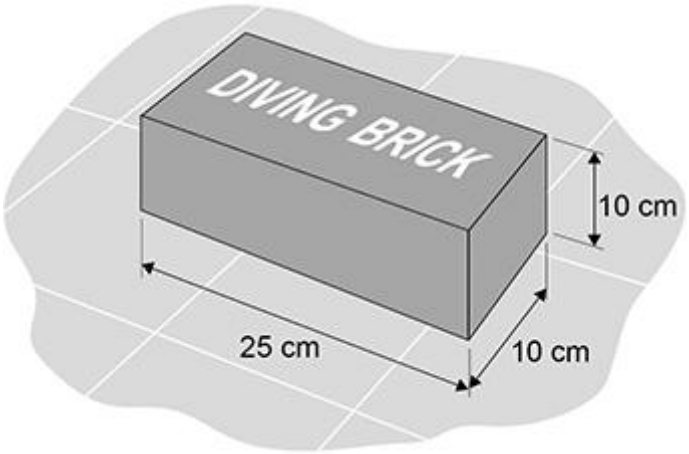
Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Q1.

Diving bricks sink to the bottom of a swimming pool.

Figure 1 shows a diving brick.

Figure 1



Swimmers practise diving to the bottom of the swimming pool to pick up the diving brick.

(a) Explain why the forces on the brick at the bottom of the pool cause the brick to be stationary.

_____

_____

_____

_____

_____

_____

(3)

(b) When the brick from **Figure 1** is at the bottom of the pool, the top surface of the brick is 2.50 m below the surface of the water.

The force acting on the top surface of the brick due to the weight of the water is 637 N.

gravitational field strength = 9.8 N/kg

Calculate the density of the water in the swimming pool.

Use the Physics Equations Sheet.

Density of water = _____ kg/m^3

(6)

(c) Professional divers are trained in a very deep swimming pool.

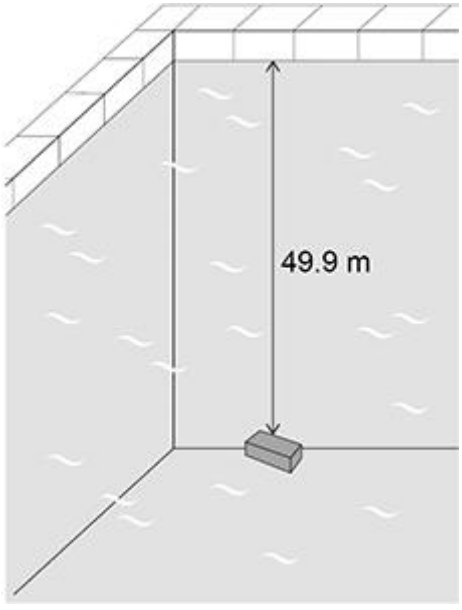
The density of the water in this pool is **not** the same as the density of the water in part (b).

The diving brick was dropped into the very deep swimming pool.

When the brick was at a depth of 2.50 m, the force due to the weight of the water on the top surface of the brick was 618 N.

Figure 2 shows the diving brick at the bottom of the very deep swimming pool.

Figure 2



Determine the force due to the weight of the water on the top surface of the brick in **Figure 2**.

Use the Physics Equations Sheet.

Give your answer to 3 significant figures.

_____

_____

_____

_____

_____

Force (3 significant figures) = _____ N

(3)

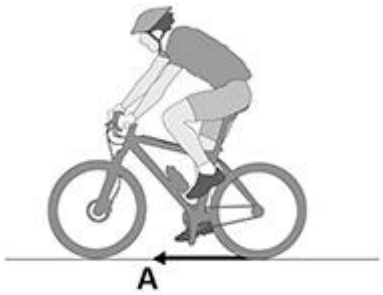
(Total 12 marks)

Q2.

Figure 1 shows a cyclist riding a bicycle.

Force **A** causes the bicycle to accelerate forwards.

Figure 1



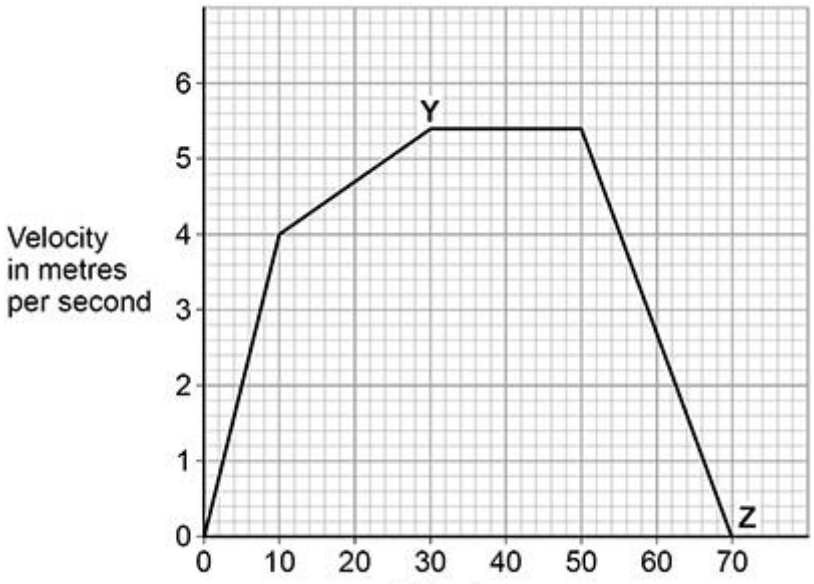
(a) What name is given to force **A**?

_____

(1)

Figure 2 shows how the velocity of the cyclist changes during a short journey.

Figure 2



(b) Determine the distance travelled by the cyclist between **Y** and **Z**.

_____

_____

_____

_____

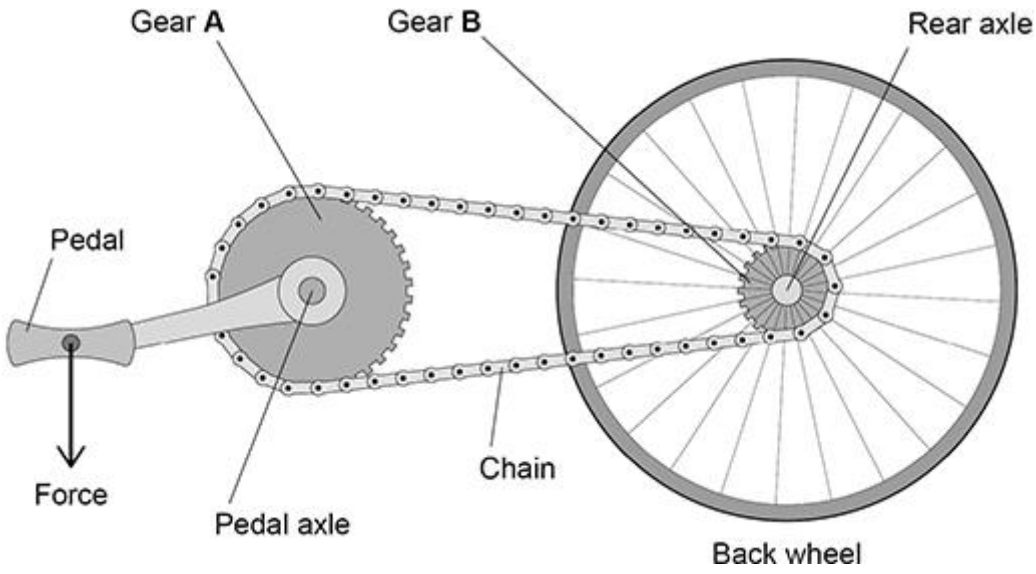
_____

Distance travelled by the cyclist between **Y** and **Z** = _____ m

(3)

(c) **Figure 3** shows the gears on the bicycle.

Figure 3



Describe how the force on the pedal causes a moment about the rear axle.

_____

_____

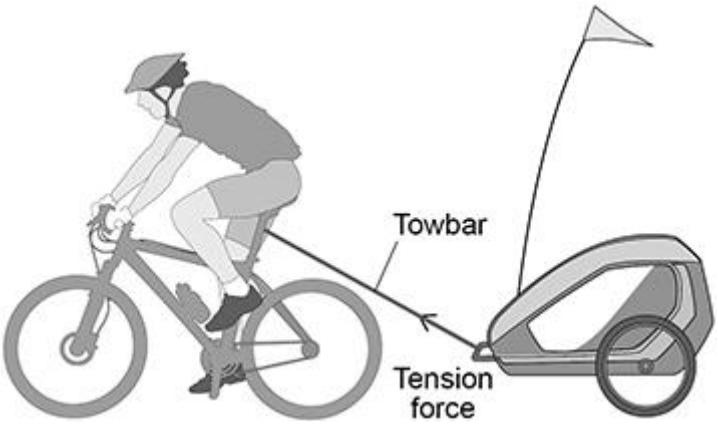
_____

_____

(2)

Figure 4 shows a different cyclist towing a trailer.

Figure 4



(d) The speed of the cyclist and trailer increased uniformly from 0 m/s to 2.4 m/s.

The cyclist travelled 0.018 km while accelerating.

Calculate the initial acceleration of the cyclist.

_____

_____

_____

_____

_____

Acceleration = _____ m/s^2

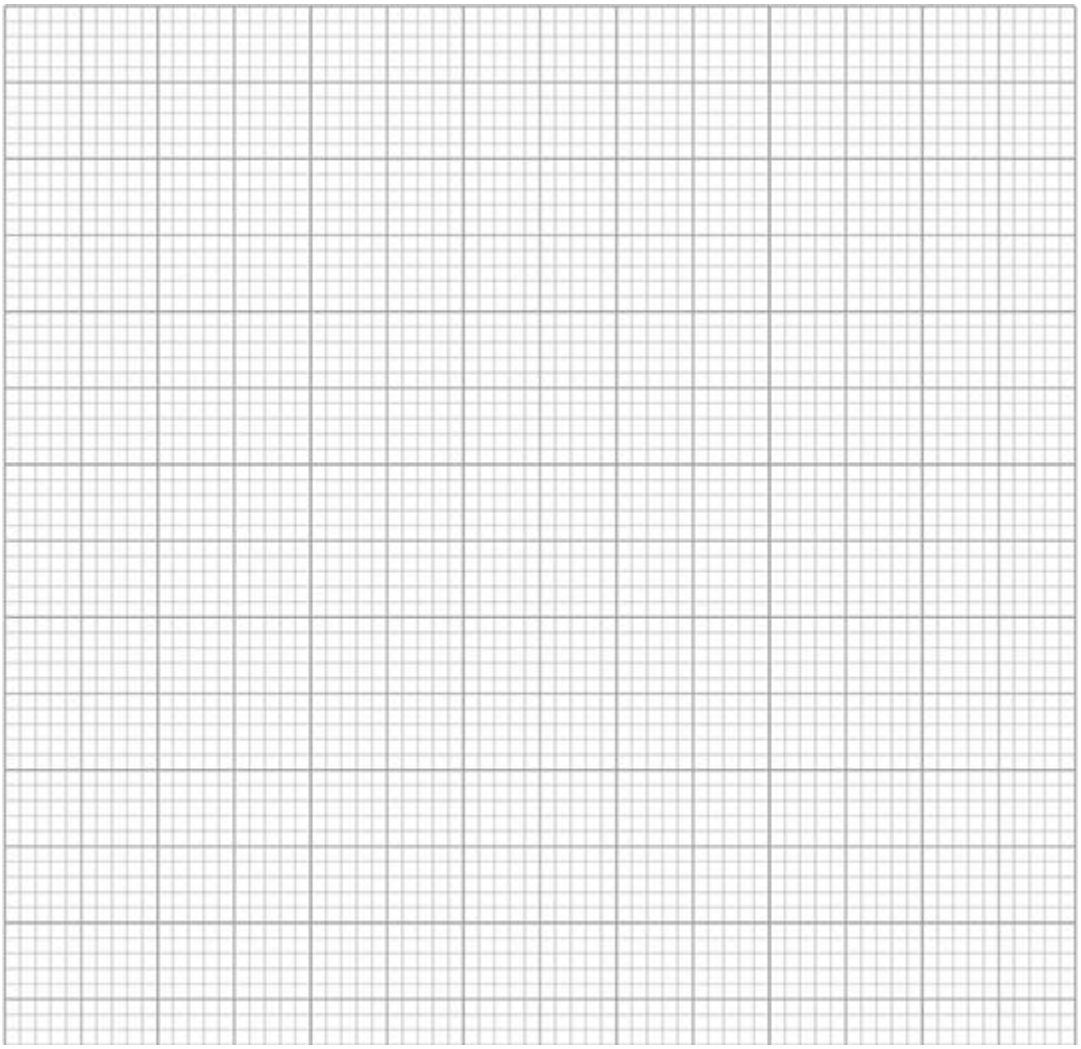
(3)

(e) The resultant force of the towbar on the trailer has a horizontal component and a vertical component.

horizontal force = 200 N

vertical force = 75 N

Determine the magnitude and direction of the resultant force of the towbar on the trailer by drawing a vector diagram.



Magnitude of force = _____ N

Direction of force = _____ degrees

(4)

(Total 13 marks)