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General physics (phys.1011)

Worksheet I

Significant Figures and uncertainty

1. A rectangular plate has a length of (21.3 ± 0.2) cm and a width of (9.8 ± 0.1) cm. Calculate the area of the plate, including its uncertainty.

2. The radius of a circle is measured to be (10.5 ± 0.2)m. Calculate the (a) area and (b) circumference of the circle and give the uncertainty in each value.

3. How many significant figures are in the following numbers?

(a) 78.9 ± 0.2 (b) $3.788\ x\ 10^9$ (c) $2.46\ x\ 10^6$ (d) 0.005 3

4. The radius of a solid sphere is measured to be (6.50 ± 0.20) cm, and its mass is measured to be (1.85 ± 0.02) kg. Determine the density of the sphere in kilograms per cubic meter and the uncertainty in the density.

5. Carry out the following arithmetic operations: (a) the sum of the measured values 756, 37.2, 0.83, and 2.5; (b) the product $0.003\ 2\ x\ 356.3$; (c) the product $5.620\ x\ \pi$

6. A sidewalk is to be constructed around a swimming pool that measures (10.0 ± 0.1)m by (17.0 ± 0.1) m. If the sidewalk is to measure (1.00 ± 0.01)m wide by (9.0 ± 0.1) cm thick, what volume of concrete is needed, and what is the approximate uncertainty of this volume?

Vectors

1. If $\vec{A} = 4\hat{\imath} + 9\hat{\jmath}$ and $\vec{B} = 3\hat{\imath} + 2\hat{\jmath}$ find (a) $\vec{A}.\vec{B}$ (b) $\vec{B}.\vec{A}$ (c) $\vec{A}.\vec{A}$ (d) $\vec{B}.\vec{B}$

2. Find the scalar product of the vectors $5\hat{\imath}$ and $8\hat{\jmath}$

3. Determine whether or not the vectors $\vec{A} = 2\hat{\imath} + 4\hat{\jmath}$ and $\vec{B} = -\hat{\imath} + 0.5\hat{\jmath}$ are perpendicular.

4. Find the component of the vector $\vec{r} = \hat{\imath} - \hat{\jmath} + 3\hat{k}$ in the direction of $\vec{A} = 7\hat{\imath} - 2\hat{\jmath} + 2\hat{k}$

5. Find a unit vector which is perpendicular to both $\vec{A} = \hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ and $\vec{B} = 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$,

6. Two vectors are given by $\vec{A} = 3i + 4j$ and $\vec{B} = 3j$

Compute:-

(a) $\vec{\boldsymbol{A}}.\vec{\boldsymbol{B}}$

(b) The magnitude of $\vec{A}$.

(c) The magnitude of $\vec{B}$.

(d) The angle between the two vectors.

7. If the component of vector **A** along the direction of vector **B** is zero, what can you conclude about the two vectors?

8. If $\boldsymbol{A} = \boldsymbol{B}$, what can you conclude about the components of **A** and **B**?