

Practice Exam 1

1. The number of significant figures in 0.00150 is:

- A) 2
- B) 3
- C) 4
- D) 5
- E) 6

$$0.00150 = \cancel{0.0015} \\ = 0.00150 \times 10^3 \times 10^{-3} = \frac{1.50 \times 10^{-3}}{\text{3 s.f.}}$$

1 pt.

2. 1 mile is equivalent to 1609 m so 55 mph (miles per hour) is:

- A) 15 m/s
- B) 25 m/s
- C) 66 m/s
- D) 88 m/s
- E) 1500 m/s

$$55 \frac{\text{miles}}{\text{hr}} \times \frac{1 \text{ hr}}{3600 \text{ s}} \times \frac{1609 \text{ m}}{1 \text{ mile}} = \frac{55 \times 1609}{3600} \text{ (s)}$$

1 pt.

3. A sphere with a radius of 1.7 cm has a surface area of:

- A) $2.1 \times 10^{-5} \text{ m}^2$
- B) $9.1 \times 10^{-4} \text{ m}^2$
- C) $3.6 \times 10^{-3} \text{ m}^2$
- D) 0.11 m^2
- E) 36 m^2

$$A = 4\pi r^2 = 4(\pi) \times (1.7 \times 10^{-2})^2 \\ = 3.6 \times 10^{-3} \text{ m}^2$$

1 pt.

4. During a short interval of time the speed v in m/s of an automobile is given by $v = at^2 + bt^3$, where the time t is in seconds. The units of a and b are respectively:

- A) $\text{m} \cdot \text{s}^{-2}$; $\text{m} \cdot \text{s}^{-4}$
- B) s^3/m ; s^1/m
- C) m/s^2 ; m/s^3
- D) m/s^3 ; m/s^4
- E) m/s^4 ; m/s^5

$$[at^2] = \frac{\text{m}}{\text{s}} \Rightarrow [a] = \frac{\text{m}}{\text{s}} \frac{1}{\text{s}^2} = \frac{\text{m}}{\text{s}^3} \\ [bt^3] = \frac{\text{m}}{\text{s}} \Rightarrow [b] = \frac{\text{m}}{\text{s}} \frac{1}{\text{s}^3} = \frac{\text{m}}{\text{s}^4}$$

1 pt.

5. A car moving with an initial velocity of 25 m/s north has a constant acceleration of 3 m/s^2 south. After 6 seconds its velocity will be:

- A) 7 m/s north
- B) 7 m/s south
- C) 43 m/s north
- D) 20 m/s north
- E) 20 m/s south

$$v = v_0 + at \quad \uparrow \text{N +ve} \\ = 25 + (-3)(6) = \cancel{12} = +7 \text{ m/s}$$

1 pt.

7. A ball is in free fall. Its acceleration is:
- A) downward during both ascent and descent
 - B) downward during ascent and upward during descent
 - C) upward during ascent and downward during descent
 - D) upward during both ascent and descent
 - E) downward at all times except at the very top when it is zero

1 pt

7. At a location where $g = 9.80 \text{ m/s}^2$, an object is thrown vertically down with an initial speed of 1.00 m/s . After 5.00 s the object will have traveled

- A) 125 m
- B) 127.5 m
- C) 245 m
- D) 250 m
- E) 255 m

$$\Delta x = ?$$

$$v_0 = -1.00 \text{ m/s}$$

$$v = ?$$

$$a = -9.80 \text{ m/s}^2$$

$$t = 5.00 \text{ s}$$

$$\Delta x = v_0 t + \frac{1}{2} a t^2$$

$$= -1(5) - 4.9(5)^2$$

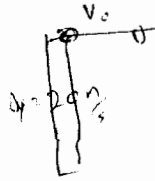
$$= 127.5$$

1 pt

8. A boy on the edge of a vertical cliff 20 m high throws a stone horizontally outwards with a speed of 20 m/s . It strikes the ground at what horizontal distance from the foot of the cliff?

Use $g = 10 \text{ m/s}^2$

- A) 10 m
- B) 40 m
- C) 50 m
- D) $50\sqrt{5} \text{ m}$
- E) none of these



x	y
$\Delta x = ?$	$\Delta y = -20 \text{ m}$
$v_{x0} = 20$	$v_{y0} = 0$
$v = ?$	$v = ?$
$a_x = 0$	$a_y = -9.80$
$t = t$	$t = ?$

$$\Delta y = v_{y0} t + \frac{1}{2} a t^2$$

$$-20 = -4.9 t^2$$

$$t = 2.02$$

$$\Delta x = (20)(2.02)$$

1 pt

9. Acceleration is always in the direction

- A) of the displacement
- B) of the initial velocity
- C) of the final velocity
- D) of the net force
- E) opposite to the frictional force

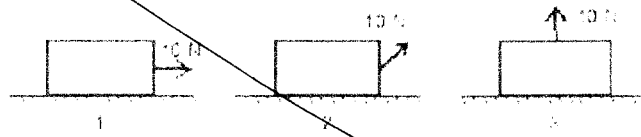
1 pt

10. The term "mass" refers to the same physical concept as

- A) weight
- B) inertia
- C) force
- D) acceleration
- E) volume

1 pt

15. A crate moves 10 m to the right on a horizontal surface as a woman pulls on it with a 10-N force. Rank the situations shown below according to the work done by her force, least to greatest.



- A) 1,2,3
 B) 2,1,3
 C) 2,3,1
 D) 1,3,2
 E) 3,2,1

NOT COVERED

1 pt

16. Which of the following bodies has the largest kinetic energy?

- A) Mass $3M$ and speed 4
 B) Mass $3M$ and speed 21
 C) Mass $2M$ and speed 31
 D) Mass M and speed 11
 E) All four of the above have the same kinetic energy

NOT COVERED

1 pt

17. A 0.6 kg rock is released from rest 80 m above the ground. When it has fallen 90 m its kinetic energy is approximately

- A) 4800 J
 B) 3500 J
 C) 1200 J
 D) 120 J
 E) 60 J

NOT COVERED

1 pt

SOLVING PROBLEMS

Show all the steps. Give right number of significant digits and write units.

1. Convert 112 m^2 from m^2 to in^2 . (5 pts)

$$\begin{aligned} &= 112 \cancel{\text{m}^2} \times \frac{10^4 \cancel{\text{cm}^2}}{1 \cancel{\text{m}^2}} \times \frac{1 \cancel{\text{in}^2} \text{cm}^2}{(2.54)^2 \cancel{\text{cm}^2}} \\ &= \frac{112 \times 10^4}{(2.54)^2} \text{m}^2 = 1.74 \times 10^5 \text{in}^2 \end{aligned}$$

$$\begin{aligned} 1 \text{ m} &= 10^2 \text{ cm} \\ 1 \text{ m}^2 &= (10^2)^2 \text{ cm}^2 \\ 1 \text{ m}^2 &= 10^4 \text{ cm}^2 \\ 1 \text{ m}^2 &= (2.54)^2 \text{ cm}^2 \end{aligned}$$

2. A car accelerates from rest to 50 km/h in 2.2 s on a straight road. Find how far the car traveled during this period. (5 pts)

$$\Delta x = ?$$

$$v_0 = 0$$

$$v = 50 \frac{\text{km}}{\text{h}} = \frac{50}{3.6} \frac{\text{m}}{\text{s}} = 13.9 \frac{\text{m}}{\text{s}}$$

$$a = ?$$

$$t = 2.2 \text{ s}$$

$$\Delta x = \frac{1}{2} (v + v_0) t$$

$$= \frac{1}{2} (13.9 + 0) (2.2)$$

$$\Delta x = 152.9 \text{ m}$$

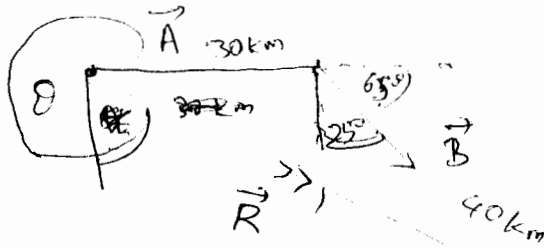
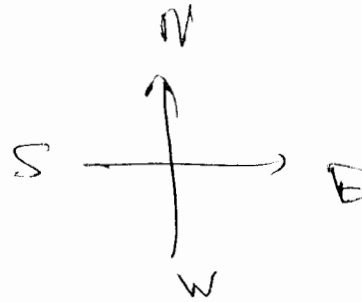
$$= 150 \text{ m} \quad (2 \text{ s.d.})$$

$$= 1.5 \times 10^2 \text{ m}$$

100%

3. A man walks 30 km east and then 40 km 25° east of south. Find where the man stands now (how far away he is from where he started and the angle).

[10 pts]



$$\vec{A} = 30 \hat{i} \text{ (km)}$$

$$\begin{aligned} \vec{B} &= 40 \cos 65^\circ \hat{i} - 40 \sin 65^\circ \hat{j} \\ &= 16.9 \hat{i} - 36.3 \hat{j} \text{ (km)} \end{aligned}$$

$$\vec{R} = \vec{A} + \vec{B} = 30 \hat{i}$$

$$A_x = 30 \text{ km}$$

$$B_x = 40 \cos 65 = 16.9 \text{ km}$$

$$A_y = 0 \text{ km}$$

$$B_y = -40 \sin 25 = -36.3 \text{ km}$$

$$R_x = A_x + B_x = 46.9 \text{ km}$$

$$R_y = A_y + B_y = -36.3 \text{ km}$$

$$\begin{aligned} R &= \sqrt{R_x^2 + R_y^2} = \sqrt{(46.9)^2 + (-36.3)^2} \\ &= 59.3 \text{ km} \end{aligned}$$

$$\theta = \tan^{-1}\left(\frac{-36.3}{46.9}\right) = -37.7^\circ$$