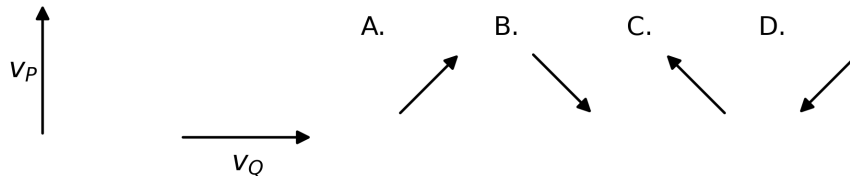




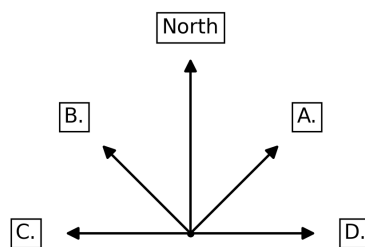
0. Uncertainties and Vectors

0.3 Vectors and scalars

1. The diagram shows the velocities v_P and v_Q of two aircraft, P and Q. The two velocities have the same magnitude. Which arrow shows the direction of the vector $v_P - v_Q$?



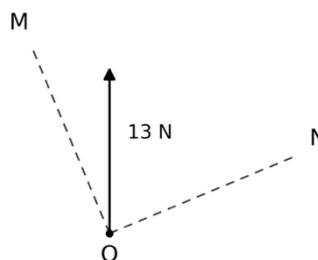
2. A steady wind blows from west to east. A pilot must fly an aircraft so that it travels due north relative to the ground. In which direction must the aircraft be pointed?



3. Which of the following is a vector quantity?

A. Impulse B. Energy C. Density D. Power

4. A force of 13 N acts at a point O. The force is resolved into two components along the perpendicular directions OM and ON.



The component along OM has a magnitude of 5 N. What is the magnitude of the component along ON?

A. 8 N B. 12 N C. 14 N D. 18 N

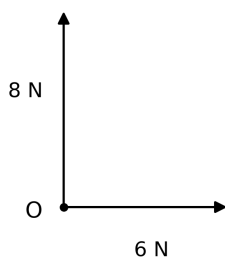
5. Which of the following is a scalar quantity?

A. Displacement B. Weight C. Speed D. Acceleration

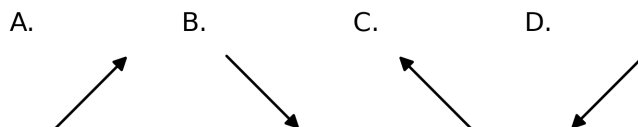


0. Uncertainties and Vectors

6. A stone is projected with speed u at an angle of 35° above the horizontal. What is the magnitude of the vertical component of the initial velocity of the stone?
- A. $u \cos 35^\circ$ B. $u \sin 35^\circ$ C. $u \tan 35^\circ$ D. u
7. The vector diagram shows two forces acting on a point object O. The forces are in the plane of the page.



A third force is now applied to O in the plane of the page so that O is in equilibrium. Which of the following gives the direction of this third force?

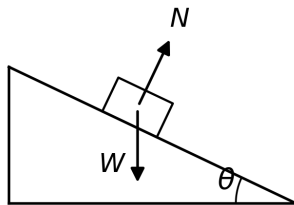


8. Which of the following lists one vector quantity and two scalar quantities?
- A. velocity, energy, mass
- B. force, acceleration, momentum
- C. speed, distance, power
- D. impulse, displacement, temperature
9. Which of the following lists two scalar quantities?
- A. work, velocity
- B. impulse, momentum
- C. gravitational field strength, weight
- D. power, speed



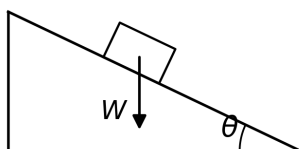
0. Uncertainties and Vectors

10. A block of weight W rests on a frictionless slope that makes an angle θ with the horizontal. The normal reaction force on the block from the slope is N .



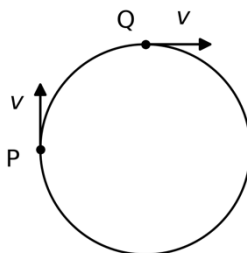
Which of the following gives the magnitude of N ?

- A. $W \tan \theta$ B. $W \sin \theta$ C. $W \cos \theta$ D. $W / \cos \theta$
11. A skier of weight W slides down a slope that makes an angle θ with the horizontal. Friction and air resistance are negligible.



Which of the following gives the magnitude of the resultant force on the skier?

- A. $W \cos \theta$ B. $W \sin \theta$ C. $W \tan \theta$ D. W
12. A car travels at a constant speed v around a horizontal circular track. The diagram shows the car at two positions, P and Q.



Which arrow shows the direction of the change in velocity of the car as it moves from position P to position Q?

A.

B.

C.

D.





0. Uncertainties and Vectors

13. Two forces, of magnitude 8 N and 5 N, act at the same point. Which of the following cannot be the magnitude of the resultant of these two forces?
- A. 3 N B. 6 N C. 13 N D. 15 N
14. Which of the following lists three vector quantities?
- A. acceleration, weight, impulse
- B. speed, energy, mass
- C. force, power, displacement
- D. electric current, pressure, momentum



0. Uncertainties and Vectors

Answers 答案与解析

题号	答案	解析
1	C	$\mathbf{v}_P - \mathbf{v}_Q = \mathbf{v}_P + (-\mathbf{v}_Q)$: $\mathbf{v}_P$ 向北, $-\mathbf{v}_Q$ 向西, 合成后指向西北。
2	B	风把飞机向东吹, 机头必须偏向西侧, 机头指向西北, 东西分量才能抵消, 合速度向正北。
3	A	冲量 = 力 $\times$ 时间, 有方向; 能量、密度、功率都是标量。
4	B	两分量互相垂直: $\sqrt{(13^2 - 5^2)} = \sqrt{144} = 12 \text{ N}$ 。
5	C	速率只有大小; 位移、重力、加速度都是矢量。
6	B	竖直分量 = $u \sin 35^\circ$ (水平分量才是 $u \cos 35^\circ$)。
7	D	两力合力 = $\sqrt{(6^2 + 8^2)} = 10 \text{ N}$, 方向在东偏北 53° ; 平衡力大小相等方向相反, 指向西南。
8	A	velocity 是矢量, energy、mass 是标量; B 三个都是矢量, C 三个都是标量, D 有两个矢量。
9	D	功率与速率都是标量; velocity、impulse、momentum、field strength、weight 均为矢量。
10	C	垂直于斜面方向平衡: $N = W \cos \theta$ 。
11	B	无摩擦时沿斜面方向的合力 = 重力的平行分量 = $W \sin \theta$ 。
12	C	$\Delta \mathbf{v} = \mathbf{v}_Q - \mathbf{v}_P$: $\mathbf{v}_Q$ 向东, $-\mathbf{v}_P$ 向南, 合成后指向东南。
13	D	合力大小范围为 $ 8 - 5 $ 到 $8 + 5$, 即 3 N 到 13 N , 15 N 不可能。
14	A	加速度、重力、冲量都是矢量; speed、energy、mass、power、current、pressure 是标量。