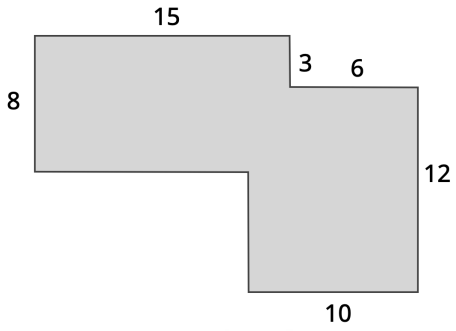
Name: _____

Preparation Task #1

A Maisie and Julian have been asked to find the area of this shape.



Their teacher told them that all angles shown were right angles and that all lengths are given centimetres.

Julian starts by drawing 2 rectangles and places one on top of the other to create the shape.

He wants to find the area of the overlapping region.

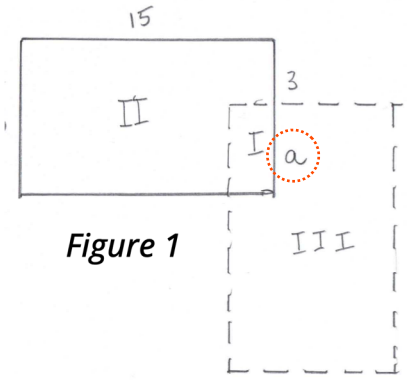


Figure 1

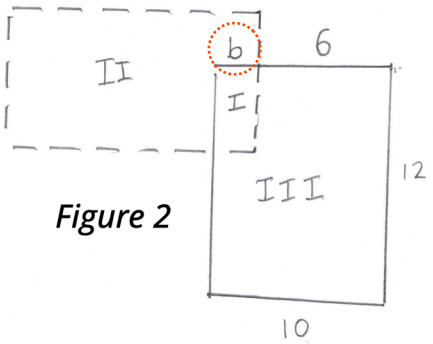


Figure 2

Decide how to calculate the missing length for *Figure 1* (labelled *a*) and width for *Figure 2* (labelled *b*).

Add this information to the figures.

B Maisie uses the information from *Figures 1* and *2* and **declares** the answer to the problem is **240 cm²**.

She is incorrect.

Describe how she arrived at her answer.

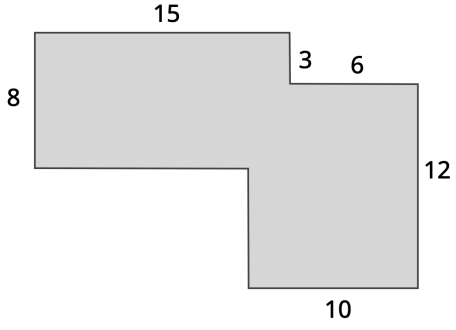
Pinpoint the detail she overlooked in her calculation.

C Eloy and his partner solved this problem correctly.

He says to Maisie and Julian, "We solved this differently. We enclosed the shape within one large rectangle."

Use Eloy's method to work out the shaded area.

Record the steps Eloy followed to find the area.



MATHS OLYMPIAD

Name: _____

Preparation Task #2

A Patrick and Malee work together to solve this problem:

A teacher surveyed 24 students and discovered that:

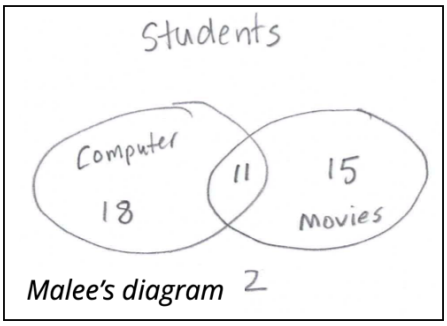
- 18 of them like to play computer games;
- 15 of them like to go to the movies; and
- 2 of them do not like either playing computer games or going to the movies.

How many of the 24 students like both activities?

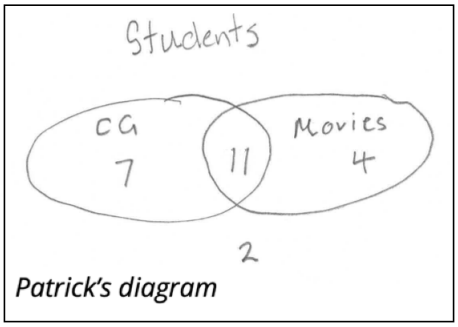
Patrick and Malee both decide to use a Venn diagram to solve this problem.

Analyse each of the diagrams below.

Identify the student whose diagram is incorrect and **discuss** why.



Malee's diagram



Patrick's diagram

B Patrick suggests they use another method to **check** their solution.

He rules up a diagram with 24 boxes, representing the 24 students.

Patrick writes an *N* in 2 of the boxes for the students who don't like either activity. Then, he writes C in 18 boxes to record the students who like playing computer games in the diagram.

Finally, Patrick writes *M* 15 times to represent the 15 students who like going to the movies.

Discuss with your partner how this diagram helps Patrick and Marlee check their solution.

N	N	C	C	C	C	C	C
C	C M	C M	C M	C M	C M	C M	C M
C M	C M	C M	C M	M	M	M	M

C ***Challenge:***

Can you solve this problem by drawing a similar diagram?

Out of all the students at Wantagh Middle School, 80% own computers and 40% are in the band.

However, 10% of all the students neither own computers nor are in the band.

What percentage of students own computers and are in the band?

MATHS OLYMPIAD

Name: _____

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?

Name: _____

Preparation Questions 4 - 6 with Hints

4 Asha has 5 more 40c stamps than 30c stamps.
The total value of her 40c stamps is $5.20 more than that of her 30c stamps.
How many 40c stamps does Asha have?

Hint: What is the value of the extra stamps if you pair each 30¢ stamp with a 40¢ stamp?

5 At the end of a power cut, a digital clock resets to 12:00 midnight.
At 9:35 a.m. on the same day the power cut occurred, the digital clock shows 3:50 a.m.
At what time did the power cut end?
(Label your answer a.m. or p.m.)

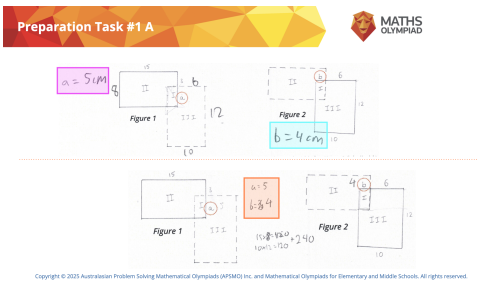
Hint: For how many hours did the power cut last?

6 The room numbers on one side of a hotel hall are odd.
They are numbered from 11 through 59 inclusive.
Kristen is in one of these rooms.
Express as a fraction the probability that Kristen's room number is divisible by 5.

Hint: How many rooms are there on that side of the hall?

Name: _____

Scan this QR code to access a slide show that includes solutions for the tasks on Page 1 and 2.



Preparation Questions - Answers and Solutions

1: 8	**2:** 77 cm^2	**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 cm^2.

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**.

Preparation Questions - Answers and Solutions

4 **Strategy 1**: *Pair each 30c stamp with a 40c stamp.*

All but five of the 40c stamps can be paired with 30c stamps.

These five "extra" 40c stamps account for $2.00 of the given $5.20.

Then the total difference of all the pairs is the remaining $3.20.

Since each pair differs by 10c, there are 32 pairs.

Then Asha has thirty-two 30c stamps and **thirty-seven 40c stamps**.

Checking, (37 × 40c) – (32 × 30c) = $14.80 – $9.60 = $5.20.

Strategy 2: *Make an organised list of simpler cases and find a pattern***.**

1	Number of 30c stamps	1	2	3	…	
2	Number of 40c stamps	6	7	8	…	?
3	Value of 30c stamps	$0.30	$0.60	$0.90	…	
4	Value of 40c stamps	$2.40	$2.80	$3.20	…	
5	Difference in value	$2.10	$2.20	$2.30	…	**$5.20**

For each additional 30c stamp, the difference in value increases by 10c, as indicated by line 5.

To change the difference in value from $2.30 to $5.20, 290c ÷ 10c = 29 additional stamps of each type are needed.

Asha has (3 + 29) = thirty-two 30c stamps and (8 + 29) = thirty- seven 40c stamps.

5 **Strategy**: *Use a convenient time, then adjust.*

When the power came back on, the clock reset to 12:00 midnight. It now shows the time 3:50 a.m.

This shows us that the power outage ended 3 hours and 50 minutes ago.

To determine the time, subtract 3 hours and 50 minutes from 9:35 a.m.

4 hours is a more convenient time.

Because 4 hours earlier the time was 5:35, then 3 hours and 50 minutes earlier the time was 5:45.

The power outage ended at **5:45 a.m.**

6 **Strategy 1:** *Count the odd numbers from 11 to 59 inclusive.*

There are 49 whole numbers from 11 through 59. Since the list starts and ends with an odd number, it contains one more odd number than even number.

Thus there are 25 odd and 24 even numbers.

There are five odd multiples of 5 between 11 and 59: 15, 25, 35, 45, and 55.

The probability of Kristen being in an odd-numbered room is $\frac{5}{25}$ or $\frac{1}{5}$.

Strategy 2: *Split the room numbers up into decades*.

Consider the five decades 11-19, 21-29, 31-39, 41-49, and 51-59.

Each decade has 5 odd room numbers, for a total of 25 odd-numbered rooms.

In each decade only the room number ending in 5 is divisible by 5.

The probability of Kristen being in an odd-numbered room is $\frac{5}{25}$ or $\frac{1}{5}$.