

## Problems

1. A force of 1.2 N [ $\leftarrow$ ] is applied to an object of mass 1.5 kg. It accelerates at 0.50 m/s<sup>2</sup> [ $\leftarrow$ ] along a surface. Determine the force of friction that is acting and the coefficient of kinetic friction involved.



From x dir:

$$\begin{aligned} F_{app} - F_f &= ma \\ F_f &= F_{app} - ma \\ F_f &= 1.2\text{ N} - (1.5\text{ kg})(0.50\text{ m/s}^2) \\ F_f &= 0.45\text{ N} \\ F_f &= 0.45\text{ N } [\rightarrow] \end{aligned}$$

From y dir:

$$\begin{aligned} F_N - F_g &= 0 \\ F_N &= F_g \\ F_f &= \mu F_N \\ \mu &= \frac{F_f}{F_N} \\ \mu &= \frac{0.45\text{ N}}{(1.5\text{ kg})(9.8\text{ m/s}^2)} \\ \mu &= 0.03 \end{aligned}$$

2. Two children pull a toy truck of mass 2.4 kg along a rough horizontal surface. One child pulls with a force of 8.4 N [N] and the other pulls with a force of 3.6 N [S]. The coefficient of friction between the toy and surface is 0.18. What is the acceleration of the toy?



$$\begin{aligned} \Sigma F_y &= F_N - F_g = 0 \\ F_N - F_g &= 0 \\ F_N &= F_g \end{aligned}$$

$$\begin{aligned} \Sigma F_x &= F_1 - F_2 - F_f = ma \\ a &= \frac{F_1 - F_2 - \mu mg}{m} \\ a &= \frac{8.4\text{ N} - 3.6\text{ N} - (0.18)(2.4\text{ kg})(9.8\text{ m/s}^2)}{2.4\text{ kg}} \\ a &= 0.236\text{ m/s}^2 \\ a &= 0.24\text{ m/s}^2 \text{ [N]} \end{aligned}$$

3. What minimum magnitude of force would be required to start a 1.0-kg object sliding along a horizontal surface if the coefficient of static friction is 0.20?



$$\begin{aligned} \Sigma F_y &= F_N - F_g = 0 \\ F_N - F_g &= 0 \\ F_N &= F_g \end{aligned}$$

$$\begin{aligned} \Sigma F_x &= F_{app} - F_f = ma \\ F_{app} - F_f &= 0 \\ F_{app} &= \mu mg \\ F_{app} &= (0.20)(1.0\text{ kg})(9.8\text{ m/s}^2) \\ F_{app} &= 1.96\text{ N} \\ F_{app} &> 2.0\text{ N} \end{aligned}$$

4. Show that an applied force of 4.0 N is insufficient to get a stationary 2.0-kg object to move horizontally if the coefficient of starting friction is 0.25.



$$\begin{aligned} \Sigma F_y &= F_N - F_g = 0 \\ F_N - F_g &= 0 \\ F_N &= F_g \end{aligned}$$

$$\begin{aligned} \Sigma F_x &= F_{app} - F_f = ma \\ F_{app} - F_f &> 0? \\ F_{app} - \mu mg &> 0? \\ 4.0\text{ N} - (0.25)(2.0\text{ kg})(9.8\text{ m/s}^2) &> 0? \\ -0.9\text{ N} &> 0? \end{aligned}$$

Since the applied force is not large than the force of static friction, their sum is less than 0 N and therefore insufficient to get the object moving.

# Dynamics Problems And Solutions

**Ian Pickup**



## **Dynamics Problems And Solutions:**

*Mechanics: Statics & Dynamics Problem Solver* The Editors of REA,2012-11-22 The Problem Solvers are an exceptional series of books that are thorough unusually well organized and structured in such a way that they can be used with any text No other series of study and solution guides has come close to the Problem Solvers in usefulness quality and effectiveness Educators consider the Problem Solvers the most effective series of study aids on the market Students regard them as most helpful for their school work and studies With these books students do not merely memorize the subject matter they really get to understand it Each Problem Solver is over 1 000 pages yet each saves hours of time in studying and finding solutions to problems These solutions are worked out in step by step detail thoroughly and clearly Each book is fully indexed for locating specific problems rapidly Detailed treatment of topics in statics friction kinematics dynamics energy relations impulse and momentum systems of particles variable mass systems and three dimensional rigid body analysis Among the advanced topics are moving coordinate frames special relativity vibrations deformable media and variational methods

The Theory of Problem-Solution Dualities and Polarities Kofi Kissi Dompere,2022-04-25 This book is concerned with the development of the understanding of the relational structures of information knowledge decision choice processes of problems and solutions in the theory and practice regarding diversity and unity principles of knowing science non science and information knowledge systems through dualistic polar conditions of variety existence and nonexistence It is a continuation of the sequence of my epistemic works on the theories on fuzzy rationality info statics info dynamics entropy and their relational connectivity to information language knowing knowledge cognitive practices relative to variety identification problem solution dualities variety transformation problem solution dualities and variety certainty uncertainty principle in all areas of knowing and human actions regarding general social transformations It is also an economic theoretic approach in understanding the diversity and unity of knowing and science through neuro decision choice actions over the space of problem solution dualities and polarities The problem solution dualities are argued to connect all areas of knowing including science and non science social science and non social science into unity with diversities under neuro decision choice actions to support human existence and nonexistence over the space of static dynamic dualities The concepts of diversity and unity are defined and explicated to connect to the tactics and strategies of decision choice actions over the space of problem solution dualities The concepts of problem and solution are defined and explicated not in the space of absoluteness but rather in the space of relativity based on real cost benefit conditions which are shown to be connected to the general parent offspring infinite process where every solution generates new problems which then generates a search for new solutions within the space of minimum maximum dualities in the decision choice space under the principle of non satiation over the space of preference non preference dualities with analytical tools drawn from the fuzzy paradigm of thought which connects the conditions of the principle of opposites to the conditions of neuro decision choice actions in the zone of variety

identifications and transformations The Monograph would be useful to all areas of Research Learning and Teaching at Advanced Stages of Knowing and Knowledge Production **Solutions to the Frictional Dynamics Problem and the Reciprocal Variable Feedback Methodology for Design and Control of Robot Mechanisms** Aristides Gogoussis,1989

**Thermo-Dynamics of Plates and Shells** Jan Awrejcewicz,Vadim Anatolevich Krys'ko,Anton V. Krys'ko,2007-02-15 This monograph is devoted to nonlinear dynamics of thin plates and shells with thermosensitive excitation Because of the variety of sizes and types of mathematical models in current use there is no prospect of solving them analytically However the book emphasizes a rigorous mathematical treatment of the obtained differential equations since it helps efficiently in further developing of various suitable numerical algorithms to solve the stated problems Process Dynamics and Control Dale E. Seborg,Thomas F. Edgar,Duncan A. Mellichamp,Francis J. Doyle, III,2016-11-16 The new 4th edition of Seborg s Process Dynamics and Control provides full topical coverage for process control courses in the chemical engineering curriculum emphasizing how process control and its related fields of process modeling and optimization are essential to the development of high value products A principal objective of this new edition is to describe modern techniques for control processes with an emphasis on complex systems necessary to the development design and operation of modern processing plants Control process instructors can cover the basic material while also having the flexibility to include advanced topics **800 Solved Problems in Vector Mechanics for Engineers: Statics** Joseph F. Shelley,1990 Operations with forces Operations with moment and couples Fundamentals of force analysis Force analysis of plane frame and machines Analysis of friction forces

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