2024 Asia and Pacific Mathematical Contest in Modeling

Problem C

Development Analyses and Strategies for Pet Industry and related Industries

As people have developed their consumption philosophy, Pet industry, an emerging industry, has been gradually gathering momentum worldwide, thanks to rapid economic development and rising per capita income. In 1992, China Small Animal Protection Association was established, followed by the entry of international pet brands like Royal Canin and Mars into the Chinese market in 1993. The pet-related industries—such as pet food, pet clinic, pet supplies and pet care—have also gradually enjoyed a vast and fast-growing market, since "pet companionship" gains popularity in China. Based on the data in the attachments and additional data collected by your team, please analyze the development trends and market demands of pet industry. According to your analyses and the current economic environment, please make corresponding strategic recommendations for the development of Chinese pet industry.

Figure 1. Pet cats and dogs.

Question 1: Based on the data in Attachment 1 and the additional data collected by your team, please analyze the development of China's pet industry in the past five years by pet type. And analyze the factors in the development of China's pet industry, so as to make an appropriate mathematical model to predict the development of China's pet industry in the next three years.

Question 2: Overseas pet industries, such as in European countries and America, have also developed rapidly in recent years. Please analyze the development of the global pet industry by pet type, based on the data in Attachment 2 and the additional data collected by your team. And make an appropriate mathematical model to forecast the global demand for pet food in the next three years.

Question 3: In light of China's pet food production and export values in Attachment 3, please analyze the development of China's pet food industry and predict its production and export of pet food in the next three years (regardless of changes in economic policies), based on the trend of global demand of pet food market and China's development.

Question 4: China's pet food industry will inevitably be influenced by the new foreign economic policies (such as tariff policies) of European countries and America. To quantitatively analyze this influence, please make an appropriate mathematical model and take the data in the attachments, the additional data you collected, and the calculation results in above questions into consideration. Based on your calculations, please develop feasible strategies for the sustainable development of China's pet food industry.

Attachment :

Attachment 1. 2019-2023 Number of Pet Cats and Dogs in China (in 10,000s)

Pets/Years	2023	2022	2021	2020	2019
Cat	6980	6536	5806	4862	4412
Dog	5175	5119	5429	5222	5503

Attachment 2. 2019-2023 Overseas Number of Pet Cats and Dogs (in 10,000s)

Countries	Pets/Years	2023	2022	2021	2020	2019
America	Cat	7380	7380	9420	6500	9420
	Dog	8010	8970	8970	8500	8970
France	Cat	1660	1490	1510	1490	1300
	Dog	990	760	750	775	740
Germany	Cat	1570	1520	1670	1570	1470
	Dog	1050	1060	1030	1070	1010

Attachment 3.2019-2023 China's Pet Food Production and Export Values (in 100 millions)

Values/Years	2023	2022	2021	2020	2019
Total Value of China's Pet Food Production	2793（CNY）	1508（CNY）	1554（CNY）	727.3（CNY）	440.7（CNY）
Total Value of China's Pet Food Exports	39.6（USD）	24.7（USD）	12.2（USD）	9.8（USD）	154.1（CNY）