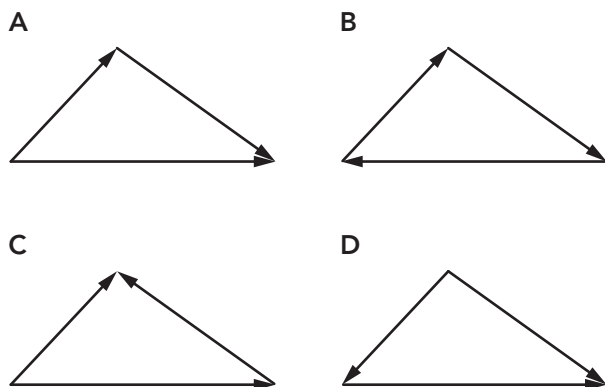


> Topic 0

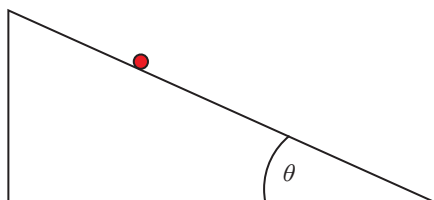
Multiple choice questions

- 1 What is 80 years in seconds?
A 10^7
B 10^9
C 10^{11}
D 10^{13}
- 2 A book has 500 pages (printed on both sides). The thickness of the book, excluding the covers, is 2.5 cm. What is the approximate thickness, in mm, of one sheet of paper?
A 0.01
B 0.1
C 0.5
D 1.0
- 3 The speed of sound is approximately 330 m s^{-1} . A thunderstorm is 3 km away. What is the approximate time between seeing lightning and hearing thunder?
A 0.1 s
B 1 s
C 3 s
D 9 s
- 4 What are the fundamental units of the quantity power per unit area per unit wavelength?
A $\text{kg m}^{-1} \text{s}^{-3}$
B $\text{kg m}^{-2} \text{s}^{-1}$
C $\text{kg m}^{-1} \text{s}^{-2}$
D $\text{kg m}^{-2} \text{s}^{-2}$
- 5 What is the fundamental unit of the quantity $\sqrt{\frac{hG}{c^5}}$?
A kg
B m
C s
D K

- 6 Which diagram in the diagram shows three forces that have a resultant force of zero?



- 7 A small ball of mass m rolls down an inclined plane that makes an angle θ to the horizontal.



What is the component of the weight of the ball down the plane in the diagram?

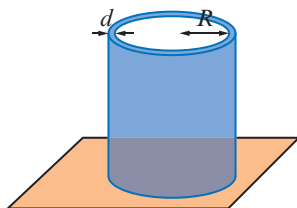
- A mg
 B $mg \sin \theta$
 C $mg \cos \theta$
 D $mg \tan \theta$
- 8 In the grid in the following figure, the width of each square represents 1 N.



What are the horizontal and vertical components of the sum of the two forces?

	Horizontal	Vertical
A	0 N	6 N
B	0 N	7 N
C	1 N	6 N
D	1 N	7 N

- 9 A hollow cylinder of mass M has inner radius R and wall thickness $d \ll R$, as shown in the diagram. What is an approximate expression for the pressure the cylinder exerts on the horizontal surface upon which it rests?



- A $\frac{Mg}{\pi R^2}$
 B $\frac{Mg}{\pi(R+d)^2}$
 C $\frac{Mg}{2\pi R d}$
 D $\frac{Mg}{2\pi R(R+d)}$
- 10 In a set of measurements X, each measurement has the same absolute uncertainty. In a set of measurements Y, each measurement has the same percentage uncertainty. Which measurement the largest percentage uncertainty in X, and which measurement has the largest absolute uncertainty in Y?

	Largest percentage uncertainty in X	Largest absolute uncertainty in Y
A	The smallest measurement	The smallest measurement
B	The smallest measurement	The largest measurement
C	The largest measurement	The smallest measurement
D	The largest measurement	The largest measurement

- 11 Two quantities, a and b , are measured with percentage uncertainty 6% and 2%, respectively. What is the percentage uncertainty in the quantity $\frac{a^2}{b^2}$?
- A 6%
 B 8%
 C 9%
 D 16%
- 12 The side of a cube is measured with an uncertainty of 2%. What is the uncertainty in the volume of the cube?
- A 2%
 B 4%
 C 6%
 D 8%
- 13 The flow rate Q through a tube of length L and radius r whose ends are kept at a pressure difference ΔP is given by $Q = \frac{cr^4\Delta P}{L}$, where c is a constant. The percentage uncertainty in L , r and ΔP is the same. Which quantity contributes the most to the percentage uncertainty in Q ?
- A r
 B ΔP
 C L
 D r , L and ΔP each give the same contribution

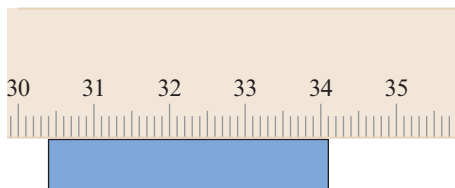
- 14 The force of air resistance F on a car depends on speed v through the formula $F = av^2 + bv$, where a and b are constants.

Which of the following produces a straight-line graph?

- A F against v
 - B F against v^2
 - C $\frac{F}{v}$ against v
 - D $\frac{F}{v}$ against $\frac{1}{v}$
- 15 Which of the following will definitely **not** reduce systematic errors in a measurement?
- A Average over many repeated measurements.
 - B Check the calibration of the instruments.
 - C Check for zero errors in instruments.
 - D Evaluate the experimental procedure.
- 16 The volume of a cone of radius R and height H is given by $V = \frac{\pi R^2 H}{3}$. The radius is measured with a precision of 5% and the height to a precision of 2%.

What is the percentage uncertainty in the volume?

- A 4%
 - B 9%
 - C 12%
 - D 27%
- 17 What is the length of the blue rod shown in the diagram? The ruler measures in cm.



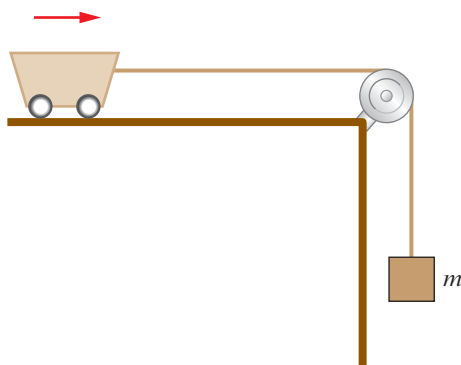
- A (3.60 ± 0.05) cm
 - B (3.6 ± 0.1) cm
 - C (3.60 ± 0.20) cm
 - D (3.6 ± 0.05) cm
- 18 The diagram shows the temperature of a liquid before and after heating.



What is the best estimate for the temperature increase of the liquid?

- A (44.0 ± 0.5) degrees
- B (44 ± 1.0) degrees
- C (44 ± 1) degrees
- D (44.0 ± 2.0) degrees

- 19 A student wants to verify that the acceleration of a system of a cart and a hanging mass m is proportional to m .



For the set-up shown, in the diagram the acceleration of the cart is given by $a = \frac{mg}{M}$, where M is the total mass of the system (cart + hanging mass).

The student has neglected to take into account a constant frictional force acting on the cart.

What type of error does this lead to, and what should be varied to show that a is proportional to m ?

	Error	Procedure
A	Random	Vary m
B	Random	Vary m keeping M constant
C	Systematic	Vary m
D	Systematic	Vary m keeping M constant

- 20 A student wants to measure the diameter of a copper wire with a micrometer. What is the best procedure for doing this?

- A Measure the diameter at the middle of the wire.
- B Measure the diameter at the middle of the wire ten times and take an average.
- C Measure the diameter at ten different points on the same line parallel to the length of the wire and take an average.
- D Measure the diameter at ten different points on different lines parallel to the length of the wire and take an average.