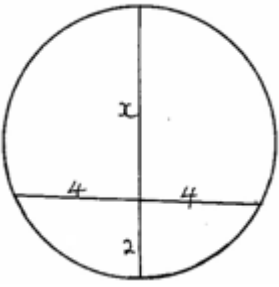
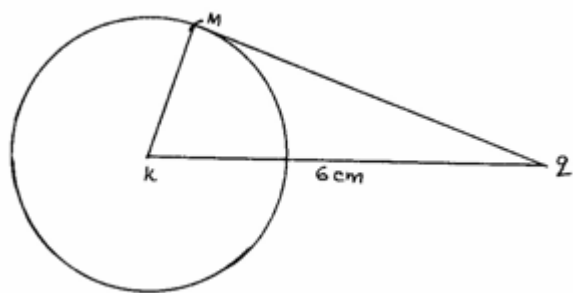


|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------|--------|--------|--------|--------|---------------------|--------|----|-----------------|---------------|---|----|--|
| 1.                  | $2^x = 3$<br>$x \log 2 = \log 3$<br>$x = \frac{\log 3}{\log 2} = \frac{0.4771}{0.3010}$<br><table><tr><td>No</td><td>Log</td></tr><tr><td>0.4771</td><td>1.6786</td></tr><tr><td>0.3010</td><td>1.4786</td></tr><tr><td><math>1.585 \times 10^4</math></td><td>0.2000</td></tr></table> $x = 1.585$                                                                                                                                                                                 | No            | Log                          | 0.4771 | 1.6786 | 0.3010 | 1.4786 | $1.585 \times 10^4$ | 0.2000 | M1 | ✓ log for 3 & 2 |               |   |    |  |
| No                  | Log                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
| 0.4771              | 1.6786                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
| 0.3010              | 1.4786                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
| $1.585 \times 10^4$ | 0.2000                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M1            | ✓ operation of logs          |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | A1            | ✓                            |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3             |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
| 2.                  | $A^2 = \frac{3 + 2x}{5 - 4x}$<br>$A^2(5 - 4x) = 3 + 2x$<br>$5A^2 - 4A^2x = 3 + 2x$<br>$5A^2 - 3 = 2x + 4A^2x$<br>$5A^2 - 3 = x(2 + 4A^2)$<br>$x = \frac{5A^2 - 3}{4A^2 + 2}$                                                                                                                                                                                                                                                                                                        | M1            | ✓ remove of $\sqrt{\quad}$   |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M1            | Bringing like terms together |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | A1            |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3             |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
| 3.                  | <table><tr><td>Men</td><td>hrs</td><td>Land</td><td>Days</td></tr><tr><td>18</td><td>8</td><td>1</td><td>12</td></tr><tr><td>24</td><td>12</td><td><math>\frac{3}{4}</math></td><td>-</td></tr></table> <p>Days required =</p> $\frac{18}{24} \times \frac{8}{12} \times \frac{3}{4} \times 12$ $= 4\frac{1}{2} \text{ days}$                                                                                                                                                       | Men           | hrs                          | Land   | Days   | 18     | 8      | 1                   | 12     | 24 | 12              | $\frac{3}{4}$ | - | M1 |  |
| Men                 | hrs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Land          | Days                         |        |        |        |        |                     |        |    |                 |               |   |    |  |
| 18                  | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1             | 12                           |        |        |        |        |                     |        |    |                 |               |   |    |  |
| 24                  | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\frac{3}{4}$ | -                            |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M1            |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | A1            |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3             |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
| 4.                  | <p>Let Soya be A and millet be B</p> <p>Let the ratio be 1: n</p> <p>1kg of A costs 65/=</p> <p>nkg of B cost 40n/=</p> <p>∴ (1 + n) kg mixture costs</p> <p>(65 + 40n)/=</p> <p>1kg mixture costs</p> $\frac{65 + 40n}{1 + n}$ <p>But 1kg mixture is sold at ksh.60/= making 20% profit</p> $\therefore 60 = \frac{120}{100} \left( \frac{65 + 40n}{1 + n} \right)$ $60(1 + n) = 1.2(65 + 40n)$ $60 + 60n = 78 + 48n$ $12n = 18$ $n = 1.5$ <p>∴ Mixture A: B = 1: 1.5</p> $= 2: 3$ | M1            |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M1            |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |
|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | A1            |                              |        |        |        |        |                     |        |    |                 |               |   |    |  |

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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                               |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 5. |  <p> <math>4 \times 4 = 2 \times x</math><br/> <math>16 = 2x</math><br/> <math>x = 8</math><br/> Diameter = <math>8 + 2</math><br/> <math>= 10\text{cm}</math><br/> <math>r = 5\text{cm}</math> </p>                                                                                                                                                                                                                                                                                                                                             | M1<br><br>M1<br>A1<br>3       |
| 6. | $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 10 \\ 14 \end{pmatrix}$ $\frac{1}{2} \begin{pmatrix} 2 & -1 \\ -2 & 2 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ $= \frac{1}{2} \begin{pmatrix} 2 & -1 \\ -2 & 2 \end{pmatrix} \begin{pmatrix} 10 \\ 14 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{2} \begin{pmatrix} 6 \\ 8 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ $x = 3 \text{ and } y = 4$ | M1<br><br>M1<br>A1<br>3       |
| 7. | $\text{Log}_2 \frac{x+7}{x-7} = 3$ $\frac{x+7}{x-7} = 2^3$ $\frac{x+7}{x-7} = 8$ $x+7 = 8(x-7)$ $x+7 = 8x-56$ $x-8x = -56-7$ $-7x = -63$ $x = 9$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | M1<br><br>M1<br>M1<br>A1<br>4 |

8.



$$Q_m = 5.5 \pm 0.1$$

B1

B1

B1

B1

3

9.

$$\text{Working quotient} = \frac{4.6}{2.0} = 2.3$$

$$\text{Maximum quotient} = \frac{4.65}{1.95} = 2.385$$

$$\begin{aligned} \text{Minimum quotient} &= \frac{4.55}{2.05} \\ &= 2.22 \end{aligned}$$

$$\begin{aligned} \text{Absolute error} &= \frac{2.385 - 2.22}{2} \\ &= 0.0825 \end{aligned}$$

} M1

A1

$$\begin{aligned} \text{(b) Percentage error} &= \frac{0.0825}{2.3} \times 100 \\ &= 3.587\% \end{aligned}$$

B1

10.

$$\begin{aligned} \text{UQ} &= \frac{3}{4} (9)^{\text{th}} = 6.75^{\text{th}} \\ &= \frac{23 + 28}{2} = 25.5 \end{aligned}$$

$$\begin{aligned} \text{LQ} &= \frac{1}{4} (9)^{\text{th}} = 2.25^{\text{th}} \\ &= \frac{15 + 16}{2} = 15.5 \end{aligned}$$

2

M1

M1

$$\text{Quartile deviation} = \frac{25.5 - 15.5}{2}$$

$$= 5$$

A1

11.

$$AC = CB = x$$

$$\therefore x^2 + x^2 = 14^2$$

$$2x^2 = 196$$

$$x^2 = 98$$

$$\begin{aligned} AC = CB &= 9.8994949 \\ &= 9.8995 \text{ cm} \end{aligned}$$

$$\text{Area} = \frac{1}{2} \times 9.8995 \times 9.8995$$

$$= \frac{1}{2} \times 98 = 49 \text{ cm}^2$$



16.  $\text{Det} = \frac{54}{13.5} = 4$

M1

$$4 = x(x - 2) - (-2x)$$

M1

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

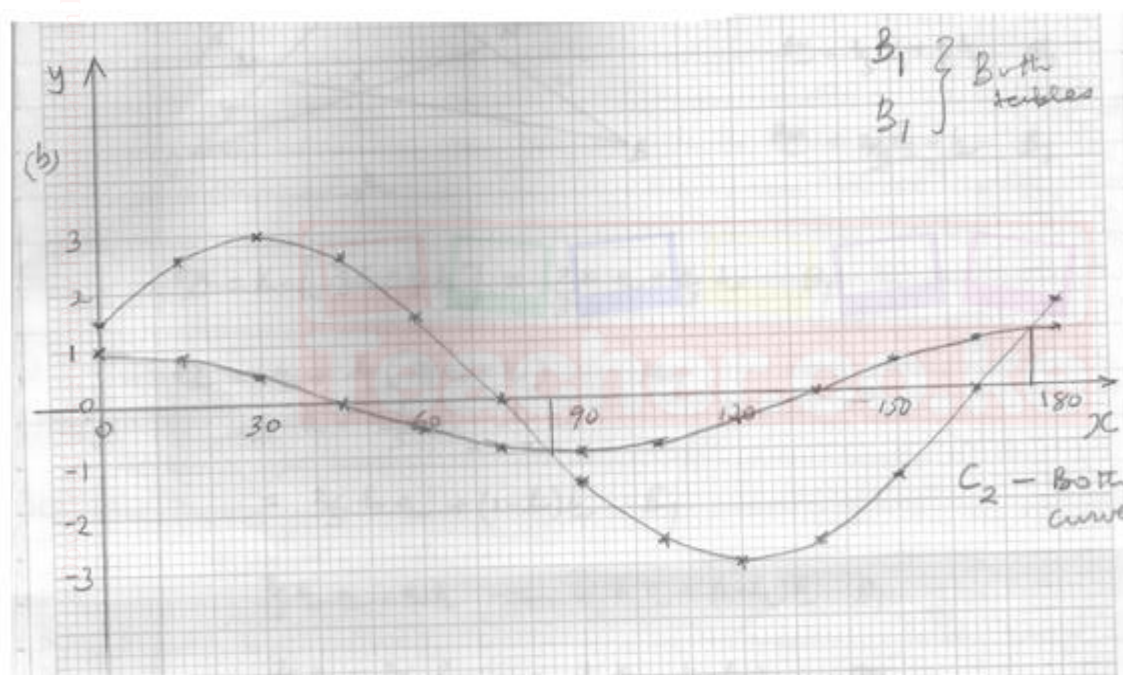
$$\sqrt{4} = x^2$$

$$x = \pm 2$$

A1 do not accept if it is one value

17.

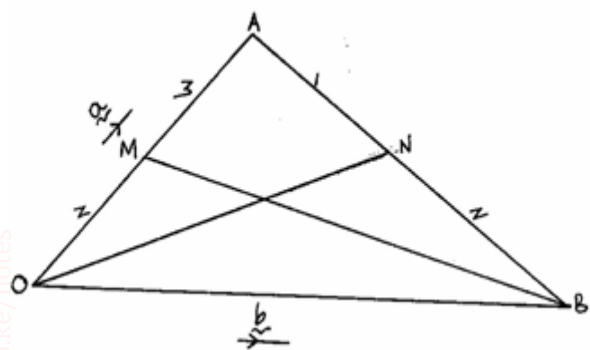
| $\chi$                         | $0^\circ$ | $15^\circ$ | $30^\circ$ | $45^\circ$ | $60^\circ$ | $75^\circ$ | $90^\circ$ | $105^\circ$ | $120^\circ$ | $135^\circ$ | $150^\circ$ | $165^\circ$ | $180^\circ$ |
|--------------------------------|-----------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| $y = 3 \sin(2\chi + 30^\circ)$ | 1.5       | 2.60       | 3          | 2.60       | 1.5        | 0          | -1.5       | -2.60       | -3          | -2.60       | -1.50       | 0           | 1.5         |
| $y = \cos 2\chi$               | 1         | 0.866      | 0.5        | 0          | -0.5       | -0.866     | -1         | -0.866      | -0.5        | 0           | 0.5         | 0.866       | 1           |



(c)  $3 \sin(2\chi + 30^\circ) = \cos 2\chi^\circ$   $\chi = 84^\circ$  or  $176^\circ$  B2 Both  $\checkmark^1$

- (d)
- (i)  $A = 3$  B1  $\checkmark^1$  value of amplitude.
  - (ii) Period =  $180^\circ$  B2  $\checkmark^1$  period.
  - (iii) Phase difference =  $30^\circ$  B1  $\checkmark^1$  phase diff.

18.



$$\underline{AB} = \underline{b} - \underline{a}$$

$$\underline{ON} = \frac{2}{3}\underline{a} + \frac{1}{3}\underline{b}$$

$$\underline{BM} = \frac{2}{5}\underline{a} - \underline{b}$$

$$\underline{OX} = K[\frac{2}{3}\underline{a} + \frac{1}{3}\underline{b}] = \frac{2}{3}K\underline{a} + \frac{K}{3}\underline{b}$$

$$\underline{OX} = \underline{b} + h(\frac{2}{5}\underline{a} - \underline{b})$$

$$= \underline{b} + \frac{2h}{5}\underline{a} - h\underline{b}$$

$$= \frac{2}{5}h\underline{a} + (1-h)\underline{b}$$

$$\frac{2}{3}K\underline{a} + \frac{K}{3}\underline{b} = \frac{2}{5}h\underline{a} + (1-h)\underline{b}$$

$$\frac{2}{3}K = \frac{2}{5}h \text{ and } \frac{K}{3} = (1-h)$$

$$10K = 6h$$

$$10K - 6h = 0$$

$$10K - 6h = 0$$

$$\underline{K + 3h = 3} \quad (\times 2)$$

$$10K - 6h = 0$$

$$\underline{2K + 6h = 6}$$

$$12K = 6$$

$$K = \frac{1}{2}$$

$$\therefore 1h = \frac{5}{6}$$

$$\underline{OX : XN = \frac{1}{2} : \frac{1}{2}}$$

$$= 1:1$$

B1

B1

B1

B1

M1

B1

B1

B1

B1

19.a) let the price of a cow be x and goat be y

$$8x + 12y = 294000$$

$$9x + 15y = 337500$$

M1

b) writing in matrix form

M1

$$\begin{pmatrix} 8 & 12 \\ 9 & 15 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 294000 \\ 337500 \end{pmatrix}$$

M1

Determinant of the co-efficient matrix is =12

M1

$$\text{Inverse } (1/12) \begin{pmatrix} 15 & -12 \\ -9 & 8 \end{pmatrix}$$

$$-(1/12) \begin{pmatrix} 15 & -12 \\ -9 & 8 \end{pmatrix} \begin{pmatrix} 8 & 12 \\ 9 & 15 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix} = (1/12) \begin{pmatrix} 15 & -12 \\ -9 & 8 \end{pmatrix} \begin{pmatrix} 294000 \\ 337500 \end{pmatrix}$$

M1

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix} = (1/12) \begin{pmatrix} 360000 \\ 54000 \end{pmatrix}$$

A1

$$X = 30000 \quad Y = 4500$$

$$\text{C) I) } (140/100) \times 30000 = 42000$$

M1

$$(145/100) \times 4500 = 6525$$

$$\text{S.P} = (42000 \times 8) + (6525 \times 12) = 414300$$

A1

(II)

$$\text{S.P} = 414300$$

M1

$$\text{B.P} = (30000 \times 8) + (4500 \times 12) = 294000$$

$$\text{PROFIT} = \text{S.P} - \text{B.P}$$

A1

$$414300 - 294000 = 120300$$

20.

$$\begin{aligned}\text{Taxable amount} &= \frac{8570}{20} \times 12 + \frac{15}{100} \times \frac{8570}{20} \times 12 \\ &= \text{k£} (5142 + 771.3) \\ &= \text{k£} 5913.3\end{aligned}$$

$$\begin{array}{rcl} 1^{\text{st}} \text{ £ } 1500 & = 2 \times 1500 & = 3000 \\ 2^{\text{nd}} \text{ £ } 1500 & = 3 \times 1500 & = 4500 \\ 3^{\text{rd}} \text{ £ } 1500 & = 5 \times 1500 & = 7500 \\ \text{Rem. } 1413.3 & = 7 \times 1413.3 & = 9893.10 \end{array}$$

$$\begin{array}{r} \text{Gross tax} \quad \quad \quad 24,893.10 \\ \text{Less relief sh}(150 \times 12) \quad \quad \underline{1800.00} \\ \text{Ksh} \quad \quad \quad \underline{23093.10} \end{array}$$

$$\text{WCPS} = \frac{2}{100} \times 8570 = 171.4 \times 12 = 2056.80$$

$$\text{NHIF} = 20 \times 12 = 240.00$$

$$\text{Co-op loan} = 240 \times 12 = 2880.00$$

$$\text{Tax} \quad \quad \text{ksh.} \quad \underline{23093.10}$$

$$\text{Total deduction} = \text{ksh} \quad \underline{28,569.90}$$

$$\text{Monthly deduction} = \text{ksh} \quad 2355.80$$

$$\begin{aligned}\text{Net salary} &= 8570 - 2355.80 \\ &= \text{ksh. } 6214.2\end{aligned}$$

M1

B1

M1

M1

M1

A1

M1

M1

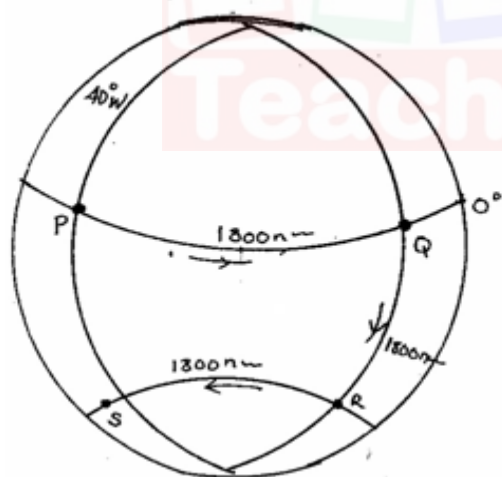
A1

10

Mathematics Paper 2

8

21.



$$\begin{aligned}(a) \quad d &= 60a \\ 1800 &= 60 \times a \\ a &= 30^\circ \\ \therefore Q \text{ is } (0^\circ, 10^\circ W) \\ 1800 &= 60a \\ a &= 30^\circ \\ R \text{ is } (30^\circ S, 10^\circ W) \\ 1800 &= 60a \cos \theta \\ 1800 &= 60a \times \cos 30^\circ \\ \frac{1800}{\cos 30} &= a = 34.64^\circ \\ B \text{ is } (30^\circ S, 44.64^\circ W)\end{aligned}$$

B1

B1

B1

B1

$$(b) \quad \text{Speed} = \frac{5400}{16} = \underline{\underline{337.5 \text{ knots}}}$$

M1



$$\text{Time for PQR} = \frac{3600}{337.5} = 10\text{hr } 40\text{ min}$$

$$\text{Time for R to S} = 10\text{hr } 40\text{min} - 2\text{hr}$$

$$= \underline{\underline{8\text{hr } 40\text{min}}}$$

M1  
A1  
M1  
M1  
A1  

---

10

22. (a)  $a + d = 8$   
 $a + 4d = 17$   
 $\underline{3d = a}$   
 $d = 3$   
 $\therefore a = 5$

(b)  $2^{\text{nd}} = 8$   
 $10^{\text{th}} = 5 + 9 \times 3 = 32$   
 $42^{\text{nd}} = 5 + 41 \times 3 = 128$   
 $\therefore \text{GP is } 8, 32, 128, \dots$   
 $a = 8$   
 $r = 4$   
 $n^{\text{th}} \text{ term of G.P} = ar^{n-1}$   
 $\therefore 10^{\text{th}} \text{ term} = 8(4)^9$   
 $= 2097152$

B1  
A1  
A1  
  
M1  
A1 (Both)  
M1  
A1

# Mathematics Paper 2

9

(c)  $S_n = \frac{a(r^n - 1)}{r - 1}$   
 $S_{10} = \frac{8(4^{10} - 1)}{4 - 1}$   
 $= \frac{8}{3} \times 1048575$   
 $= 2796200$

M1  
M1  
A1

23. (a)  $a = 3t - 3$   
 $\frac{dv}{dt} = 3t - 3$   
 $\int dv = \int (3t - 3)dt$   
 $V = \frac{3t^2}{2} - 3t + C$   
 $5 = \frac{3 \times 2^2}{2} - 3 \times 2 + C$   
 $5 = 6 - 6 + C$   
 $\Rightarrow C = 5$

(i)  $V = \frac{3t^2}{2} - 3t + 5$   
 When  $t = 4$   
 $V = \frac{3 \times 4^2}{2} - 3 \times 4 + 5$   
 $= 24 - 12 + 5 = 17\text{m/s}$

M1  
M1  
A1  
  
✓<sup>1</sup> Equation  
Substitution

(ii)  $V = \frac{ds}{dt} = \frac{3t^2}{2} - 3t + 5$

$$S = \frac{3t^3}{6} - \frac{3t^2}{2} + 5t + C$$

When  $t = 0$ ,  $S = 0$ ,  $C = 0$

Distance when  $t = 4$

$$S = \frac{4^3}{2} - \frac{3 \times 4^2}{2} + 5 \times 4$$

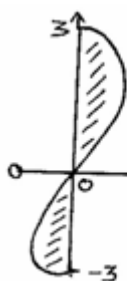
$$S = 32 - 24 + 20 = 28m$$

M1 ✓<sup>1</sup> Equation

M1 Substitution

A1

(b)



$$\text{Area} = \int_{-3}^3 (9y - y^2) dy$$

B1 ✓<sup>1</sup> area with points (0, 3),  
(0, 0) at (0, -3)

$$= \left[ \frac{9y^2}{2} - \frac{y^3}{3} \right]_{-3}^0 + \left[ \frac{9y^2}{2} - \frac{y^3}{3} \right]_0^3$$

M1 ✓<sup>1</sup> integral

$$= (40.5 - 9) + (40.5 - 9)$$

$$= 31.5 + 31.5 = 63 \text{sq units}$$

M1 ✓<sup>1</sup> Substitution  
A1

10

## Mathematics Paper 2

10

24.

(a) P(RR) or P(BB)

$$\left( \frac{6}{9} \times \frac{2}{5} \right) + \left( \frac{3}{9} \times \frac{3}{5} \right) = \frac{4}{15} + \frac{1}{5}$$

$$= \frac{7}{15}$$

M1M1M1

A1

For P(RR), P(BB)  
Addition (correctly)

(b) (1) P(RR) or P(RR)

$$= \left( \frac{6}{9} \times \frac{5}{8} \right) + \left( \frac{2}{5} \times \frac{1}{4} \right)$$

$$= \frac{5}{12} + \frac{1}{10}$$

$$= \frac{31}{60}$$

M1M1

M1

A1

(ii) P(RR) and P(RR)

$$\left( \frac{6}{9} \times \frac{5}{8} \right) \times \left( \frac{2}{5} \times \frac{1}{4} \right)$$

$$\frac{5}{12} \times \frac{1}{10}$$

$$= \frac{1}{24}$$

M1