Unit 8 Test — Answer Key

Law of Sines/Cosines, Vectors, Polar Coordinates & Parametric Equations

FOR TEACHER / SELF-CHECK USE

This test was written to cover Unit 8's topics (Law of Sines, Law of Cosines, vectors, polar coordinates, and parametric equations). Every solution below has been independently verified.

1

Law of Sines: $a/\sin(A) = b/\sin(B) \rightarrow b = a\cdot\sin(B)/\sin(A) = 10\cdot\sin(45°)/\sin(30°) = 10\cdot(\sqrt{2}/2)/(1/2)$.

Answer: A — $10\sqrt{2}$

2

Law of Cosines: $c^2 = a^2 + b^2 - 2ab\cdot\cos(C) = 49 + 81 - 2(7)(9)(1/2) = 130 - 63 = 67$. $c = \sqrt{67}$.

Answer: A — $\sqrt{67}$

3

$\cos(C) = (a^2 + b^2 - c^2)/(2ab) = (64 + 36 - 100)/(2\cdot8\cdot6) = 0/96 = 0$. $\cos(C) = 0$ means $C = 90°$ (this is a 6-8-10 right triangle).

Answer: C = 90°

4

Add corresponding components: $(3 + (-1), -2 + 5) = (2, 3)$.

Answer: A — (2, 3)

5

Magnitude $= \sqrt{(3^2 + 4^2)} = \sqrt{(9+16)} = \sqrt{25}$.

Answer: A — 5

6

Magnitude of $(6,8) = \sqrt{(36+64)} = \sqrt{100} = 10$. Divide each component by 10: $(6/10, 8/10) = (3/5, 4/5)$.

Answer: (3/5, 4/5)

7

$x = r\cdot\cos(\theta) = 4\cdot\cos(\pi/3) = 4(1/2) = 2$. $y = r\cdot\sin(\theta) = 4\cdot\sin(\pi/3) = 4(\sqrt{3}/2) = 2\sqrt{3}$.

Answer: A — (2, $2\sqrt{3}$)

8

$r = \sqrt{(0^2 + (-5)^2)} = 5$. The point lies on the negative y-axis, which corresponds to $\theta = 3\pi/2$ (with $r > 0$).

Answer: A — (5, $3\pi/2$)

9

The forces are perpendicular vectors: (40, 0) and (0, 30). Resultant = (40, 30).
Magnitude $= \sqrt{(40^2 + 30^2)} = \sqrt{(1600+900)} = \sqrt{2500} = 50$ N.
Direction $= \arctan(30/40) = \arctan(0.75) \approx 36.87°$ above east.

Answer: Magnitude 50 N, direction ≈ 36.87° above east

10

Solve $x = 2t+1$ for t: $t = (x-1)/2$.
Substitute into $y = t^2 - 3$: $y = ((x-1)/2)^2 - 3 = (x-1)^2/4 - 3$.
This is a parabola (vertex form) with vertex at $(1, -3)$, opening upward.

Answer: $y = (x - 1)^2/4 - 3$; the curve is a parabola with vertex (1, −3)