

1. [AJC Prelims 17]

Mr Tan invested a total of \$25,000 in a structured deposit account, bonds and an estate fund. He invested \$7,000 more in bonds than in estate fund. The projected annual interest rates for structured deposit account, bonds and estate fund are 2%, 3% and 4.5% respectively. Money that is not drawn out at the end of the year will be re-invested for the following year.

Mr Tan plans to draw out his money from all investments at the end of the second year and estimates that he will receive a total of \$26,300. Find the amount of money Mr Tan invested in each investment, giving your answer to the nearest dollar. [5]

2. [CJC Prelims 17]

The curve with equation $y = f(x)$, where $f(x)$ is a cubic polynomial, has a maximum point with coordinates $(-2, \frac{34}{3})$ and a minimum point with coordinates $(3, -\frac{19}{2})$. Find the equation of the curve. [4]

3. [DHS Prelims 17]

Using an algebraic method, find the set of values of x that satisfies the inequality

$$2 - x \leq \frac{x}{2 - x}.$$

[3]

Hence solve

$$2 - x^2 \leq \frac{x^2}{2 - x^2}.$$

[3]

4. [DHS Prelims 17]

For this question, leave your answers to the nearest dollar.

Mr Foo invested \$25,000 in three different stocks A , B and C . After a year, the value of the stocks A and B grew by 2% and 6% respectively, while the value of stock C fell by 2%. Mr Foo did not gain or lose any money. Let a , b and c denote the amount of money he invested in stocks A , B and C respectively.

(a) Find expressions for a and b , in terms of c . [2]

(b) Find the values between which c must lie. [2]

5. [HCI Prelims 17]

2 By first expressing $3x - x^2 - 4$ in completed square form, show that $3x - x^2 - 4$ is always negative for all real values of x . [3]

(a) Hence or otherwise, without the use of a calculator, solve this inequality

$$\frac{(3x - x^2 - 4)(x - 1)^2}{x^2 - 2x - 5} \leq 0,$$

leaving your answer in exact form. [4]

6. [IJC Prelims 17]

(a) Without using a graphic calculator, solve the inequality

$$\frac{4x^2 + 7x + 1}{3x + 1} \leq x + 2.$$

[3]

(b) Hence solve the inequality

$$\frac{4x + 7\sqrt{x} + 1}{3\sqrt{x} + 1} \leq \sqrt{x} + 2.$$

[2]

7. [TPJC Prelims 17]

Without using a calculator, solve the inequality

$$\frac{3x^2 + 7x + 1}{x + 3} < 2x - 1.$$

[4]

8. [MI Prelims 17]

The sum of the first n terms of a sequence is denoted by S_n . The first term of the sequence is 3 and it is known that $S_3 = 21$ and $S_{10} = 210$. Given that S_n is a quadratic polynomial in n , find S_n in terms of n .

[3]

9. [MJC Prelims 17]

Without using a calculator, solve the inequality

$$\frac{x}{x - 1} \leq \frac{4}{x + 2}.$$

[5]

10. **NJC Prelims 17]**

There are 3 bike-sharing companies in the current market. For each ride, α -bike charges a certain amount per 5 min block or part thereof, β -bike charges a certain amount per 10 min block or part thereof and μ -bike charges a certain amount per 15 min block or part thereof. Rebecca rode each of the bike-sharing companies' bikes once in each month. The table below shows the amount of time Rebecca clocked for each ride and her total spending for each month. In celebration of the company's first anniversary, the pricings in February and March 2017 of μ -bikes are a 5% discount off the immediate previous months pricing.

	January 2017	February 2017	March 2017
α -bike	25 min	17 min	36 min
β -bike	30 min	10 min	39 min
μ -bike	15 min	44 min	33 min
Total spending	\$5.70	\$5.72	\$9.71

Determine which bike-sharing company offers the cheapest rate (without any discount) for a 40-min ride. Justify your answer clearly.

[4]

11. **[SRJC Prelims 17]**

Solve the inequality $\frac{2x^2 + 2x - 1}{x^2 + 2x} \leq 1$.

Hence, solve the inequality $\frac{2x^2 + 2|x| - 1}{x^2 + 2|x|} \leq 1$.

[6]

12. **[RI Prelims 17]**

A local wholesaler sells Pikachu plushies in two sizes, small and large. The number of Pikachu plushies bought by three particular retailers and the total amount they paid are shown in the following table.

Retailer	Small	Large	Total Amount Paid
A	30	50	\$1375
B	k	$2k$	\$2704
C	$2k$	k	\$2522

Find the price of each small and each large Pikachu plushy and determine the value of k .

[4]

Answers

1. $x = 13938, y = 9031, z = 2031$.
2. $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 6x + 4$.
3. $\{x : 1 \leq 2 < 2 \text{ or } x \geq 4\}$.
 $x \leq -2 \text{ or } -\sqrt{2} < x \leq -1 \text{ or } 1 \leq x < \sqrt{2} \text{ or } x \geq 2$.
4. (a) $a = 37500 - 2c, b = c - 12500$.
(b) Between 12500 and 18750.
5. $x < 1 - \sqrt{6} \text{ or } x > 1 + \sqrt{6} \text{ or } x = 1$.
6. $x \leq -1 \text{ or } -\frac{1}{3} < x \leq 1$.
 $0 \leq x \leq 1$.
7. $x < -3$.
8. $S_n = 2n^2 + n$.
9. $-2 < x < 1$.
10. $\alpha = \$0.41, \beta = \$0.84, \mu = \$1.14$.
 α -bike.
11. $-2 < x \leq -1 \text{ or } 0 < x \leq 1$.
 $-1 \leq x \leq 1, x \neq 0$.
12. \$15, \$18.50, $k = 52$.