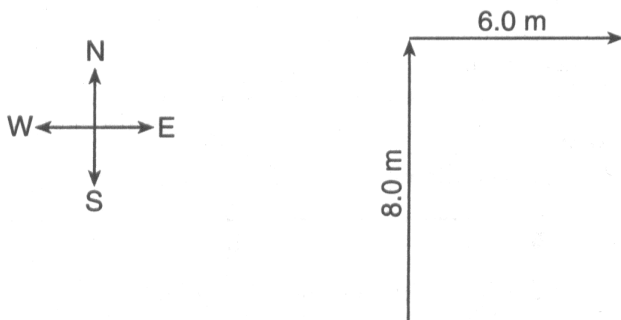


Winter Takehome

Base your answer to questions 1 and 2 on the information and vector diagram below.

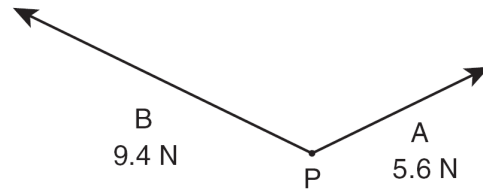
A dog walks 8.0 meters due north and then 6.0 meters due east.



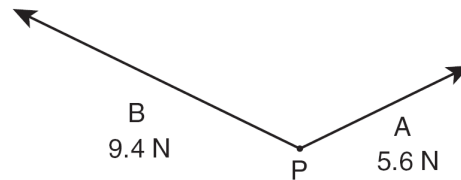
1. On the diagram above, construct the resultant vector that represents the dog's total displacement.
2. Determine the magnitude of the dog's total displacement.

3. Base your answer to the following question on the information and diagram below.

Force *A* with a magnitude of 5.6 newtons and force *B* with a magnitude of 9.4 newtons act concurrently on point *P*.

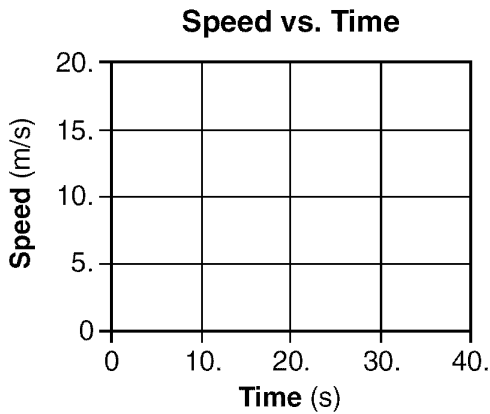


On the diagram below, use a ruler and protractor to construct a vector representing the resultant of forces *A* and *B*.



4. Base your answer to the following question on the information below.

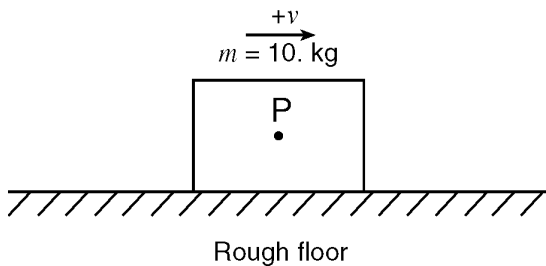
A car on a straight road starts from rest and accelerates at $1.0 \text{ meter per second}^2$ for 10. seconds. Then the car continues to travel at constant speed for an additional 20. seconds.



On the grid provided, use a ruler or straightedge to construct a graph of the car's speed as a function of time for the entire 30.-second interval.

5. Base your answer to the following question on the information and diagram below.

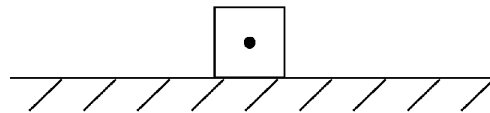
A 10.-kilogram box, sliding to the right across a rough horizontal floor, accelerates at $-2.0 \text{ meters per second}^2$ due to the force of friction.



On the diagram provided, draw a vector representing the net force acting on the box. Begin the vector at point *P* and use a scale of 1.0 centimeter = 5.0 newtons.

6. Base your answer to the following question on the information below.

A force of 10. Newtons toward the right is exerted on a wooden crate initially moving to the right on a horizontal wooden floor. The crate weighs 25 Newtons.



a Calculate the magnitude of the force of friction between the crate and the floor.

b On the diagram, draw and label all vertical forces acting on the crate.

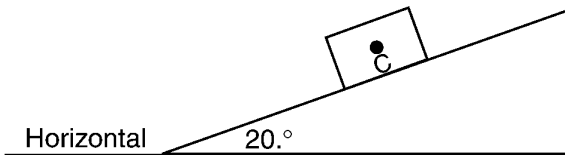
c On the diagram, draw and label all horizontal forces acting on the crate.

d What is the magnitude of the net force acting on the crate?

e Is the crate accelerating? Explain your answer.

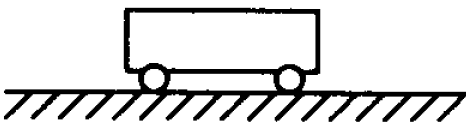
7. Base your answer to the following question on the information and diagram below.

The following diagram is provided for practice purposes only. A 10.0-kilogram block slides at constant speed down a plane inclined at 20.0° to the horizontal, as shown.



On the diagram above, draw an arrow to represent and identify the direction of each of the three forces (weight, friction, normal force) acting on the block. Begin each arrow at point C and label each arrow with the force that it represents.

8. A student pulls a cart across a horizontal floor by exerting a force of 50. newtons at an angle of 35° to the horizontal.



a On the diagram above, using a protractor and a straightedge, construct a scaled vector showing the 50.-newton force acting on the cart at the appropriate angle. The force must be drawn to a scale of 1.0 centimeter = 10. N. Label the 50.-newton force and the 35° angle on your diagram. Be sure your final answer appears with the correct labels (*numbers and units*).

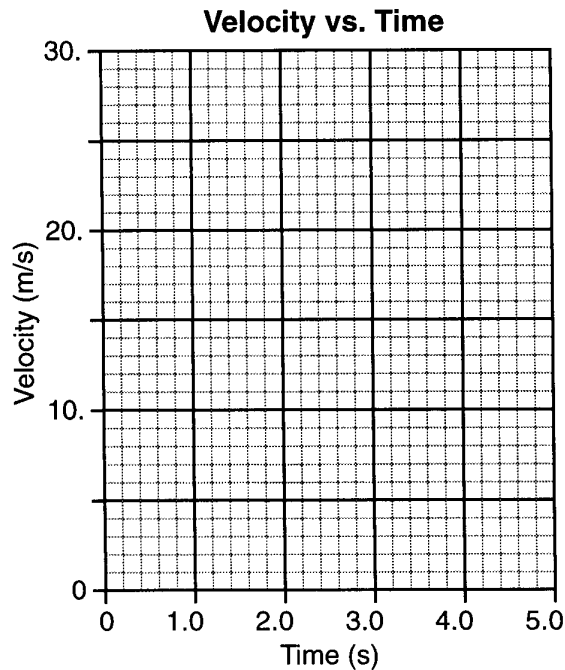
b Construct the horizontal component of the force vector to scale on your diagram, and label it *H*.

c What is the magnitude of the horizontal component of the force?

9. Base your answer to the following question on the information and data table below.

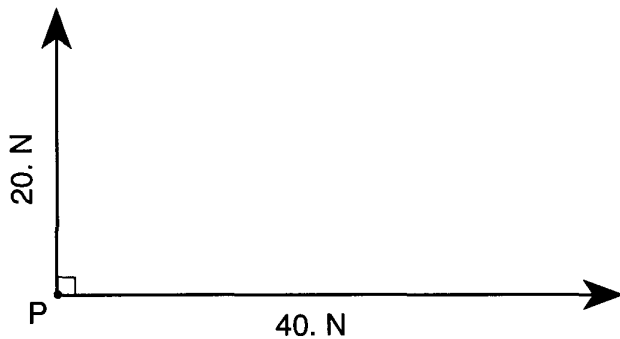
A car is traveling due north at 24.0 meters per second when the driver sees an obstruction on the highway. The data table below shows the velocity of the car at 1.0-second intervals as it is brought to rest on the straight, level highway.

Time (s)	Velocity (m/s)
0.0	24.0
1.0	19.0
2.0	14.0
3.0	10.0
4.0	4.0



Using your graph, determine the acceleration of the car.
[Show all calculations, including the equation and substitution with units.]

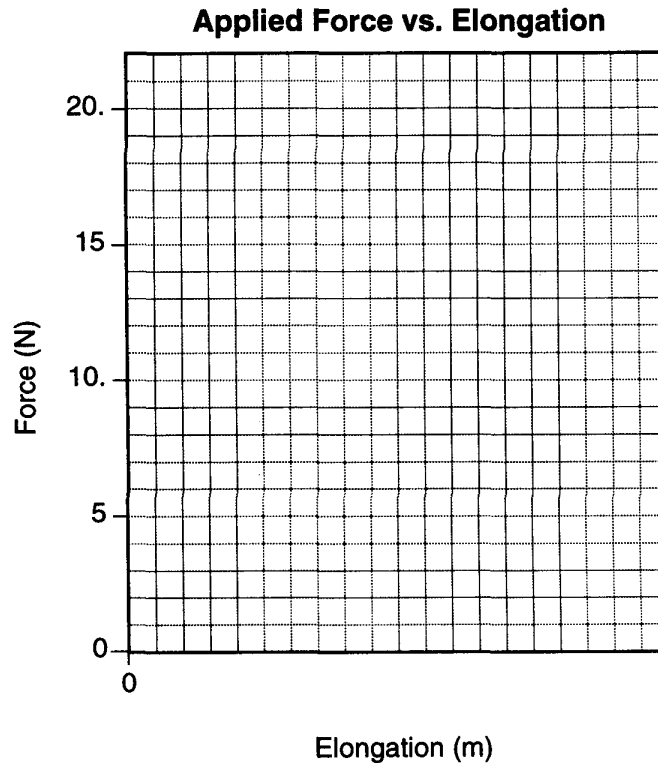
10. Base your answer to the following question on the information and vector diagram below.



Calculate the magnitude of the acceleration of the object. [Show all calculations, including the equation and substitution with units.]

Base your answer to questions **11** through **14** on the information in the data table below. The data were obtained by varying the force applied to a spring and measuring the corresponding elongation of the spring.

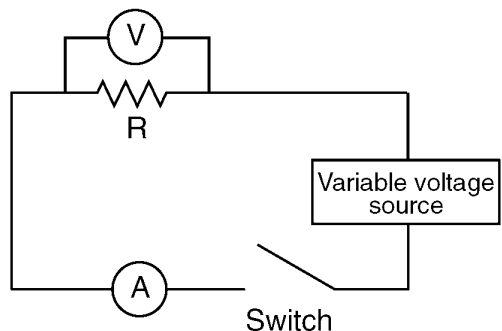
Applied Force (N)	Elongation of Spring (m)
0.0	0.00
4.0	0.16
8.0	0.27
12.0	0.42
16.0	0.54
20.0	0.71



11. Draw the best-fit line.
12. Plot the data points for force versus elongation.
13. Mark an appropriate scale on the axis labeled "Elongation (m)."
14. Using the best-fit line, determine the spring constant of the spring. [Show all calculations, including the equation and substitution with units.]

Base your answer to questions **15** and **16** on the information, circuit diagram, and data table below.

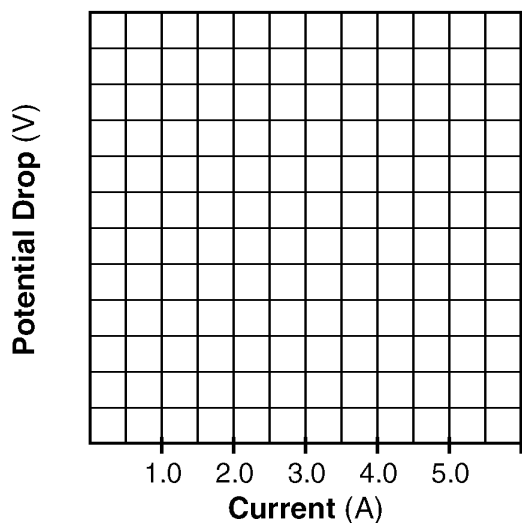
In a physics lab, a student used the circuit shown to measure the current through and the potential drop across a resistor of unknown resistance, R . The instructor told the student to use the switch to operate the circuit only long enough to take each reading. The student's measurements are recorded in the data table.



Data Table

Current (A)	Potential Drop (V)
0.80	21.4
1.20	35.8
1.90	56.0
2.30	72.4
3.20	98.4

Potential Drop vs. Current



15. Mark an appropriate scale on the axis labeled "Potential Drop (V)."

16. Draw the line or curve of best fit.