SPEED: SCIENTIFIC NOTATION

All of the following questions will require a calculator. Write answers both before and after rounding. Write your answers in **scientific notation** and correct to **3 significant figures**.

1. A human hair grows at a rate of $3 \cdot 046 \times 10^{-9}$ **metres** per **second**.
   Calculate the time in **days** for a human hair to grow by 5 **centimetres**.

2. The New Horizons space probe travels at an average speed of $1 \cdot 378 \times 10^{4}$ **metres** per **second**.
   Calculate the distance, in **kilometres**, the probe will travel in 6 **hours**.

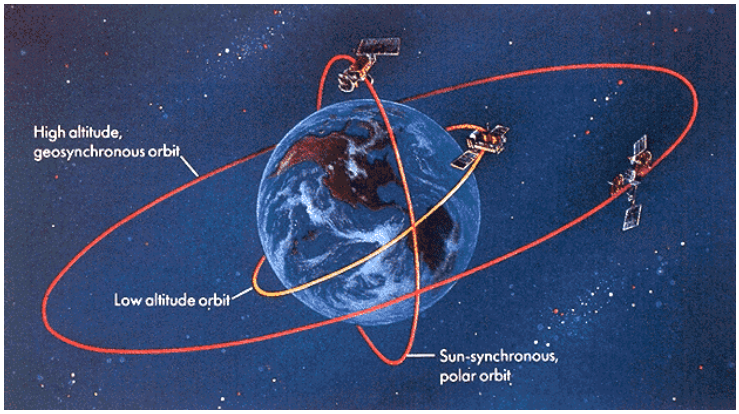
   Questions 3 and 4 use the **speed of light** which is $2 \cdot 998 \times 10^{5}$ kilometres per second.

3. The Sun is $1 \cdot 496 \times 10^{8}$ kilometres from earth.
   Calculate the time in seconds for light from the Sun to reach earth.

4. The Sun is $2 \cdot 869 \times 10^{9}$ kilometres from the planet Uranus.
   Calculate the time in **minutes** for light from the Sun to reach Uranus.

5. A satellite in a high altitude orbit lies directly above the equator.
   It travels around the earth in a circle, in the same direction and taking exactly the same time, 24 **hours**, as the earth's rotation.
   Seen from the earth the satellite then appears stationary overhead.

   The orbit height is $3 \cdot 592 \times 10^{7}$ metres.
   The earth's radius is $6 \cdot 3782 \times 10^{6}$ metres at the equator.



   Calculate: (a) the diameter of the orbit.
   (b) the circumference of the orbit.
   (c) the speed, in metres per **second**, of the satellite in its orbit .

6. A satellite in a polar orbit lies above the earth at a height of $8 \cdot 715 \times 10^{5}$ metres.
   It travels around the earth in a circle, taking 102 **minutes** to complete one orbit.
   The radius of the earth around the poles is $6 \cdot 3568 \times 10^{6}$ metres.
   Calculate: (a) the diameter of the orbit.
   (b) the circumference of the orbit.
   (c) the speed, in metres per **second**, of the satellite in its orbit.

7. The Hubble Space Telescope is in a low altitude orbit at a height of $6 \cdot 104 \times 10^{5}$ metres.
   It travels around the earth in a circle at a speed of $7 \cdot 537 \times 10^{3}$ metres per **second**.
   The average radius of the earth is $6 \cdot 371 \times 10^{6}$ metres.
   Calculate: (a) the diameter of the orbit.
   (b) the circumference of the orbit.
   (c) the time, in **minutes**, for the Hubble Space Telescope to complete one orbit.

ANSWERS

1. $1 \cdot 8998.... \times 10^{2} = 1 \cdot 90 \times 10^{2}$ days

2. $2 \cdot 97648 \times 10^{5} = 2 \cdot 98 \times 10^{5}$ kilometres

3. $4 \cdot 9899.... \times 10^{2} = 4 \cdot 99 \times 10^{2}$ seconds

4. $1 \cdot 5949.... \times 10^{2} = 1 \cdot 59 \times 10^{2}$ minutes

5. (a) $8 \cdot 4596.... \times 10^{7} = 8 \cdot 46 \times 10^{7}$ m
   (b) $2 \cdot 6576.... \times 10^{8} = 2 \cdot 66 \times 10^{8}$ m
   (c) $3 \cdot 0760.... \times 10^{3} = 3 \cdot 08 \times 10^{3}$ m/s

6. (a) $1 \cdot 4456.... \times 10^{7} = 1 \cdot 45 \times 10^{7}$ m
   (b) $4 \cdot 5416.... \times 10^{7} = 4 \cdot 54 \times 10^{7}$ m
   (c) $7 \cdot 4210.... \times 10^{3} = 7 \cdot 42 \times 10^{3}$ m/s

7. (a) $1 \cdot 3962.... \times 10^{7} = 1 \cdot 40 \times 10^{7}$ m
   (b) $4 \cdot 3865.... \times 10^{7} = 4 \cdot 39 \times 10^{7}$ m
   (c) $9 \cdot 7000.... \times 10^{1} = 9 \cdot 70 \times 10^{1}$ minutes