

CSIT113

Problem Solving

Workshop

Week 2

Where's Wally



He's here!

He is usually harder to find...

Can you think of a good strategy to find him?

Discuss this in your groups.

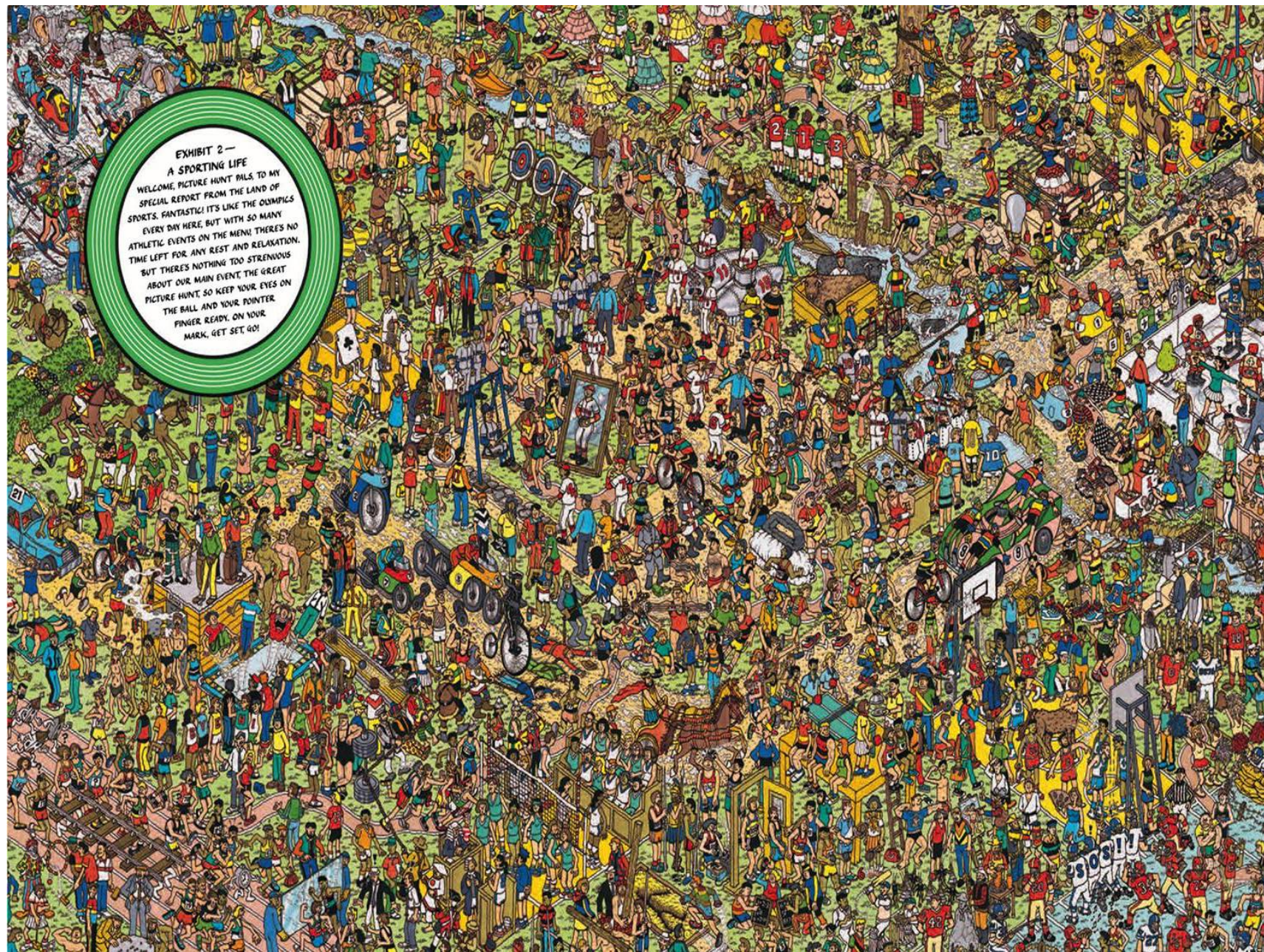


EXHIBIT 2 —
A SPORTING LIFE
WELCOME, PICTURE HUNT PILS. TO MY
SPECIAL REPORT FROM THE LAND OF
SPORTS. FANTASTIC! IT'S LIKE THE OLYMPICS
EVERY DAY HERE, BUT WITH SO MANY
ATHLETIC EVENTS ON THE MENU, THERE'S NO
TIME LEFT FOR ANY REST AND RELAXATION.
BUT THERE'S NOTHING TOO STRENUOUS
ABOUT OUR MAIN EVENT: THE GREAT
PICTURE HUNT. SO KEEP YOUR EYES ON
THE BALL AND YOUR POINTER
FINGER READY. ON YOUR
MARK, GET SET GO!

Actually...

- ...I'm not really interested in how to find him...
- ...how can we convince someone **we** know where Wally is, without telling **them** where Wally is?
- This is what I want you to think about.

Zero Knowledge Proofs: What and Why?

- What we need to do with this problem is to provide a zero knowledge proof.
 - Provide evidence of knowledge.
 - Without leaking the knowledge.
 - Without allowing transferability.
- Prove identity/ownership/knowledge.

- So, how can we provide a “zero-knowledge” proof relating to the location of Wally?
- Work on a strategy, or strategies in groups for a while.
- We will then talk about the ideas as a class.

A Game

I like cats but I don't like dogs.

I like elephants and alligators but not crocodiles.

Whales are fine but fish I cannot stand.

I like apples and grapes but not lemons.

Does anyone know what I am talking about?

Another one

I like frogs but not tadpoles.

I like kittens and cats.

I don't like penguins and I don't like bats.

I like most tables but I don't like trees.

I cannot stand snakes, so tell me please.

What do I like?

Last one.

I like aces not kings

Not buttons or rings.

I'd like a cent but not a dollar

Not a hat and not a collar.

An exits no good, but a door is okay

No doorway can ever quite please me I say.

I'd happily dent but never would bend

This stupid poem is now at an end!

- There are four problems which you are to work through in groups of about 4 to 6.
- For each problem:
 1. Clearly identify the problem.
 2. Identify the start state.
 3. Identify any constraints.
 4. Identify the operators.
 5. Look for ways to simplify the problem
 6. Look for ways to abstract the problem.
 7. Think about an appropriate notation for the problem.
- Discuss what you are doing as you go.
 - It's more about the process than the solution.

Problem 1

- You have a bag with three types of object in it.
- Each turn you remove 2 objects of different types and replace them with an object of the third type.
 - You are allowed to look in the bag when you are taking things out 😊
- **For what starting conditions can we finish with exactly one object in the bag?**

Problem 2

- A group of adults and children want to cross a river.
- The boat will hold one adult or up to two children.
- **How can they all cross?**
- **What must be true for the problem to be soluble at all?**

Problem 3

- Alice, Bob, Carol and Dave want to cross a river.
- They have a boat with a capacity of 100Kg.
- Alice weighs 46Kg, Bob 49Kg, Carol 52Kg and Dave 100Kg.
- Bob Can't Row!
- **Find a way to get them all across.**

Problem 4

- You have to cook n pancakes, where $n > 0$, using a frying pan that can only hold up to two pancakes at a time.
- Each pancake has to be cooked on both sides; each side requires one minute to cook, regardless of how many pancakes are in the pan.
- What is the minimum time required to cook n pancakes (for any value of n)?
- How do you achieve this minimum time?