1. IF y VARIES DIRECTLY AS x, FIND THE
   - (i) effect on y if x is trebled;
   - (ii) value of y when $x = 10$ given that $y = 6$ when $x = 2$.

2. IT IS KNOWN THAT y IS PROPORTIONAL TO THE SQUARE OF x. Find
   - (i) by what factor y is multiplied if x is doubled;
   - (ii) the value of y when $x = 10$, if $y = 18$ when $x = 3$.

3. GIVEN THAT y VARIES AS THE CUBE OF x, AND THAT $y = 32$ WHEN $x = 2$,
   determine the value of (i) y when $x = 5$ (ii) x when $y = 108$.
   By what factor is y multiplied if x is multiplied by 1/3?

4. IF y VARIES INVERSELY AS x, FIND THE
   - (i) factor by which y is multiplied if x is doubled;
   - (ii) value of y when $x = 6$, given that $y = 3$ when $x = 4$.

5. GIVEN THAT y VARIES INVERSELY AS THE SQUARE OF x, and $y = 3$ when
   $x = 1$, find the value of (i) y when $x = -4$ (ii) x when $y = 4/27$.
   If x is halved, by what factor is y multiplied?

6. IF x VARIES DIRECTLY AS z AND INVERSELY AS y, and $x = 7/2$ when $y = 4$,
   $z = 7$ prove that the variation constant $k = 2$, and hence find the
   value of x when $y = 8$, $z = 9$.
   *What effect is there on x if z is doubled and y is halved?*

7. THE QUANTITY a IS PROPORTIONAL TO b AND INVERSELY PROPORTIONAL TO
   c^2. By what factor is a multiplied if b is trebled and c is
   doubled?
   If $a = 8$ when $b = 4$, $c = 3$ determine the value of a when $b = 3$, $c = 2$.

8. For a body falling from rest from the top of a tower, the velocity
   v m/s varies as the time fallen, t sec.
   - (i) WHAT IS THE EFFECT on the velocity if the time of fall is
     doubled?
   - (ii) IF THE VELOCITY OF THE BODY IS 20 m/s AFTER 2 sec, find the
     velocity after 4 sec; and hence determine the increase in the
     velocity during the fifth second (i.e. between $t = 4$, $t = 5$).

9. The distance s metres covered by a body falling from rest varies as
   the square of the time of fall, t sec.
   - (i) IGNORING AIR RESISTANCE, FIND THE RATIO OF THE DISTANCES
     FALLEN BY TWO PARACHUTISTS A, B in free fall (i.e. with
     parachutes unopened) if their times of fall are in the ratio
     3:1.
   - (ii) IF A FALLS 45 m IN 3 sec, DETERMINE THE DISTANCE FALLEN IN
     4 sec; and hence determine how far A falls in the fourth
     second (i.e. in the time interval $t = 3$, $t = 4$).

10. In a certain electric circuit, the electric current i (amps) varies
    inversely as the resistance R (ohms).
    - (i) WHAT CHANGE IN i results from doubling R?

†11. The area m^2 of an ellipse varies as the product
    of the lengths a cm, b cm of the semi-axes.

   - (i) WHAT CHANGE RESULTS in A if a is doubled and
     b is halved?
   - (ii) WHEN $a = 4$, $b = 1.5$, $A = 6\pi$ find the area
     (in terms of π) of an ellipse whose semi-axes are 5 cm, 4 cm
     respectively.
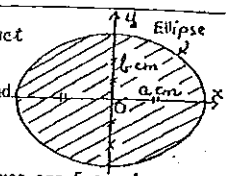
†12. For a sphere the volume V varies as the cube of the radius r whilst
    the surface area A varies as the square of the radius.
    - (i) I BLOW UP A SPHERICAL BALLOON UNTIL THE RADIUS IS DOUBLED.
      What effect does this have on the amount of air in the balloon
      and the surface area of rubber in the balloon?
    - (ii) THREE LEADEN SPHERES A, B, C HAVE RADII IN THE RATIO 1:2:3.
      - (a) *What is the ratio of their surface areas?* If the cost of
        painting sphere A is $25, what would be the cost (at the
        same rate) of painting spheres B, C?
      - (b) *What is the ratio of their volumes?* If the weight of
        sphere A is 25 kg, determine the weight of spheres B, C.

†13. The energy E needed for a body of mass m to attain a velocity v is
    proportional to the product of the mass and the square of the
    velocity.
    IF THE VELOCITY REQUIRED FOR A SATELLITE TO ESCAPE THE MOON'S
    GRAVITATIONAL PULL IS 0.2 TIMES THAT NEEDED TO ESCAPE THE EARTH'S
    ATMOSPHERE, how much energy relatively is needed to escape from the
    moon than from earth, assuming the mass of the satellite escaping
    from the moon is
    - (i) the same as (ii) one quarter of, that sent from earth.

†14. For stones of the same quality, the value ($V) of a diamond is
    proportional to the square of its weight (w carats).
    FIND THE LOSS INCURRED BY CUTTING A DIAMOND WORTH $450 INTO TWO
    PARTS whose weights are in the ratio 1:2. {*Hint: Let the original
    diamond weight 3 carats.*}