleration of the matatu? (2 marks)

$a = \frac{15-0}{50-60}$ M1

$= \frac{15}{-10} = -1.5 m/s^2$ A1

c) What distance does the matatu cover while accelerating? (2 marks)

~~Area $= \frac{1}{2} \times 10 \times 15 = 75$ M1~~

~~$= 75m$ A1~~

$A = \frac{1}{2} \times 20 \times 15$ M1

$= 150m$ A1

d) Calculate the distance covered by matatu while decelerating (2marks)

Area $= \frac{1}{2} \times 10 \times 15 = 75$ M1

$= 75m$ A1

e) Calculate the distance between the two bus stops. (2 marks

Area = $\frac{1}{2}h(a+b)$

$= \frac{1}{2} \times 15(60+30)$ M1

$= 7.5 \times 90$

$= 675\text{m}$ A1

21. An amount of money was shared among five boys Ali, Juma, Musa, Khalid and Mustafa. Ali got $^{3}/_{8}$ of the total amount while Juma got $^{2}/_{5}$ of the remainder. The remaining amount was shared equally among Musa, Khalid and Mustafa, each of which received Kshs 600.

a) How much did Juma get? (3 marks)

Ali $= \frac{3}{8}x$

Juma $= \frac{2}{5}$ of $(1-\frac{3}{8})x = \frac{1}{4}x$

Remaining $= (1-(\frac{3}{8}+\frac{1}{4}))x = \frac{3}{8}x$ M1

$= \frac{3}{8}x \times \frac{1}{3} = 600$ M1

$= x = 600 \times 8$

$= 4,800$ A1

b) How much was shared among the five boys. (2 marks)

$\frac{3}{8}x = 4,800$

$x = \frac{4800 \times 8}{3}$ M1

$= 12,800$ A1

c) Ali, Juma and Mustafa invested their money and earned a profit of Kshs 1200. A third of the profit was left to maintain the business and the rest shared according to their investments. Calculate how much each got. (5 marks)

Ali $= \frac{3}{8} \times 12,800 = 4,800$

Juma $= \frac{1}{4} \times 12,800 = 3,200$ M1

Mustafa $= 600$ +

$8,600$ B1

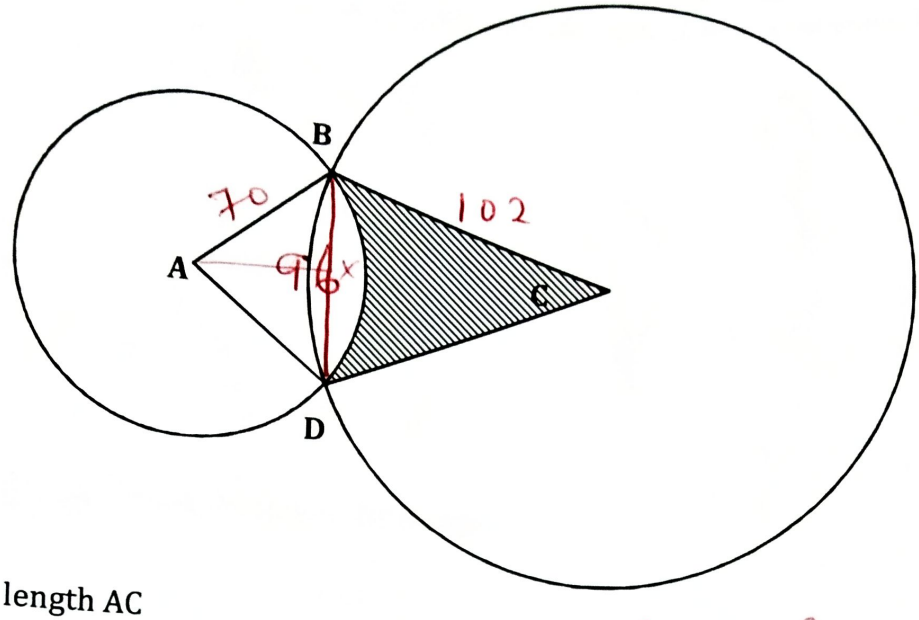
Ali $= \frac{4800}{8600} \times 1200 = 670$ A1

Juma $= \frac{3200}{8600} \times 1200 = 446.50$ A1

Mustafa $= \frac{600}{8600} \times 1200$

$= 84$ A1

22. In the diagram below, two circles centres A and C have radii 70cm and 102cm respectively, intersects at B and D . BD = 96cm



a) Find the length AC (3 marks)

$AX^2 = 70^2 - 48^2$ $\quad CX^2 = 102^2 - 48^2$

$AX = 50.95$ ✓M1 $\quad CX = 90$ ✓M1

$AC = AX + CX = 90 + 50.95 = 140.95\text{cm}$ ✓A1

b) Calculate

i) Angle BAD (2 marks)

$\angle BAD = 2\angle BAX$

$\sin \angle BAX = 48/70$

$\angle BAX = \sin^{-1}(48/70)$ ✓M1

$= 43.29°$

$\angle BAD = 2(43.29)$

$= 86.58°$ A1

ii) Angle BCD (2 marks)

$\angle BCD = 2\angle BCX$

$\sin \angle BCX = 48/102$

$\angle BCX = \sin^{-1}(48/102)$

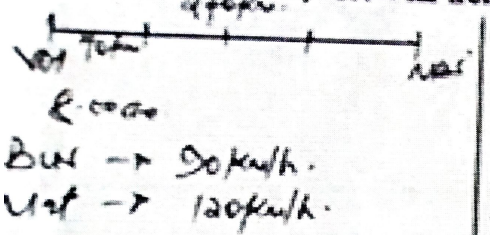
$= 28.07$ ✓M1

$\angle BCD = 56.14°$ ✓A1

iii) The area of the shaded part. (3 marks)

14. A bus and a matatu left voi for Mombasa ,240km away at 8.00am.they travelled at 90km/h and 120km/h respectively. After 20minutes the matatu had a puncture which took 30 minutes to mend.it then continued with thee journey.

a) How far from voi did the matatu catch up with the bus (6mks)



$D = S \times T$

$= 120 \times \frac{20}{60}$

$= 40km.$

$D = S \times T$

$= 90 \times \frac{50}{60}$

$= 75km.$

$D.D = 35km.$

R.speed $= (120 - 90)km/h.$

$= 30km/h.$

$D.T = \frac{35}{30} = 1\frac{1}{6}hrs.$

$= \frac{7}{6}hrs.$

$D = S \times T.$

$= 120 \times \frac{7}{6} = 140km.$

D from voi

$= (40 + 140)km.$

$= 180km.$

b) At wht time did the matatu catch up with the bus? (2mks)

$= (8.00am + 90min + 30min)$

$= 8.50am + 1hr\ 10min$

$= 10.00am.$

c) At what time did the bus reach Mombasa? (2mks)

$T = \frac{D}{S}$

$= \frac{240km}{90km/h}$

$= 2\frac{2}{3}hrs.$ or $\frac{8}{3}hrs$

$\therefore 8.00a.m + 2hr\ 40min.$

$= 10:40am$

24. A particle P moves in a straight line such that t seconds after passing a fixed point Q. its velocity is given by the equation $2t^2 - 10t + 12$ find:

a) The values of t when p is instantaneously at rest. (2 marks)

$V = 2t^2 - 10t + 12$

$\frac{2}{2}t^2 - \frac{10t}{2} + \frac{12}{2} = 0$ M1

$t^2 - 5t + 6 = 0$

$t = 3$ or $t = 2$ A1

b) An expression for the distance moved by P after t seconds. (2 marks)

$\frac{ds}{dt} = 2t^2 - 10t + 12$ ✓m_1

$s = \int 2t^3 - 10t + 12dt = \frac{2}{3}t^3 - 5t^2 + 12t + C$

c) The total distance traveled by P in the first 3 seconds after passing point O. (3 marks)

$\int_0^3 2t^2 - 10t + 12dt$

$= \frac{2}{3}t^3 - 5t^2 + 12t$ ✓m_1 $= 9m$ ✓A_1

$= \frac{2}{3}(3)^3 - 5(3)^2 + 12(3)$ ✓m_1

$18 - 45 + 36$

d) The maximum velocity attained by the body. $\frac{dv}{dt} = 0$ (3 marks)

$a = \frac{dv}{dt} = 4t - 10$ ✓m_1

$4t - 10 = 0$

$s = 2.5s$ ✓m_1

$V = 2 \times 2.5^2 - 10 \times 2.5 + 12 = -0.5$ ✓m/s^2 A_1

(26) On the graph paper provided plot the points P(2,2) Q(2,5) and R(4,4)

a) Join them to form a triangle PQR (1mk)

b) Reflect the triangle PQR in the line x=0 and label the image s $P^1Q^1R^1$. (2mks)

c) Triangle PQR is given translation by vector T $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ to $P^{11}Q^{11}R^{11}$.plot the triangle $P^{11}Q^{11}R^{11}$. (3mks)

d) Rotate triangle $P^{11}Q^{11}R^{11}$ about the origin through -90^0.state the coordinates of $P^{111}Q^{111}R^{111}$. (3mks)

e) Identify two pairs of triangle that are direct congruence (1mk)

(16)

c) $\begin{pmatrix} P' \\ 4 \\ 6 \end{pmatrix}$ $\begin{pmatrix} Q'' \\ 4 \\ 7 \end{pmatrix}$ $\begin{pmatrix} R'' \\ 6 \\ 6 \end{pmatrix}$ $P''(4,6)$ $Q''(4,7)$ $R''(6,6)$

d) Rotate 180° $P'''(4,-4)$ $Q'''(7,-4)$ $R'''(6,-6)$