**Unit 4 Factors Affecting Magnitude of Force of Kinetic Friction**

**Data Collection**

**Free Body Diagram of boxes pulled by constant velocity cart.**

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| **Part A: Effect of Surface Area on Magnitude of Force of Kinetic Friction** |
| **Table 1 – Effect of Surface Area on Magnitude of Force of Kinetic Friction** **Constant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;** **Constant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;**

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| **Trial** | **Rep.** | **Length*****L*****(cm)** | **Width*****w*****(cm)** | **Surface Area*****SA*** **(cm2)** | **Magnitude of Force of Cart on Boxes*****FConB*** **(N)** | **Magnitude of Force of Kinetic Friction on Boxes*****Ffk*** **(N)** |
| **1** | **1** |  |  |  |  |  |
| **1** | **2** |  |  |  |  |  |
| **1** | **3** |  |  |  |  |  |
| **1** | **Avg.** |  |  |  |  |  |
| **2** | **1** |  |  |  |  |  |
| **2** | **2** |  |  |  |  |  |
| **2** | **3** |  |  |  |  |  |
| **2** | **Avg.** |  |  |  |  |  |
| **3** | **1** |  |  |  |  |  |
| **3** | **2** |  |  |  |  |  |
| **3** | **3** |  |  |  |  |  |
| **3** | **Avg.** |  |  |  |  |  |

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| **Part B: Effect of Magnitude of Normal Force (Mass) on Magnitude of Force of Kinetic Friction** |
| **Table 2 – Effect of Magnitude of Normal Force (Mass) on Magnitude of Force of Kinetic Friction** **Constant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;** **Constant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;**

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| --- | --- | --- | --- | --- | --- | --- |
| **Trial** | **Rep.** | **Mass of Box(es)*****m*****(kg)** | **Magnitude of Force of Earth on Boxes*****FEonB (Fg )*****(N)** | **Magnitude of Normal Force on Boxes*****FN*** **(N)** | **Magnitude of Force of Cart on Boxes*****FConB*** **(N)** | **Magnitude of Force of Kinetic Friction on Boxes*****Ffk*** **(N)** |
| **1** | **1** |  |  |  |  |  |
| **1** | **2** |  |  |  |  |  |
| **1** | **3** |  |  |  |  |  |
| **1** | **Avg.** |  |  |  |  |  |
| **2** | **1** |  |  |  |  |  |
| **2** | **2** |  |  |  |  |  |
| **2** | **3** |  |  |  |  |  |
| **2** | **Avg.** |  |  |  |  |  |
| **3** | **1** |  |  |  |  |  |
| **3** | **2** |  |  |  |  |  |
| **3** | **3** |  |  |  |  |  |
| **3** | **Avg.** |  |  |  |  |  |

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**Calculation for Magnitude of Normal Force on Boxes**

$$\left|\vec{F}\_{N}\right|=\left|\vec{F}\_{g}\right|=m\vec{g}=$$

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| **Part C: Effect of Coefficient of Kinetic Friction (surface types) on Magnitude of Force of Kinetic Friction** |
| **Table 3 – Effect of Coefficient of Kinetic Friction (surface types) on Magnitude of Force of Kinetic Friction** **Constant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;** **Constant \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_;**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Trial** | **Rep.** | **Mass of Box(es)*****m*****(kg)** | **Magnitude of Force of Earth on Boxes*****FEonB (Fg )*****(N)** | **Magnitude of Normal Force on Boxes*****FN*** **(N)** | **Magnitude of Force of Cart on Boxes*****FConB*** **(N)** | **Magnitude of Force of Kinetic Friction on Boxes*****Ffk*** **(N)** | **Coefficient of Kinetic Friction µk****(dimen-sionless)** |
| **1** | **1** |  |  |  |  |  |  |
| **1** | **2** |  |  |  |  |  |  |
| **1** | **3** |  |  |  |  |  |  |
| **1** | **Avg.** |  |  |  |  |  |  |
| **2** | **1** |  |  |  |  |  |  |
| **2** | **2** |  |  |  |  |  |  |
| **2** | **3** |  |  |  |  |  |  |
| **2** | **Avg.** |  |  |  |  |  |  |
| **3** | **1** |  |  |  |  |  |  |
| **3** | **2** |  |  |  |  |  |  |
| **3** | **3** |  |  |  |  |  |  |
| **3** | **Avg.** |  |  |  |  |  |  |

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**Calculation for Coefficient of Kinetic Friction**

$$μ\_{k}=\frac{\left|\vec{F}\_{k}\right|}{\left|\vec{F}\_{N}\right|}=\frac{\left|\vec{F}\_{Cart on Boxes}\right|}{\left|\vec{F}\_{g}\right|}=$$