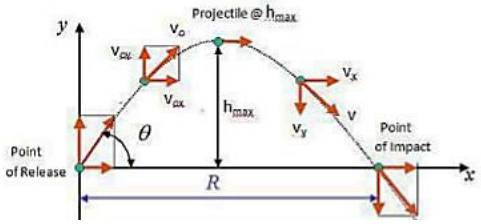
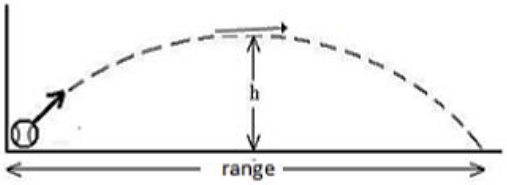
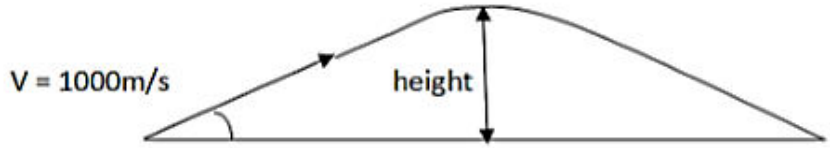
SUVA SANGAM COLLEGE

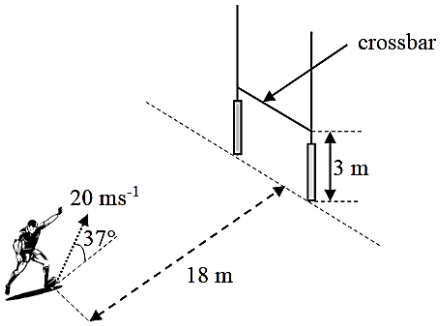
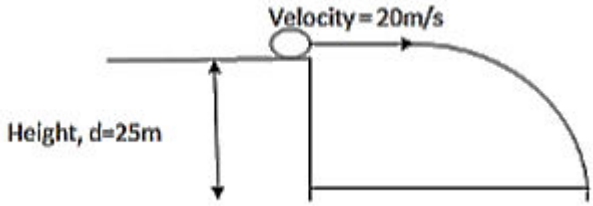
YEAR 12

PHYSICS

WORKSHEET 10

STRAND 1 MECHANICS

NO.	**CONCEPT IN BRIEF: PROJECTILE MOTION** **FULL PROJECTILE**
	  • Path of the full projectile - **parabolic** • Maximum height of flight is reached when the vertical component ($\boldsymbol{v_y = vsin\theta}$) of the projectile velocity is zero. • Total time of flight is twice the time taken to reach the maximum height. ($\boldsymbol{total\ time = 2 \times time\ to\ reach\ maximum\ height}$) • Range is the distance travelled horizontally is determined by the product of horizontal component of velocity ($\boldsymbol{v_x = vcos\theta}$) and the total time of flight. ($\boldsymbol{Range\ =\ Velocity\ in\ horizontal\ component\ x\ Total\ time\ of\ flight}$) • The projectile hits the ground at the same speed as it was fired and makes the same angle to the horizontal. Impact velocity: $\boldsymbol{v_f = \sqrt{(v_y)^2 + (v_x)^2}}$ where $\boldsymbol{v_y = \sqrt{(20d)}}$
1	A rocket is fired at 1000m/s at an angle of 30°.  Calculate: a) The greatest height reached by the rocket b) The time of flight of the rocket c) The Range (horizontal distance) travelled by the rocket

2.	A rugby player kicks a rugby ball with an initial speed of 20 m/s at an angle of 37° from a point 18m in front of the goal. The cross bar is 3m high from the ground as shown in the diagram below. Assume that the ball travels between the two goal posts.  (i) Calculate the horizontal component of the velocity. (ii) Calculate the vertical component of the velocity. (iii) Explain whether the rugby ball will clear the 3 m bar. Show working to support your answer.
	CONCEPT IN BRIEF: HALF PROJECTILE $\boldsymbol{v_i = 0m/s}$ $\boldsymbol{a = 10m/s^2}$ $\boldsymbol{v_x = remains\ the\ same}$ $\boldsymbol{impact\ velocity = \sqrt{(v_x{}^2) + (v_y{}^2)}}$
3	A 6kg projectile is launched horizontally from a height of 25m with a velocity of 20m/s as shown below.  (i) Calculate the time of flight of the projectile (ii) Calculate the velocity of projectile just before it hit the ground.