ODDS

Distance, Speed, and Time Practice Problems

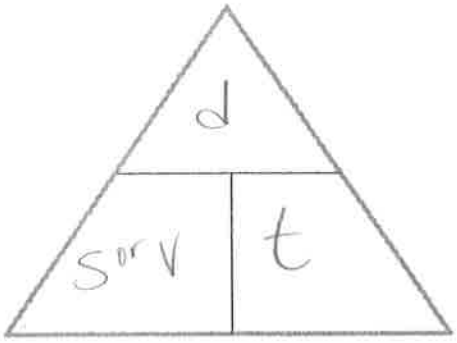
WORKSHEET 5 A

d from www.Barringtonmiddle.

YOU MUST SHOW YOUR WORK.

You can use a calculator but you must show all of the steps involved in doing the problem.

SPEED $Speed = \frac{\text{Distance}}{\text{Time}}$



1. If a car travels 400m in 20 seconds how fast is it going?

$V = \frac{d}{t} = \frac{400m}{20s} = 20 m/s$

2. If you move 50 meters in 10 seconds, what is your speed?

$V = \frac{50m}{10s} = 5 m/s$

3. You arrive in my class 45 seconds after leaving math which is 90 meters away. How fast did you travel?

$V = \frac{d}{t} = \frac{90m}{45s} = 2 m/s$

4. A plane travels 395,000 meters in 9000 seconds. What was its speed?

$V = \frac{395000 m}{9000 s} = 43.9 m/s$

5. It takes Serina 0.25 hours to drive to school. Her route is 16 km long. What is Serina's average speed on her drive to school?

$\bar{V} = \frac{d}{t} = \frac{16km}{0.25h} = 64 km/hr$

TIME $Time = \frac{\text{Distance}}{\text{Speed}}$

6. How much time will it take for a bug to travel 5 meters across the floor if it is traveling at 1 m/s?

$t = \frac{d}{V} = \frac{5m}{1m/s} = 5s$

7. You need to get to class, 200 meters away, and you can only walk in the hallways at about 1.5 m/s. (if you run any faster, you'll be caught for running). How much time will it take to get to your class?

$t = \frac{d}{V} = \frac{200m}{1.5 m/s} = 133.3 s$

8. In a competition, an athlete threw a flying disk 139 meters through the air. While in flight, the disk traveled at an average speed of 13.0 m/s. How long did the disk remain in the air?

$t = \frac{d}{V} = \frac{139m}{13.0 m/s} = 10.7 s$

DISTANCE *Distance* = Speed x Time

WORKSHEET 5 A

9. How far can you get away from your little brother with the squirt gun filled with paint if you can travel at 3 m/s and you have 15s before he sees you?

$d = vt = 3\,m/s \cdot 15\,s = 45\,m$

10. How far can your little brother get if he can travel at 2.5 m/s and in 5 seconds you will discover that his squirt gun has run out of paint?

$d = vt = 2.5\,m/s \cdot 5\,s = 12.5\,m$

11. If you shout into the Grand Canyon, your voice travels at the speed of sound (340 m/s) to the bottom of the canyon and back, and you hear an echo. How deep is the Grand Canyon at a spot where you can hear your echo 5.2 seconds after you shout?

$d = vt = 340\,m/s \cdot 5.2\,s = 1768\,m$

CHALLENGE PROBLEM

Bill and Amy want to ride their bikes from their neighborhood to school which is 14.4 kilometers away. It takes Amy 40 minutes to arrive at school. Bill arrives 20 minutes after Amy. How much faster **(in meters/second)** is Amy's average speed for the entire trip?

Be sure to show all necessary metric conversions!!

$V_{Amy} = \frac{d}{t} = \frac{14.4\,km}{40\,min} \cdot \frac{1000\,m}{1\,km} \cdot \frac{1\,min}{60\,s} = 6\,m/s$

$V_{BILL} = \frac{d}{t} = \frac{14.4\,km}{(40+20)\,min} \cdot \frac{1000\,m}{1\,km} \cdot \frac{1\,min}{60\,s} = 4\,m/s$

Amy travelled 2 m/s faster than Bill

Combining Velocity Worksheet

WORKSHEET 5 B

Modified fromhttp://physics.info/vector-addition/problems.shtmlhttp://physics.info/vector-addition/problems.shtml

ɔirection

1. Two people are pushing a broken down car. One pushes of 2 m/s east, the other a 1.5 m/s east. What direction is the will the ball move? East @ 3.5 m/s

2m/s E
1.5m/s E

2. Two soccer players kick a ball simultaneously from *opposite* sides. Red #3 kicks to the right with a velocity of 5 m/s while Blue #5 kicks to the left with a velocity of 6.3 m/s. What direction will the ball move? left @ 1.3 m/s

5m/s →
← 6.3m/s

3. An airplane flies due north at 100 m/s through a 30 m/s cross wind blowing from the South. Determine the directional velocity of the airplane. 130 m/s N

100m/s N
30m/s

Mathematical

1. A plane flies with a velocity of 52 m/s south in a 12 m/s wind blowing the plane south. Find the combined direction and velocity. 64 m/s South

S
← 52m/s
← 12m/s

2. A boat heads east up a river with a velocity of 12 m/s. If the river flows at 6.0 m/s west. Find the combined direction and velocity. 6 m/s East

12m/s →
← 6m/s W

3. A boy jumps upwards at a rate of 2 m/s. He is in an elevator also going up at a rate of 5 m/s. Find the combined direction and velocity. 7 m/s up.

↑2m/s ↑5m/s

Acceleration Practice Worksheet

WORKSHEET 5 C

Modified from Mr. Santowski's page (http://mrsantowski.tripod.com/2008ICP/Physics/Acceleration_Worksheet.pdf) and Toll Middle School's page (www.tollmiddleschool.org/.../Acceleration%20Worksheet.doc)

1. A roller coaster car rapidly picks up speed as it rolls down a slope. As it starts down the slope, its speed is 4 m/s. But 3 seconds later, at the bottom of the slope, its speed is 22 m/s. What is its average acceleration?

$a = \frac{v_f - v_i}{t} = \frac{22\,m/s - 4\,m/s}{3s} = \frac{18\,m/s}{3s} = 6\,m/s^2$

2. A car advertisement states that a certain car can accelerate from rest to 70 km/h in 7 seconds. Find the car's average acceleration.

$70\frac{km}{h} \cdot \frac{1\,hr}{60\,min} \cdot \frac{1\,min}{60s} \cdot \frac{1000\,m}{1\,km} = 19.4\,m/s$

$a = \frac{v_f - v_i}{t} = \frac{70\,km/h - 0\,km/h}{7\,s} = \frac{19.4\,m/s}{7s} = 2.8\,m/s^2$

3. A lizard accelerates from 2 m/s to 10 m/s in 4 seconds. What is the lizard's average acceleration?

$a = \frac{v_f - v_i}{t} = \frac{10\,m/s - 2\,m/s}{4s} \cdot \frac{8\,m/s}{4s} \cdot 2\,m/s^2$

4. If a Ferrari, with an initial velocity of 10 m/s, accelerates at a rate of 50 m/s/s for 3 seconds, what will its final velocity be?

$\Delta v = at = 50\,m/s^2 \cdot 3s = 150\,m/s = v_f - 10\,m/s$ (+10 m/s)

$\Delta v = v_f - v_i$

$v_f = 160\,m/s$

5. A cyclist accelerates from 0 m/s to 8 m/s in 3 seconds. What is his acceleration? Is this acceleration higher than that of a car which accelerates from 0 to 30 m/s in 8 seconds?

$a = \frac{v_f - v_i}{t} = \frac{8\,m/s - 0\,m/s}{3s} = 2.7\,m/s^2$

$a = \frac{30\,m/s - 0\,m/s}{8s} = 3.75\,m/s^2$

No, it is not a greater acceleration

6. A skater increases her velocity from 2.0 m/s to 10.0 m/s in 3.0 seconds. What is the skater's acceleration?

$a = \frac{v_f - v_i}{t} = \frac{10\,m/s - 2\,m/s}{3s} = \frac{8\,m/s}{3s} = 2.7\,m/s^2$

WORKSHEET 5 C

7. A car accelerates at a rate of 3.0 m/s². If its original speed is 8.0 m/s; how many seconds will it take the car to reach a final speed of 25.0 m/s?

$$t = \frac{\Delta V}{a} = \frac{V_f - V_i}{a} = \frac{25\ m/s - 8\ m/s}{3\ m/s^2} = 5.7\ s$$

8. While traveling along a highway a driver slows from 24 m/s to 15 m/s in 12 seconds. What is the automobile's acceleration? (Remember that a negative value indicates a slowing down or deceleration.)

$$a = \frac{15\ m/s - 24\ m/s}{12\ s} = \frac{-9\ m/s}{12\ s} = -0.75\ m/s^2$$

9. A helicopter's speed increases from 25 m/s to 60 m/s in 5 seconds. What is the acceleration of this helicopter?

$$a = \frac{V_f - V_i}{t} = \frac{60\ m/s - 25\ m/s}{5\ s} = \frac{35\ m/s}{5\ s} = 7\ m/s^2$$

10. A motorcycle traveling at 25 m/s accelerates at a rate of 7.0 m/s² for 6.0 seconds. What is the final speed of the motorcycle?

Solve V_f

$$\Delta V = at = 7\ m/s^2 \cdot 6\ s = 42\ m/s = V_f - V_i$$

$$42\ m/s + 25\ m/s = V_f - V_i + 25\ m/s$$

$$V_f = 67\ m/s$$

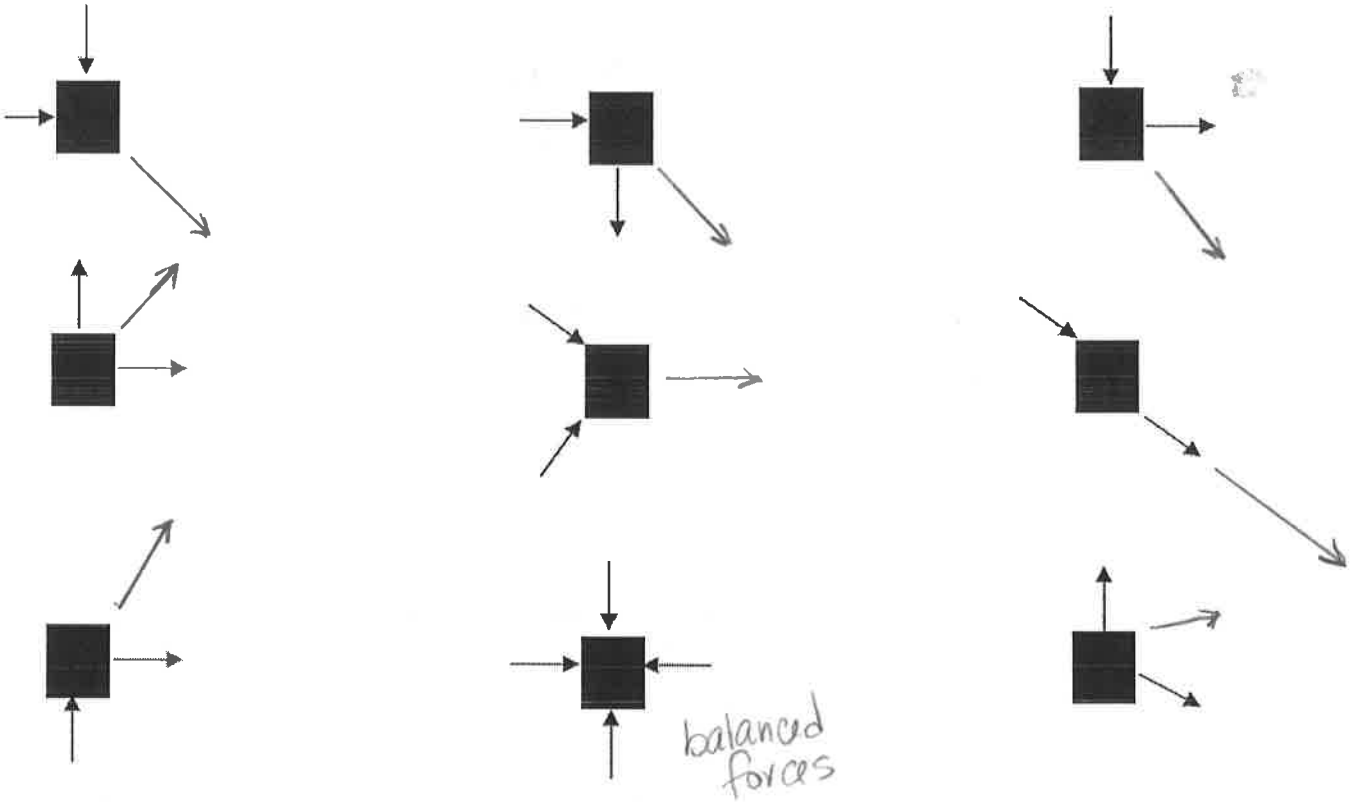
11. A cyclist accelerates at a rate of 7.0 m/s². How long will it take the cyclist to reach a speed of 18 m/s?

$$t = \frac{\Delta V}{a} = \frac{18\ m/s - 0\ m/s}{7\ m/s^2} = 2.6\ s$$

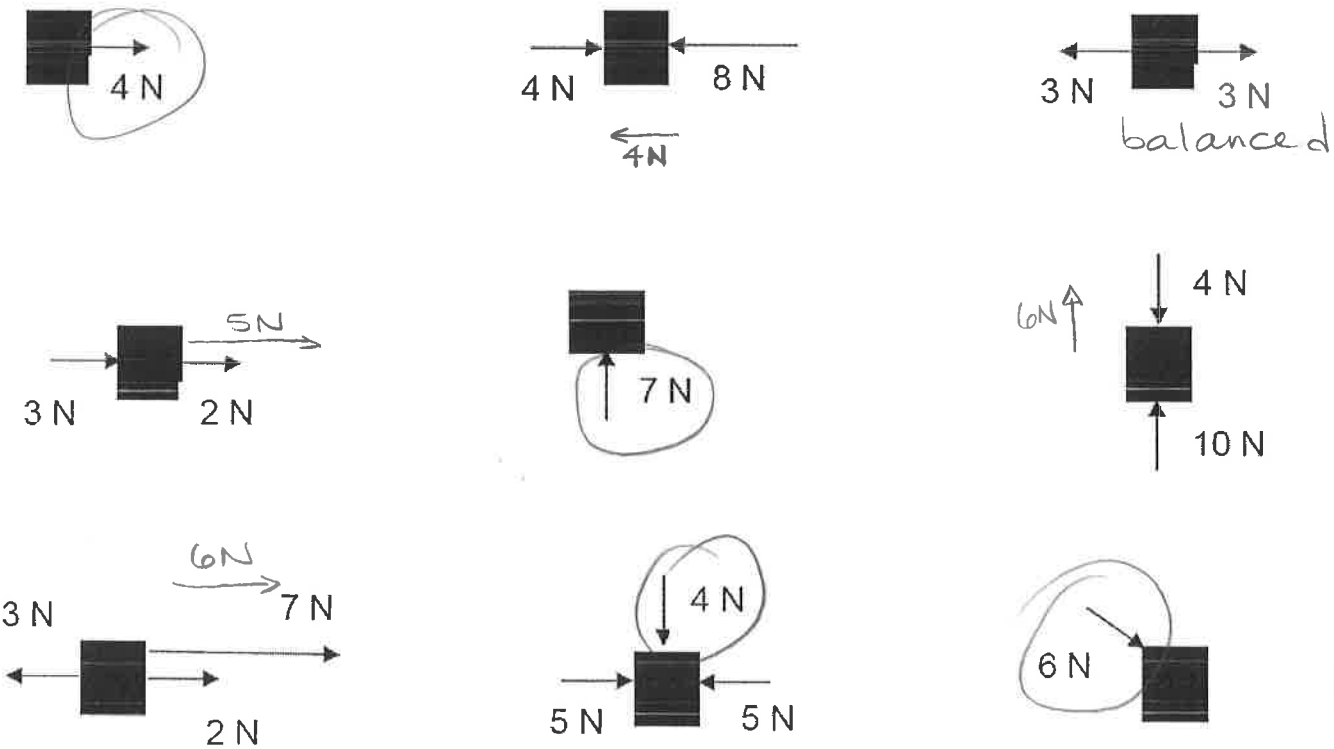
WORKSHEET 5 D

Calculating Net Force

Given the following diagrams, estimate the net force's direction.



Given the following diagrams, find the net force's direction and magnitude.



Chapter 5 math practice

1. A cabin cruiser left a harbor and traveled to a small island in 24 m. On the return trip, the cabin cruiser traveled for 16 m. The total time of the trip was 5 hours. What was the average speed of the ENTIRE TRIP?

$$\bar{V} = \frac{d}{t} = \frac{24m + 16m}{5h} = \frac{40m}{5h} = \boxed{8m/hr}$$

2. John drove for 3 hours for 50 miles and for 2 hours at 60 miles. What was his average speed for the WHOLE JOURNEY?

$$\bar{V} = \frac{d}{t} = \frac{50mi + 60mi}{5h} = \frac{110mi}{5h} = \boxed{22mi/hr}$$

3. A child in an airport is able to cover 291 meters in 3 minutes running at a steady speed down a moving sidewalk in the direction of the sidewalk's motion. What is the child's speed?

$$V = \frac{d}{t} = \frac{291m}{3min} = \boxed{97m/min}$$

4. A child has a speed of 2.8 m/s and is running up a down escalator. The escalator has a velocity of 1.2 m/s down. What is the overall velocity of the child?

$$V = 2.8m/s + 1.2m/s = \boxed{4.0m/s \text{ down}}$$

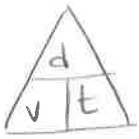
5. If a car travels 460m in 18 seconds how fast is it going?

$$V = \frac{d}{t} = \frac{460m}{18s} = \boxed{25.6\ m/s}$$

6. A plane travels 275,000 meters in 7000 seconds. What was its speed?

$$V = \frac{d}{t} = \frac{275000m}{7000s} = \boxed{39.3m/s}$$

7. How much time will it take for a snake to travel 8 meters across the floor if it is slithering at .96 m/s?



$$t = \frac{d}{V} = \frac{8m}{.96\frac{m}{s}} = \boxed{8.3s}$$

$v = \frac{d}{t}$

8. In a game, a pitcher threw a baseball 14 meters through the air. While in flight, the ball traveled at an average speed of 37 m/s. How long did the ball remain in the air?

$t = \frac{d}{v} = \frac{14\text{m}}{37\text{m/s}} = \boxed{0.38\text{s}}$

9. How far can a dragonfly get if it flies 17 seconds at a speed of 4.2 m/s?

$d = vt = 4.2\frac{\text{m}}{\text{s}} \cdot 17\text{s} = \boxed{71.4\text{m}}$

10. What distance could a toddler travel if they crawl at a rate of .73 m/s for 20 seconds?

$d = vt = 0.73\text{m/s} \cdot 20\text{s} = \boxed{14.6\text{m}}$

11. The Kingda Ka rollercoaster boasts a top speed of 100 miles/sec (starting at 0 miles/sec). If it takes only 3.5 seconds to do this, what is the acceleration of the roller coaster?

$a = \frac{\Delta v}{t} = \frac{v_f - v_i}{t} = \frac{100\text{mi/s} - 0\text{mi/s}}{3.5\text{s}} = \boxed{28.6\text{mi/s}^2}$

~~12~~. A car starts from rest and accelerates uniformly over a time of 5.21 seconds for a distance of 110 m. Determine the acceleration of the car.

$a = \frac{\Delta v}{t}$

13. A feather is dropped on the moon and has a final velocity of 5.85 m/s. The acceleration of gravity on the moon is 1.67 m/s^2. Determine the time for the feather to fall to the surface of the moon.

$t = \frac{\Delta v}{a} = \frac{5.85\text{m/s} - 0\text{m/s}}{1.67\text{m/s}^2} = \boxed{3.50}$