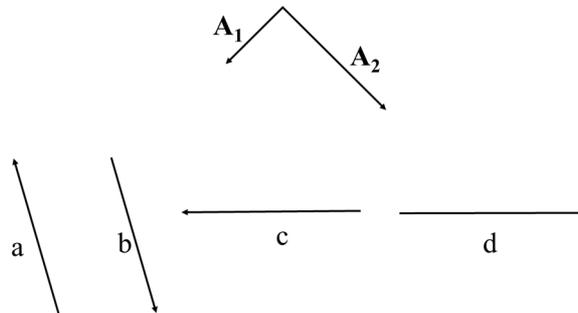


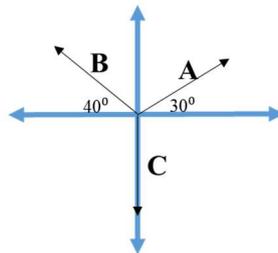
Lab tutorial #1

1. The length of a plant cell is $4.4 \mu\text{m}$. What is this length in (a) m (b) km
 Ans. $4.4 \times 10^{-6} \text{ m}$, $4.4 \times 10^{-9} \text{ km}$
2. A motorist travels at 120 miles per hour (mph), determine how fast it is travelling in (a) km h^{-1} and (b) in m s^{-1} . (1 mile = 1600 m.)
 Ans. 192 kmh^{-1} , 53.3 ms^{-1}
3. Given that $1 \text{ ml} = 1 \text{ cm}^3$. Express the volume of 4 litre in cm^3 .
 Ans. 4000 cm^3
4. An object moves 7 m to the east, 3 m to the south, then 11 m west. Find the magnitude of its total displacement.
 Ans. 5 m
5. A 110 m building casts a shadow which make an angle of 25° with the horizontal. What is the length of the shadow over horizontal ground?
 Ans. 236 m
6. The figure below shows two vectors, \mathbf{A}_1 and \mathbf{A}_2 . Which of the possibilities represents their vector sum.



Ans. b

7. Consider three vectors A, B and C in the diagram below. Vector $\mathbf{A} = 5 \text{ ms}^{-1}$, forms an angle of 30° with the positive x-axis, vector $\mathbf{B} = 7 \text{ ms}^{-1}$, forms an angle of 40° with the negative x-axis and $\mathbf{C} = 8 \text{ ms}^{-1}$, points towards the negative y-axis. The sum of the y-components of all the vectors is,



Ans. $R_y = -1 \text{ ms}^{-1}$

8. Two horses are pulling a cart. One horse pulls with a force of $\mathbf{F}_1 = 50 \text{ N}$ towards the east and another horse pulls with a force $\mathbf{F}_2 = 30 \text{ N}$ at 30° north of east.
 - (a) Draw a diagram to show the direction of the resultant
 - (b) Find the magnitude and the direction of the resultant using addition of vectors using components

(c) Find the magnitude and the direction of the resultant using parallelogram method

Ans. 77.5 N, 11.2° for (b) and (c)

9. An aircraft flying horizontally with a speed of 200 ms^{-1} drops an object from a height of 1960 m above level ground. Calculate (a) the position of the object 3.0 seconds after release, (b) the complete time of flight of the object and (c) the velocity of the object (in magnitude and direction) when it hits the ground.

Ans. (a) 600 m ahead of and 44.1 m below point of release. (b) 20 seconds. (c) 280 ms^{-1} at $44^\circ 25'$ below the horizontal.

10. A body is projected with a speed of 19.6 m s^{-1} at an angle of 30° above the horizontal from the top of a tower 39.2 m high. Calculate (a) the maximum height the body reaches above the ground, (b) the time taken for the body to reach the ground and (c) the angle subtended by the tower at the point of impact with the ground. (assume the ground to be horizontal and neglect air resistance.)

Ans. (44.1 m, 4 s; 60°)

11. An object is projected downward at an angle of 30° to the horizontal, with an initial speed of 40 ms^{-1} , from the top of a tower 150 m high. What will be the vertical component of its velocity when it strikes the ground? In what time will it strike the ground? How far from the tower will it strike the ground? At what angle with the horizontal will it strike?

Ans. (58 ms^{-1} , 3.9 s, 135 m; 59°)