

Motion Problems – Speed, Velocity and Momentum problems. Key

- Find the speed of a long-distance runner who runs 30 miles in 6 hours.
 $30 \text{ miles} = d$
 $6 \text{ hours} = t$
 $? = s$
 $s = d/t$
 $s = 30 / 6$
 $s = 5 \text{ mi/hr}$
- A jet airplane flies from St. Louis, Missouri, to Phoenix, Arizona, in 3 hrs. The distance is 1,500 miles. what is the plane's speed?
 $3 \text{ hr} = t$
 $1500 \text{ mi} = d$
 $? = s$
 $s = d/t$
 $s = 1500 / 3$
 $s = 500 \text{ mi/hr}$
- It takes a runner 10 seconds to run 100 yards. What is the runner's speed?
 $10 \text{ s} = t$
 $100 \text{ yd} = d$
 $? = s$
 $s = d/t$
 $s = 100 / 10$
 $s = 10 \text{ yd/s}$
- A sprinter runs the 100-meter race in 10 seconds. What is the sprinter's speed?
 $100 \text{ m} = d$
 $10 \text{ s} = t$
 $? = s$
 $s = d/t$
 $s = 100 / 10$
 $s = 10 \text{ m/s}$
- A train travels a distance of 1200 kilometers in 20 hours. What is the speed of the train?
 $1200 \text{ km} = d$
 $20 \text{ hr} = t$
 $? = s$
 $s = d/t$
 $s = 1200 / 20$
 $s = 60 \text{ km/hr}$
- A car travels 500 miles east in 10 hours. What is the speed of the car?
 $500 \text{ mi} = d$
 $10 \text{ hr} = t$
 $? = s$
 $s = d/t$
 $s = 500 / 10$
 $s = 50 \text{ mi/hr}$
- A car travels 500 miles east in 10 hours. What is the velocity of the car?
 $500 \text{ mi} = d$
 $10 \text{ hr} = t$
 $? = v$
 $v = d/t$
 $v = 500 / 10$
 $v = 50 \text{ mi/hr}$
- Find the velocity of a long-distance runner who runs south for 30 miles in 6 hours.
 $30 \text{ mi} = d$
 $6 \text{ hrs} = t$
 $v = ?$
 $v = d/t$
 $v = 30 / 6$
 $v = 5 \text{ mi/hr}$
- Emily rode her horse 2 hours and traveled 4 miles. What was her speed?
 $2 \text{ hr} = t$
 $4 \text{ mi} = d$
 $s = d/t$
 $s = 4/2$
 $s = 2 \text{ mi/hr}$
- Sally drove at a speed of 50 km / hr south for 2 hours. How far did she travel?
 $50 \text{ km / hr} = s$
 $2 \text{ hrs} = t$
 $? = d$
 $s = d/t$
 $50 \text{ km/hr} = d / 2 \text{ hrs}$
 $d = 100 \text{ km}$
- Hannah was driving northeast at a velocity of 60 km/hr for .5 hrs (30 minutes). How far did she travel?
 $60 \text{ km/hr} = v$
 $.5 \text{ hrs} = t$
 $? = d$
 $v = d/t$
 $60 = d/.5$
 $d = 30 \text{ km}$
- Two planes leave the same airport. One plane is flying east at a velocity of 300 km/hr and the other plane is flying south at a velocity of 350 km/hr. If both planes traveled for 2 hours, what distance did each plane travel?
 $300 \text{ km/hr} = v \text{ (plane a)}$
 $350 \text{ km/hr} = v \text{ (plane b)}$
 $2 \text{ hrs} = t$
 $? = d$
 $v = d/t$
a) $300 = d / 2$ b) $350 = d / t$

$$d = 600 \text{ km} \quad d = 700 \text{ km}$$

13. A high school student ran the 100 meter dash in 12.20 seconds. What was the student's velocity?

$$100 \text{ m} = d$$

$$12.2 \text{ s} = t$$

$$? = v$$

$$v = d/t$$

$$v = 100 / 12.20$$

$$v = 8.20 \text{ m/s}$$

14. A horse ran 500 meters in 50 seconds. What is the velocity of the horse?

$$500 \text{ m} = d$$

$$50 \text{ s} = t$$

$$? = v$$

$$v = d/t$$

$$v = 500 / 50$$

$$v = 10 \text{ m/s}$$

15. A funny car at a drag strip went 800 meters in 9 seconds. What was its velocity?

$$800 \text{ m} = d$$

$$9 \text{ s} = t$$

$$? = v$$

$$v = d/t$$

$$v = 800 / 9$$

$$v = 88.89 \text{ m/s}$$

16. A pigeon flew 1000 meters in 48 seconds. What was the pigeon's velocity?

$$1000 \text{ m} = d$$

$$48 \text{ s} = t$$

$$? = v$$

$$v = d/t$$

$$v = 1000 / 48$$

$$v = 20.83$$

17. A hiker walked a 5 kilometer trail in 65 minutes. What was his velocity?

$$5 \text{ km} = d$$

$$65 \text{ m} = t$$

$$? = v$$

$$v = d/t$$

$$v = 5 / 60$$

$$v = 0.08 \text{ km/m}$$

18. A dog chased a ball 25 meters in 3 seconds, what was the speed of the dog?

$$25 \text{ m} = d$$

$$3 \text{ s} = t$$

$$? = s$$

$$s = d/t$$

$$s = 25 / 3$$

$$s = 12.5 \text{ m/s}$$

19. What is the velocity of a model rocket that climbed 950 meters in 3 seconds?

$$950 \text{ m} = d$$

$$3 \text{ s} = t$$

$$? = v$$

$$v = d/t$$

$$v = 316.67 \text{ m/s}$$

20. What would the velocity be of a bullet that strikes a tin can 350 meters away in 0.25 seconds?

$$350 \text{ m} = d$$

$$0.25 \text{ s} = t$$

$$? = v$$

$$v = d/t$$

$$v = 350 / 0.25$$

$$v = 1400 \text{ m/s}$$

21. What is the speed of a subway train that traveled 13 kilometers in 8 minutes?

$$13 \text{ km} = d$$

$$8 \text{ min} = t$$

$$? = v$$

$$v = d/t$$

$$v = 13 / 8$$

$$v = 1.63 \text{ km/m}$$

22. A school bus drove at a velocity of 23.04 km/m for 18 minutes. What distance did the bus travel?

$$23.04 \text{ km/m} = v$$

$$18 \text{ m} = t$$

$$? = d$$

$$v = d/t$$

$$d = 23.04 \times 18$$

$$d = 1.28 \text{ km}$$

23. A motorcycle has a mass of 250 kg and a velocity of 28 m/s, what is its momentum?

$$250 \text{ kg} = m$$

$$28 \text{ m/s} = v$$

$$? = p$$

$$p = mv$$

$$p = 250 \times 28$$

$$p = 7000 \text{ kgxm/s}$$

24. A skateboarder with a mass of 60 kg is moving at a velocity of 3 m/s. What is the skateboarder's momentum?

$$60 \text{ kg} = m$$

$$3 \text{ m/s} = v$$

$$? = p$$

$$p = mv$$

$$p = 60 \times 3$$

$$p = 180 \text{ kg x m/s}$$

25. What is the velocity of a car that is moving with a momentum of 35 kg x m/s and has a mass of 945 kg?

$$\begin{aligned}35 \text{ kgxm/s} &= p \\945 \text{ kg} &= m \\? &= v \\p &= mv \\35 &= 945 \times v \\v &= 27 \text{ m/s}\end{aligned}$$

26. What is the mass of a car with a momentum of 6480 kg x m/s and a velocity of 18 m/s?

$$\begin{aligned}6480 \text{ kg} &= p \\18 \text{ m/s} &= v \\? &= m \\p &= mv \\6480 &= m \times 18 \\m &= 360 \text{ kg}\end{aligned}$$

27. What is the momentum of a 620 kg truck traveling at a velocity of 33 m/s?

$$\begin{aligned}620 \text{ kg} &= m \\33 \text{ m/s} &= v \\? &= p \\p &= m v \\p &= 620 \times 33 \\p &= 20,460 \text{ kg x m/s}\end{aligned}$$

28. A bike rider went from 3 m/s to 8 m/s in 2 seconds, what was his acceleration?

$$\begin{aligned}3 \text{ m/s} &= v_i \\8 \text{ m/s} &= v_f \\2 \text{ s} &= t \\? &= a \\a &= v_f - v_i / t \\a &= 8 - 3 / 2 \\a &= 2.5 \text{ m/s}^2\end{aligned}$$

29. A car went from 110 m/s to 80 m/s in 20 seconds. What was the acceleration of the car?

$$\begin{aligned}110 \text{ m/s} &= v_i \\80 \text{ m/s} &= v_f \\20 \text{ s} &= t \\? &= a \\a &= v_f - v_i / t \\a &= 80 - 110 / 20 \\a &= - 1.5 \text{ m/s}^2\end{aligned}$$

30. A car had a change in velocity of 40 m/s with an acceleration of 5 m/s². How long did it take this acceleration to occur?

$$\begin{aligned}40 \text{ m/s} &= \Delta v \\5 \text{ m/s}^2 &= a \\? &= t \\a &= v_f - v_i / t \\5 &= 40 / t \\t &= 8 \text{ s}\end{aligned}$$