

- ① Which terms represent vector quantities?
- 1 distance and kinetic energy
  - 2 displacement and work
  - 3 speed and impulse
  - 4 velocity and momentum

- ② Which is a vector quantity?
- |              |           |
|--------------|-----------|
| (1) distance | (3) power |
| (2) speed    | (4) force |

- ③ 1 The speedometer in a car does *not* measure the car's velocity because velocity is a
- (1) vector quantity and has a direction associated with it
  - (2) vector quantity and does not have a direction associated with it
  - (3) scalar quantity and has a direction associated with it
  - (4) scalar quantity and does not have a direction associated with it

④ A person walks 150. meters due east and then walks 30. meters due west. The entire trip takes the person 10. minutes. Determine the magnitude and the direction of the person's total displacement. [2]

magnitude = \_\_\_\_\_

direction = \_\_\_\_\_

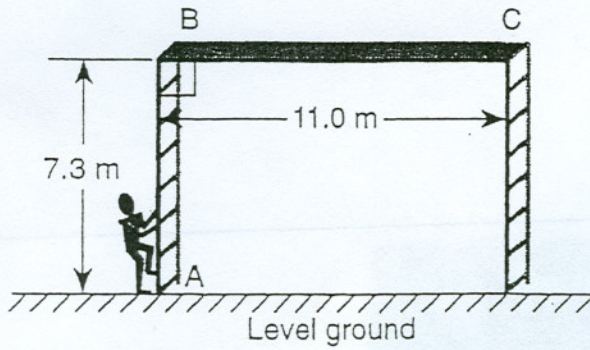
⑤ What is this persons avg. velocity in meter/sec? (Note 10 min. = 600 sec)

Velocity = \_\_\_\_\_ m/s

⑥ What is this persons avg. speed in m/s?

Speed = \_\_\_\_\_ m/s

As shown in the diagram below, a painter climbs 7.3 meters up a vertical scaffold from A to B and then walks 11.0 meters from B to C along a level platform.

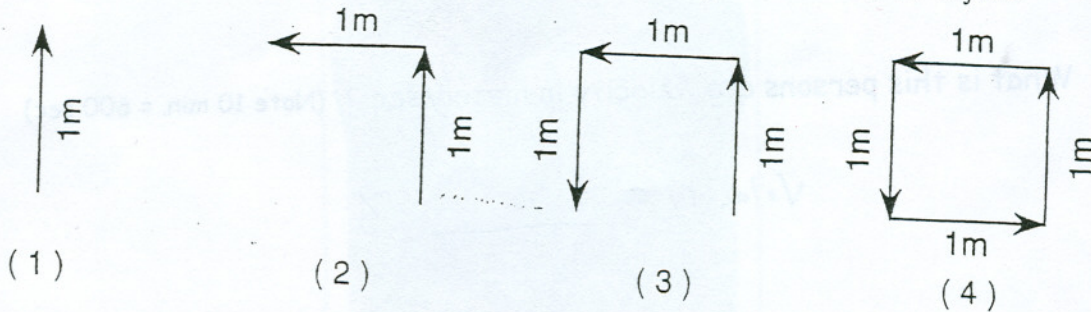


- 7) The magnitude of the painter's total displacement while moving from A to C is
- |            |            |
|------------|------------|
| (1) 3.7 m  | (3) 18.3 m |
| (2) 13.2 m | (4) 25.6 m |

8) For the painter in problem 7, if it takes him 5 seconds to move from A to C, What is his speed? (Note, Asked for speed NOT velocity)

- |             |             |
|-------------|-------------|
| 1) 1.46 m/s | 3) 2.64 m/s |
| 2) 2.20 m/s | 4) 3.66 m/s |

9) Which vector diagram represents the greatest magnitude of displacement for an object?



10

A car travels 90. meters due north in 15 seconds. Then the car turns around and travels 40. meters due south in 5.0 seconds. What is the magnitude of the average velocity of the car during this 20.-second interval?

- (1) 2.5 m/s
- (2) 5.0 m/s
- (3) 6.5 m/s
- (4) 7.0 m/s

11

A force of 25 newtons east and a force of 25 newtons west act concurrently on a 5.0-kilogram cart. What is the Total Force on the cart?

- 1) 0 N
- 2) 25 N
- 3) 35 N
- 4) 50 N

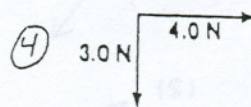
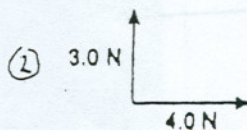
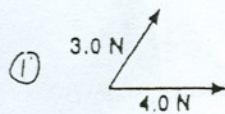
12

A 6.0-newton force and an 8.0-newton force act concurrently on a point. As the angle between these forces increases from  $0^\circ$  to  $90^\circ$ , the magnitude of their resultant

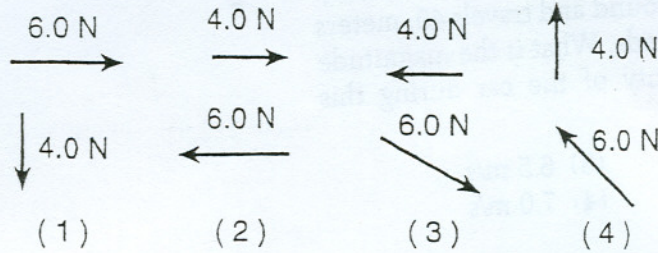
- (1) decreases
- (2) increases
- (3) remains the same

13

A 3.0-newton force and a 4.0-newton force act concurrently on a point. In which diagram below would the orientation of these forces produce the greatest net force on the point?



Which pair of forces acting concurrently on an object will produce the resultant of greatest magnitude?



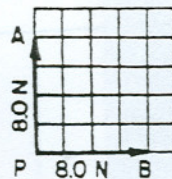
15

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)  $180^\circ$

16

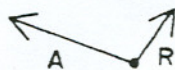
Two forces ( $\vec{PA}$  and  $\vec{PB}$ ) act simultaneously at point  $P$  as shown in the diagram at the right. The magnitude of the resultant force is closest to



- (1) 8.0 N
- (2) 11 N
- (3) 15 N
- (4) 16 N

17

Forces  $A$  and  $B$  have a resultant  $R$ . Force  $A$  and resultant  $R$  are shown in the diagram below.



Which vector below best represents force  $B$ ?

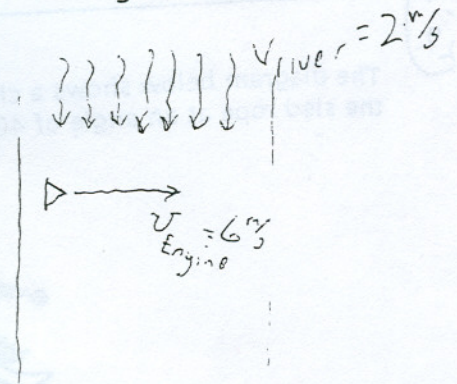
- (1)
- (2)
- (3)
- (4)

18 & 19

18

A boat sets off from the bank of a river and heads due East. The boat's engine pushes it forward with a velocity of  $6\text{ m/s}$ , but the river has a strong current that pulls the boat southward at  $2\text{ m/s}$ . What will the magnitude of the boat's velocity be to a person standing on the shore.

- 1)  $4\text{ m/s}$
- 2)  $6.3\text{ m/s}$
- 3)  $6\text{ m/s}$
- 4)  $8\text{ m/s}$



19

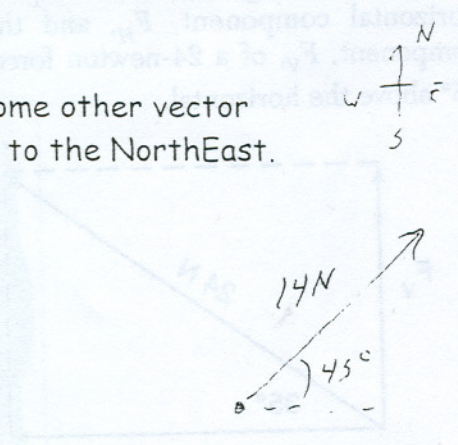
Which of the following statements is true about the boat.

- 1) It will get across the river faster because it picks up some velocity from the river current.
- 2) It will get across in the same amount of time as it would have if it went straight across with no river current.
- 3) It will take a longer time than it would have if it went straight across with no river current.

20

A  $10\text{ Newton}$  force vector North is combined with some other vector and the resultant of the two is a  $14\text{ Newton}$  vector to the NorthEast. What must the 2<sup>nd</sup> force vector be?

- 1)  $4\text{ Newtons North}$
- 2)  $4\text{ Newtons East}$
- 3)  $10\text{ Newtons North}$
- 4)  $10\text{ Newtons East}$



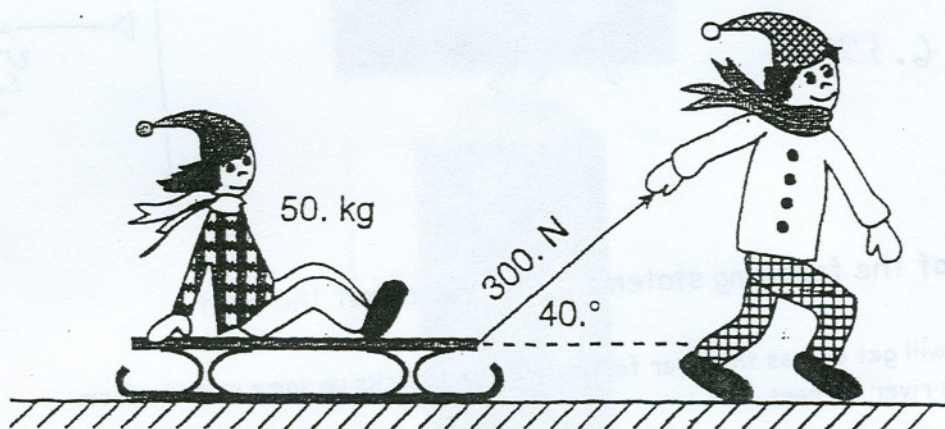
21

The smallest possible resultant of a 4-nt. force and a 7-nt. force acting at a point is

- (1) 11 nt.
- (2) 5 nt.
- (3) 3 nt.
- (4) 0 nt.

22

The diagram below shows a child pulling a 50.-kilogram friend on a sled by applying a 300.-newton force on the sled rope at an angle of  $40^\circ$  with the horizontal

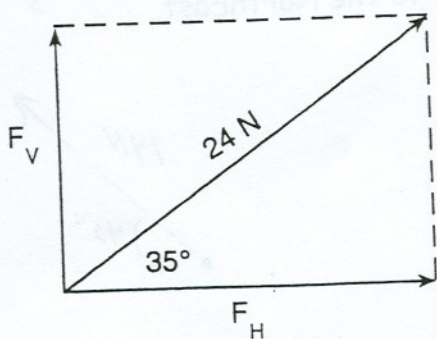


The vertical component of the 300.-newton force is approximately

- (1) 510 N
- (2) 230 N
- (3) 190 N
- (4) 32 N

23

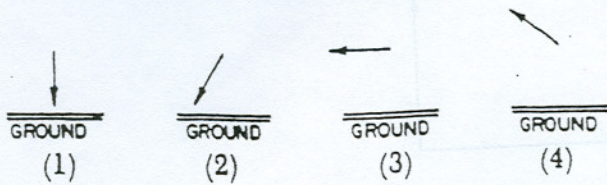
The vector diagram below represents the horizontal component,  $F_H$ , and the vertical component,  $F_V$ , of a 24-newton force acting at  $35^\circ$  above the horizontal.



What are the magnitudes of the horizontal and vertical components?

- (1)  $F_H = 3.5$  N and  $F_V = 4.9$  N
- (2)  $F_H = 4.9$  N and  $F_V = 3.5$  N
- (3)  $F_H = 14$  N and  $F_V = 20.$  N
- (4)  $F_H = 20.$  N and  $F_V = 14$  N

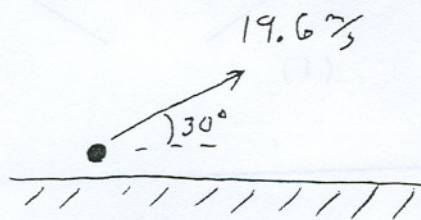
4) Which diagram represents the vector with the largest downward component? [Assume each vector has the same magnitude.]



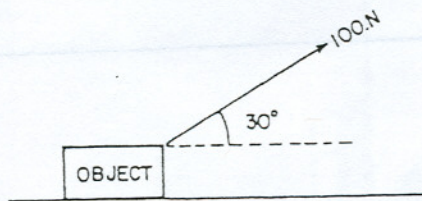
25) An outfielder throws a baseball to the first baseman at a speed of 19.6 meters per second and an angle of  $30^\circ$  above the horizontal.

51) Which pair represents the initial horizontal velocity ( $v_x$ ) and initial vertical velocity ( $v_y$ ) of the baseball?

- (1)  $v_x = 17.0$  m/s,  $v_y = 9.80$  m/s
- (2)  $v_x = 9.80$  m/s,  $v_y = 17.0$  m/s
- (3)  $v_x = 19.4$  m/s,  $v_y = 5.90$  m/s
- (4)  $v_x = 19.6$  m/s,  $v_y = 19.6$  m/s



26) A force of 100. newtons is applied to an object at an angle of  $30^\circ$  from the horizontal as shown in the diagram below. What is the magnitude of the vertical component of this force?



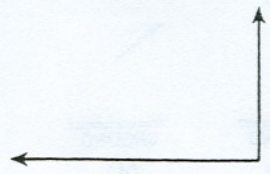
- (1) 0 N
- (2) 50.0 N
- (3) 86.7 N
- (4) 100. N

27) A vector makes an angle,  $\theta$ , with the horizontal. The horizontal and vertical components of the vector will be equal in magnitude if angle  $\theta$  is

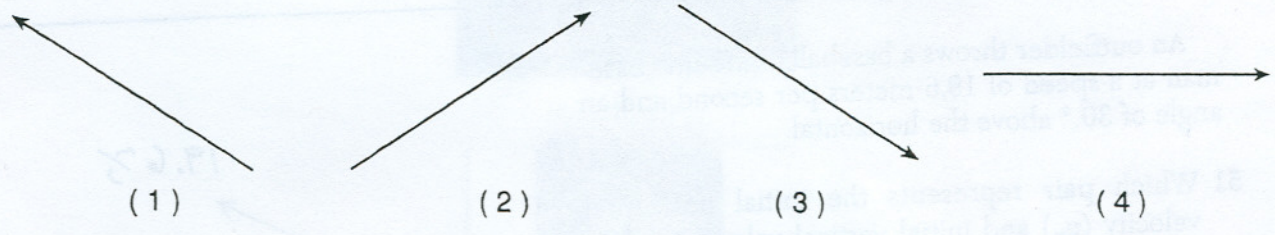
- (1)  $30^\circ$
- (2)  $45^\circ$
- (3)  $60^\circ$
- (4)  $90^\circ$

28

The diagram below represents two concurrent forces.



Which vector represents the force that will produce equilibrium with these two forces?



29

Which combination of three concurrent forces acting on a body could *not* produce equilibrium?

- (1) 1 N, 3 N, 5 N
- (2) 2 N, 2 N, 2 N
- (3) 3 N, 4 N, 5 N
- (4) 4 N, 4 N, 5 N

30

As the angle between two concurrent forces decreases, the magnitude of the force required to produce equilibrium

- (1) decreases
- (2) increases
- (3) remains the same



## Long Problems -

- 1) Three equal 15 newton forces act on an object. Show how these forces can be arranged so that the resultant force is zero, in other words the object will be in vector equilibrium. [1]  
(The forces don't have to be drawn to scale, but there should be one particular angle between them)

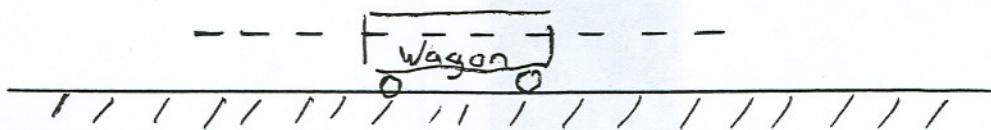


- 2) What are the two things a vector has that makes a vector different than a scalar? [2] (Fill in the blanks)

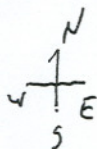
Vectors have \_\_\_\_\_ and \_\_\_\_\_

Scalars have \_\_\_\_\_ only

- 3) A 70 newton pull acts on a wagon at an angle of  $55^\circ$  above the horizontal Direction. Draw this vector on the diagram provided using a scale of  $1\text{cm} = 10\text{ newtons}$ . (Make sure you label the vector and the angle for full credit) [3]



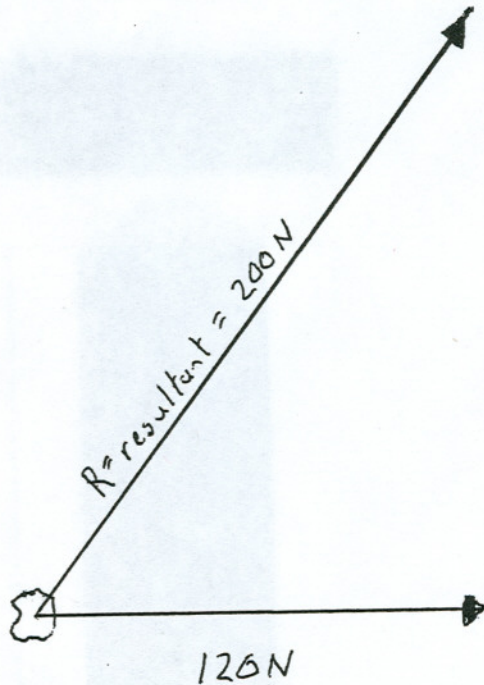
- 4) a) At the bell a student walks from her class during her trip she travels 20 meters north to her locker, then 40 meters east to visit her friend, finally she goes 10 meters south to gym. Starting at point P construct three displacement vectors that represent the three parts of her trip. A scale of  $1\text{ cm} = 10\text{ meters}$  must be used. [2]  
(Make sure vectors are labeled and have arrowheads for full credit)



P

- b) Draw a single vector that represents her resultant displacement for her trip and label it R. Then find the magnitude (or size) of her resultant displacement. [2]
- c) If the trips time was 300 sec (Or 5 minutes) Which would be greater the size of her average velocity, or the size of her average speed? [1]

- 5) Two vector forces act at a *right angle* on an object one is 120 Newtons to the right, the second force is unknown. The resultant of these forces 200 Newtons as shown in the diagram below.  
(Note forces are drawn to scale)



A - What scale is being used in the vector diagram [1]

1cm = \_\_\_\_\_ Newtons

B - What is the measure of the angle between the 120 Newton vector and the resultant. [1]

Angle = \_\_\_\_\_ Degrees

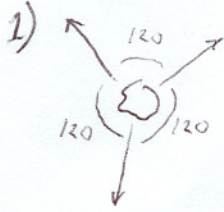
C - What is the size and direction of the second that acts with the 120 Newton vector to produce the 200 Newton resultant. [1]

D - On the diagram sketch the ~~second~~ vector to scale and in the [2] correct direction.

# Vectors Test Answers

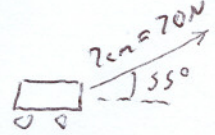
1 - 4	7 - 2	14 - 4	22 - 3	28 - 3
2 - 4	8 - 4	15 - 1	22 - 3	29 - 1
3 - 1	9 - 2	16 - 2	23 - 4	30 - 2
4 - mag = 120 east	10 - 1	17 - 3	24 - 1	
5 - .2 m/s	11 - 1	18 - 2	25 - 1	
6 - .3 m/s	12 - 1	19 - 2	26 - 2	
	13 - 1	20 - 4	27 - 2	

Problems

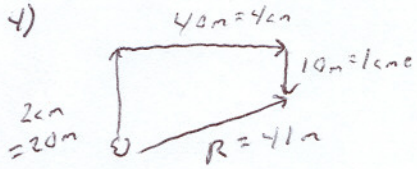


2) Vectors - Size & Direction  
Scalars - Size only

3)



4)



Speed  
greater

5)  $10m = 20N$

$\theta = 53^\circ$

