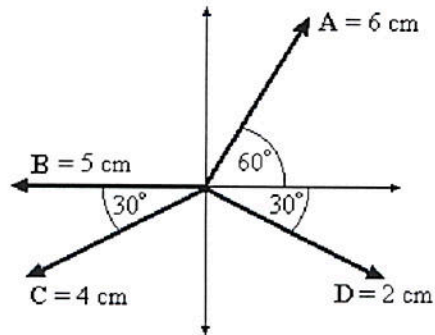**SHORT ANSWER.  Write the word or phrase that best completes each statement or answers the question**

1) A displacement vector is 34.0 m in length and is directed 60.0° east of north. What are the          1) _____
components of this vector?

| Choice | Northward component | Eastward component |
|--------|---------------------|--------------------|
| 1 | 29.4 m | 17.0 m |
| 2 | 18.2 m | 28.1 m |
| 3 | 22.4 m | 11.5 m |
| 4 | 17.0 m | 29.4 m |
| 5 | 23.6 m | 16.3 m |

**Figure 3–8**

2) Refer to Figure 3–8. The components of the vector sum are given by          2) _____

| choice | x-component | y-component |
|--------|-------------|-------------|
| 1 | 3.73 cm | 2.20 cm |
| 2 | –3.73 cm | 2.20 cm |
| 3 | –2.27 cm | 0 cm |
| 4 | 2.27 cm | 0 cm |
| 5 | 3.73 cm | –2.20 cm |

3) If a vector $\vec{A}$ has components $A_x > 0$, and $A_y > 0$, then the angle that this vector makes          3) _____
with the positive $x$-axis must be in the range

4) The horizontal and vertical components of the initial velocity of a football are 24 m/s and 7          4) _____
m/s respectively. What is the initial velocity of the football?

5) A person throws a ball horizontally from the top of a building that is 24.0 m above the          5) _____
ground level. The ball lands 100 m down range from the base of the building. What was
the initial velocity of the ball?

6) A bullet is fired from ground level with a speed of 150 m/s at an angle 30.0° above the          6) _____
horizontal at a location where $g = 10.0$ m/s$^2$. What is the vertical component of its velocity
after 4 seconds?

7) A child throws a ball with an initial speed of 8.00 m/s at an angle of 40.0° above the horizontal. The ball leaves her hand 1.00 m above the ground. How far from where the child is standing does the ball hit the ground?

7) _____

8) If the acceleration vector of an object is directed parallel to the velocity vector,

8) _____

9) For general projectile motion, the vertical component of a projectile's acceleration

9) _____

10) For general projectile motion, which statement is true when the projectile is at the highest point of its trajectory?

10) _____

11) A pilot drops a bomb from a plane flying horizontally at a constant speed. Neglecting air resistance, when the bomb hits the ground the horizontal location of the plane will

11) _____

12) A rock is thrown from ground level at some angle above the horizontal with a certain velocity. It reaches its highest point and starts falling down. What is the magnitude of the velocity of the rock right before it hits the ground?

12) _____

13) A boy kicks a football from ground level with an initial velocity of 20 m/s at an angle of 60° above the horizontal. What is the horizontal distance to the point where the football hits the ground?

13) _____

14) A boy kicks a football with an initial velocity of 28.0 m/s at an angle of 30.0° above the horizontal. What is the highest elevation reached by the football in its trajectory?

14) _____

15) A boy kicks a football from ground level with an initial velocity of 20 m/s at an angle of 30° above the horizontal. What is the horizontal component of its velocity just before it hits the ground?

15) _____

16) A ball is thrown with an initial speed of 60 m/s at an angle of 30° above the horizontal. What is the ball's horizontal displacement at the end of 4 seconds? Use $g = 10$ m/s$^2$.

16) _____

17) A boy kicks a football with a certain initial velocity at an angle 20° above the horizontal. In 2.0 seconds, the ball reaches at its highest point in its trajectory. What is the initial velocity of the ball?

17) _____

18) A projectile is shot from the edge of a vertical cliff 60.0 m above the ocean. It has a speed of 100 m/s and is fired at an angle of 35.0° above the horizontal. How far from the foot of the vertical cliff does the projectile hit the water?

18) _____

19) A ball is thrown horizontally from the top of a building. What will be its vertical displacement from the top of building 2.0 seconds after it leaves your hands?

19) _____

20) A ball is thrown horizontally with an initial velocity of 20.0 m/s from the edge of a building of a certain height. The ball lands at a horizontal distance of 82.0 m from the base of the building. What is the height of the building?

20) _____

21) The horizontal and vertical components of the initial velocity of a football are 16 m/s and 20 m/s respectively. How long does it take for the football to rise to the highest point of its trajectory?

21) _____

22) A bullet is fired with a certain velocity at an angle $\theta$ above the horizontal at a location where $g = 10.0$ m/s$^2$. The initial $x$ and $y$ components of its velocity are 86.6 m/s and 50.0 m/s respectively. At what angle is the bullet fired above the horizontal?

22) _____

23) A ball rolls over the edge of a table with a horizontal velocity $v$ m/s. The height of the table is 1.6 m and the horizontal range of the ball from the base of the table is 20 m. What is the magnitude and direction of the ball's acceleration right after it leaves the table?

23) _____

24) A hockey puck slides off the edge of a table with an initial velocity of 20 m/s. The height of the table above the ground is 2.0 m. What is the acceleration of the puck just before it touches the ground?

24) _____

25) A hockey puck slides off the edge of a table with an initial velocity of 20.0 m/s. The height of the table above the ground is 2.0 m. What is the magnitude of the velocity of the puck just before it touches the ground?

25) _____

26) A ball rolls over the edge of a table with a horizontal velocity $v$ m/s. The height of the table is 1.6 m and the horizontal range of the ball from the base of the table is 20 m. What is the initial speed of the ball?

26) _____

27) A ball rolls off the edge of a table with an initial velocity of 20 m/s. The height of the table above the ground is 2.0 m. How long does it take the ball to reach the ground?

27) _____

28) If a vector $\vec{A}$ has components $A_x < 0$, and $A_y > 0$, then the angle that this vector makes with the positive $x$-axis must be in the range

28) _____

**Figure 3–1**
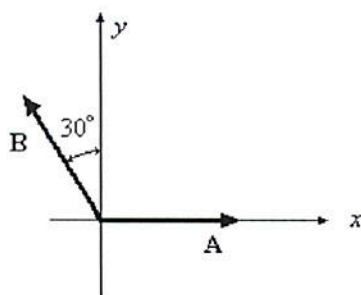


29) Refer to Figure 3–1. The components of vectors $\vec{A}$ and $\vec{B}$ are

29) _____

30) The sum of two vectors has the greatest magnitude when the angle between these two vectors is

30) _____

31) The resultant vector $\vec{C}$ of two vectors $\vec{A}$ and $\vec{B}$ will have the minimum value when the angle between these vectors is one of the following?

31) _____

32) When vectors $\vec{A}$ and $\vec{B}$ are added together they form vector $\vec{C}$ and these vectors satisfy the relationship $A^2 + B^2 = C^2$. Which statement is true for these vectors?

32) _____

33) What is the smallest number of vectors that can be added to give a zero resultant?

33) _____

34) Two vectors $\vec{A}$ and $\vec{B}$ are added together giving vector $\vec{C}$. The magnitude of C is such that $C = \sqrt{A^2 + B^2}$. If the magnitudes of both vectors $\vec{A}$ and $\vec{B}$ are doubled, the magnitude of vector $\vec{C}$ will

34) _____

Figure 3–8
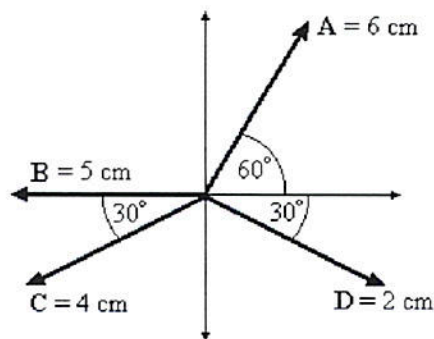


35) Refer to Figure 3–8. The sum of these vectors is given by

35) _____

36) A boy jumps at a speed of 16.0 m/s at an angle of 20.0° above the horizontal. How long does he stay in the air before touching the ground?

36) _____

37) A soccer player carries the ball for a distance of 40.0 m in the direction 42.0° west of south. Find the westward component of the ball's displacement.

37) _____

38) A vector $\vec{A}$ has components $A_x = 12.0$ m and $A_y = 5.00$ m. What is the angle that vector $\vec{A}$ makes with the $x$–axis?

38) _____

39) A player throws a football 74.0 m at 61.0° north of west. The westward component of the displacement of the football thrown is given by

39) _____

40) Vector $\vec{A}$ has a magnitude of 16.0 m and is pointing eastward. It is rotated 110.0° clockwise. The component of this vector along west is

40) _____

41) A boy jumps at a speed of 20.0 m/s at an angle of 25.0° above the horizontal. What is the horizontal component of the boy's velocity?

41) _____

42) The components of vectors $\vec{M}$ and $\vec{N}$ are as follows: $\vec{M} = (1, -1)$ and $\vec{N} = (2, 4)$. The components of the resultant vector $\vec{M} + \vec{N}$ are given by

42) _____

4

43) The components of vectors $\vec{M}$ and $\vec{N}$ are as follows: $\vec{M}$ (1, –1) and $\vec{N}$ (2, 4). The components of the resultant vector $\vec{M} - \vec{N}$ are given by

43) _____

44) Vector $\vec{A} = 6.0$ m and points 30° north of east. Vector $\vec{B} = 4.0$ m and points 30° east of north. The resultant vector $\vec{A} + \vec{B}$ is given by

44) _____

45) Vector $\vec{A} = 6.0$ m and points 30° north of east. Vector $\vec{B} = 4.0$ m and points 30° south of west. The resultant vector $\vec{A} + \vec{B}$ is given by

45) _____

46) Vector $\vec{A} = 6.0$ m and points 30° south of east. Vector $\vec{B} = 4.0$ m and points 30° west of south. The resultant vector $\vec{A} + \vec{B}$ is given by

46) _____

1) Choice 4
2) Choice 2
3) 0° to 90°.
4) 25 m/s
5) 45.2 m/s
6) 35 m/s
7) 7.46 m
8) the object is speeding up.
9) remains a non-zero constant.
10) Its velocity is perpendicular to the acceleration.
11) be over the bomb.
12) It is equal to the magnitude of its initial velocity.
13) 35 m
14) 10.0 m
15) 17 m/s
16) 210 m
17) 57 m/s
18) 1080 m
19) 19.6 m
20) 82.4 m
21) 2.0 s
22) 30.0°
23) 9.8 m/s$^2$ downward
24) 9.8 m/s$^2$
25) 21 m/s
26) 35 m/s
27) 0.64 s
28) 90° to 180°.
29) $A_x = A \cos 0°$    $B_x = -B \cos 60°$    $A_y = A \cos 90°$    $B_y = B \cos 30°$.
30) 0°.
31) 180°
32) Vectors $\vec{A}$ and $\vec{B}$ must be perpendicular.
33) 2
34) increase by a factor of 2.
35) 4.33 cm at an angle 149.5° with respect to +$x$–axis.
36) 1.12 s
37) 26.8 m
38) 22.6°
39) 35.9 m.
40) 5.47 m.
41) 18.1 m/s
42) (3, 3).
43) (−1, −5).
44) 9.7 m at an angle 42° north of east.
45) 2.0 m at an angle 30° north of east.
46) 7.2 m at an angle 64° south of east.