# 1 Quiz 1 (Basics and Vectors)

**In this quiz you will get the same questions but with different numbers.**

**You will not get all 10 questions but will get a random selection of 5 of them. You, therefore, need to understand how to solve them all.**

1) A speed of 88 miles per hour in m/s is (1 mile = 1609 m)
Solution:

$$88\ \frac{miles}{hr}\ \frac{1609\ m}{1\ mile}\ \frac{1\ hr}{60\ mins}\ \frac{1\ min}{60\ sec} = 38\ \frac{m}{s}$$

2) The wavelength of a certain laser is 0.80 microns. Where 1 micron = $1 \times 10^{-6}$ m. What is this wavelength in nanometers? (1 nm = $10^{-9}$ m)
Solution:

$$0.80\ \mu m\ \frac{10^{-6}\ m}{1\ \mu m}\ \frac{1\ nm}{10^{-9}\ m} = 800\ nm$$

3) Express $[8.3 \times 10^{3}]^{-1/2}$ in scientific notation.
Solution:

$$= 1.1 \text{ x } 10^{-2}$$

4) What is 0.176/2.3 to the proper number of significant figures?
Solution:

$$\frac{0.176}{2.3} = 0.07652 = 0.077$$

5) Estimate the number of times an average person's heart beats in a lifetime. Assume the average heart rate is 72 beats/min and a life span of 95 years
Solution:

$$72\ \frac{beats}{min}\ \frac{60\ min}{1\ hr}\ \frac{24\ hr}{1\ day}\ \frac{365\ day}{1\ year}\ \times 95 = 4 \times 10^9\ beats$$

6) What is $0.034^{1/3}$, to the proper number of significant figures?
Solution:

$$0.034^{1/3} = 0.32$$

7) The components of vector **A** are given as follows:

$$A_x = +10.4$$

$$A_y = -3.6$$

The magnitude of **A** is closest to:
Solution:

$$\sqrt{10.4^2 + 3.6^2} = 11$$

8) The components of vector **A** are given as

$$A_x = +0.4$$

$$A_y = -1.3$$

follows:

The angle measured counterclockwise from the

x-axis to vector **A**, in degrees, is

$$tan^{-1}\left(\frac{|y|}{|x|}\right) = tan^{-1}\left(\frac{1.3}{0.4}\right) = 73°$$

$$\theta = 360° - 73° = 287°$$

9) The components of vectors **A** and **B** are given as follows:

$A_x = +8.3$ $\quad$ $B_x = -6.7$

$A_y = -4.2$ $\quad$ $B_y = -3.0$

The magnitude of the vector difference **B-A**, is

Solution:

| | x | y |
|---|---|---|
| B | -6.7 | -3.0 |
| A | 8.3 | -4.2 |
| B - A | -15 | 1.2 |

$$\left|\vec{B} - \vec{A}\right| = \sqrt{15^2 + 1.2^2} = 15.1$$

10) Find the magnitude of the resultant R of the three vectors shown in Figure 2.1. The vectors have the following magnitudes: A = 8.0, B = 10, and C = 11.

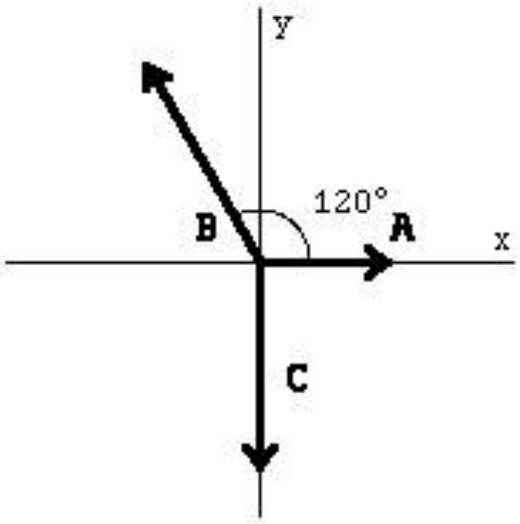


Figure 2.1: Three vectors

Solution:

| | X | Y |
|---|---|---|
| A | 8 | 0 |
| B | 10 cos 120 | 10 sin 120 |
| C | 0 | -11 |
| R=A+B+C | 3 | -2.3 |

$$R = \sqrt{(3^2 + 2.3^2)} = 3.8$$