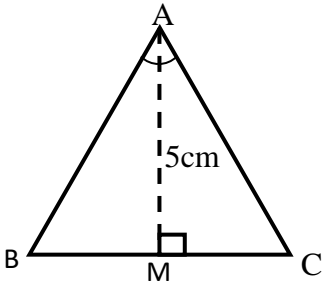


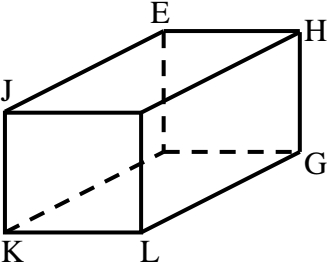
SCHOOL BASED FORM 4 EXAM JULY-AUGUST 2017

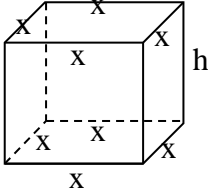
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E.)

121/1 MATHEMATICS

PAPER 1 MARKING SCHEME

| No | | MARKS | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|---|--------------------|-----|-------|--------|---------|------------------|-------------------|--------|--|--------|--|-----|--|-----|--|--------|--|---------------|--|---|----------|--------|---------|--|---|--|
| 1. | (a) $94344 - 36425 \div 5$ $= 94344 - 7285$ $= 87059$ (b) 7000 | A1 B1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 02 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Rhino - $\frac{1}{5}$ Zebras - $\frac{3}{4}$ $\frac{1}{5} + \frac{3}{4} = \frac{4+15}{20}$ $= \frac{19}{20}$ Zebras $\frac{2}{3} \times \frac{1}{20} = \frac{1}{30}$ $\frac{1}{5} + \frac{3}{4} + \frac{1}{30} = \frac{12+45+2}{60}$ $= \frac{59}{60}$ Fraction of warthogs is $\frac{1}{60}$ | M1 M1 A1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 03 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Length of the cube $\sqrt[3]{2744}$ $= 14\text{cm}$ Diagonal of a face $= \sqrt{392}$ $= \sqrt{196 \times 2}$ $= 14\sqrt{2}\text{cm}$ | M1 M1 A1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 03 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="border-bottom: 1px solid black; width: 30%;">No.</th> <th style="border-bottom: 1px solid black;">Log</th> </tr> </thead> <tbody> <tr> <td>24.36</td> <td>1.3867</td> </tr> <tr> <td>0.66547</td> <td>$\bar{1}.8231 +$</td> </tr> <tr> <td>1.48²</td> <td>1.2098</td> </tr> <tr> <td></td> <td>0.1703</td> </tr> <tr> <td></td> <td style="text-align: right;">} -</td> </tr> <tr> <td></td> <td style="text-align: right;">x 2</td> </tr> <tr> <td></td> <td style="text-align: right;">0.3406</td> </tr> <tr> <td></td> <td style="text-align: right;"><u>0.8692</u></td> </tr> <tr> <td></td> <td style="text-align: right;">3</td> </tr> <tr> <td style="border-top: 1px solid black;">1.9485 ←</td> <td style="border-top: 1px solid black;">0.2897</td> </tr> <tr> <td>= 1.949</td> <td></td> </tr> </tbody> </table> | No. | Log | 24.36 | 1.3867 | 0.66547 | $\bar{1}.8231 +$ | 1.48 ² | 1.2098 | | 0.1703 | | } - | | x 2 | | 0.3406 | | <u>0.8692</u> | | 3 | 1.9485 ← | 0.2897 | = 1.949 | | Logs M1 M1 ✓ Division by 3 A1 | |
| No. | Log | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24.36 | 1.3867 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.66547 | $\bar{1}.8231 +$ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.48 ² | 1.2098 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.1703 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | } - | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | x 2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.3406 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <u>0.8692</u> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.9485 ← | 0.2897 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| = 1.949 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 03 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. |  <p>MC = $5 \tan 20^\circ$ $= 1.81985\text{cm}$</p> | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | |
|----|--|---|--|
| | $BC = 3.6397\text{cm}$ $\sin 20^\circ = \frac{1.81985}{AC}$ $AC = \frac{1.81985}{\sin 20^\circ}$ $= \frac{1.81985}{0.34202}$ $= 5.321\text{cm}$ Length of the wire = $3.6397 + 2 \times 5.321$ $= 14.3\text{cm}$ | M1 M1 A1 | |
| | | 03 | |
| 6. | Mass of the liquid $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$ $1.2 = \frac{m}{300}$ $= 360\text{gm}$ Total mass = 360 + 380 640gm | M1 M1 A1 | |
| | | 03 | |
| 7. |  Completed cuboid Use of dotted lines for the hidden edges | B1 B1 | |
| | | 02 | |
| 8. | $2p = p \left(1 + \frac{r}{200}\right)^{10}$ $= \left(1 + \frac{r}{200}\right)$ $1.0718 = 1 + \frac{r}{200}$ $0.0718 = \frac{r}{200}$ $r = 0.0718 \times 200$ $= 14.36\%$ | M1 M1 Tenth root A1 | |
| | | 03 | |
| 9. | (a) $(2n - 40)90 = 40 \left(\frac{360}{n}\right)$ $2.25n(2n - 4) = 360$ $4.5n^2 - 9n - 360 = 0$ $n^2 - 2n - 80 = 0$ $n^2 - 10n + 8n - 80 = 0$ $n(n-10) + 8(n-10) = 0$ $\therefore n = 10$ (b) Decagon | M1 ✓ equations ✓ factorization A1 B1 | |
| | | 03 | |

| 10. | (a) Class <table border="1"> <thead> <tr> <th>$(a - b)$</th> <th>f</th> <th>$x = \left(\frac{a+b}{2}\right)$</th> <th>fx</th> </tr> </thead> <tbody> <tr> <td>38 - 39</td> <td>3</td> <td>38.5</td> <td>115.5</td> </tr> <tr> <td>40-41</td> <td>7</td> <td>40.5</td> <td>283.5</td> </tr> <tr> <td>42-43</td> <td>7</td> <td>42.5</td> <td>297.5</td> </tr> <tr> <td>44-45</td> <td>5</td> <td>44.5</td> <td>222.5</td> </tr> <tr> <td>46-47</td> <td>6</td> <td>46.5</td> <td>279</td> </tr> <tr> <td>48-49</td> <td>4</td> <td>48.5</td> <td>194</td> </tr> <tr> <td>B1</td> <td>$\Sigma=32$</td> <td></td> <td>$\Sigma fx = 1392$</td> </tr> <tr> <td></td> <td>B1</td> <td></td> <td>B1</td> </tr> </tbody> </table> | $(a - b)$ | f | $x = \left(\frac{a+b}{2}\right)$ | fx | 38 - 39 | 3 | 38.5 | 115.5 | 40-41 | 7 | 40.5 | 283.5 | 42-43 | 7 | 42.5 | 297.5 | 44-45 | 5 | 44.5 | 222.5 | 46-47 | 6 | 46.5 | 279 | 48-49 | 4 | 48.5 | 194 | B1 | $\Sigma=32$ | | $\Sigma fx = 1392$ | | B1 | | B1 | | |
|-----------|---|---------------------------------------|--------------------|----------------------------------|----|---------|---|------|-------|-------|---|------|-------|-------|---|------|-------|-------|---|------|-------|-------|---|------|-----|-------|---|------|-----|----|-------------|--|--------------------|--|----|--|----|--|--|
| $(a - b)$ | f | $x = \left(\frac{a+b}{2}\right)$ | fx | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 38 - 39 | 3 | 38.5 | 115.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40-41 | 7 | 40.5 | 283.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 42-43 | 7 | 42.5 | 297.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 44-45 | 5 | 44.5 | 222.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 46-47 | 6 | 46.5 | 279 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48-49 | 4 | 48.5 | 194 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B1 | $\Sigma=32$ | | $\Sigma fx = 1392$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | B1 | | B1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (b) $\bar{x} = \frac{1392}{32}$ $= 43.5$ | B1 A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11. | (a) $\underline{q} = 5 \begin{pmatrix} -2 \\ -3 \end{pmatrix} - 3 \begin{pmatrix} 1 \\ -2 \end{pmatrix}$ $= \begin{pmatrix} -10 & -3 \\ -15 & +6 \end{pmatrix}$ $= \begin{pmatrix} -13 \\ -9 \end{pmatrix}$ (b) Translation $\begin{pmatrix} 3 \\ 2 \end{pmatrix} - \begin{pmatrix} 0 \\ -2 \end{pmatrix}$ $= \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ | M1 A1 B1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12. | $\frac{5(-5)^2 - (2x-3) - (4x - \frac{1}{3})}{\frac{1}{3}(-3)^2 + 2x - 5}$ $= \frac{125 + 6 + \frac{4}{3}}{\frac{1}{3}(9-10)}$ $= \frac{132\frac{1}{3}}{-\frac{1}{3}}$ $= \frac{397}{3} x - \frac{3}{1}$ $= -397$ | M1 ✓ Substitution M1 A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13. |  $8x + 4h = 36$ $h = \frac{36-8x}{4}$ $v = x^2(9-2x)\text{cm}^2$ | M1 M1 A1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 03 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14. | (a) $\begin{pmatrix} 4 & 3 \\ 2 & -1 \end{pmatrix}$ $\Delta = -4 - 6$ $= -10$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | |
|-----|--|---|--|
| | <p>Inverse</p> $-\frac{1}{10} \begin{pmatrix} -1 & -3 \\ -2 & 4 \end{pmatrix}$ <p>(b) $4x + 3y = 8$ $2x - y = 9$</p> $-\frac{1}{10} \begin{pmatrix} -1 & -3 \\ -2 & 4 \end{pmatrix} \begin{pmatrix} 4 & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = -\frac{1}{10} \begin{pmatrix} -1 & -3 \\ -2 & 4 \end{pmatrix} \begin{pmatrix} 8 \\ 9 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \frac{1}{10} \begin{pmatrix} -35 \\ -1.8 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3.5 \\ -1.8 \end{pmatrix}$ <p>$\therefore x = 3.5, y = -1.8$</p> | <p>B1</p> <p>M1</p> <p>A1</p> | <p>M0 for post multiplication on the right hand side</p> |
| | | 04 | |
| 15. | <p>(a) $\frac{20-0}{10-0}$ m/s $= 2\text{m/s}^2$</p> <p>(b) $\frac{1}{2} \times 10 \times 20 + \frac{1}{2} \times 5 (20 + 15) + 5 \times 15 + \frac{1}{2} \times 10 \times 15$ $= 100 + 87.5 + 75 + 75$ $= 337.5\text{m}$</p> | <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> | |
| | | 04 | |
| 16. | <p>Area = $\frac{1}{2} \times 2 (11 + 27 + 2(3 + 3 + 11))n^2$ $= 38 + 2(17)u^2$ } $= 38 + 34 u^2$ } $= 72u^2$</p> | <p>M1</p> <p>M1</p> <p>A1</p> | |
| | SECTION B | 03 | |
| 17. | <p>(a) Amount received = 12000×240 $= \text{KSh. } 2,888,000$</p> <p>(b) (i) Sales = $\frac{125}{100} \times 12000 \times 240$ $= 3,600,000$ Decreased $\frac{90}{100} \times 3,600,000$ $= 3,240,000$ % increase = $\frac{3,240,000 - 2,880,000}{2,880,000} \times 100$ $= \frac{360000}{280000} \times 100$ $= 12.5\%$</p> <p>(ii) New price in 2003 $\frac{16}{15} \times \frac{125}{100} \times 12000$ $\text{KSh. } 16000$</p> <p>(c) No. of sofa sets sold in the year 2003 $\frac{90}{100} \times 240 = 216$ No. of sets sold in the year 2003 = $\frac{\text{Sales in year 2003}}{\text{Price per sofa set}}$ $= \frac{3240000}{16000}$ $= 203$ $P = \frac{216 - 202.5}{216} \times 100$ $P = 6.25\%$</p> | <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> | |
| | | 10 | |

| | | | |
|-----|---|--|--|
| | $\text{Area of circle} = \pi r^2$ $= 3.142 \times 1.3^2$ $= 5.310$ $\text{Area} = 12 - 5.310 = 6.690\text{cm}^2$ | M1 A1 | |
| | | 10 | |
| 20. | <p>(a) $a^2 = b^2 + c^2 - 2bc\cos A$ $a^2 = 6^2 + 8^2 - 2 \times 6 \times 8 \times \cos 50$ $a^2 = 36 + 64 - 61.71$ $a^2 = 100 - 61.71$ $a = 6.188\text{cm}$ $B = 6.19\text{cm}$</p> <p>(b) $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\frac{6.188}{\sin 50} = \frac{6}{\sin B}$ $\sin B = \frac{6 \sin 50}{6.188}$ $B = 47.97^\circ$</p> <p>(c) $a^2 = d^2 + c^2 - 2d\cos A$ $2.82^2 = 6^2 + 7^2 - 2 \times 6 \times 7 \times \cos A$ $7.9524 = 36 + 49 - 84\cos A$ $7.9524 = 85 - 84\cos A$ $84\cos A = 85 - 7.9524$ $\cos A = \frac{77.0476}{84}$ $A = 23.48^\circ$</p> <p>(d) Area of $\triangle ACD$ $A = \frac{1}{2} ab \sin C$ $A = \frac{1}{2} \times 7 \times 6 \times \sin 23.48$ $A = 21 \sin 23.48$ $A = 8.367\text{cm}^2$ $A = 8.37\text{cm}$</p> | M1 M1 A1 M1 A1 M1 A1 M1 A1 | |
| | | 10 | |
| 21. | <p>(a) $L \Rightarrow (-2, 3) (-1, 6)$ $\text{Gradient} = \frac{6-3}{-1-(-2)} = \frac{3}{-1+2} = \frac{3}{1} = 3$ $\frac{y-3}{x-(-2)} = 3$ $\frac{y-3}{x+2} = \frac{3}{1}$ $y-3 = 3x+6$ $y = 3x+6+3$ $y = 3x+9$</p> <p>(b) $P \Rightarrow m_1 \times m_2 = -1$ $3m_2 = -1$ $m_2 = -\frac{1}{3}$ $\frac{y-6}{x-(-1)} = -\frac{1}{3}$ $\frac{y-6}{x+1} = -\frac{1}{3}$ $3(y-6) = -x-1$ $3y-18 = -x-1$ $3y = -x+17$ $x+3y = 17$</p> <p>(c) $Q \Rightarrow m_1 = m_2 = 3 (1, 2)$ $\frac{y-2}{x-1} = \frac{3}{1}$ $y-2 = 3x-3$</p> | M1 A1 M1 A1 | |

| | | |
|---|---|---|
| $y = 3x - 3 + 2$ $y = 3x - 1$ <p>At y – intercept, $x = 0$</p> $y = 3x - 1$ $y = 3(0) - 1$ $y = -1$ <p>y – intercept (0,-1)</p> <p>At x – intercept, $y = 0$</p> $y = 3x - 1$ $0 = 3x - 1$ $\frac{3x}{3} = \frac{1}{3}$ $x = \frac{1}{3}$ <p>x – intercept $(\frac{1}{3}, 0)$</p> <p>(d) Point of intersection</p> $P \Rightarrow x + 3y = 17 \quad y = -1 - \frac{x}{3} + \frac{17}{3} \dots\dots\dots(1)$ $Q \Rightarrow y = 3x - 1 \dots\dots\dots (ii)$ <p>Equating (i) and (ii)</p> $3x - 1 = -\frac{x}{3} + \frac{17}{3}$ $3x + \frac{x}{3} = \frac{17}{3} + 1$ $\Rightarrow \frac{10}{3}x = \frac{20}{3}$ $x = \frac{20}{3} \times \frac{3}{10}$ $x = 2$ <p>(d) $x = 2$</p> $y = 3x - 1$ $y = 3(2) - 1$ $y = 6 - 1$ $y = 5$ $x = 2$ $y = 5$ <p>P (2,5)</p> | <p>A1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> | <p>Accept alternative methods of solving simultaneous equations</p> |
| | 10 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|---|----------|----|---|---|----|----|---|---|----|---|---|---|---|----|----|---|----|---|---|----|----|---|---|---|--|--|
| | <p>(b) Volume of 1 tin $\Rightarrow V = \pi r^2 h$ $V = \frac{22}{7} \times 5 \times 5 \times 20$ $V = 1571.4283 \text{ cm}^3$ No. of tins = $\frac{480,000}{1571.4286}$ $\cong 305$ tins</p> <p>(ii) Total mass = Mass of the box + Total mass of the tins $= 26.1 + \frac{(120 \times 305)}{1000}$ $= 62.7 \text{ kg}$</p> | M1 M1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 10 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24. | <p>(a) (i) Stationary points of $y = x^3 - 3x + 2$ $\frac{dy}{dx} = 3x^2 - 3$ $y = x^3 - 3x + 2$ At stationary points $\frac{dy}{dx} = 0$ $\therefore 3x^2 - 3 = 0$ $\frac{3x^2}{3} = \frac{3}{3}$ $x^2 = 1$ $x = \pm 1$ When $x = 1$ $y = 1^3 - 3(1) + 2$ $y = 1 - 3 + 2$ $y = 0$ $(1, 0)$ When $x = -1$ $y = (-1)^3 - 3(-1) + 2$ $y = -1 + 3 + 2$ $y = 4$ $(-1, 4)$</p> <p>(ii) Nature of the stationary points $(1, 0) \frac{dy}{dx} = 3x^2 - 3$ <table style="margin-left: 20px;"> <tr><td>x</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>dy</td><td>-3</td><td>0</td><td>9</td></tr> <tr><td>dx</td><td>-</td><td>0</td><td>+</td></tr> </table> <p style="margin-left: 40px;">Minimum point $(-1, 4)$</p> <table style="margin-left: 20px;"> <tr><td>x</td><td>-2</td><td>-1</td><td>0</td></tr> <tr><td>dy</td><td>9</td><td>0</td><td>-3</td></tr> <tr><td>dx</td><td>-</td><td>0</td><td>+</td></tr> </table> <p style="margin-left: 40px;">Maximum point</p> </p> | x | 0 | 1 | 2 | dy | -3 | 0 | 9 | dx | - | 0 | + | x | -2 | -1 | 0 | dy | 9 | 0 | -3 | dx | - | 0 | + | M1 M1 A1 A1 B1 B1 A1 | |
| x | 0 | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| dy | -3 | 0 | 9 | | | | | | | | | | | | | | | | | | | | | | | | |
| dx | - | 0 | + | | | | | | | | | | | | | | | | | | | | | | | | |
| x | -2 | -1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| dy | 9 | 0 | -3 | | | | | | | | | | | | | | | | | | | | | | | | |
| dx | - | 0 | + | | | | | | | | | | | | | | | | | | | | | | | | |
| | (c) | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | |
|--|--|----------------------------|--|
| | | y intercept B1 Curve B1 | |
| | | 10 | |