12. An advertising agency is monitoring the number of views of an online advert.

The equation

$$\log_{10} V = 0.072t + 2.379 \qquad 1 \leqslant t \leqslant 30, \, t \in \mathbb{N}$$

is used to model the total number of views of the advert, V, in the first t days after the advert went live.

(a) Show that $V = ab^t$ where a and b are constants to be found.

Give the value of a to the nearest whole number and give the value of b to 3 significant figures.

(4)

(b) Interpret, with reference to the model, the value of ab.

(1)

Using this model, calculate

(c) the total number of views of the advert in the first 20 days after the advert went live. Give your answer to 2 significant figures.

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(2)

(a)
$$\log_{10} V = 0.072t + 2.379$$
$$\Rightarrow V = 10^{(0.072t + 2.379)} \quad \longleftrightarrow \boxed{\text{Definition of log}}$$
$$= 10^{0.072t} \times 10^{2.379} \quad \longleftrightarrow \boxed{x^{(a+b)} = x^a \times x^b}$$
$$= (10^{2.379})(10^{0.072})^t \quad \text{Compare with required result}$$

$\uparrow a \qquad \uparrow b \leftarrow \boxed{\text{using } x^{mn} = (x^m)^n}$

Gives $\quad a = 239$
$$b = 1.18$$

So $\quad \underline{V = 239 \times (1.18)^t}$

(b) When $V = ab$ $\quad t = 1$, so ab represents the number of views in the **first day** after it went live.

(c) This is when $t = 20$ so
$$V = 239 \times 1.18^{20}$$
$$= \underline{6500} \text{ to 2 sig fig.}$$