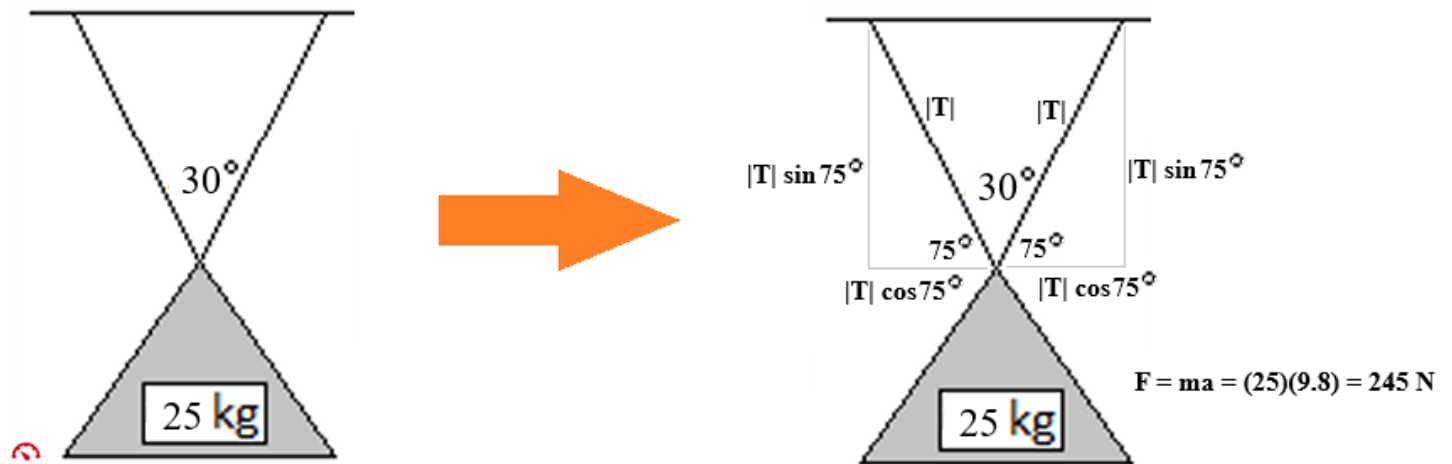


MAT267 Quiz 1 – August 27, 2026

A 25 kg mass hangs by two symmetric cables from a ceiling such that the cables meet at a 30-degree angle at the mass itself. Find the tension (in Newtons) on each cable.



The two upward vertical components cancel the 245 N downward force:

$$2|T| \sin 75^\circ = 245$$

Solve for $|T|$:

$$|T| = \frac{245}{2 \sin 75^\circ} = 126.82 \text{ N.}$$

Part A:

Question 1

An object in R^3 is originally at the origin. Three forces act on it, $v = \langle 1, 3, 2 \rangle$, $w = \langle -2, 4, 0 \rangle$ and $u = \langle 5, -3, 6 \rangle$. What is the object's new location?

The new location is the sum, $u + v + w$, which is $\langle 4, 4, 8 \rangle$.

☐ $\langle 4, -4, 8 \rangle$

☒ $\langle 4, 4, 8 \rangle$

☐ $\langle -4, 4, 8 \rangle$

☐ $\langle -4, 4, -8 \rangle$

Question 2

1 pts

Consider the same object from the previous question. How far is the object from the origin after the forces have acted on it?

The distance is the magnitude, $\sqrt{4^2 + 4^2 + 8^2} = \sqrt{96}$

☐ $\sqrt{16}$

☒ $\sqrt{96}$

☐ $\sqrt{86}$

☐ 16

Question 3

1 pts

Points $A = (2, 3, 2)$ and $B = (6, -1, -8)$ lie directly opposite one another on a sphere. Find the equation of the sphere in $(x - x_0)^2 + (y - y_0)^2 + (z - z_0)^2 = r^2$ format.

Midpt: $\left(\frac{2+6}{2}, \frac{3+(-1)}{2}, \frac{2+(-8)}{2}\right) = (4, 1, -3)$. Diameter is $\sqrt{(6-2)^2 + (-1-3)^2 + (-8-2)^2} = \sqrt{4^2 + 4^2 + 10^2} = \sqrt{132}$, so the radius is $r = \frac{1}{2}\sqrt{132}$. Note that $r^2 = \frac{1}{4}(132) = 33$. Thus, sphere is $(x - 4)^2 + (y - 1)^2 + (z + 3)^2 = 33$. I made an error in the choices, so everyone got this point, for up to 5 points total on Part A.

Question 4

The sphere $(x - 2)^2 + (y + 1)^2 + (z - 6)^2 = 81$ passes through the xy plane, and forms a circle. Find the radius of this circle.

☐ $\sqrt{80}$

☐ $(2, -1, 0)$

☐ $\sqrt{77}$

☒ $\sqrt{45}$

xy-plane means $z=0$, so set $z=0$. This gives $(x-2)^2 + (y+1)^2 + 36 = 81$, which is $(x-2)^2 + (y+1)^2 = 45$, so the radius is $\sqrt{45}$

Question 5

Given the vector $u = 5i + 7j$, find a vector parallel to u but with length 12.

☐ $\langle 60, 84 \rangle$

☐ $\langle -60/\sqrt{74}, -84/\sqrt{74} \rangle$

☒ $\langle 60/\sqrt{74}, 84/\sqrt{74} \rangle$

☐ $\langle -60, -84 \rangle$

$|u| = \sqrt{74}$, so unit vector of u is $(1/\sqrt{74})u$, then multiply by 12.