**Exercise 1** Calc. : ✓

**Part 1**

A company launched an online service in 2020, and has seen rapid growth in the number of subscribers each year. The company believes that the growth follows an exponential model $S$ given by:

$$S(t) = 5000 \cdot e^{0.3 \cdot t},$$

where $S(t)$ is the number of subscribers $t$ years after 2020.

a) **Write down** the number of subscribers the company had in 2020. — 1 mark

b) **Estimate** the number of subscribers there will be in 2025. — 1 mark

c) **Determine** the annual growth rate as a percentage. — 2 marks

d) The company aims to reach 100 000 subscribers. **Determine** in which year this is likely to be achieved. — 2 marks

**Part 2**

The same company has been tracking its annual advertising spending and corresponding revenue for several years. The data are given in the table:

| Year | Advertising Spending, $x$, in thousands of euros | Revenue, $y$, in thousands of euros |
|---|---|---|
| 2020 | 20.5 | 149.8 |
| 2021 | 25.3 | 181.7 |
| 2022 | 30.2 | 200.5 |
| 2023 | 35.4 | 239.3 |
| 2024 | 40.1 | 261.4 |

e) **Represent** the above data on a scatter diagram. — 2 marks

f) **Determine** the equation of the regression line for the data, in the form $y = mx + p$, with $m$ and $p$ rounded to two decimal places. **Draw** the regression line on the same diagram. — 3 marks

g) **Interpret** the value of the correlation coefficient $r$. — 2 marks

h) Using the model $y = 5.7x + 33.8$, **estimate** the revenue if the company spends 50 thousand euros on advertising. — 2 marks

i) **Interpret** in context the values 5.7 and 33.8. — 3 marks

**Part 3**

The company observes that the number of customer orders each month follows a normal distribution with mean $\mu = 1200$ orders and standard deviation $\sigma = 150$ orders.

j) **Determine** the probability that in a given month the company will receive between 1000 and 1350 orders. — 2 marks

k) **Determine** the probability that the company will receive more than 1300 orders in a given month. — 2 marks

l) In an advertisement, the company claims that it has at least 800 orders each month. **Examine** whether this claim is valid. — 3 marks