GENMATHS RESOURCES

STANDARD FORM OPERATIONS

LARGE POWERS OF 10

Task 1 – For each of the following, give your answers in standard form.

1) $(7.2 \times 10^{68}) \times (4.5 \times 10^{93})$

2) $(3.9 \times 10^{144}) \times (2.4 \times 10^{-37})$

3) $(1.6 \times 10^{182}) \div (4 \times 10^{29})$

4) $(9.5 \times 10^{211}) \div (3.8 \times 10^{-19})$

5) $(5.2 \times 10^{125}) \times (6.8 \times 10^{77})$

6) $(2.4 \times 10^{101}) \times (7 \times 10^{56})$

7) $(4.3 \times 10^{88}) \div (1.1 \times 10^{12})$

8) $\frac{(2.7 \times 10^{64})^3}{(9 \times 10^{58})^2}$

9) An observatory records photon readings from a telescope. The size of each uncompressed reading is 4.6×10^{173} units of data. Each reading is compressed by a factor of 2.3×10^{-7}. A storage block can hold 5×10^{168} units of data. Work out how many compressed readings fit into one block.

10) A data centre processes 3.2×10^{152} bytes per second for 45 minutes. Work out the total number of bytes of data that was processed.

Task 2 – For each of the following, give your answers in standard form.

11) $(8 \times 10^{137}) + (3.4 \times 10^{137})$

12) $(6.1 \times 10^{159}) - (2.9 \times 10^{159})$

13) $(9.3 \times 10^{120}) + (1.7 \times 10^{121})$

14) $(4.8 \times 10^{-188}) + (7 \times 10^{-189})$

15) $(5.6 \times 10^{134}) - (4.2 \times 10^{133})$

16) $(3.1 \times 10^{76}) + (2.49 \times 10^{78})$

17) $(7.5 \times 10^{-162}) - (2.3 \times 10^{-163})$

18) $(2.2 \times 10^{92})^2 + (4.4 \times 10^{184})$

19) A rare-event simulation logs 6.02×10^{14} events in Phase 1 and 8.1×10^{145} events in Phase 2. During validation, 3.5×10^{145} events are discarded. What is the final count in standard form?

20) A deep-sky survey estimates the mass of a cluster as 2.7×10^{45} kg with a correction of 1.2×10^{44} kg added for unseen matter, then subtracts 8×10^{43} kg for instrument bias. Find the corrected mass. Give your answer in standard form.

Challenge

21) Given that,

$(a \times 10^p) \times (b \times 10^q) = 3.15 \times 10^{210}$

with, $a = 4.5$**,** $b = 7$**, and** $p - q = 19$

Work out the values of p and q.

22) The numbers

$X = k \times 10^{190}$ **and** $Y = 8.0 \times 10^{188}$ **satisfy**

$X + Y = 8.56 \times 10^{190}$.

Work out the value of k.

23) A student writes:

$$(4.0 \times 10^{172}) + (5.0 \times 10^{170})$$
$$= 9.0 \times 10^{172}$$

a) Explain the error.

b) Give the correct result in standard form.

24) Without completing a full calculation, order these numbers from least to greatest, justifying briefly:

$$A = (2.9 \times 10^{155}) \times (4 \times 10^{77})$$
$$B = (1.1 \times 10^{233})$$
$$C = (6 \times 10^{78})^3$$

25) Construct two different pairs (U, V) **in standard form with** $U > V$ **such that** $U + V = 1 \times 10^{161}$ **and** $U \times V = 9 \times 10^{320}$