Which of the following lists three vector quantities?

A. momentum, electric field strength, displacement

B. momentum, displacement, pressure

C. pressure, electric current, displacement

D. electric current, electric field strength, impulse

Which unit is equivalent to $J\,kg^{-1}$?

A. $m\,s^{-1}$

B. $m\,s^{-2}$

C. $m^2\,s^{-1}$

D. $m^2\,s^{-2}$

$$\frac{mv^2}{2} = [kg]\left[\frac{m^2}{s^2}\right]$$

$$\frac{kg \cdot m^2}{s^2 \cdot kg} = \frac{m^2}{s^2} = m^2 s^{-2}$$

The maximum acceleration a_{max} of an oscillator undergoing simple harmonic motion (SHM) has a percentage uncertainty of 12%. The amplitude x_0 of the oscillation has a percentage uncertainty of 20%. If $k = \sqrt{\frac{a_{max}}{x_0}}$ what is the percentage uncertainty in the constant k?

A. 4%

B. 8%

C. 16%

D. 32%

$$20\% + 12\% = 32\%$$

$$\left(\frac{1}{2}\right)(32\%) = 16\%$$

Which of the following is a fundamental unit?

A.   Ampere

B.   Coulomb

C.   Ohm

D.   Volt

Each side of a metal cube is measured to be 2.0 cm ±0.20 cm. What is the absolute uncertainty in the calculated volume of the cube?

A.   ±0.08 cm^3

B.   ±0.60 cm^3

C.   ±0.80 cm^3

D.   ±2.4 cm^3

$$\frac{0.2}{2.0} = 10\%$$

$$(3)(10\%)(2^3) = 2.4$$

What is the unit for surface heat capacity?

A. $Nm^{-2}K^{-1}$

B. $kgms^{-2}K^{-1}$

C. $kgs^{-2}K^{-1}$

D. $Nm^{-3}K^{-1}$

m^2

unit for heat capacity: $\frac{J}{K}$

For surface: $\frac{J}{m^2 \cdot k} = \frac{\frac{kg \cdot m^2}{s^2}}{m^2 \cdot k} = \frac{kg \cdot m^2}{s^2 \cdot m^2 \cdot k} = \frac{kg}{s^2 k} = kg \cdot s^{-2} \cdot k^{-1}$

Two loudspeakers, L_1 and L_2, emit identical sound waves.

$L_1P = 3.10\,m$

$L_2P = 3.70\,m$

$L_1Q = 3.20\,m$

$L_2Q = 3.50\,m$

● P

● Q

L_1

L_2

(not to scale)
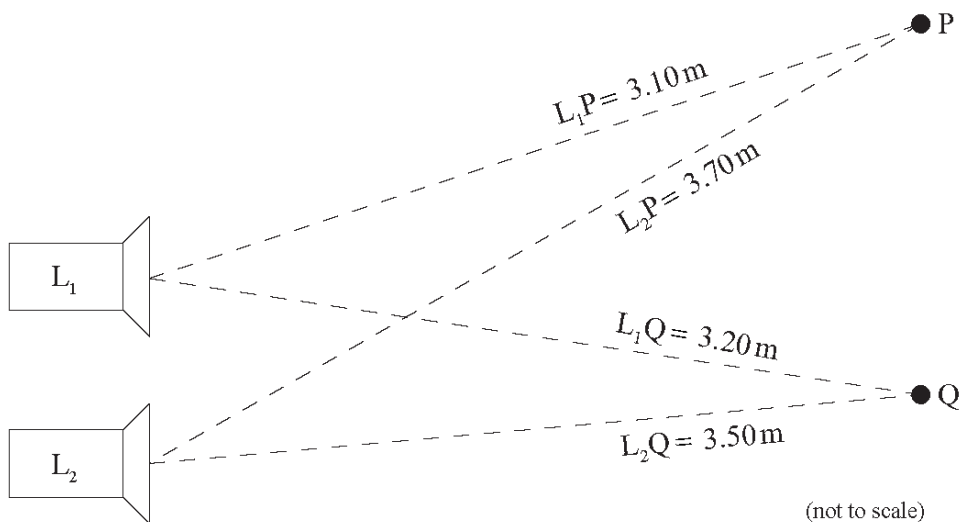
The waves leaving L_1 and L_2 are in phase and are observed at points P and Q.

The wavelength of the sound is 0.60 m. The distances of points P and Q from the loudspeakers are shown in the diagram.

Which of the following is true about the intensity of the sound at P and the intensity of the sound at Q?

	Intensity at P	Intensity at Q
A.	maximum	maximum
B.	maximum	minimum
C.	minimum	maximum
D.	minimum	minimum

The length of the side of a cube is 10.0 ±0.3 cm. What is the uncertainty in the volume of the cube?

A.   ±0.027 cm³

B.   ±2.7 cm³

C.   ±9.0 cm³

D.   ±90 cm³

$(3) \cdot \left(\frac{0.3}{10}\right)(10^3) = (0.09)(1000)$

$= 90$

An archer aims five arrows at the centre of a target. The arrows strike the target as shown below.
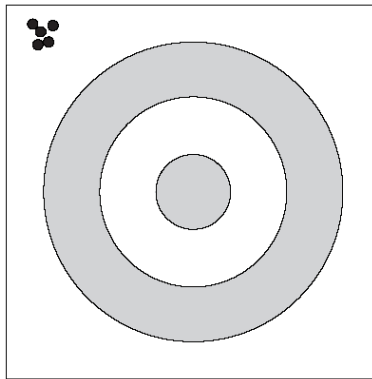
Which of the following describes the aim of the archer?

A.   Accurate and precise

B.   Accurate but not precise

C.   Precise but not accurate

D.   Neither accurate nor precise

The sides of a square are measured to be 5.0 ± 0.2 cm. Which of the following gives the area of the square and its uncertainty?

A. 25.0 ± 0.2 cm²

B. 25.0 ± 0.4 cm²

C. 25 ± 2 cm²

D. 25 ± 4 cm²

$$(2)\left(\frac{0.2}{5}\right)(5^2) = (0.08)(25)$$

$$= 2$$

Which of the following lists two vector quantities and one scalar quantity?

A.   force, mass, time

B.   acceleration, energy, momentum

C.   distance, impulse, power

D.   density, pressure, temperature

The force of air resistance F that acts on a car moving at speed v is given by $F=kv^2$ where k is a constant. What is the unit of k?

A. kg m^{-1}

B. $\text{kg m}^{-2}\text{s}^2$

C. kg m^{-2}

D. $\text{kg m}^{-2}\text{s}^{-2}$

$$\left[\frac{kg\cdot m}{s^2}\right] = \left[\frac{m^2}{s^2}\right]\left[?\right]$$

$$\frac{kg}{m}$$

The radius of a sphere is measured with an uncertainty of 2%. What is the uncertainty in the volume of the sphere?

A. 2%

B. 4%

C. 6%

D. 8%

$$\frac{4}{3}\pi r^3$$

Which of the following is a unit of energy?

A. $\text{kg m}^{-1}\text{s}^{-1}$

B. $\text{kg m}^{2}\text{s}^{-2}$

C. kg m s^{-2}

D. $\text{kg m}^{2}\text{s}^{-1}$

$$\overline{Jouel} =$$

The volume V of a cylinder of radius R and height H is given by $V=\pi R^2 H$. The volume of the cylinder was measured with an uncertainty of 10% and the height was measured with an uncertainty of 6%. What is the uncertainty in the radius of the cylinder?

A. 1%

B. 2%

C. 4%

D. 8%

$$V = \pi r^2 h$$

$$r = \sqrt{\frac{V}{\pi h}}$$

$$\Delta r = \frac{1}{2}(10\% + 6\%)$$

$$= 8\%$$