

# SOLUTION FOR ENGINEERING MECHANICS STATICS AND DYNAMICS 13TH EDITION

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**Solution Manual for Engineering Mechanics: Statics and Dynamics, 13th Edition**

**Question:**

Find the resultant force acting on a particle located at the origin of a coordinate system and subjected to the following forces:

- $F_1 = 30 \text{ N}$ , acting at an angle of  $30^\circ$  with the positive x-axis
- $F_2 = 40 \text{ N}$ , acting at an angle of  $60^\circ$  below the positive x-axis
- $F_3 = 20 \text{ N}$ , acting vertically upwards

**Answer:**

To find the resultant force, we need to add the three forces vectorially:

$$R = F_1 + F_2 + F_3$$

First, we resolve each force into its x and y components:

$$F_{1x} = 30 \cos(30^\circ) = 26 \text{ N}$$

$$F_{1y} = 30 \sin(30^\circ) = 15 \text{ N}$$

$$F_{2x} = 40 \cos(60^\circ) = 20 \text{ N}$$

$$F_{2y} = -40 \sin(60^\circ) = -34.6 \text{ N}$$

$$F_{3x} = 0 \text{ N}$$

$$F_{3y} = 20 \text{ N}$$

Then, we add the x and y components separately:

$$R_x = F_{1x} + F_{2x} + F_{3x} = 46 \text{ N}$$

$$R_y = F_{1y} + F_{2y} + F_{3y} = -19.6 \text{ N}$$

Finally, we find the magnitude of the resultant force using the Pythagorean theorem:

$$R = \sqrt{R_x^2 + R_y^2} = 49.2 \text{ N}$$

Therefore, the resultant force acting on the particle is 49.2 N at an angle of  $24.4^\circ$  below the positive x-axis.

### Question:

A cylindrical tank has a diameter of 2 m and a height of 3 m. It is filled with water to a depth of 2 m. Determine the hydrostatic force acting on the bottom of the tank.

### Answer:

The hydrostatic force is given by:

$$F = \rho g h A$$

where:

- $\rho$  is the density of water ( $1000 \text{ kg/m}^3$ )
- $g$  is the acceleration due to gravity ( $9.81 \text{ m/s}^2$ )
- $h$  is the depth of water (2 m)
- $A$  is the area of the bottom of the tank ( $\pi r^2 = 3.14 \text{ m}^2$ )

Substituting these values, we get:

$$F = 1000 \text{ kg/m}^3 \times 9.81 \text{ m/s}^2 \times 2 \text{ m} \times 3.14 \text{ m}^2 = 61,174 \text{ N}$$

Therefore, the hydrostatic force acting on the bottom of the tank is 61,174 N.

### The 5 Essential People Skills for Success

In today's fast-paced, competitive world, strong people skills are essential for success in both personal and professional life. According to Dale Carnegie Training,

there are five key people skills that are crucial for developing effective relationships, achieving goals, and resolving conflicts.

### **1. Asserting Yourself**

Assertiveness is the ability to express your thoughts, feelings, and needs in a clear and direct manner while respecting the rights of others. It's not about being aggressive or pushy, but rather about confidently communicating your perspective.

**Question:** How can I assert myself without coming across as overly aggressive?

**Answer:** Focus on using "I" statements to express your needs. For example, instead of saying "You need to help me," try saying "I need your help with this project."

### **2. Listening to Others**

Effective listening involves paying attention to what others are saying, understanding their point of view, and responding with empathy. It builds trust and fosters stronger relationships.

**Question:** How can I become a better listener?

**Answer:** Practice active listening by making eye contact, nodding, and asking clarifying questions. Avoid interrupting and try to see things from the other person's perspective.

### **3. Resolving Conflicts**

Conflict is a natural part of human interaction. Resolving conflicts effectively requires a willingness to compromise, find common ground, and maintain a respectful dialogue.

**Question:** What are the steps to resolving a conflict?

**Answer:** According to Dale Carnegie Training, the steps include:

- Identify the problem
- Express your emotions and concerns
- Listen to the other person's perspective

- Brainstorm solutions together
- Compromise and find a mutually acceptable solution

#### **4. Building Relationships**

Strong relationships are the foundation for success. Building relationships involves being genuine, showing interest in others, and demonstrating empathy.

**Question:** How can I build stronger relationships?

**Answer:** Make an effort to connect with others on a personal level. Share experiences, ask questions, and offer support. Be reliable and keep your commitments.

#### **5. Handling Criticism**

Criticism is an inevitable part of life. Handling criticism effectively requires maintaining a positive attitude, understanding the source of the feedback, and using it to improve.

**Question:** How can I handle criticism without getting defensive?

**Answer:** Take a step back and consider the feedback objectively. Ask clarifying questions and try to understand the intent behind the criticism. Use it as an opportunity for personal growth and development.

### **Tartine Bread: A Culinary Masterpiece by Chad Robertson**

#### **What is Tartine Bread?**

Tartine Bread is a legendary sourdough bread crafted by master baker Chad Robertson at Tartine Bakery in San Francisco, California. Its distinct flavor and chewy texture have captivated bread enthusiasts worldwide.

#### **Who is Chad Robertson?**

Chad Robertson is a renowned baker and author known for his pioneering work in sourdough breadmaking. His innovative techniques and commitment to using organic, locally sourced ingredients have revolutionized the craft.

## **How is Tartine Bread Made?**

Tartine Bread is made using a sourdough starter, a fermented dough containing wild yeast and bacteria. The starter is fed daily and used to leaven the bread, giving it its characteristic sour flavor and long shelf life. It is baked in a cast iron Dutch oven, creating a crispy crust and moist interior.

## **What is the Secret to Tartine Bread's Success?**

The secret to Tartine Bread's success lies in its ingredients and craftsmanship. Robertson uses high-quality organic flour, water filtered through a reverse osmosis system, and sea salt. The sourdough starter provides both flavor and texture, while the long fermentation process enhances its complexity.

## **How Can I Enjoy Tartine Bread?**

Tartine Bread can be enjoyed in countless ways. It is perfect toasted with butter or paired with spreads like cheese or jams. It is also a versatile culinary ingredient, used in sandwiches, pizzas, croutons, and many other dishes.

**What are the basic principles of heating, ventilation, and air conditioning?** The key features of HVAC system working principles include the ability to move large volumes of air, the use of convection and radiation for heating and cooling, and components that help regulate humidity levels. The movement of air is achieved by using fans which can push cold or hot air into space as needed.

**What is the principle of HVAC?** HVAC Working Principles The basic goals of any HVAC system are to control the ambient temperature, keep humidity levels in check, and ensure optimal air quality inside the building. Depending on whether you desire heating or cooling, your HVAC system will go through a specific process to reach the optimal temperature.

**What is the basic principle of heating and Air Conditioning systems work on the same principle?** The basic principle behind both heating and cooling is the movement of heat from a warmer to a cooler area.

**What are the mechanical principles of HVAC?** The refrigerant enters the cooling coils, absorbs heat from the air passing the coils, and returns to its source to desorb the heat that it took in. The heating coils are fed from a heat source such as a boiler or electricity. The heat from these coils is transferred to the air passing over it.

**What is the basic principle of ventilation?** Ventilation has two basic functions: air exchange and air distribution. Air exchange may be summarized simply as the cycle of fresh air in, stale air out. Air distribution is the process of delivering fresh air to all animals and mixing fresh air with stale air prior to removal from the building.

**What is the basic theory of HVAC?** The heating and cooling systems in HVAC work on a principle: heat transfers from a warmer object to a cooler object. During the winter, a thermostat, which is a regulating device, uses fuels like oil, gas, or electricity to produce heat.

**What is the main principle of AC?** AC generators work on the principle of Faraday's law of electromagnetic induction, which states that electromotive force – EMF or voltage – is generated in a current-carrying conductor that cuts a uniform magnetic field.

**How does HVAC ventilation work?** When it comes to HVAC, as in heating and cooling systems specifically, the ventilation is made up of your air handler, ducts, return vents, and blower assembly. These systems work in tandem to provide “mechanical ventilation”, aiming to reduce humidity levels and normalize temperatures throughout the home.

**What is the fundamental principle of air conditioner?** The basic principle of an air conditioner is a vapor compression cycle to minimize the air temperature with the help of a condenser, compressor, expansion valve, and evaporator. The complete cooling process is a heat transfer between the room air and refrigerant gas.

**What is the basic concept of HVAC system?** HVAC is an acronym that stands for Heating, Ventilation, and Air Conditioning. A residential HVAC system is a complete home comfort system that can heat and cool your home, as well as provide improved indoor air quality and humidity control. There are many different types of HVAC systems.

**What is the principle of heating?** With the help of the energy provided (electricity, hot water, burning), the heating element is warmed to a temperature which is higher than the surrounding environment, and the air which surrounds the heating element is heated and rises.

**How does HVAC work?** The outdoor AC unit houses a compressor that pumps refrigerant to an evaporator coil located inside near the furnace. The refrigerant absorbs heat from inside your home, then transports that heat through the outdoor coil, releasing the heat to the outside air to cool your home.

**What are the basic principles of HVAC system?** The HVAC system working principle is based on three sub-principles. These are Thermodynamics, fluid flow, and heat transfer. They are utilized at various levels during the functioning of the HVAC system. The concept of thermodynamics is utilized for maintaining indoor air quality.

**What is the working principle of heating, ventilation, and air conditioning?** Outside, fresh air is generally drawn into the system by a vent into a mix air chamber for mixing with the space return air. Then the mixture air enters an indoor or outdoor heat exchanger section where the air is to be cooled down, then be guided to the space creating positive air pressure.

**What is HVAC mechanical ventilation?** Mechanical ventilation systems circulate fresh air using ducts and fans, rather than relying on airflow through small holes or cracks in a home's walls, roof, or windows. Homeowners can breathe easier knowing their home has good ventilation. **BENEFITS OF MECHANICAL VENTILATION.** • Better Indoor Air Quality.

**What is the general principle of mechanical ventilation?** Mechanical ventilation decreases work of breathing by ensuring adequate VT, optimizing inspiratory and expiratory times during respiration to prevent air trapping, and preventing airway collapse. During mechanical ventilation, VT, PEEP, and Fio2 control oxygenation.

**What are the 3 basic types of ventilation system?** There are three methods that may be used to ventilate a building: natural, mechanical and hybrid (mixed-mode) ventilation.

**What is the rule of ventilation?** 'Dew Point Rule' or 'Three Degree Rule' The Dew Point Rule states that a cargo hold should be ventilated when the dew point of the outside air is lower than the dew point of the air inside the cargo space. Both rules are a suitable means of deciding whether or not it is appropriate to ventilate.

**What are the fundamentals of HVAC?** The HVAC basics encompass the furnace, the air conditioner, and the ductwork that connects them throughout your home. While most people think of the HVAC fundamentals as heating or cooling, the ventilation component is essential. Your HVAC equipment forms a closed system.

**What is the law of thermodynamics in HVAC?** Put into layman's terms, this law says that energy can neither be created nor destroyed. It can move around from place to place, as with heat from your furnace to your living room. It can change forms, as with the potential energy in natural gas becoming heat in the furnace.

**What is HVAC mechanics?** HVAC technicians install various HVAC equipment and commercial refrigeration systems, including furnaces, heating and air conditioning systems, heat pumps, ventilation systems, and refrigeration units. They follow blueprints, specifications, and manufacturer instructions to ensure proper installation.

**What are the principles of the air conditioner?** The basic principle of an air conditioner is a vapor compression cycle to minimize the air temperature with the help of a condenser, compressor, expansion valve, and evaporator. The complete cooling process is a heat transfer between the room air and refrigerant gas.

**What is the heating, ventilation, and air conditioning system?** HVAC is an acronym that stands for Heating, Ventilation, and Air Conditioning. A residential HVAC system is a complete home comfort system that can heat and cool your home, as well as provide improved indoor air quality and humidity control. There are many different types of HVAC systems.

**What are the basics of heating and cooling?** Heating and cooling systems have three basic elements—a source of warm or cool air, a method of sending the heated or cooled air into your living space, and a way to control the temperature in your home.



**What are the basics of ventilation system?** Understanding the Basics of Home Ventilation It involves the exchange of indoor air with fresh outdoor air, helping to reduce moisture, odours, and airborne pollutants. The right ventilation system not only enhances air quality but also regulates indoor temperatures and prevents the buildup of harmful substances.

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