Question 1

vectors have direction **(2)**
scalars have no direction **(2)**
e.g. velocity and speed **(2 × 2)**

Describe an experiment to find the resultant of two vectors.
apparatus and arrangement e.g. 3 weights and pulleys **(3)**
procedure and measurements e.g. adjust and read each force **(3)**
observation and result e.g. statement *(–1 if correct direction not shown)* **(3)**

A golfer pulls his trolley and bag along a level path. He applies a force of 277 N at an angle of 24.53° to the horizontal. The weight of the trolley and bag together is 115 N and the force of friction is 252 N.

Calculate the net force acting on the trolley and bag.
Horizontal force applied by golfer = 277Cos24.53° ≈ 252 N **(3)**
Vertical force applied by golfer = 277Sin24.53° ≈ 115 N **(3)**
Net force ≈ 0 N **(3)**

What does the net force tell you about the golfer's motion?
constant speed **(3)**

Use Newton's second law of motion to derive an equation relating force, mass and acceleration.
F proportional to (mv – mu)/t **(2)**
F proportional to ma **(2)**
F = kma **(2)**
k = 1 (by definition of the newton) **(2)**
F = ma **(1)**

A force of 5.3 kN is applied to a golf ball by a club. The mass of the ball is 45 g and the ball and club are in contact for 0.54 ms.

Calculate the speed of the ball as it leaves the club.
F = ma // I = Ft // F = (mv – mu)/t **(3)**
correct substitution **(3)**
v = 63.6 m s^{-1} *(–1 for omission of or incorrect units)* **(3)**

The ball leaves the club head at an angle of 15° to the horizontal. Calculate the maximum height reached by the ball. You may ignore the effect of air resistance.
u_y = 16.46 m s^{-1} **(3)**
$v^2 = u^2 + 2as$ // $\frac{1}{2}mv^2 = mgh$ **(3)**
height = 13.82 m *(–1 for omission of or incorrect units)* **(3)**