

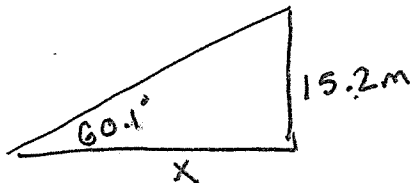
# Physics

## Trigonometry Practice Sheet I

Name: Key

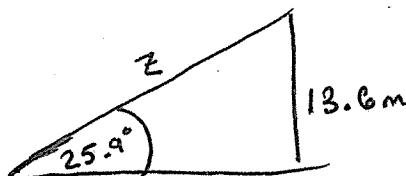
**Instructions:** Draw a simple, labeled diagram and show the mathematical solution for each problem.

- \* 1) A flag pole is 15.2 meters high and you can see the top at an angle of  $60.1^\circ$  above the ground, at ground level. How far are you from the pole?



$$x = 8.74m$$

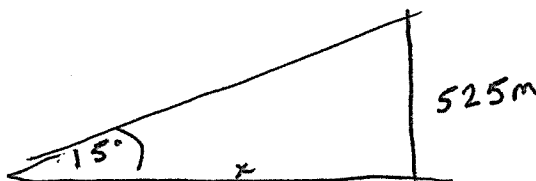
- 2) A rope is stretched from the top of a post to ground level and makes an angle of  $25.9^\circ$  with the ground. How long is the rope if the post is 13.6 meters high?



$$\sin(25.9^\circ) = \frac{13.6m}{z}$$

$$z = 31.1m$$

- 3) You can see the FUJI blimp hovering 525 meters over the National Tennis Center at an angle of  $15.0^\circ$  above the horizon. How far are you from the NTC?

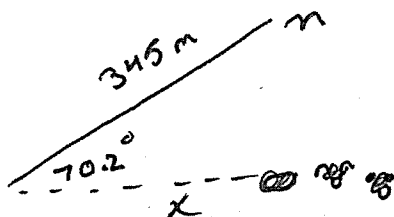


$$\tan(15^\circ) = \frac{525m}{x}$$

$$x = 1959.3m$$

$$x = 1960m \text{ or } 1.96 \times 10^3 m$$

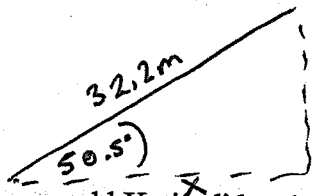
- 4) A buzzard is circling over its prey and you measure its angle from the horizon to be  $70.2^\circ$ . If the buzzard (in the air) is 345 meters from you (on the ground), how far are you from the buzzard's prey?



$$\cos(70.2^\circ) = \frac{x}{345m}$$

$$x = 116.86m = 117m$$

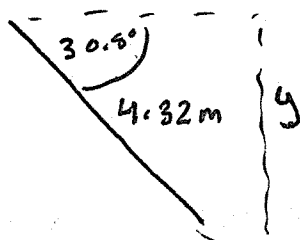
- 5) A LILCO lineman notices that a 32.2 meter wire makes a  $50.5^\circ$  angle with the ground when stretched from the pole top to the ground. How far is the lower end of the wire from the pole's base?



$$\cos(50.5^\circ) = \frac{x}{32.2m}$$

$$x = 20.5m$$

- 6) Four year old Katie slides down a banister which is 4.32 meters long and makes of  $30.8^\circ$  below the horizontal. If the bottom of the banister is 1.00 meters above the floor, how high is the top of the banister above the same floor?



$$\sin(30.8^\circ) = \frac{y}{4.32m}$$

$$y = 2.21m$$

$$x = 3.21m$$

$$3.21m$$



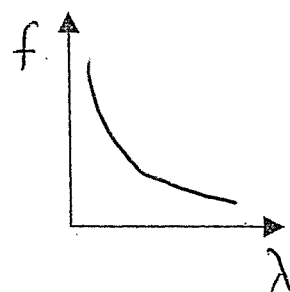
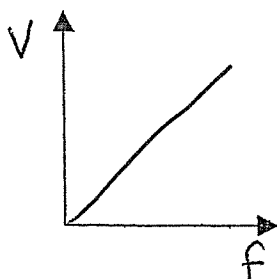
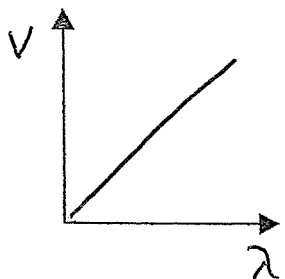
PHYSICS PRACTICE SHEET  
GRAPHING RELATIONSHIPS

Key

**Directions.** For each of the following problems, indicate the relationship between the two variables labeled on the axes (given the equation above), and sketch the trend in the space provided.

1.

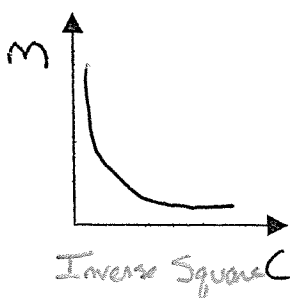
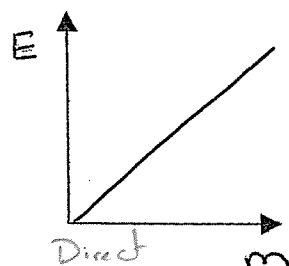
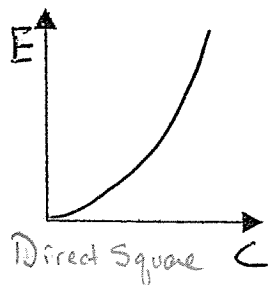
$$V = f \lambda$$



2.

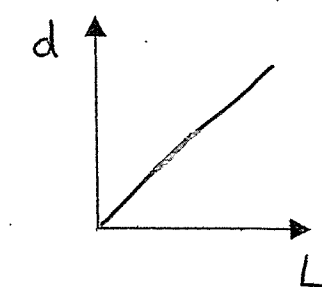
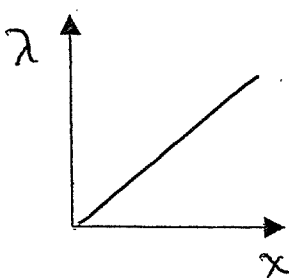
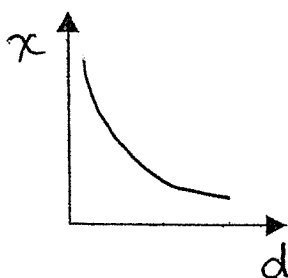
$$E = mc^2$$

$$c = \text{const}$$



3.

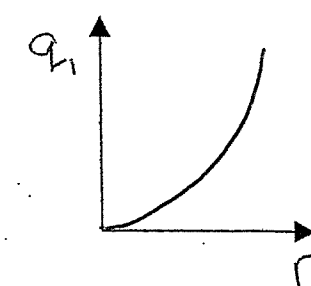
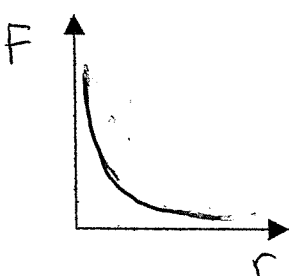
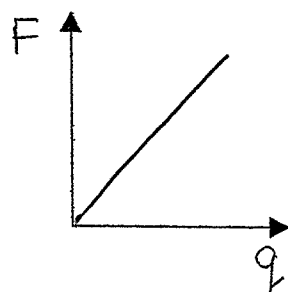
$$\frac{\lambda}{d} = \frac{x}{L}$$



4.

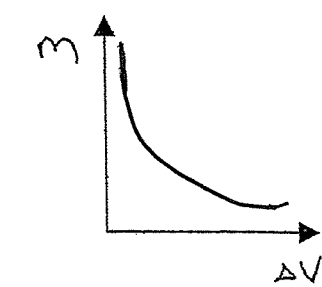
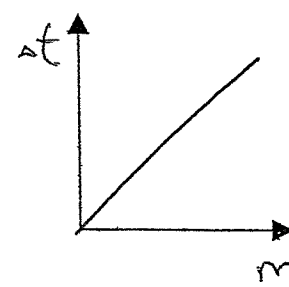
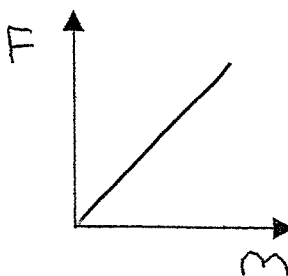
$$F = \frac{k q_1 q_2}{r^2}$$

$y = x^2$



5.

$$F \Delta t = m(\Delta v)$$





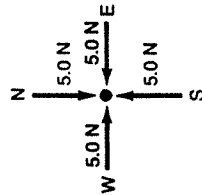
### QUESTIONS

1. An object is displaced 3.0 meters to the west and then 4.0 meters to the south. Which vector represents the resultant displacement?



2. Four forces act concurrently on a point as shown at the right. The resultant of the four forces is

- (1) 0.0 N (2) 5.0 N (3) 14 N  
 (4) 20. N



3. A 5-newton force directed north and a 5-newton force directed west both act on the same point. The resultant of these two forces is approximately (1) 5 N northwest (2) 7 N northwest (3) 5 N southwest (4) 7 N southwest

4. The resultant of a 12-newton force and a 7-newton force has a magnitude of 5 newtons. The angle between the original forces is (1) 0° (2) 45° (3) 90° (4) 180°

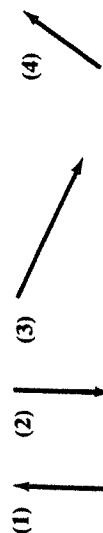
5. Two concurrent forces of 30. newtons east and 10. newtons south act on an object. The resultant force is (1) 0.0 N (2) 5.0 N southeast (3) 14 N southeast (4) 20. N southeast

6. Concurrent forces of 10. newtons east and 10. newtons south act on an object. The resultant force is (1) 0.0 N (2) 5.0 N southeast (3) 14 N southeast (4) 20. N southeast

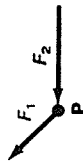
7. Which pair of concurrent forces may produce a resultant of 20. newtons? (1) 5.0 N and 10. N (2) 20. N and 20. N (3) 20. N and 50. N (4) 30. N and 5.0 N

8. The magnitude of the resultant force produced by a 9.0-newton force acting west and a 12.0-newton force acting south concurrently on a point is (1) 30. N (2) 25 N (3) 3.0 N (4) 15 N

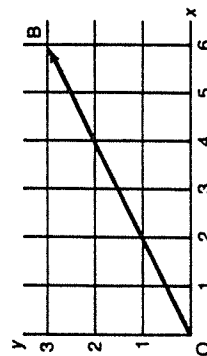
9. Which vector best represents the resultant of forces  $F_1$  and  $F_2$  acting on point P?



10. The resultant of two forces acting on the same point is a maximum when the angle between the two forces is (1) 0° (2) 45° (3) 90° (4) 180°
11. The vector that best represents the resultant of the forces  $F_1$  and  $F_2$  shown acting on point P is



12. What is the magnitude of the vertical or y-component of vector  $OB$  in the diagram? (1) 9 (2) 6 (3) 3 (4) 0



13. Which force could act concurrently with force A to produce force B as a resultant?



14. Three forces act concurrently on an object in equilibrium. These forces are 10. newtons, 8 newtons, and 6 newtons. The resultant of the 6-newton and 8-newton forces has a magnitude of (1) 0.0 N (2) between 0.0 and 10. N (3) 10. N (4) more than 10. N

15. As the angle between two concurrent forces increases, the magnitude of their resultant (1) decreases (2) increases (3) remains the same

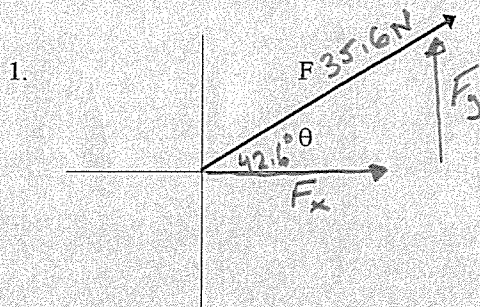
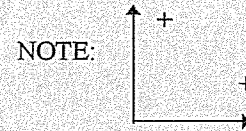
16. As the angle between two concurrent forces is increased from 15 degrees to 75 degrees, the magnitude of their equilibrant (1) decreases (2) increases (3) remains the same



PHYSICS  
VECTOR COMPONENT PRACTICE SHEET

NAME: \_\_\_\_\_

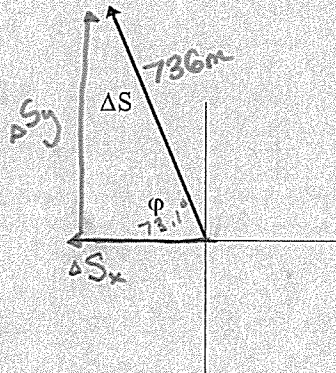
**Instructions:** Determine the X and Y components of the following vectors:  
(Diagrams are not drawn to scale.)



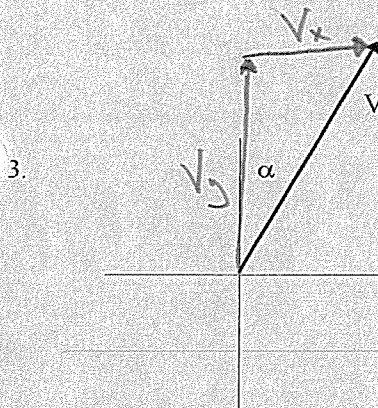
$F = 35.6 \text{ N}$   
 $\theta = 42.6^\circ$

1)  $F_x = 26.2 \text{ N}$   
 $F_y = 24.1 \text{ N}$

2.  
 $\Delta S = 736 \text{ m}$   
 $\phi = 73.1^\circ$



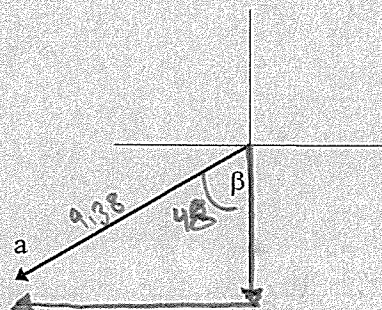
2)  $\Delta S_x = -214 \text{ m}$   
 $\Delta S_y = 704 \text{ m}$



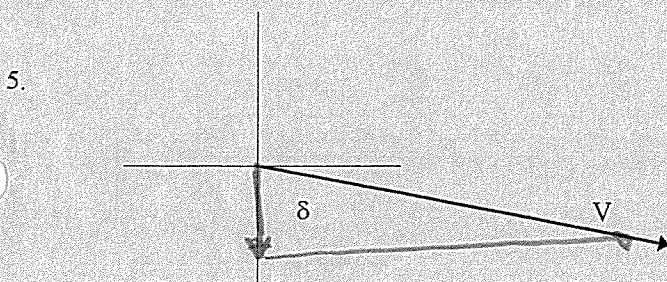
$V = 12.1 \text{ m/s}$   
 $\alpha = 39.6^\circ$

3)  $V_x = 7.71 \text{ m/s}$   
 $V_y = 9.32 \text{ m/s}$

4.  
 $a = 9.38 \text{ m/s}^2$   
 $\beta = 48.0^\circ$

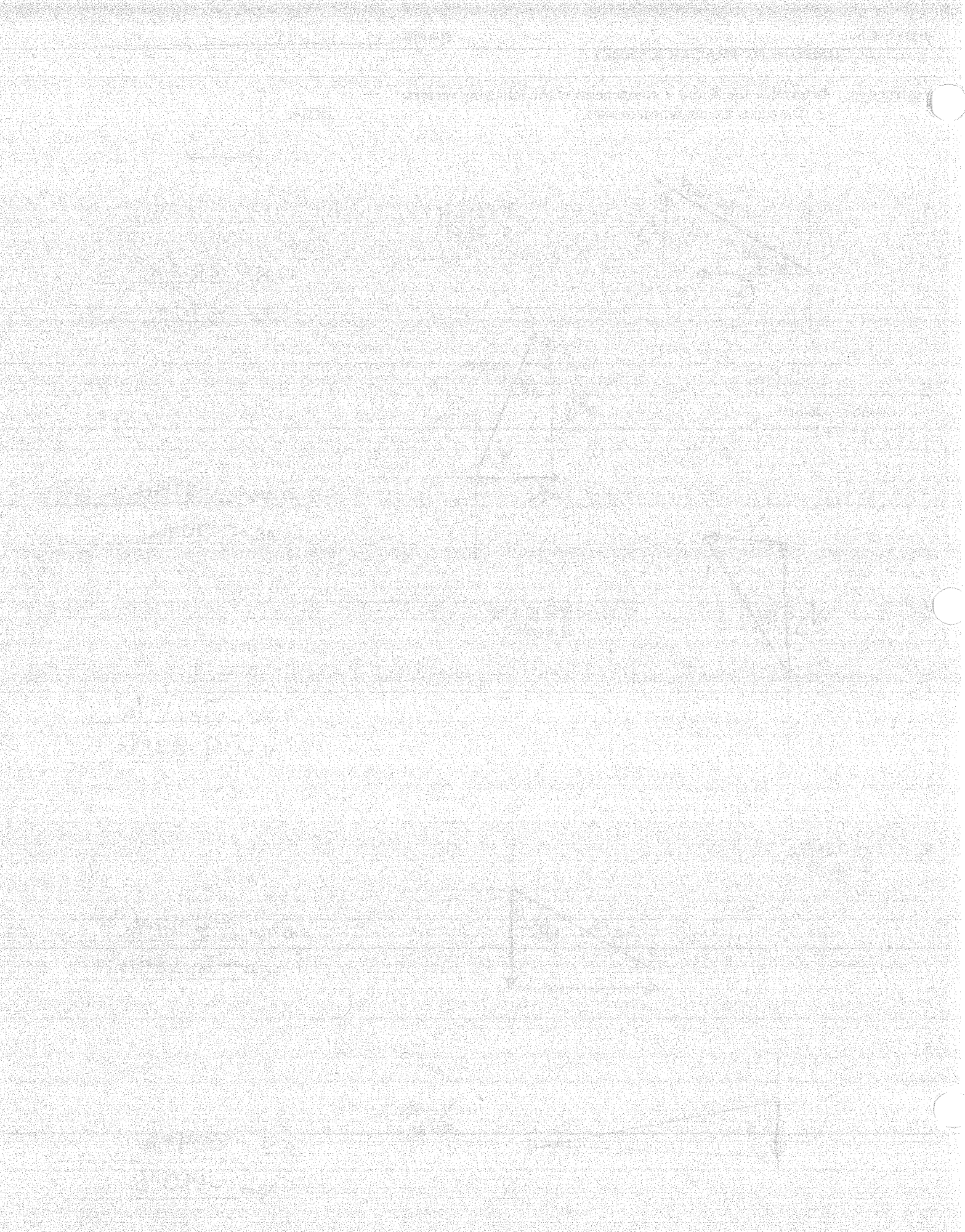


4)  $a_x = -6.97 \text{ m/s}^2$   
 $a_y = -6.28 \text{ m/s}^2$



$V = 328 \text{ m/s}$   
 $\delta = 81.4^\circ$

5)  $V_x = 324 \text{ m/s}$   
 $V_y = -49.0 \text{ m/s}$



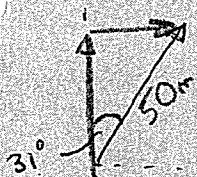


# PROBLEM SET: VECTORS

(Key)

Resolve the following vectors into their components:

- 1) Chris walks 50.0 meters in a direction  $31^\circ$  east of north.



$$\begin{aligned}d_y &= 43\text{m} \\ d_x &= 26\text{m}\end{aligned}$$

- 2) Dana pulls with a force of 148 Newtons on a rope that is attached to a sled. The rope makes an angle of  $25.0^\circ$  above the horizontal.

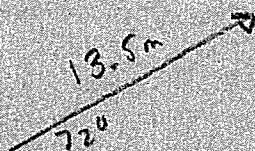


$$\begin{aligned}F_x &= 134\text{N} \\ F_y &= 62.5\text{N}\end{aligned}$$

- 3) An escalator makes an angle of  $48^\circ$  to the floor. A passenger on the escalator has a velocity of .650 m/s while going up towards the top.

$$\begin{aligned}V_x &= .43\text{m/s} \\ V_y &= .48\text{m/s}\end{aligned}$$

- 4) An arrow is shot at an angle of  $72^\circ$  above the horizontal. How far up, and how far forward, has it gone when it is 13.5 meters from the bow? Assume that it has travelled in a STRAIGHT line.



$$\begin{aligned}d_x &= 4.2\text{m} \\ d_y &= 13\text{m}\end{aligned}$$

- 5) When digging a hole in the ground with a shovel, you step down on the blade of the shovel with a force of 500 N at an angle of  $21^\circ$  to vertical.



$$\begin{aligned}F_x &= 18\text{N} \\ F_y &= -47\text{N}\end{aligned}$$

- 6) A car travelling at 23.0 m/s is going down a hill whose slope is  $12.0^\circ$  below the horizontal.



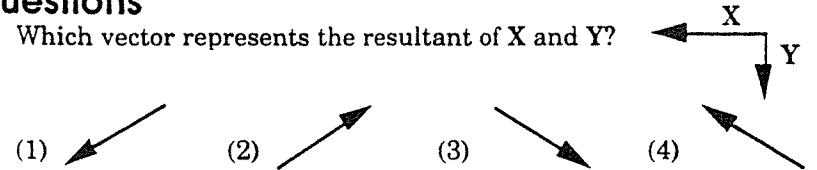
$$\begin{aligned}V_x &= 22.5\text{m/s} \\ V_y &= -4.78\text{m/s}\end{aligned}$$



# ANSWER KEY

## Questions

- 1 Which vector represents the resultant of X and Y?
 


- 2 The resultant of two concurrent forces is minimum when the angle between them is
 

(1) 0 degrees

(3) 90 degrees

(2) 45 degrees

(4) 180 degrees
- 2 Which pair of terms are vector quantities?
 

(1) work and velocity

(3) weight and distance

(2) force and momentum

(4) acceleration and mass
- 3 Two displacement vectors of 9 meters and 4 meters are combined. The maximum resultant is
 

(1) 5 m

(2) 9 m

(3) 13 m

(4) 36 m
- 2 A person travels 4 meters North, 6 meters West, and 4 meters South. What is the total displacement?
 

(1) 14 m East

(3) 4 m South

(2) 6 m West

(4) 4 m North
- 4 A boy exerts a force  $F$  in pulling a wagon by means of a cord making an angle  $A$  to the ground.  $F_x$  is the horizontal component of  $F$ , and  $F_y$  is the vertical component of  $F$ . If the angle  $A$  is increased while  $F$  is kept constant
 

(1) both  $F_x$  and  $F_y$  will increase

(3)  $F_x$  will increase and  $F_y$  will decrease

(2) both  $F_x$  and  $F_y$  will decrease

(4)  $F_y$  will increase and  $F_x$  will decrease
- 2 Mass is to weight as kilogram is to
 

(1) joule

(3) force

(2) newton

(4) watt
- 2 A 800 N store sign is supported by two slanting wire cables of equal length. The cables make an angle of  $90^\circ$  at the point of the sign to which they are attached. The component of force exerted by the sign along each cable is about
 

(1) 400 N

(3) 720 N

(2) 560 N

(4) 800 N
- 1 If the angle between the cables in item 8 is increased, the force acting along the cables will
 

(1) increase

(2) decrease

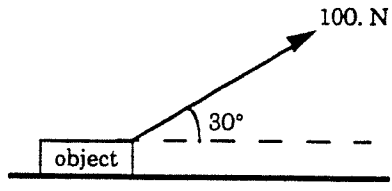
(3) remains the same
- 3 A man walks 40 meters north, then 70 meters east and then 40 meters south. What is his displacement from the starting point?
 

(1) 150 meters east

(3) 70 meters east

(2) 150 meters west

(4) 70 meters west
- 2 A force of 100. newtons is applied to an object at an angle of  $30^\circ$  from the horizontal as shown in the diagram. What is the magnitude of the vertical component of this force?
 



(1) 0 N

(3) 6.0 N

(2) 50.0 N

(4) 100 N
- 1 As the angle between two concurrent forces increases from 45 to 90 degrees, the magnitude of their resultant
 

(1) decreases

(2) increases

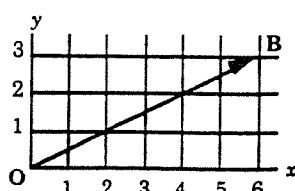
(3) remains the same
- 2 A resultant force of 10. newtons is made up of two component forces acting at right angles to each other. If the magnitude of one of the components is 6.0 newtons, the magnitude of the other component must be
 

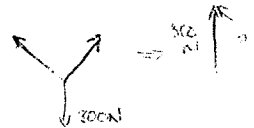
(1) 16 N

(2) 8.0 N

(3) 6.0 N

(4) 4.0 N
- 2 What is the magnitude of the horizontal or x-component of vector  $OB$  in the diagram?
 





- 15 A man pulls a wagon by applying a force of 100 N to the handle which is held at an angle of  $15^\circ$  to the ground. The horizontal component of the man's force is

(1) 26 N (2) 44 N (3) 50 N (4) 97 N

- 16 Referring to item 15, the vertical component of the man's force is

(1) 26 N (2) 44 N (3) 50 N (4) 97 N

- 17 The maximum number of components that a single vector can be resolved into is

(1) one (2) two (3) three (4) unlimited

- 18 A man in a car going northward at 16 m/s throws a ball through the window at a speed of 12 m/s in the eastward direction. The velocity of the ball with respect to the ground is

(1) 12 m/s east (2) 9 m/s north (3) 20 m/s northeast (4) 28 m/s northeast

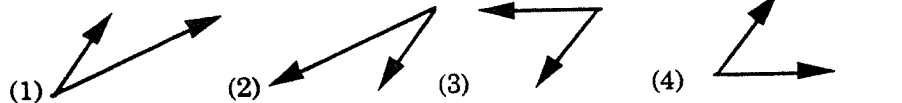
- 19 Which pair of concurrent forces may have a resultant of 20 N?

(1) 5.0 N and 10 N (2) 20 N and 20 N (3) 20 N and 50 N (4) 30 N and 5.0 N

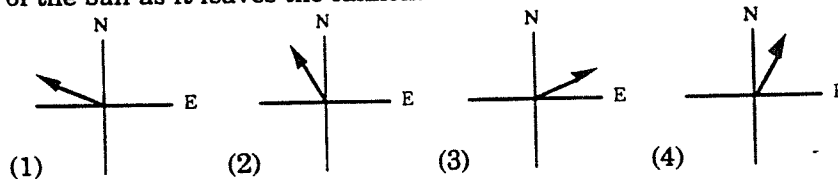
- 20 Three forces act concurrently on an object in equilibrium. These forces are 10 N, 8 N, and 6 N. The resultant of the 6 N force and the 8 N force is

(1) 0 (2) between 0 and 10 N (3) 10 N (4) greater than 10 N

- 21 If the force vector shown in the diagram at the right is resolved into two components, these two components could best be represented by which diagram?

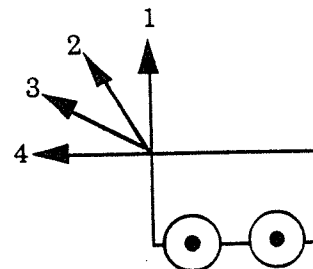


- 22 A ball is fired with a velocity of 12 meters per second from a cannon pointing north, while the cannon is moving eastward at a velocity of 24 meters per second. Which vector best represents the resultant velocity of the ball as it leaves the cannon?

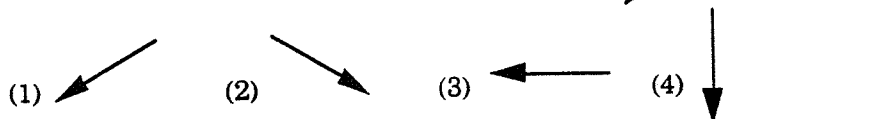


- 23 In the diagram, the numbers 1, 2, 3, and 4 represent possible directions in which a force could be applied to a cart. If the force applied in each direction has the same magnitude, in which direction will the vertical component of the force be the least?

(1) 1  
(2) 2  
(3) 3  
(4) 4

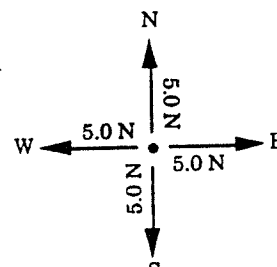


- 24 Which force could act concurrently with Force A to produce Force B as a resultant?



- 25 Four forces act concurrently on a point as shown at the right. The point is moving to the right with constant velocity. The resultant of the four forces is

(1) 0.0 N  
(2) 5.0 N  
(3) 14 N  
(4) 20. N



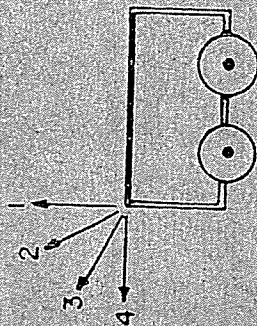


# QUESTIONS Answer Key

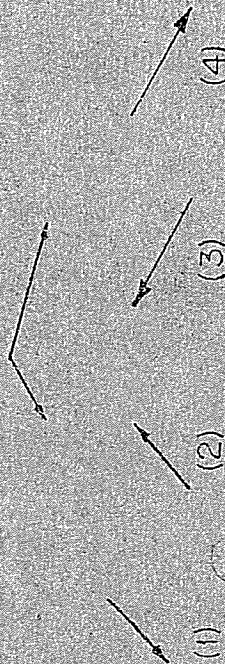
1. A force of 3 newtons and a force of 5 newtons act concurrently to produce a resultant of 8 newtons. The angle between the forces must be (1)  $0^\circ$  (2)  $60^\circ$  (3)  $90^\circ$  (4)  $180^\circ$
2. The diagram below represents two forces acting concurrently on an object. The magnitude of the resultant force is closest to (1) 20 N (2) 40 N (3) 45 N (4) 60 N



3. In the following diagram, the numbers 1, 2, 3, and 4 represent possible directions in which a force could be applied to a cart. If the force applied in each direction has the same magnitude, in which direction will the vertical component of the force be the *least*? (1) 1 (2) 2 (3) 3 (4) 4

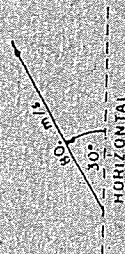


5. A bullet is fired from a rifle with a muzzle velocity of 100 meters per second at an angle of  $30^\circ$  up from the horizontal. What is the magnitude of the vertical component of the muzzle velocity? (1) 0.0 m/s (2) 50 m/s (3) 87 m/s (4) 100 m/s
6. Two forces act on an object concurrently. The resultant will be greatest when the angle between the forces is (1)  $0^\circ$  (2)  $60^\circ$  (3)  $90^\circ$  (4)  $180^\circ$
7. If a woman runs 100 meters north and then 70 meters south, her total displacement will be (1) 30 m north (2) 30 m south (3) 170 m north (4) 170 m south
8. The diagram below represents two concurrent forces acting on a point. Which vector best represents their resultant?



9. The resultant of two forces acting on the same point at the same time will be greatest when the angle between the forces is (1)  $0^\circ$  (2)  $45^\circ$  (3)  $90^\circ$  (4)  $180^\circ$
10. Two concurrent forces act at right angles to each other. If one of the forces is 40 newtons and the resultant of the two forces is 50 newtons, the magnitude of the other force must be (1) 10 newtons (2) 20 newtons (3) 30 newtons (4) 40 newtons

11. If two 10.-newton concurrent forces have a resultant of zero, the angle between the forces must be (1)  $0^\circ$  (2)  $45^\circ$  (3)  $90^\circ$  (4)  $180^\circ$
12. The maximum number of components that a single force may be resolved into is (1) one (2) two (3) three (4) unlimited
13. As the angle between two concurrent forces of 5.0 newtons and 7.0 newtons increases from  $0^\circ$  to  $180^\circ$ , the magnitude of their resultant changes from (1) 0 N to 35 N (2) 2.0 N to 12 N (3) 12 N to 2.0 N (4) 12 N to 0 N
14. Two 10.0-newton forces act concurrently on a point at an angle of  $180^\circ$  to each other. The magnitude of the resultant of the two forces is (1) 0.00 N (2) 10.0 N (3) 18.0 N (4) 20.0 N
15. What is the magnitude of the vertical component of the velocity vector shown below? (1) 10. m/s (2) 69 m/s (3) 30. m/s (4) 40. m/s



16. Forces of 6.0N north and 8.0N west act concurrently. What is the magnitude and direction of the *equilibrant* force? (1) 10N Northwest (2) 10N Southeast (3) 14N Northeast (4) 14N Southwest



