4.91 The tension in the cable \( AB \) is 1 kN. Determine the moment about the \( x \) axis due to the force exerted on the hatch by the cable at point \( B \). Draw a sketch to indicate the direction of the moment.

4.94 The coordinates of \( A \) are \((-2.4, 0, -0.6)\) m, and the coordinates of \( B \) are \((-2.2, 0.7, -1.2)\) m. The force exerted at \( B \) by the sailboat's main sheet \( AB \) is 130 N. Determine the moment of the force about the centerline of the mast (the \( y \) axis). Draw a sketch to indicate the direction of the moment.

4.92 Determine the moment of the force applied at \( D \) about the straight line through the hinges \( A \) and \( B \). (The line through \( A \) and \( B \) lies in the \( y-z \) plane.)

4.93 The tension in the cable \( CE \) is 160 lb. Determine the moment of the force exerted by the cable on the hatch at \( C \) about the straight line through the hinges \( A \) and \( B \).

4.95 The tension in cable \( AB \) is 200 lb. Determine the moment about each of the coordinate axes due to the force exerted on point \( B \) by the cable. Draw sketches to indicate the direction of the moments.
4.116 Determine the sum of the moments exerted about A by the couple and the two forces.

![Diagram of a beam with forces and moments labeled](image)

**Problem 4.116**

4.117 Determine the sum of the moments exerted about A by the couple and the two forces.

![Diagram of a pipe with forces and moments labeled](image)

**Problem 4.117**

4.118 The sum of the moments about point A due to the forces and couples acting on the bar is zero.

(a) What is the magnitude of the couple C?

(b) Determine the sum of the moments about point B due to the forces and couples acting on the bar.

![Diagram of a bar with forces and moments labeled](image)

**Problem 4.118**

4.120 (a) What is the moment of the couple?

(b) Determine the perpendicular distance between the lines of action of the two forces.

![Diagram of a couple with forces and distances labeled](image)

**Problem 4.120**

4.121 Determine the sum of the moments exerted on the plate by the three couples. (The 80-lb forces are contained in the x-z plane.)

![Diagram of a plate with forces and moments labeled](image)

**Problem 4.121**

4.122 What is the magnitude of the sum of the moments exerted on the T-shaped structure by the two couples?

![Diagram of a T-shaped structure with forces labeled](image)

**Problem 4.122**

**Note:**

4.119 In Example 4.11, suppose that instead of acting in the positive z axis direction, the upper 20-N force acts in the positive z axis direction. Instead of acting in the negative z axis direction, the lower 20-N force act in the negative z axis direction. Draw a sketch of the pipe showing the forces acting on it. Determine the sum of the moments exerted on the pipe by the two couples.
4.139 Represent the two forces and couple acting on the beam by a force \( \mathbf{F} \). Determine \( \mathbf{F} \) and determine where its line of action intersects the \( x \) axis.

![Problem 4.139](image)

4.140 The bracket is subjected to three forces and a couple. If you represent this system by a force \( \mathbf{F} \), what is \( \mathbf{F} \) and where does its line of action intersect the \( x \) axis?

![Problem 4.140](image)

4.141 The vector sum of the forces acting on the beam is zero, and the sum of the moments about the left end of the beam is zero.

(a) Determine the forces \( A_x \) and \( A_y \), and the couple \( M_A \).

(b) Determine the sum of the moments about the right end of the beam.

(c) If you represent the 600-N force, the 200-N force, and the 140-N-m couple by a force \( \mathbf{F} \) acting at the left end of the beam and couple \( M \), what are \( \mathbf{F} \) and \( M \)?

![Problem 4.141](image)

4.142 The vector sum of the forces acting on the truss is zero, and the sum of the moments about the origin \( O \) is zero.

(a) Determine the forces \( A_x, A_y \), and \( B \).

(b) If you represent the 2-kip, 4-kip, and 6-kip forces by a force \( \mathbf{F} \), what is \( \mathbf{F} \), and where does its line of action intersect the \( y \) axis?

(c) If you replace the 2-kip, 4-kip, and 6-kip forces by the force you determined in (b), what are the vector sum of the forces acting on the truss and the sum of the moments about \( O \)?

![Problem 4.142](image)

4.143 The distributed force exerted on part of a building foundation by the soil is represented by five forces. If you represent them by a force \( \mathbf{F} \), what is \( \mathbf{F} \), and where does its line of action intersect the \( x \) axis?

![Problem 4.143](image)
4.152 The wall bracket is subjected to the force shown. Determine the moment exerted by the force about the z-axis. Determine the moment exerted by the force about the y-axis. If you represent the force by a force \( \mathbf{F} \) acting at \( O \) and a couple \( \mathbf{M} \), what are \( \mathbf{F} \) and \( \mathbf{M} \)?

4.153 A basketball player executes a "slam dunk" shot, then bungee jumps from a 100-lb force. The dimensions are \( h = 14 \frac{1}{2} \) in and \( r = 9 \frac{1}{2} \) in, and the angle \( \alpha = 120^\circ \).
(a) If you represent the forces he exerts by a force \( \mathbf{F} \) acting at \( O \) and a couple \( \mathbf{M} \), what are \( \mathbf{F} \) and \( \mathbf{M} \)?
(b) The glass backboard will shatter if \( |\mathbf{M}| > 4000 \) in-lb. Does it break?

4.154 In Example 4.14, suppose that the 30-lb upward force in system 1 is changed to a 25-lb upward force. If you want to represent system 1 by a single force \( \mathbf{F} \) (system 2), where does the line of action of \( \mathbf{F} \) intersect the \( x-z \) plane?

4.155 The normal forces exerted on the car's tires by the road are:
\[ N_A = 5104 \text{ N}, \]
\[ N_B = 5027 \text{ N}, \]
\[ N_C = 3613 \text{ N}, \]
\[ N_D = 3559 \text{ N}. \]
If you represent these forces by a single equivalent force \( \mathbf{N} \), what is \( \mathbf{N} \) and where does its line of action intersect the \( x-z \) plane?

4.156 Two forces act on the beam. If you represent them by a force \( \mathbf{F} \) acting at \( C \) and a couple \( \mathbf{M} \), what are \( \mathbf{F} \) and \( \mathbf{M} \)?
4.162 Point G is at the center of the block. The forces are
\[ F_A = -20i + 10j + 20k \text{ (lb)}, \]
\[ F_B = 10i - 10k \text{ (lb)}. \]

You represent the two forces by a force \( F \) acting at \( G \) and a couple \( M \), what are \( F \) and \( M \)?

Problem 4.162

4.165 The tension in cable \( AB \) is 100 lb, and the tension in cable \( CD \) is 60 lb. Suppose that you want to replace these two cables by a single cable \( EF \) so that the force exerted on the wall at \( E \) is equivalent to the two forces exerted by cables \( AB \) and \( CD \) on the walls at \( A \) and \( C \). What is the tension in cable \( EF \), and what are the coordinates of points \( E \) and \( F \)?

Problem 4.165

4.166 The distance \( s = 4 \text{ m} \). If you represent the force and the 200-N-m couple by a force \( F \) acting at the origin \( O \) and a couple \( M \), what are \( F \) and \( M \)?

Problem 4.166