Gr 11 Science Term 1: Extra questions on gravitation (Mrs. Hough)

1. In each of the following cases, how does the gravitational pull, between the 2 objects change?
    a. One of the masses is doubled.
    b. Both masses are doubled.
    c. One of the masses is halved.
    d. Both masses are halved.
    e. The distance between the objects is halved.
    f. The distance between the objects is doubled.
    g. One of the masses is doubled and the distance is halved.
    h. Both masses is doubled and the distance is halved.
    i. Both masses and the distance is doubled.
2. The gravitational force that the earth exerts on an object is described by F = mg, where m is the mass of the object in kg and g is the gravitational acceleration on earth (9.8 $m.s^{-1}$).
    a. Calculate the gravitational pull between a man with a mass of 100kg and a child with a mass of 20kg if they are 100mm from each other.
    b. Determine the gravitational force the earth exerts on the man.
    c. Determine the gravitational force the earth exerts on the child.
    d. Explain why the man and child do not feel the gravitational pull between them as calculated.

Answers

1. Force is

   a) doubled

   b) four times bigger

   c) halved

   d) quarter

   e) four times bigger

   f) quarter

   g) eight times bigger

   h) sixteen times bigger

   i) no change

2. a) $F = \frac{Gm_1m_2}{d^2}$

   $F = \frac{6.7\times10^{-11}\times100\times20}{0.1^2}$

   $F = 1.34 \times 10^{-5} N$

   b) F = m.g

   F = 100 x 9.8

   = 980 N

   c) F = m.g

   F = 20 x 9.8

   F = 196 N

   d) The gravitational force between the man and the child is so small when compared to the gravitational force between them and the earth, that they only experience the gravitational force of the earth.