Preparation Questions 1 - 3

1   Four volunteers can pack 12 boxes every 30 minutes.

How many additional volunteers are needed to pack 72 boxes every hour?

[Assume all volunteers work at the same pace.]

2   Suppose the number of units in each of the length and width of a rectangle are prime numbers and the perimeter is 36 cm.

What is the area of the largest rectangle in square centimetres?

3   Grace chooses five different numbers from the list 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Two of those numbers are 4 and 5, and they are the only two numbers she picks that differ by 1.

What is the greatest possible sum of the five numbers?

Preparation Questions 1 - 3 with Hints

1   Four volunteers can pack 12 boxes every 30 minutes.

How many additional volunteers are needed to pack 72 boxes every hour?

[Assume all volunteers work at the same pace.]

Hint: How many boxes can 4 volunteers pack in one hour?

2   Suppose the number of units in each of the length and width of a rectangle are prime numbers and the perimeter is 36 cm.

What is the area of the largest rectangle in square centimetres?

Hint: The semi-perimeter of the rectangle is 18. Which 2 primes have a sum of 18?

3   Grace chooses five different numbers from the list 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Two of those numbers are 4 and 5, and they are the only two numbers she picks that differ by 1.

What is the greatest possible sum of the five numbers?

Hint: Work your way down from the greatest choice given that 4 and 5 must be included.

Preparation Questions Solutions

1: 8	**2:** 77 cm²	**3:** 29	**4:** 37	**5:** 5:45 a.m.	**6:** $\frac{1}{5}$

1   **Strategy 1**: *Find how much 4 volunteers can do in 1 hour*.

If 4 volunteers can pack 12 boxes every 30 minutes, then 4 volunteers can pack 24 boxes every hour (60 minutes).

In order to pack 72 boxes in an hour, since 72 ÷ 24 = 3, three times as many volunteers are needed.

So 12 volunteers are needed to do the job; therefore **8 additional volunteers are needed.**

Strategy 2: *Find how many boxes 1 volunteer can pack in an hour.*

If 4 volunteers can pack 12 boxes every 30 minutes, then 1 volunteer can pack $\frac{1}{4}$ as many in 30 minutes, or 3 boxes.

One volunteer can then pack 6 boxes in an hour.

To pack 72 boxes requires 12 volunteers and so **8 additional volunteers are needed.**

2   **Strategy:** *Find the semi-perimeter.*

The sum of the width and length (called the "semi-perimeter") is 18.

We need to find two primes to represent the width (W) and the length (L) with a sum of 18.

The largest area the rectangle could have is 77 cm².

W	L	Area
5	13	65
7	11	77

3   **Strategy 1**: *Start with the greatest number*.

To get the greatest sum, start by choosing 10. 9 can't be used as it differs from 10 by 1.

Next we choose 8. This means 7 can't be used.

6 can't be used because it's adjacent to 5 which is given as one of the numbers.

4 and 5 must be included, so 3 can't be used.

Choose 2 as the final number.

The greatest possible sum of Grace's numbers is **10 + 8 + 5 + 4 + 2 = 29**.

Strategy 2: *Start with the known numbers*.

Two of the numbers are 4 and 5.

Neither 3 nor 6 can be used because they differ by 1 from 4 and 5 respectively.

The other three numbers must be chosen from 1, 2, 7, 8, 9, and 10, but not consecutive numbers.

The greatest possible sum of Grace's numbers is **10 + 8 + 5 + 4 + 2 = 29**.