INTERNATIONAL BACCALAUREATE

Mathematics: analysis and approaches

Math AA

EXERCISES [Math-AA 1.1]

NUMBERS – ROUNDING

Compiled by Christos Nikolaidis

O. Practice questions

1. [Maximum mark: 8] ***[without GDC]***

Let $x = 1352.406$ and $y = 0.0001352406$

(a) State the value of x correct (i) to 2dp. (ii) to 3sf. (iii) to 2sf. [3]

(b) State the value of y correct (i) to 5dp. (ii) to 3sf. (iii) to 2sf. [3]

(c) State the value of x in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

(d) State the value of y in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

2. [Maximum mark: 4] ***[without GDC]***

The value of x correct to 3 sf is 34 500. The value of y correct to 3 sf is 0.0301.

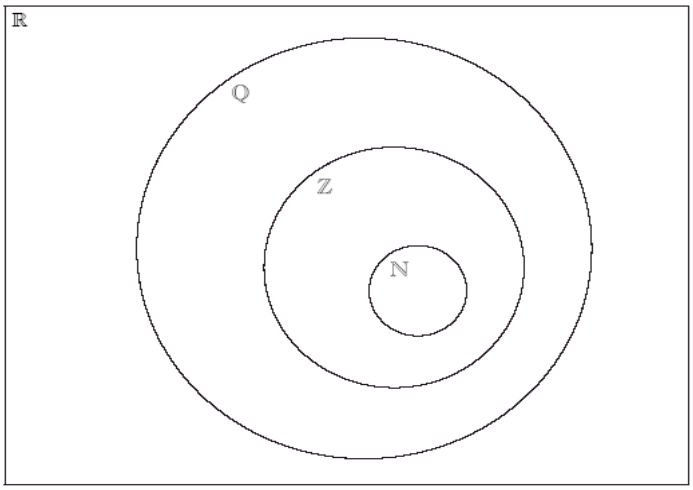
The value of z correct to 2 dp is 15.30. The value of w correct to 3 sf is 145.

Find the range of the possible values of x, y, z, w.

3. [Maximum mark: 5] ***[without GDC]***

The Venn diagram shows the number sets $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$ and $\mathbb{R}$. Place each of the following numbers in the appropriate region of the Venn diagram.

$$\frac{1}{4},\ -3,\ \pi,\ -0.3,\ 2.7 \times 10^3,\ 3.4 \times 10^{-2}$$



4. [Maximum mark: 4] ***[without GDC]***

(a) Given $x = 2.6 \times 10^4$ and $y = 5.0 \times 10^{-8}$, calculate the value of $w = x \times y$. Give your answer in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [2]

(b) Which **two** of the following statements about the nature of x, y and w above are **incorrect**?

(i) $x \in \mathbb{N}$ (ii) $y \in \mathbb{Z}$ (iii) $y \in \mathbb{Q}$

(iv) $w < y$ (v) $x + y \in \mathbb{R}$ (vi) $\frac{1}{w} < z$ [2]

A. Exam style questions (SHORT)

5. [Maximum mark: 8] ***[without GDC]***

(a) Express the following numbers to 3 s.f

(i) 0.030473 (ii) 2034999 (iii) 2.3011 [2]

(b) Let $x = 1.3 \times 10^5$ and $y = 2 \times 10^{-5}$.

(i) Write down the **exact** value of $x + y$.

(ii) Write down the **exact** value of xy.

(ii) Find the value of $\frac{x}{y}$ in the standard form $a \times 10^k$, where $1 \leq a < 10$, $k \in Z$, and a correct to 3 s.f. [4]

(c) The value of A given to 3 s.f. is 2.36

Write down the range of the possible values of A. [2]

6. [Maximum mark: 4] ***[without GDC]***

(a) Write down the following numbers in increasing order.

$3.5, \quad 1.6 \times 10^{-19}, \quad 60730, \quad 6.073 \times 10^5, \quad 0.006073 \times 10^6, \quad \pi, \quad 9.8 \times 10^{-18}.$ [3]

(b) State which of the numbers in part (a) is irrational. [1]

7. [Maximum mark: 4] ***[without GDC]***

(a) A girl's height is 1.623 m. Write her height **to the nearest cm**. [1]

(b) The time taken to fill a tank was 2 hours 43 minutes. Write this time **to the nearest 5 minutes**. [1]

(c) The attendance at a show was 2591 people. How many people, **to the nearest 100**, were at the show? [1]

(d) The mean distance of the Moon from the Earth is approximately 384 403 km.

Write this distance in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

8. [Maximum mark: 4] ***[with / without GDC]***

Let $A = 4.5 \times 10^{-3}$ and $B = 6.2 \times 10^{-4}$. Find

(a) AB; [2]

(b) $2(A + B)$. [2]

Give your answers in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

9. [Maximum mark: 5] ***[with / without GDC]***

Consider the following four numbers.

$$p = 0.00314\ ; \qquad q = 0.00314 \times 10^2\ ; \qquad r = \frac{\pi}{1000}\ ; \qquad s = 3.14 \times 10^{-2}$$

(a) One of these numbers is written in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$..
Write down this number. [1]

(b) Write down the smallest of these numbers. [1]

(c) Write down the value of $q + s$. [2]

(d) Give your answer to part (c) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

10. [Maximum mark: 8] ***[with / without GDC]***

Let $m = 6.0 \times 10^3$ and $n = 2.4 \times 10^{-5}$.

(a) Express each of the following in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

(i) mn (ii) $\frac{m}{n}$. (iii) m^2 [6]

(b) Find the **exact** value of $m + n$ [2]

11. [Maximum mark: 4] ***[with / without GDC]***

If $x = 3.1 \times 10^4$ and $y = 2.4 \times 10^{-7}$, calculate the values of the following, expressing your answers in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

(i) x^2 (ii) xy

12. [Maximum mark: 4] ***[with / without GDC]***

A rectangle has length 2.6×10^4 and width 1.9×10^4. Find each of the following, giving your answer in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$.

(a) The area of the rectangle; [2]

(b) The perimeter of the rectangle. [2]

13. [Maximum mark: 5] ***[with GDC]***

A rectangle is 2680 cm long and 1970 cm wide.

(a) Find the perimeter of the rectangle, giving your answer in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [2]

(b) Find the area of the rectangle, giving your answer correct to the nearest thousand square centimetres. [3]

14. [Maximum mark: 4] ***[with GDC]***

Using the formula $V = \pi r^2 (H - h)$, and your calculator value of π, calculate the value of V when $r = 4.26$, $H = 21.58$ and $h = 14.35$.

(a) Give the full calculator display. [1]

(b) Give your answer to two decimal places. [1]

(c) Give your answer to two significant figures. [1]

(d) Write your answer to part (c) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

15. [Maximum mark: 4] ***[with GDC]***

Let $x = 7.94$.

(a) Calculate the value of $\frac{2x+1}{x^3}$. [1]

(b) (i) Give your answer correct to **three** decimal places.

(ii) Write your answer to (b)(i) as a percentage. [2]

(c) Give your answer to part (b)(i) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

16. [Maximum mark: 4] ***[with GDC]***

The volume of a sphere is $V = \sqrt{\frac{S^3}{36\pi}}$, where S is its surface area.

The surface area of a sphere is 500 cm^2.

(a) Calculate the volume of the sphere. Give your answer correct to **two decimal places**. [2]

(b) Write down your answer to (a) correct to the nearest integer. [1]

(c) Write down your answer to (b) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

17. [Maximum mark: 4] ***[with GDC]***

Given that $h = \sqrt{l^2 - \frac{d^2}{4}}$,

(a) Calculate the **exact** value of h when $l = 0.03625$ and $d = 0.05$. [1]

(b) Write down the answer to part (a) correct to three decimal places. [1]

(c) Write down the answer to part (a) correct to three significant figures. [1]

(d) Write down the answer to part (a) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

18. [Maximum mark: 5] ***[with / without GDC]***

A satellite travels around the Earth in a circular orbit 500 kilometres above the Earth's surface. The radius of the Earth is taken as 6400 kilometres.

(a) Write down the radius of the satellite's orbit. [1]

(b) Calculate the distance travelled by the satellite in one orbit of the Earth.
Give your answer correct to the nearest km. [3]

(c) Write down your answer to (b) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]

19. [Maximum mark: 5] ***[with GDC]***

The planet Earth takes one year to revolve around the Sun. Assume that a year is 365 days and the path of the Earth around the Sun is the circumference of a circle of radius 150 000 000 km.

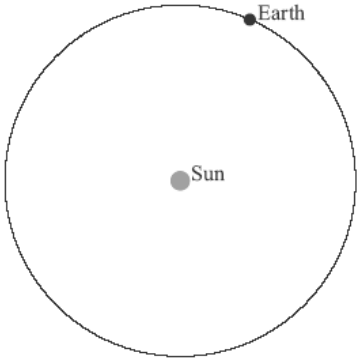


diagram not to scale

(a) Calculate the distance travelled by the Earth in **one day** (answer in 3sf) [4]

(b) Give your answer to part (a) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1]