INSTRUCTIONS TO CANDIDATES

• Write your name and Index number in the spaces provided
• This paper consists of two sections, A and B.
• Answer ALL the questions in the spaces provided.
• All working must be clearly shown in the spaces provided in this booklet
• Mathematical tables and Electronic calculators may be used.

Take $g = 10\text{m/s}^2$

FOR EXAMINERS USE ONLY

<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Maximum Score</th>
<th>Candidate’s Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1-14</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>
This paper consists of 12 printed pages. Candidates should check the question paper to ensure all the pages are printed as indicated and no questions are missing.

SECTION A: (25 MARKS)
Answer all questions in this section.

1. What is the actual reading of the micrometer screw gauge shown below if it has an error of +0.5 mm?
   
   (2 marks)

   ![Micrometer Reading Diagram]

2. In a ball and ring experiment, the ball goes through the rings at room temperature. When it is heated, it does not go through the ring, but when left on the ring for some time, it goes through. Explain this observation.
   
   (2 marks)

3. In the study of free fall, it is assumed that the force \( F \) acting on a given body of mass, \( m \), is gravitational, given by \( F = mg \). State two other forces that act on the same body.
   
   (2 marks)

4. In the setup shown below, it is observed that the level of the water initially drops before starting to rise. Explain this observation.
   
   (2 marks)
5. Distinguish between speed and velocity. (1mark)

6. State how the pressure in a moving fluid varies with speed of the fluid. (1mark)

7. A piece of metal weighs 3N in air and 2N when totally immersed in water. Calculate the volume of the metal. (Density of water = 1000Kg/m$^3$) (3marks)

8. Why is banking of roads necessary? (1mark)

9. Give a reason why air is not commonly used as the fluid in a hydraulic lift. (1mark)

10. Tall buildings are built with lighter materials at the upper part. Explain (2marks)
11. The figure below shows a swinging pendulum.

State the energy conservation taking place as the pendulum moves from A to B and B to C
A to B.........................................................................................................................
B to C.........................................................................................................................

12. The identical springs each of spring constant 3N/cm are used to support a load of 30N as shown.

Determine the extension on of each spring. (3marks)
........................................................................................................................................
13. In a vacuum flask, the walls enclosing the vacuum are silvered on the inside. State the reason for this. (1mark)

………………………………………………………………………………………………………

14. Sketch velocity — time graph of a body moving down a viscous fluid. (2marks)

SECTION B: (55 MARKS)

Answer ALL the questions in the spaces provided.

15. a) Define the term efficiency as applied in simple machine. (2marks)

………………………………………………………………………………………………………

b) A man used a wooden plank to lift a log of wood from the ground to a stationary lorry on a flat ground as shown in figure below. The wooden plank was inclined at an angle of 30° to the ground.
i) Indicate with an arrow on the diagram, the direction of the effort and the load. (2 marks)

ii) Calculate the velocity ratio of the set up. (2 marks)

iii) Calculate the mechanical advantage of the set up if its efficiency is 65%. (2 marks)

c) A pump is used to spray water from a pool to form a fountain.
   i) Determine the minimum power of the pump if it ejects 50 litres of water per minute and spray reached a height of 5 metres. (Density of water = 1000 Kg/m³) (3 marks)
ii) Give a reason why water from the pump has a different temperature from that which left the pool. (1mark)

16. a) Define centre of gravity (1mark)

b) The figure below shows a wine glass

![Wine Glass Diagram]

Explain how the stability of the glass is affected if it is filled with wine. (2marks)

c) In the triangular ABC shown in the figure below, determine geometrically the position of centre of gravity. (1mark)
d) The figure below shows a uniform rod AE which is 40cm long. It has a mass of 2kg pivoted at D. If 2N is acting at point E, and 30N force is passed through a frictionless pulley.

Find the force \( x \) acting at end A. \( \quad \) (3marks)

e) i) State the principle of moments. \( \quad \) (1mark)
ii) The figure below shows a metal plate 2M long, 1M wide and negligible thickness.
    A horizontal force of 50N applied at point ‘A’ just makes the plate tilt.

    ![Diagram of a metal plate with dimensions and force applied](image)

    Determine the weight of the plate. (3marks)

17. a) State one factor that affects melting point of water. (1mark)

    b) Define the term *specific heat capacity* of a substance (1mark)

    c) The figure below shows a container carrying 0.5 Kg of water at 80°C
A metal block of mass 1Kg and specific heat capacity 4000Jkg\(^{-1}\)k\(^{-1}\) at a temperature of 25°C is lowered into the hot water. The container losses 600J of heat during mixing and a steady final temperature of the mixture obtained is \(T\). Assume no further heat is lost to the surrounding and specific heat capacity of water is 4200Jkg\(^{-1}\)k\(^{-1}\)

I. Derive the expression for:
   i) The heat lost by the hot water. (2mks)
   ii) The total heat lost by hot water and the container (2mks)

II. Determine the steady temperature \(T\) of the mixture (3mks)
d) Water drops from a water fall 120m High. The temperature of the water at the bottom is found to be 24°C. Calculate its temperature at the top (Take specific heat capacity of water = 4200Jkg$^{-1}$k$^{-1}$) (3marks)

18. a) State the law of floatation (1mark)

b) A solid metal block cross-section area 4cm$^2$ and of density 2.5g/cm$^3$ is fully immersed in water, supported by a spring balance.
i) A part from the weight, state and indicate the direction of any two forces acting on the metal block (2 marks)

ii) If the upward force acting on the bottom face is 1.5N, calculate the volume of the block (Density of water = 1000 kg/cm³) (3 marks)

iii) Determine the apparent weight of block in water. (3 marks)

(c) Explain why the hydrometer is not graduated uniformly. (1 mark)

19. (a) Using Kinetic theory of Gases, explain how the rise in temperature of a gas causes rise in the pressure of a gas if the volume is kept constant. (3 marks)
(b) The figure below is a set up that can be used to verify Charles’ law of gases.

![Diagram of gas setup]

i) State two measurements that should be taken in the experiment. (2 marks)

ii) Explain how the measurements taken above can be used to verify Charles law. (3 marks)

iii) A certain mass of hydrogen gas occupies a volume of 2.6 m$^3$ at a pressure of $1.5 \times 10^5$ pa and temperature of 12°C. Determine its volume at a temperature of 0°C, if its pressure is $1.0 \times 10^5$ pa. (3 marks)
INSTRUCTIONS TO CANDIDATES
• Write your name and Index number in the spaces provided
• This paper consists of two sections, A and B.
• Answer ALL the questions in the spaces provided.
• All working must be clearly shown in the spaces provided in this booklet
• Mathematical tables and Electronic calculators may be used.

FOR EXAMINERS USE ONLY

<table>
<thead>
<tr>
<th>Section</th>
<th>Question</th>
<th>Maximum Score</th>
<th>Candidate’s Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1-11</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>12</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
SECTION A: (25MARKS)

1. State any two ways of increasing the size of an image formed by a fixed pinhole camera. (2marks)

2. State one advantages of an alkaline battery over a lead acid battery. (1mark)

3. The figure above shows a 6V battery connected to an arrangement of resistors. Determine the current flowing through the 2\(\Omega\) resistor. (3marks)

4. A negatively charged rod is brought near the cap of a lightly charged electroscope. The leaf divergence first reduces but as the rod comes nearer, it diverges more.
i) State the charge of the electroscope (1 mark)

ii) Explain the behaviour of the leaf above. (1 mark)

5. The figure below shows an electromagnetic relay.

![Electromagnetic Relay Diagram]

Explain what happened when the switch is closed. (3 marks)

6. A current 12 A flows through a circuit for 2.5 minutes. How much charge passes through the circuit? (2 marks)
7. The diagram below shows part of a wave form. The numbers on the diagram show scales in centimeters. The speed of the wave is 16ms⁻¹

From the graph of the wave shown, determine:

a) The wavelength

b) The frequency
8. Figure below shows wavefront before and after passing through an opening as shown in fig.5.

\[ \text{Incident waves} \]
\[ \text{Gap} \]
\[ \text{Barrier} \]

State what would be observed on the pattern after passing the opening if:

i) Wave length is increased. (1 mark)

ii) Gap is increased. (1 mark)

9. State two ways by which the frequency of a note produced by a sonometer wire may be increased. (2 marks)

10. An electric kettle rated at 2.0kW, 240V is filled with water. If the water requires $7.0 \times 10^5$ Joules of heat to boil from the initial temperature, determine the resistance of the element. (3 marks)
11. A certain glass material has a refractive index of 2.5. What is its critical angle? (2 marks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………...
Determine the resistance of the lamp when a current of 0.4A flows through it. (3 marks)

13. a) Define the term *principal focus* in relation to a thin convex lens (1 mark)
b) Distinguish between a real and virtual image. (1 mark)

…………………………………………………………………………………………………………………………………………………..

…………………………………………………………………………………………………………………………………………………..

c) The diagram shows an arrangement of lenses; \( L_0 \) and \( L_e \) used in a compound microscope.
\( F_0 \) and \( F_e \) are principal foci of \( L_0 \) and \( L_e \) respectively.
Draw the rays to show how the final image is formed in the microscope. (3 marks)

(d) The table below shows the object distance, \( U \) and the corresponding image distance, \( V \) for an object placed.

<table>
<thead>
<tr>
<th>( U ) (cm)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V ) (cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{1}{u} ) (cm(^{-1}))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{1}{v} ) (cm(^{-1}))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(i) Complete the table and plot a graph of $\frac{1}{v}$ against $\frac{1}{u}$ (7 marks)

(ii) Determine the focal length of the lens. (2 marks)
14. a) Give two conditions necessary for total internal reflection to occur. (2 marks)

b) Figure below shows the path of a ray of light passing through a rectangular block of Perspex to air.

![Diagram of light passing through Perspex block]

Calculate the refractive index of Perspex. (3 marks)

c) Give one use of an optical fibre (1 mark)

d) In a transparent liquid container, an air bubbles appears to be 18 cm when viewed from
end A and 12cm when viewed from end B as shown in figure below. Where exactly is the air bubble. If the length of the tank is 40cm? (4marks)

!!! Figure with a diagram showing a tank with water and an air bubble. !!!
ii) The value of X. (3 marks)

c) Figure 12 below shows the displacement of a particle in progressive wave incident on a boundary between deep and shallow regions.

i) Complete the diagram to show what is observed beyond the boundary. (Assume no loss of energy) (2 marks)

ii) Explain the observation in C (i) above. (2 marks)
16. (a) State two factors that affect the capacitance of a parallel plate capacitor. (2 marks)

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………

(b) The diagram below shows an arrangement of capacitors in a circuit.

Determine;

i) The total capacitance (3 marks)

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
ii) The total charge (2 marks)

iii) The energy stored by the $2 \mu F$ capacitor. (3 marks)
KABONDO DIVISION JOINT EVALUATION TEST

Kenya Certificate of Secondary Education (K. C.S.E.)

(PRACTICAL)
March/April 2015
Time: 1½ Hours

Instructions to Candidates
• This paper consists of two questions
• Answer all questions in the spaces provided
• All workings must be clearly shown in the spaces provided.
• Mathematical tables and Non-programmable silent electronic calculators may be used

Question 1

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>d</th>
<th>e(i)</th>
<th>e(ii)</th>
<th>e(iii)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum score</td>
<td>1</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Candidates Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total

Question 2

<table>
<thead>
<tr>
<th></th>
<th>viii</th>
<th>ix</th>
<th>x</th>
<th>xi</th>
<th>xii</th>
<th>drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum score</td>
<td>1</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Candidates Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total

Grand Total

© 2015 Kabondo Division Joint Evaluation Test
1. You are provided with the following apparatus
- Voltmeter
- A milliammeter
- A wire mounted on a millimeter scale
- A switch
- A crocodile clip
- One cell and one cell holder
- A micrometer screw gauge [to be shared]
- Six connecting wires [two with Crocodile clip]

Procedure as follows
a). Measure the diameter of the mounted wire at three different points
   d1= _________ mm
   d2= _________ mm
   d3= _________ mm
   Average diameter d = _________ mm  
   (1mk)

b). Set up the apparatus as shown in the circuit in fig 1.
Close the switch S and tap the mounted wire with crocodile clip.
Ensure both meters show positive deflection. Open the switch
c). Press the crocodile clip on the mounted wire at point L = 20cm close the switch, read and record in the table I the milliammeter and voltmeter readings.

d). Repeat the procedure in [c] for other values of L shown in the tables

Table 1

<table>
<thead>
<tr>
<th>Length L (cm)</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.d (Volts)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current I(mA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current I(A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R = \sqrt{I}$ (Ω)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complete the table (8mks)
e). i. On the grid provided plot a graph of $R(y\text{-axis})$ against $L (m)$  

(ii) Determine the slope of the graph.
(iii) Given that \( R = \frac{PL}{A} \) where \( A \) is cross-sectional area of the wire and \( P \) is a constant for the material of the wire, determine the constant \( P \). (3mks)

2. You are provided with

- A glass block
- A protractor
- Four optical pins
- A plane mirror
- A meter rule
- A plain sheet of paper
- A soft board

i. Trace the outline of the glass block on the plain paper fixed on the soft board.

ii. Draw a normal at one of the longest sides as shown in figure 2 below.

iii. Draw a line making an angle \( \theta = 10^\circ \) to normal.
The plain paper used must be submitted.

iv. Fix two pins $P_1$ and $P_2$ on the line

v. Fix two other pins $P_3$ and $P_4$ viewing from position of the eye such that they are in line with the images of $P_1$ and $P_2$ as seen through the glass block.

vi. Extend $P_1\ P_2$ into the trace of the block and also $P_3\ P_4$ into the trace to meet at a point $M$

vii. Measure the perpendicular distance $X$

viii. Repeat the procedure for different values of $\theta$ and record your results in table 2 below
ix. Plot a graph of $x$ (Y-axis) against angle $\theta$ (5mks)
x. Determine the maximum value of $x$ from the graph

$X_{\text{max}}$ ____________________________ (2mks)

xi. Measure the width of glass block

$W = $ ______________________________ (1mk)

xii. Calculate $n$ from the formula (2mks)

$$ n = \frac{W}{X_{\text{max}}} $$