Design rationale

Suggested Grade Level: G5-6 students

This activity presupposes that students possess ***prior knowledge*** or familiarity in the following domains:

- Measuring lengths and areas with metric units.

  (4M1 Perimeters (I), 5M1 Area (II))
- Properties of two-dimensional shapes. (4S1 Quadrilateral (III))
- Creating three-dimensional models to scale. (5S2 3-D shapes (III))
- Ratio. (5N5 Fraction (V) with school-based content)

Suggested duration/ number of lessons:

Two double lessons across two weeks (Students in group may have discussion during weekend) Students may need to complete Q1 & 2 and understand the problem thoroughly before the lessons.

Design rationale

Motivation:

In our authentic campus setting with bustling traffic, where numerous students depend on the school bus service for dismissal, the issue of parking holds significant relevance. Students witness the daily organization of school buses in a well-structured manner, making the parking problem a genuine reflection of their everyday life experiences.

Related information

29座

19座（學童巴士）

Related information

Body Type 車型		Long Wheel Base 標準版		Super Long Wheel Base 超長車版	
Model 型號		[illegible]-ZETQY (A/T 自動波)	XZB70R-ZEMQY (M/T 手波)	XZB80R-ZETQY5 (A/T 自動波)	XZB80R-ZEMQY5 (M/T 手波)
Dimensions & Weight 車身尺寸及重量					
Length 全長	(mm)	6,990		7,725	
Width 全闊	(mm)	2,080		2,080	
Height 全高	(mm)	2,635		2,640	
Wheelbase 軸距	(mm)	3,935		4,435	
Tread 輪距	Front 前 (mm)	1,690		1,690	
	Rear 後 (mm)	1,490		1,490	
Gross Vehicle Weight 全車總重	(kg)	5,235	5,290	5,580	5,600
Engine 引擎					
Code 型號		1CD-FTV		N04C-WA	
Type 類型		4 Cylinder In-line DOHC Turbocharged 直列式4汽缸雙頂置凸輪軸渦輪增壓		4 Cylinder In-line OHV Turbocharged 直列式4汽缸頂桿渦輪增壓	
Displacement 汽缸容量	(cc)	2,755		4,009	
Bore x Stroke 內徑及衝程	(mm)	92.0 x 103.6		104.0 x 118.0	
Max. Output 最大馬力	kW (PS) / rpm	110 (150) / 2,500		110 (150) / 2,500	
Max. Torque 最大扭力	Nm (kg-m) / rpm	420 (42.8) / 1,400 - 2,500		420 (42.8) / 1,400-2,500	
Compression Ratio 壓縮比		15.6		18.0	
Fuel System 燃油系統					
Type 類型		Common Rail System 高壓共管式燃油噴注系統			
Fuel Type 燃油		柴油 Diesel			
Fuel Tank Capacity 油缸容量	(L)	95			
DPR & UREA-SCR System 高效微粒淨化及尿素選擇性催化還原系統		•			
AdBlue® tank capacity 尿素缸容積	(L)	23			
Emission Standard 排放標準		歐盟5期 EURO 5			
Chassis 車身					
Transmission 傳動系統		6 Speed Automatic with +/- Switch 六前進自動波連+/-控制	5 Speed Manual 五前進手波	6 Speed Automatic 六前進自動波	5 Speed Manual 五前進手波
Drive System 驅動系統		Rear Wheel Drive 後輪驅動			
Suspension 懸掛系統	Front 前	Double Wishbone 雙橫臂			
	Rear 後	Semi-elliptical leaf springs 半橢圓彈簧片式鋼板			
Brake System 剎車系統	Front 前	Ventilated Disc 通風碟式			
	Rear 後	Drums 鼓式			
Steering 轉向系統		Recirculating Ball 循環球式轉向			
Minimum turning radius 最小轉向半徑	(m)	7.9 (車身 Body)		8.0 (車身 Body)	
Tyre & Wheel 輪胎及輪圈		215/70R17.5			
Alternator 發電機		12V X 150A			
Exterior 外型					
Power Sliding Door 電動趟門		•			
Side Window Types 側座窗		固定 Fixed / 開啓 Sliding			
Front Intermittent Wipers 間歇式前水掃		•			
Rear Under View Mirror 低角度後視鏡		•			
Power Adjustable & Retractable Side Mirror 電動調校及摺合側鏡		• (左側鏡 Left Mirror)			
Front Fog Lamps 前霧燈		•			
Factory-Fitted Double Hinge Doors 原廠雙開門		•			
Alloy Wheel 合金輪圈		-		•	
Interior 車廂					
Factory-Fitted Air Conditioner 原廠冷氣		•			
Optitron Meter with Multi Information Display Optitron儀表板連資訊顯示屏		•			
Electronic Tuning Radio/CD Player System 電子選台收音機 / 碟影數碼音響系統		•			
Digital Clock 電子鐘		•			
Cupholders 杯座架		•			
Safety System 安全系統					
SRS Driver Airbag 司機座安全氣囊		•			
VSC (Vehicle Stability Control) 行車穩定控制系統		•			

Length (mm): 6990
Width (mm): 2080

Design rationale

The problem presented offers a considerable level of flexibility, granting students the freedom to choose their approach. It can be structured with supportive guidance to lead them towards a solution, or students can be given the opportunity to independently solve the problem. The provided sample responses at the end of the resource serve as a reference, offering insight into the expected outcomes when students adopt specific problem-solving approaches.

Background

Scenario:

Imagine you are the person-in-charge at school bus company providing DBSPD with a bustling campus. The school has a fleet of school buses that transport DBSPD students to and from the campus every day. However, the current parking arrangement for the buses is inefficient and causes congestion during peak hours. Your task is to design an optimal parking configuration for the school buses within the available space on campus.

The available parking area on the campus is an irregular space, and you need to determine the best way to arrange the buses within this area. The dimensions of each school bus are known, including its length (L) and width (W). The area available for parking the buses is limited (A) and needs to be utilized effectively.

Background

Your objective is to maximize the number of buses that can be accommodated within the available parking area while adhering to safety regulations. Additionally, you need to ensure that the arrangement allows for easy access for both the students and the bus drivers. Your goal is to provide a practical and effective solution that minimizes disruptions and ensures a smooth and safe flow of buses in and out of the campus.

By formulating and solving a mathematical model, you aim to find the optimal combination of parking area and Chi Ping Drive parked buses (x and y) that maximize the number of buses parked on campus. This will help alleviate congestion, streamline bus movements, and enhance the overall efficiency of the transportation system for DBSPD students.

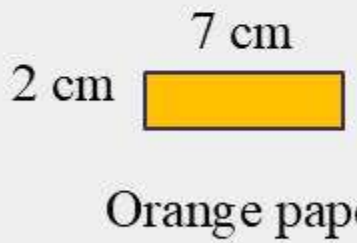
Leading Question

What is the maximum number of school buses that can be parked on campus, considering both the parking area and Chi Ping Drive?

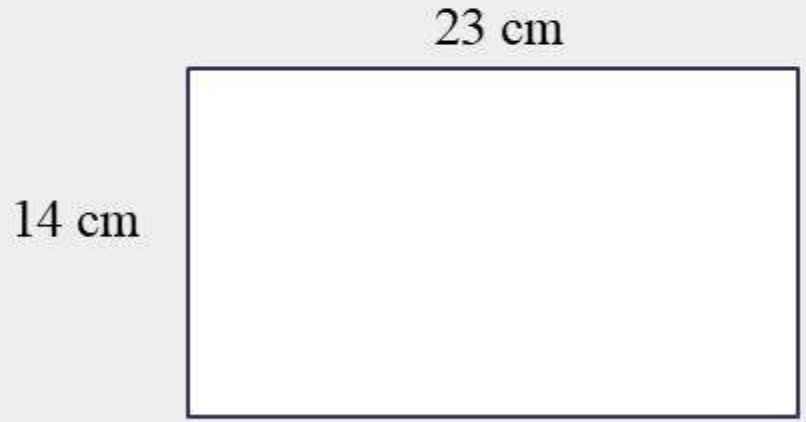
Let x and y be the maximum number of school buses that can be parked on the parking area and Chi Ping Drive respectively.

Question 1

Ms. Tsang is striving to maximize the coverage on a rectangular grey board measuring 23 cm in length and 14 cm in width. To accomplish this, she plans to use orange rectangular papers, each with a length of 7 cm and a width of 2 cm. Without any overlapping, we need to determine the number of orange paper pieces Ms. Tsang will require to achieve the maximum coverage on the board.



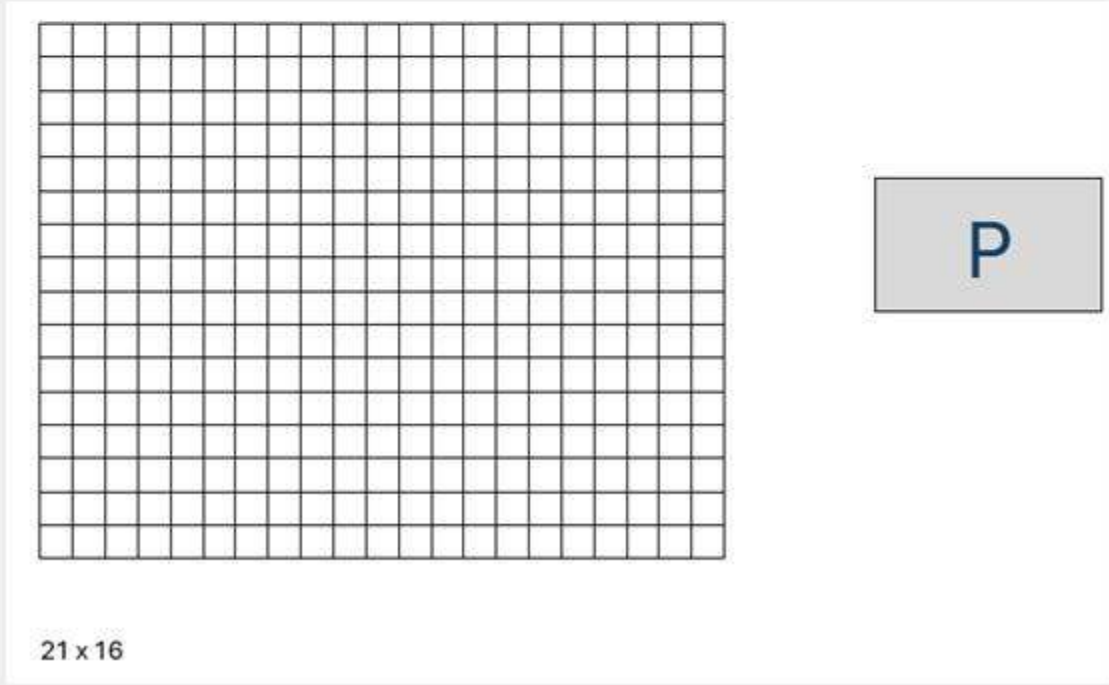
Orange paper



Grey board

Question 2

Ms. Ip is planning to construct a carpark on a rectangular piece of land measuring 21 metres in length and 16 metres in width. Each car park space requires a dimension of 4 metres by 7 metres, and it is essential to maintain a minimum clearance of 5 meters between rows to ensure the safe movement of school buses. Can you devise a carpark layout that can accommodate a minimum of 8 cars within this space?



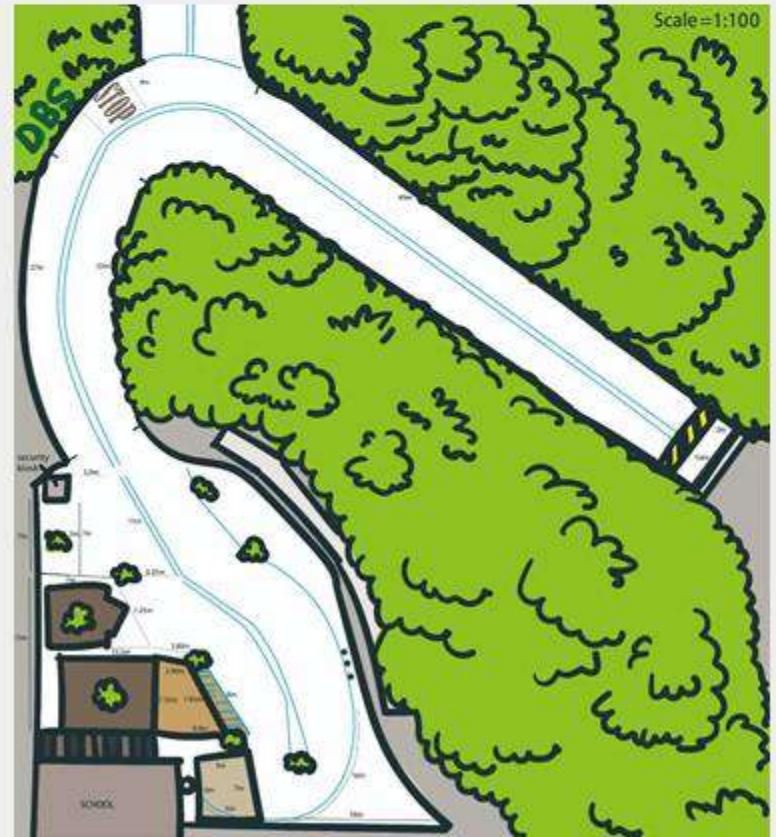
Question 3

You are going to strategize the arrangement of school buses within the parking area of DBSPD. The school buses have dimensions of 7 metres by 2 metres. Utilizing a map of the DBSPD parking area and orange rectangles as models of the school buses, both drawn to scale 1: 100, your objective is to determine the maximum number of school buses that can be accommodated in the

(a) parking area; and

(b) Chi Ping Drive.

School bus

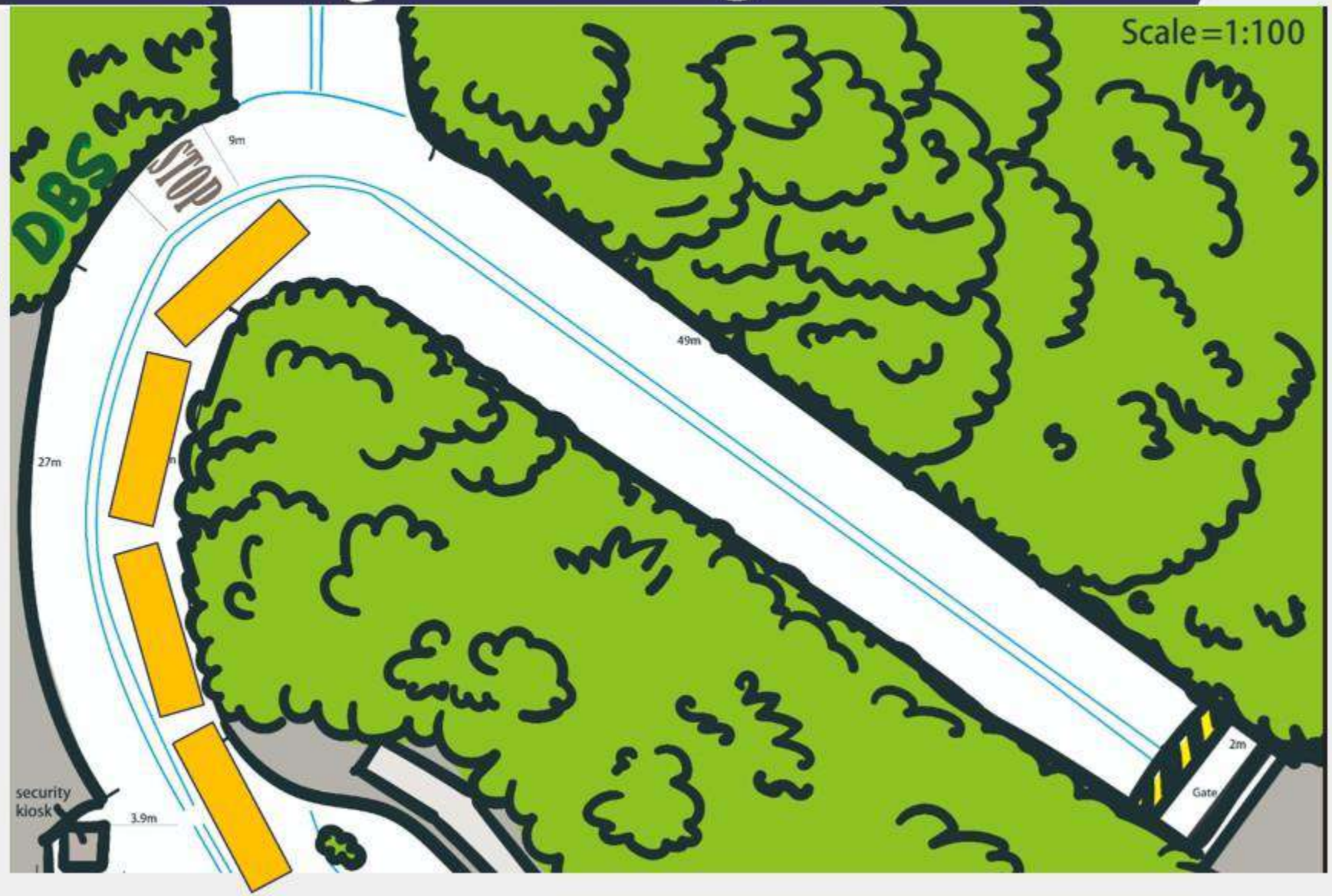


Question 3a

School bus

Question 3b

School bus

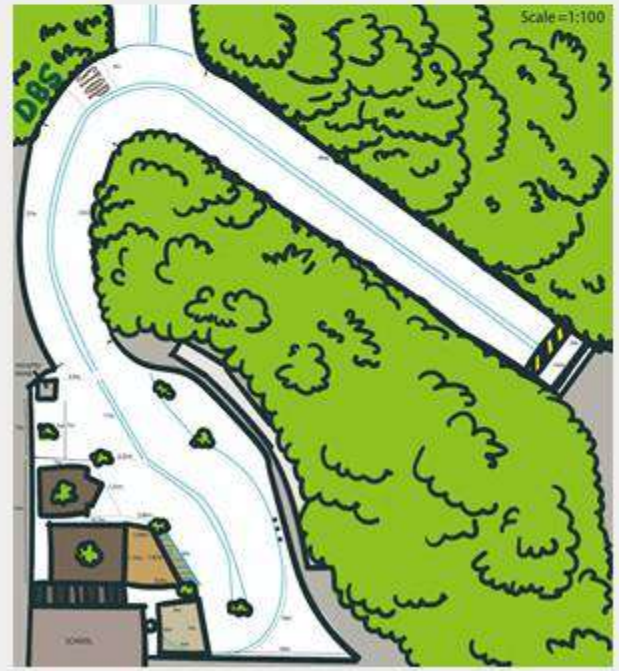


Question 3.2

You are in charge of coordinating the departure of school buses from the DBSPD campus. Each school bus has dimensions of 7 meters by 2 meters. Using a map of the DBSPD parking area and orange rectangles as models of the school buses, drawn to a scale of 1:100, your task is to determine the time it takes for all the school buses to leave the campus.

By calculating the time taken for the buses to exit each specified location, we can effectively manage the departure process.

School bus



Question 3.3

Your task is to strategize the arrangement of school buses within the campus parking area of DBSPD. The dimensions of each school bus are 7 meters by 2 meters. Using a scaled map of the campus parking area and representing the school buses with orange rectangles, drawn to a scale of 1:100, your objective is to find the maximum number of school buses that can be accommodated, considering both the available campus area and the space occupied by each school bus.

By optimizing the arrangement, you need to determine the maximum number of school buses that can be parked within the given campus space, taking into account the dimensions of each bus.

School bus

Question 3.3

School bus

Question 1 (Answer)

Orange paper

Grey board

Number of orange papers can be placed along 23 cm:

$23 \div 7$

$=3 \ldots 2$

Number of orange papers can be placed along 14 cm:

$14 \div 2$

$=7$

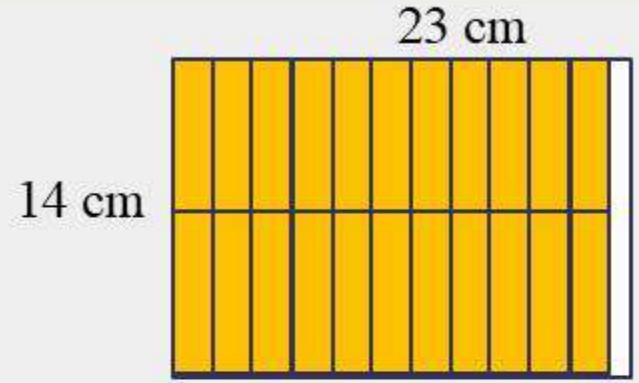
Total number of orange papers can be placed in this arrangement:

3×7

$= 21$

Question 1 (Answer)

Orange paper



Grey board

Number of orange papers can be placed along 23 cm:

$23 \div 2$

$=11 \ldots 1$

Number of orange papers can be placed along 14 cm:

$14 \div 7$

$=2$

Total number of orange papers can be placed in this arrangement:

11×2

$= 22$

Question 1 (Answer)

Orange paper

Grey board

Total number of orange papers can be placed in this arrangement:

$(23 \times 14) \div (7 \times 2)$

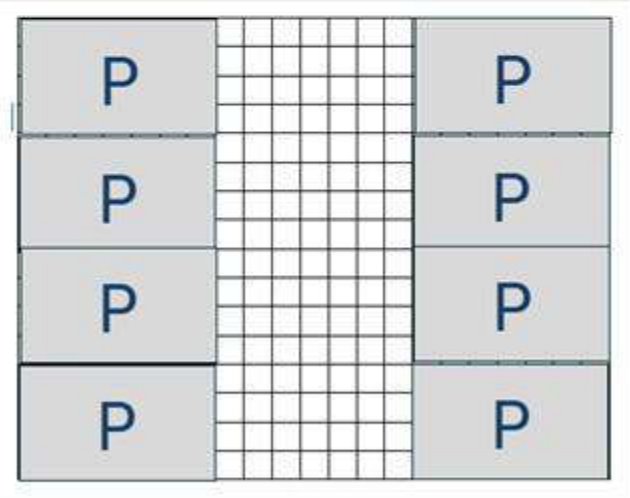
$= 23$

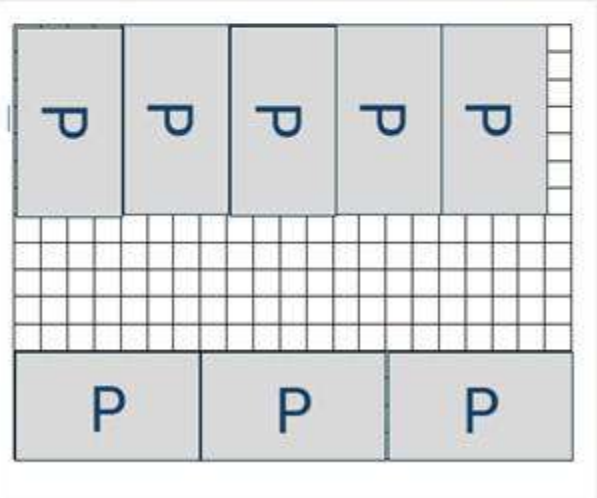
Two orange papers needed to be arranged in different direction so as to fully utilize the space.

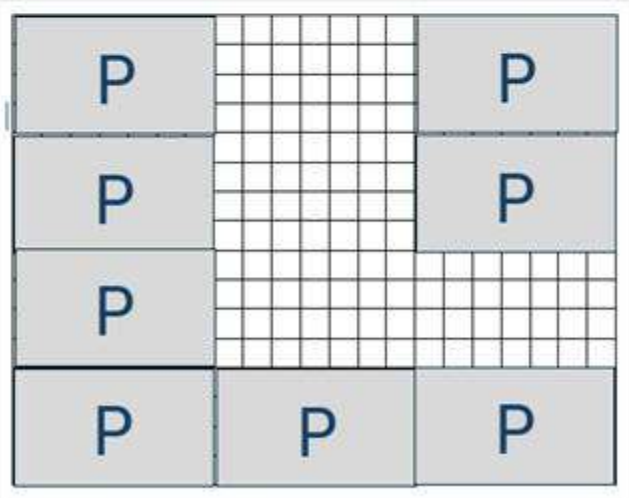
Question 2 (Answer)

Ms. Ip is planning to construct a carpark on a rectangular piece of land measuring 21 metres in length and 16 metres in width. Each car park space requires a dimension of 4 metres by 7 metres, and it is essential to maintain a minimum clearance of 5 meters between rows to ensure the safe movement of school buses. Can you devise a carpark layout that can accommodate a minimum of 8 cars within this space?

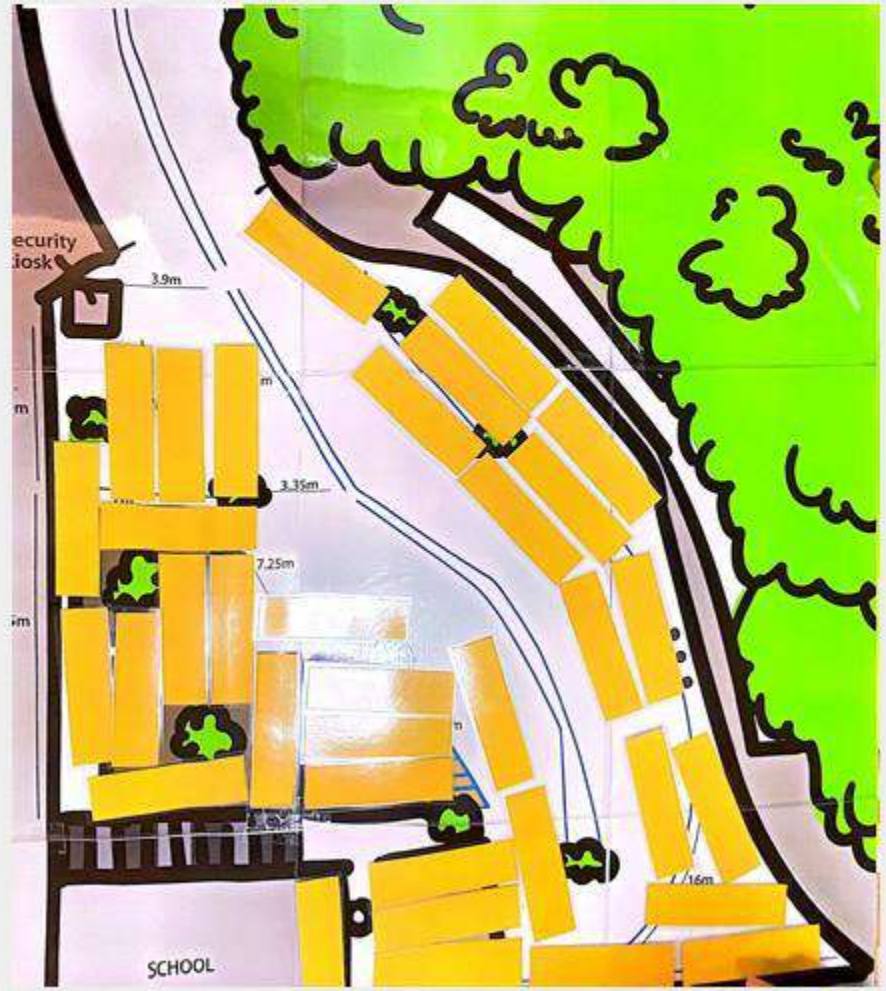
Some possible answers:



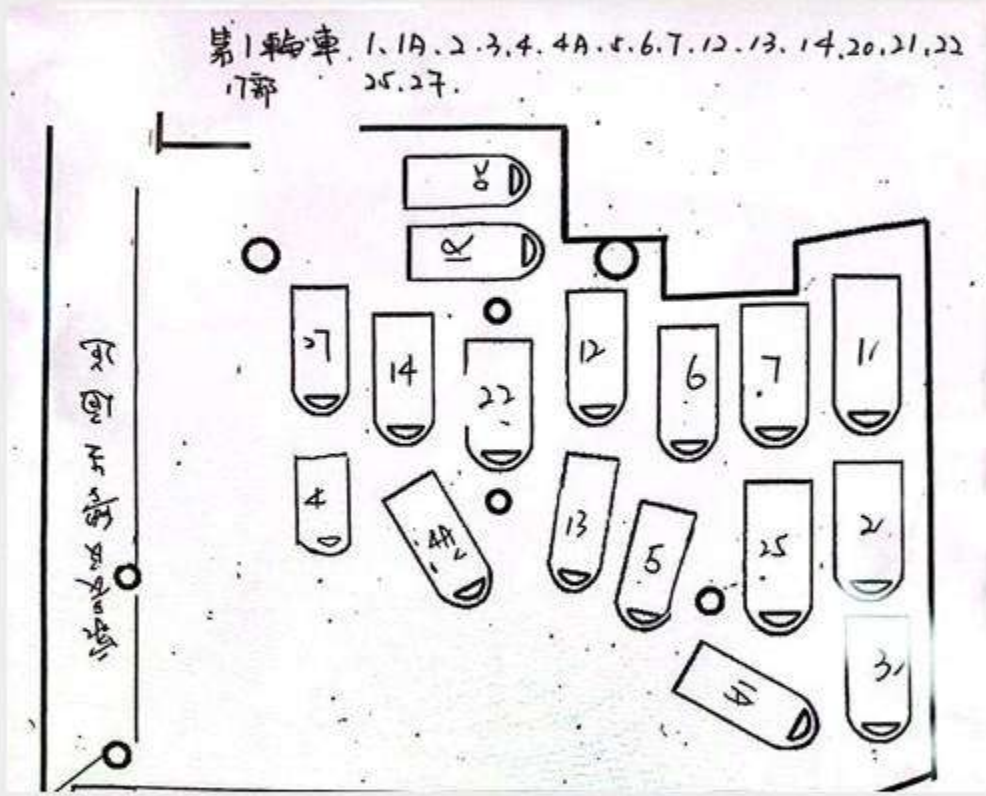




Question 3 (Answer)



Question 3 (Answer)



Question 3 (Answer)

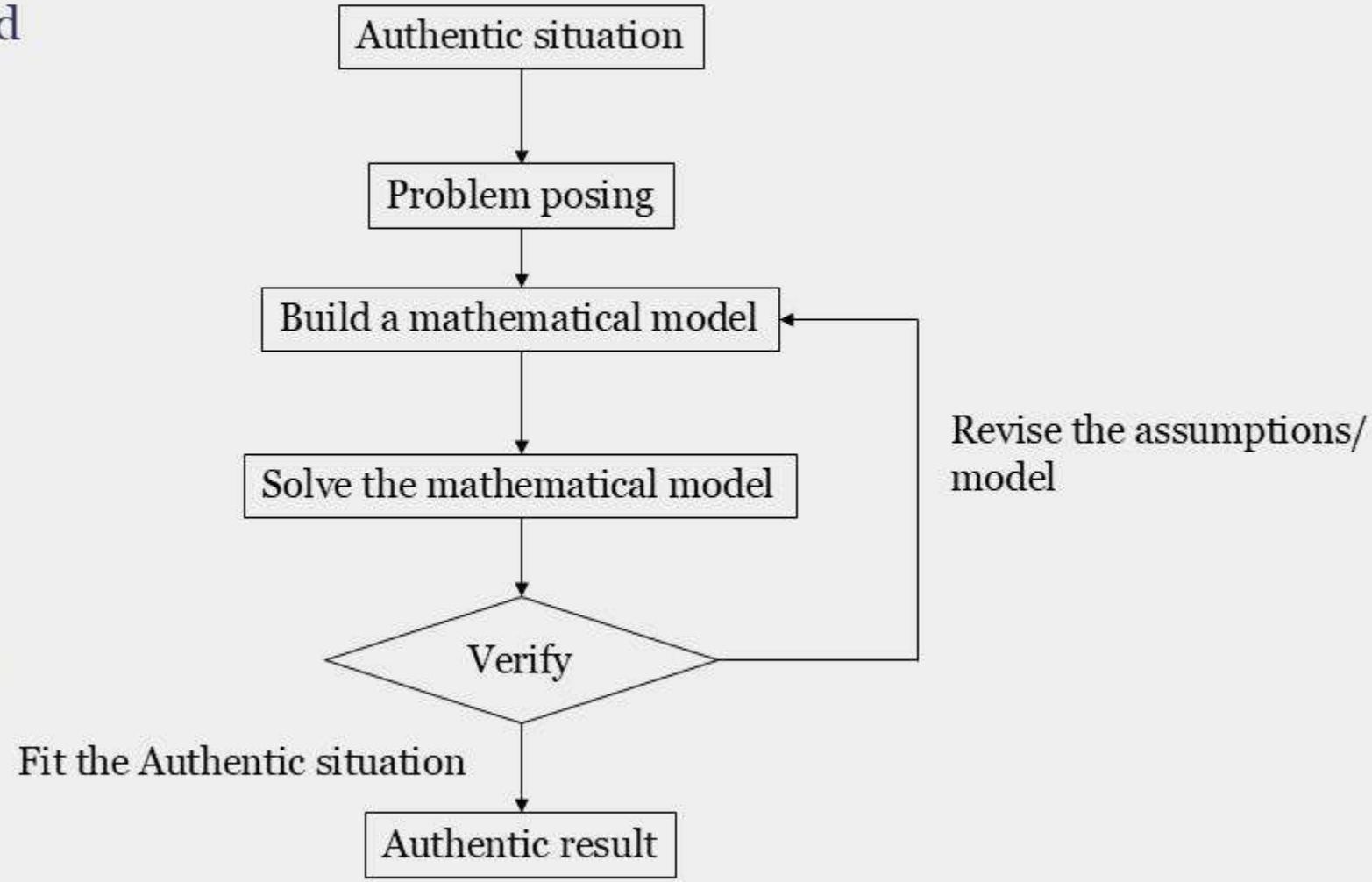
4-steps of Problem Solving & Modelling Cycle:

1. Understand

2. Plan

3. Work out

4. Look back



4-steps of Problem Solving:

1. Understand:

- Have I comprehended the situation correctly?
- Do I possess all the necessary information, or is anything missing?
- Do I have a visual understanding of the dimensions of a 21m by 16m area, or should I measure it out on the court?
- Am I aware of the size of each car park, or do I need additional clarification?

4-steps of Problem Solving:

2. Plan:

- What strategies can I employ? Is it necessary to construct the carpark to its actual size?
- Could creating a model or drawing a diagram be effective strategies?
- What criteria should be considered when constructing my model or diagram? (Scale accuracy is crucial.)
- Can digital graphics serve as a valuable tool in this process?
- What information is necessary to have before a mathematical model is constructed?
- What variables do you have to consider?
- What variables should not be considered?

4-steps of Problem Solving:

3. Work out:

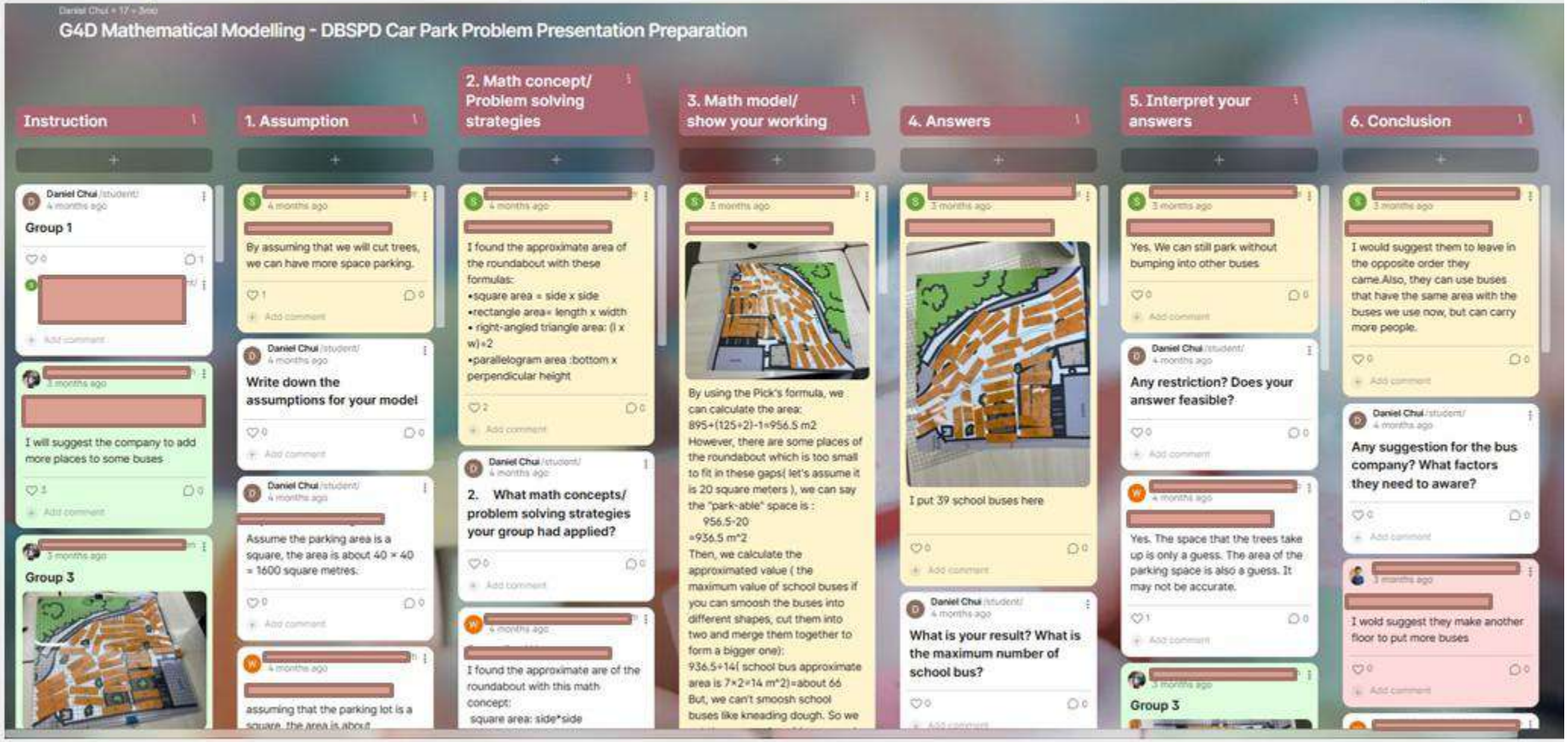
- Have I documented my ideas in a manner that allows me to explore various layouts?
- What insights am I gaining as I experiment with different arrangements and observe what works and what doesn't?
- Am I adequately considering the necessary conditions each time, especially regarding the spaces required for cars to enter and exit?
- Have I made any assumptions about the car layout that may not be valid?
- How do my findings differ from those of others, and what factors could contribute to these discrepancies?

4-steps of Problem Solving:

4. Look back:

- What is my proposed solution, and does it fulfill all the specified requirements?
- Is my solution the most optimal one, and if so, what makes it the best choice?
- How can I effectively persuade someone else that my layout is the superior option?
- Could I have approached the problem in a more efficient manner, leading to a quicker or better solution?
- Which ideas or tools proved to be effective during my investigation?
- What alternative approaches or strategies could I consider for future attempts?
- What additional information or mathematical concepts would be valuable for me to learn in order to further explore this problem?

Padlet record



Assumptions

Group 1	Group 2	Group 3
• No matter how you park the buses, the buses can still get out. • We can ignore the trees and move them to the Secondary Division later.	• Assuming that we will cut/move trees, we can park more school buses. • If we don't cut/move trees the maximum number of buses able to park in that area will be much less, because the driver needs space to get on/off the bus, to make sure he/she can drive out safely, because everyone knows: SAFETY FIRST!!	• Assuming we cannot move the trees

Assumptions

Group 4	Group 5	Group 6
• The original dimensions of a school bus is 7 m x 2 m. • We assume 0.5 m extra width on each side is required for students getting on the bus. And it is a safety driving distance between each vehicle. • We assume all trees' diameters are the same, which are 5.25 m base on the measurement and scale on the map. • We assume it is the school day after class time, other than school bus, there is no other vehicle will drive into the parking area.	• Assuming that the parking lot is a square, the area is about 32 x 32=1024 square meters.	• If we assume the total parking space is a square, and the side length is 40 m Then the result of the total parking space is 4000m^2.

Mathematical concepts used

Math Model

By using the Pick's formula, we can calculate the area:

895+(125÷2)-1 = 956.5 m^2

However, there are some places of the roundabout which is too small to fit in these gaps

(let's assume it is 20 square meters), we can say the "park-able" space is :

956.5-20 = 936.5 m^2

Then, we calculate the approximated value (the maximum value of school buses if you can smoosh the buses into different shapes, cut them into two and merge them together to form a bigger one):

936.5÷14(school bus approximate area is 7x2=14 m^2) = about 66

But, we can't smoosh school buses like kneading dough. So we get the map and a grid paper and put the school buses(100 times smaller of course)(photo on top)⬆

Here ,we put 39 school buses which is actually a lot, but it is pretty far from 66. But it makes a lot of sense as you can't shape school buses.

3. Math model

Using area calculation to calculate the number of school buses able to park within the space.

Mathematical concepts used

What Mathematics Has Our Group Applied?

Divide the parking spaces into 3 rectangles and calculate their areas and multiply all of their areas .

Problem solving strategies

We used the following two methods:

1. **Physical modelling**
   a. Layout as many school buses (same scale as the map) as possible on the available parking area. Our goal is to maximum utilisation of the parking area.
2. Calculations
   a. **By calculating the final usable parking area, then divided it by the school bus area**
      i. Breaking the irregular shape into simple geometric shapes (like triangles, rectangles, etc)
      ii. Subtracting the areas occupied by trees
      iii. Dividing the final usable parking area by each school bus area

Mathematical concepts used

Mathematical strategies

We found the approximate area of the roundabout with this math concept:

square area: side*side

Mathematics applied

We used area to calculate the total area of the parking space.

Square side length x side length

Mathematical concepts used

Math Model

By using the Pick's formula, we can calculate the area:

$895+(125\div2)-1 = 956.5\ m^2$

However, there are some places of the roundabout which is too small to fit in these gaps

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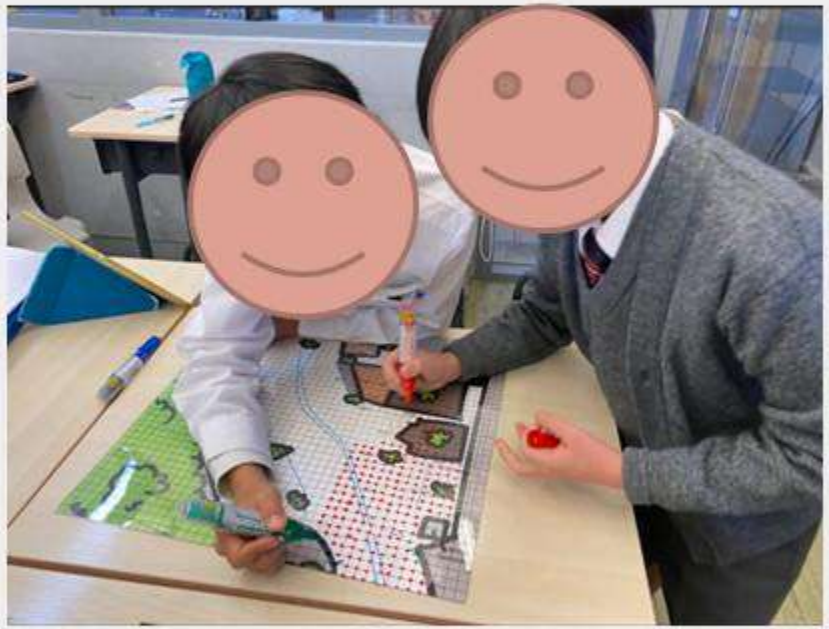
Mathematical concepts used



Mathematical concepts used

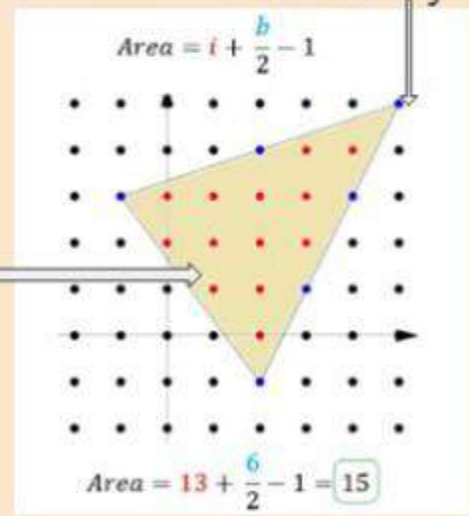
What mathematics our group had applied?

By using a formula called the Pick's formula that calculates the area of polygons and irregular shapes, I found the area of the roundabout:

895+(125/2)-1=956.5

5 blue dots:
Dots on boundary

13 red dots:
Dots in the area without touching the boundary



First attempt

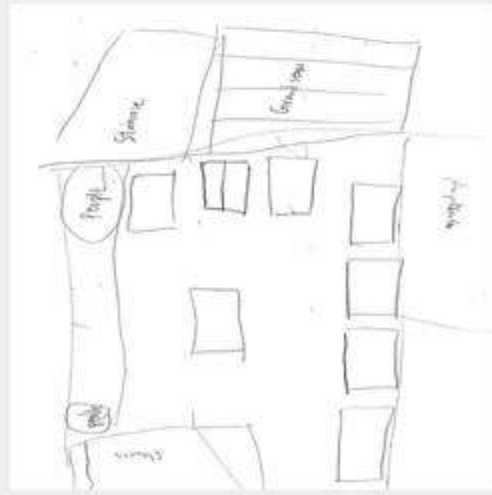
Group 1 (28)

Group 2 (38)

Group 3 (43)

Group 4 (22)

Group 5 (50)



Group 6 (37)

(No.): Solution

Revised assumption

Group 1	Group 2	Group 3
• leave a 5 meter gap between every row. So we estimate the area that has been taken by the trees is 9 m^2, and 936.5−9=927.5. • So let's say the roundabout is approximately 26 meters wide in average, and 35 meters long.	• Assume we need to park the maximum number of school buses inside the area and with the trees counted, so the buses won't crash into the trees when parking.	• Get Rid of All the Trees (47 School Buses) • Don't Change the Area at All (40 School Buses)

Revised assumption

Group 4	Group 5	Group 6
• We assume all trees' diameters are the same, which are 5.25 m base on the measurement and scale on the map. • Breaking the irregular shape into simple geometric shapes (like triangles, rectangles, etc)	• The parking space could be a square. • Or, if counted each 1 m^2 by each 1 m^2, the answer is 1174 m^2. That would be the most accurate answer.	• Can park extra 10 school buses along the Chi Ping Drive (only along the lane of going up). • Can park 30 school buses in the parking area as we removed 14 school buses (44-14=30) to allow reasonable spaces in between to ensure safety.

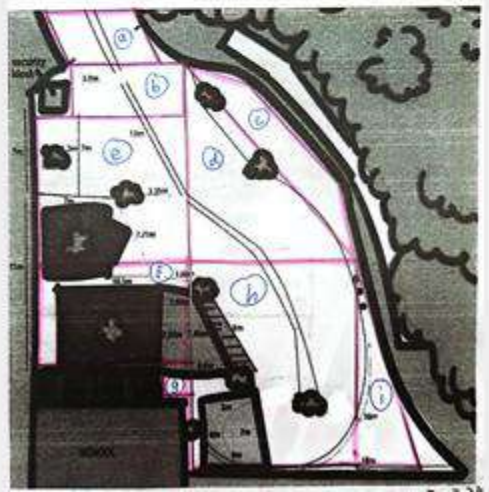
Revised solutions

Group 1 (39)

Group 2 (41)

Group 3 (47)

Group 4 (22)



Group 5 (48)

Group 6 (40)

(No.): Solution

Compare of the solutions

1st attempt
Group 3 (43)

Assuming we cannot move the trees

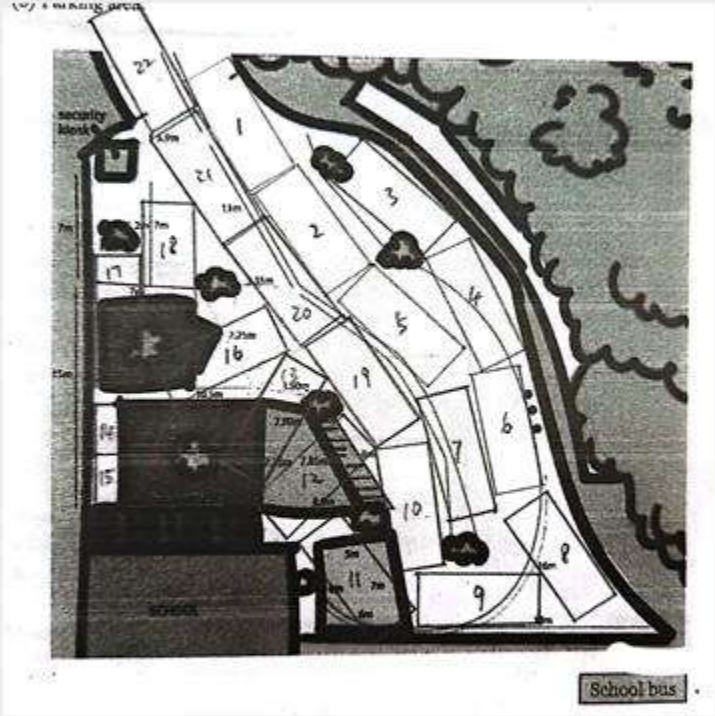
Revised solution
Group 3 (47)

Assuming we get rid of all the trees

(No.): Solution

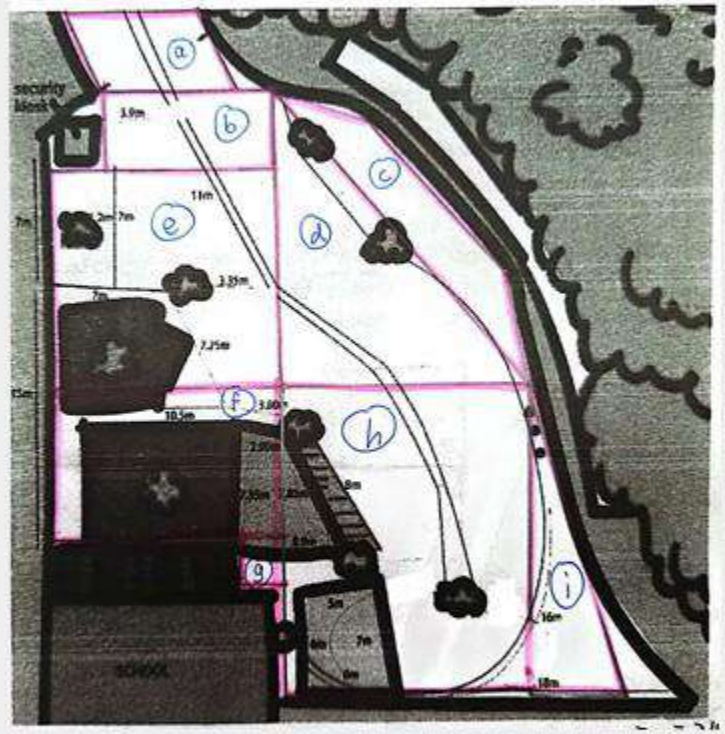
Compare of the solutions

1st attempt: Group 4 (22)



- The original dimensions of a school bus is 7 m x 2 m.
- We assume 0.5 m extra width on each side is required for students getting on the bus. And it is a safety driving distance between each vehicle.
- We assume all trees' diameters are the same, which are 5.25 m base on the measurement and scale on the map.
- We assume it is the school day after class time, other than school bus, there is no other vehicle will drive into the parking area.

Revised solution: Group 4 (22)



- We assume all trees' diameters are the same, which are 5.25 m base on the measurement and scale on the map.
- Breaking the irregular shape into simple geometric shapes (like triangles, rectangles, etc)

(No.): Solution

Interpret solutions

Conclusion

So we can accomodate 39 buses no matter we park them randomly or orderly.

But that doesn't mean that is the best answer. You can continue working on it, and you can get 40, 41, 42, 43… You can even make it to 60 if you use the basketball court. But how? I do not know, but I know how to make you do it. Just keep working and the answer will come soon.

8.Conclusion/suggestion

Move the trees to a smaller corner and make Chi Ping drive straighter so the buses can park easily. Also,we should flatten the current school bus parking spaces.

Interpret solutions

Conclusion/ Suggestion

We suggest that the school should create another platform for the buses to park and move the trees to some place else.In conclusion , the parking area is very packed and the are many parking problems and we need to solve them quickly.Also, we can fit 40 buses as we don't change or move any obstacles.

Conclusion

Since both models give the same answer,we conclude that the maximum number of school buses parked is 22.

Overall answer:22

Interpret solutions

Conclusion & Suggestion

Conclusion

This math model has two answers that we found:

1. Using the calculating form and assumption- the answer was 50
2. Using the counting form (Counting how many cm2 there was) and the answer was 56.

Both of them have different answers, so we propose that the answer should be 50-55.

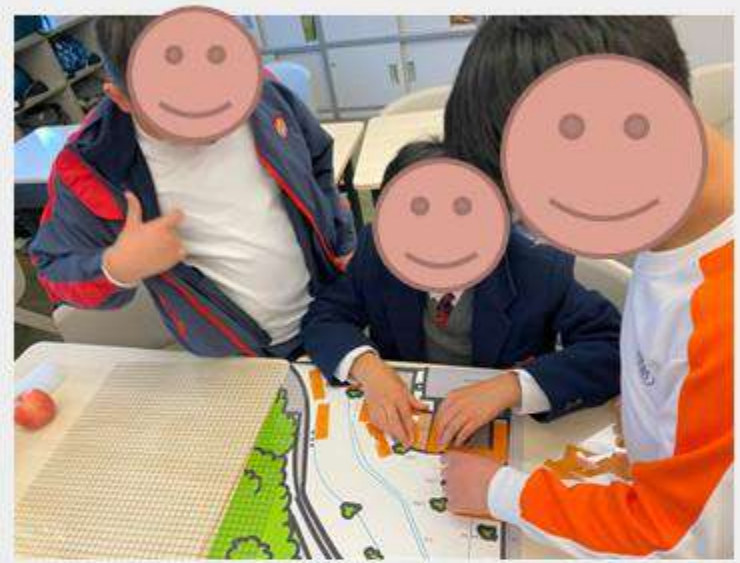
Suggestion

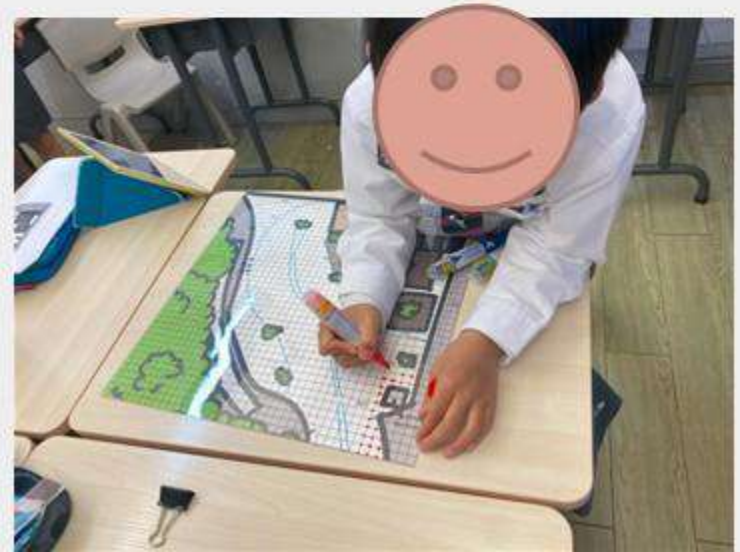
I would suggest that the bus company should go out in the opposite order they came in, using the phrase “First in, Last out”.

Conclusion

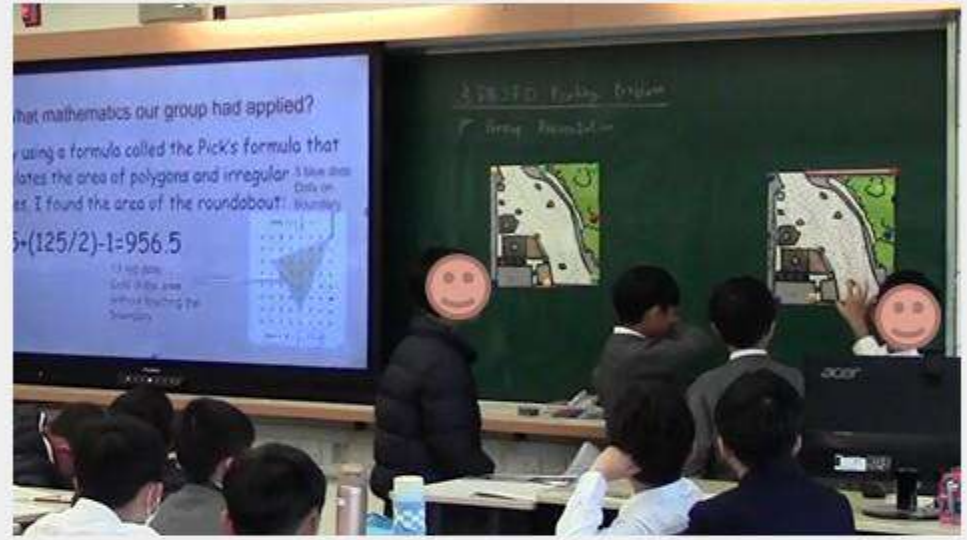
I think that the school bus company should change their school buses into one type so there will not be space wasted

Students' discussion





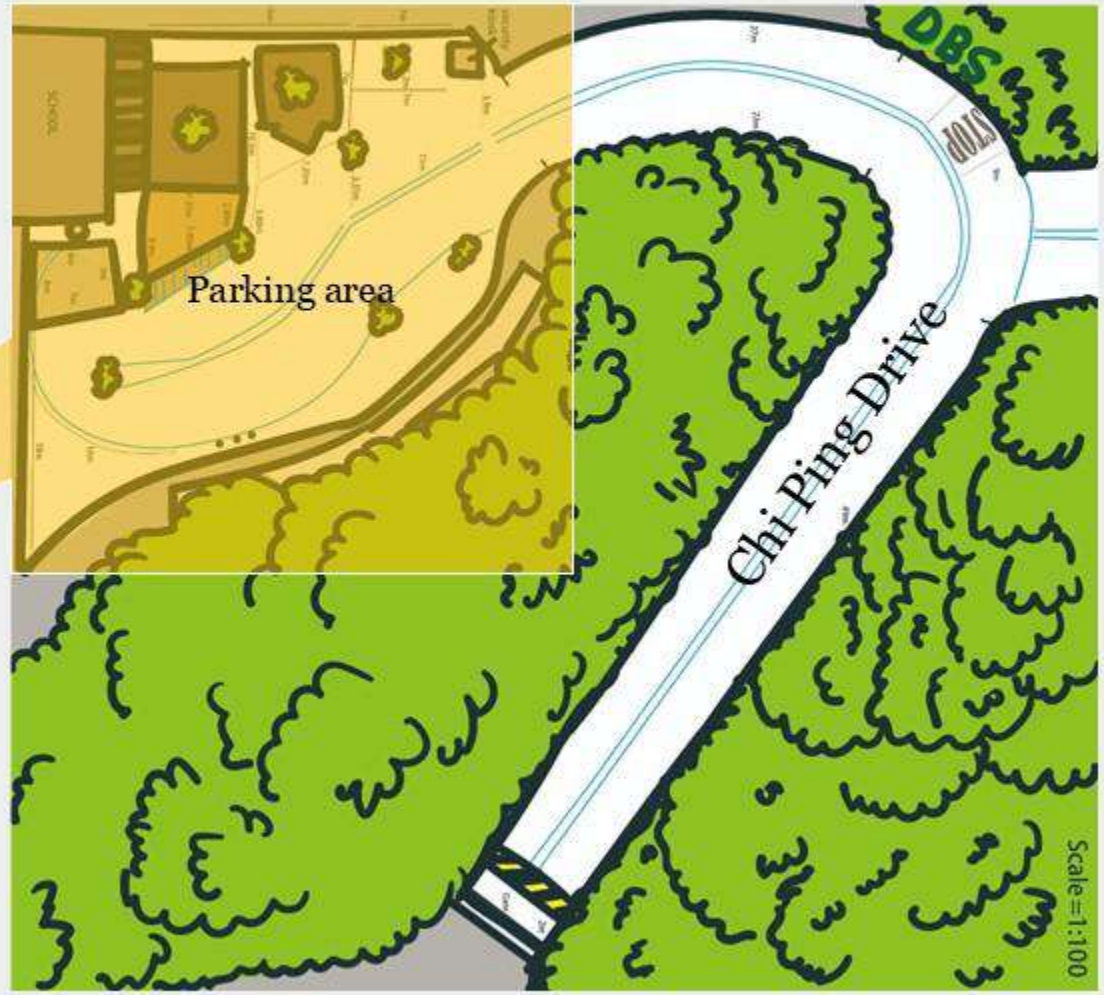
Students' presentation



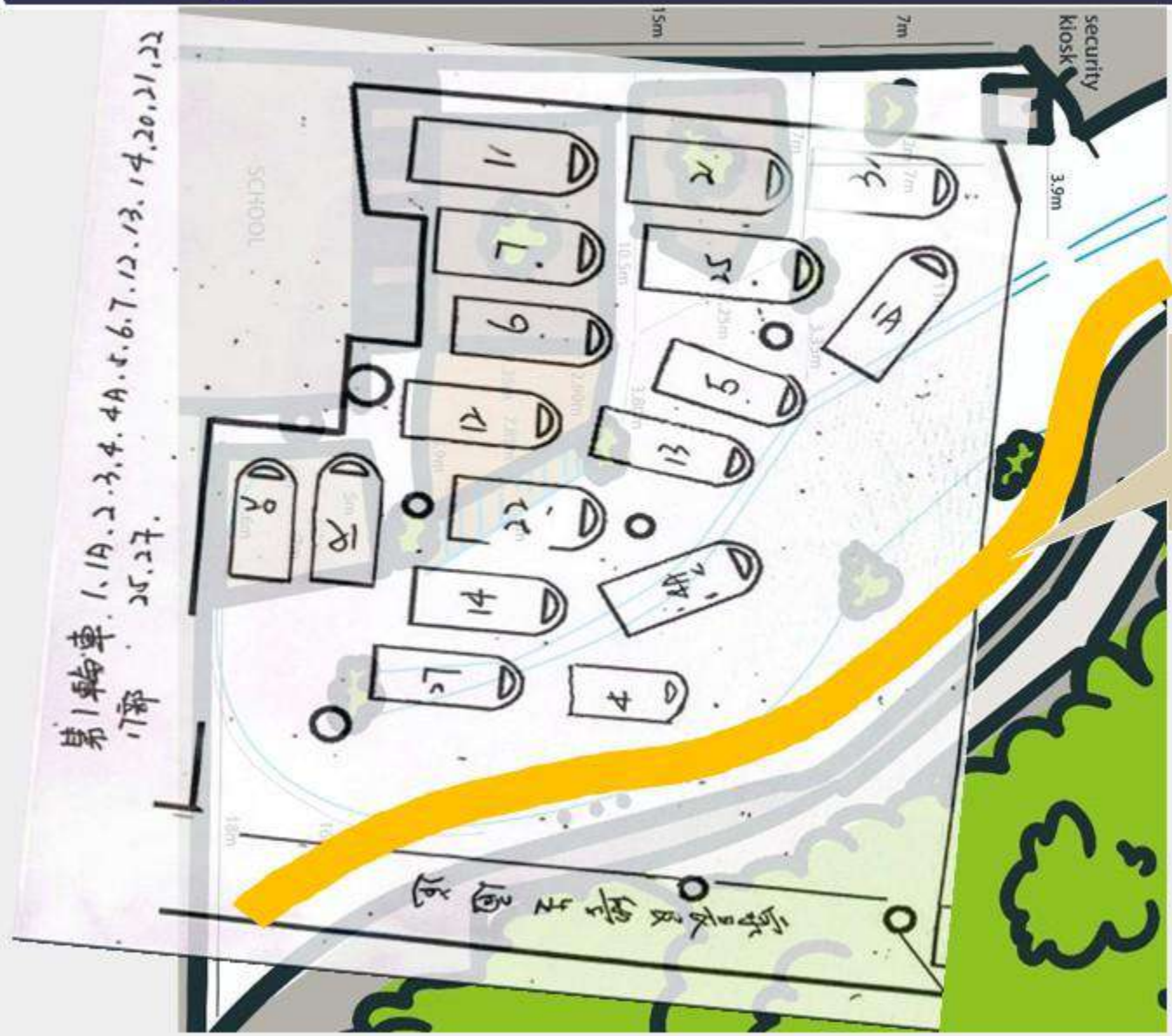
Experience from the company

- At most 27 school buses can be parked in the parking area
- Fixed position for each school bus to park, so that nannies know the route to guide students to get on the school bus
- Enough space for students to walk is a must
- Two rounds for school buses to drive in the campus
- Use the SD (Senior Division) as reserved parking space
- With these arrangements (two rounds, use SD area), more school bus routes are possible

Experience from the company



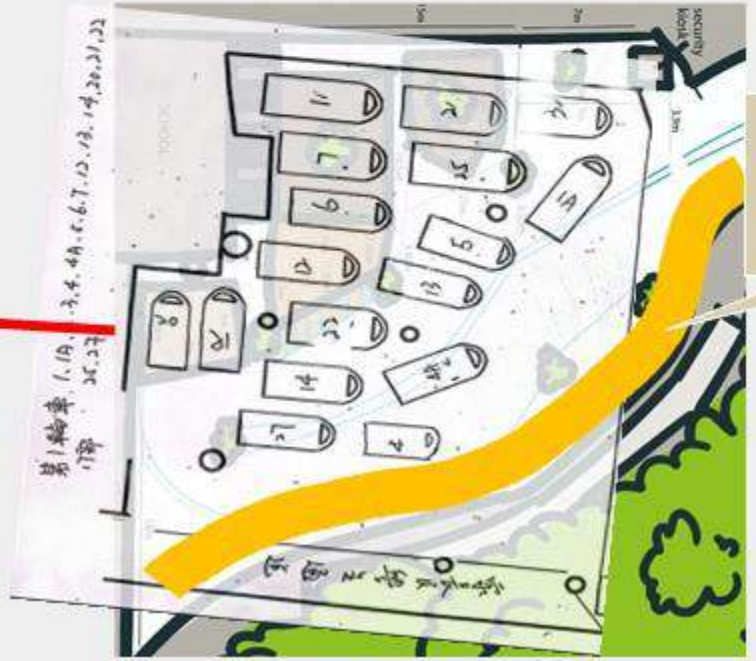
Experience from the company



Walking space for parents and students (Self-dismissal)

Experience from the company

2nd round dismissal



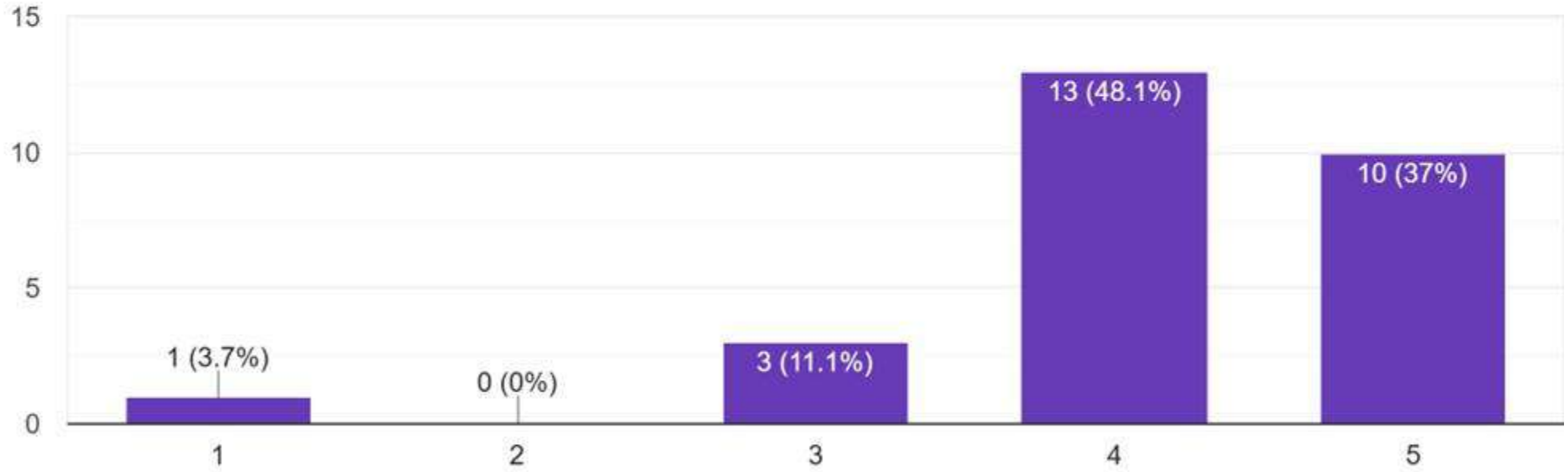
Walking space for parents and students (Self-dismissal)

1st round dismissal

Students' feedback

1. I believe I can understand and apply mathematical modelling concepts.

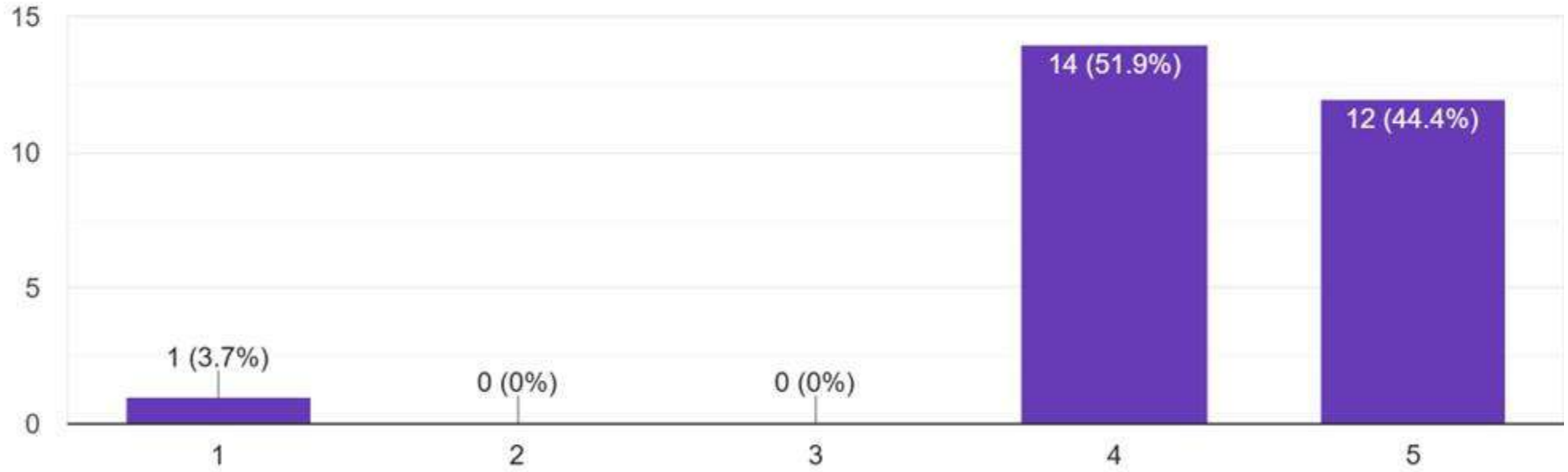
27 responses



Students' feedback

2. I value the importance of mathematical modelling in solving real-world problems.

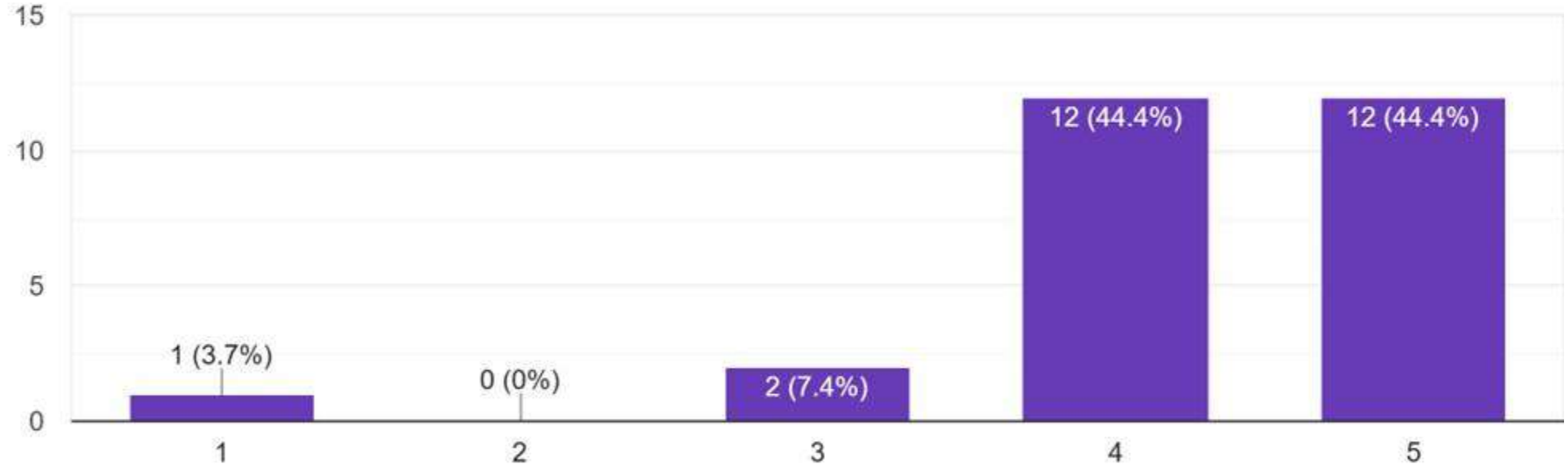
27 responses



Students' feedback

3. I am focused on learning and improving my skills in mathematical modelling.

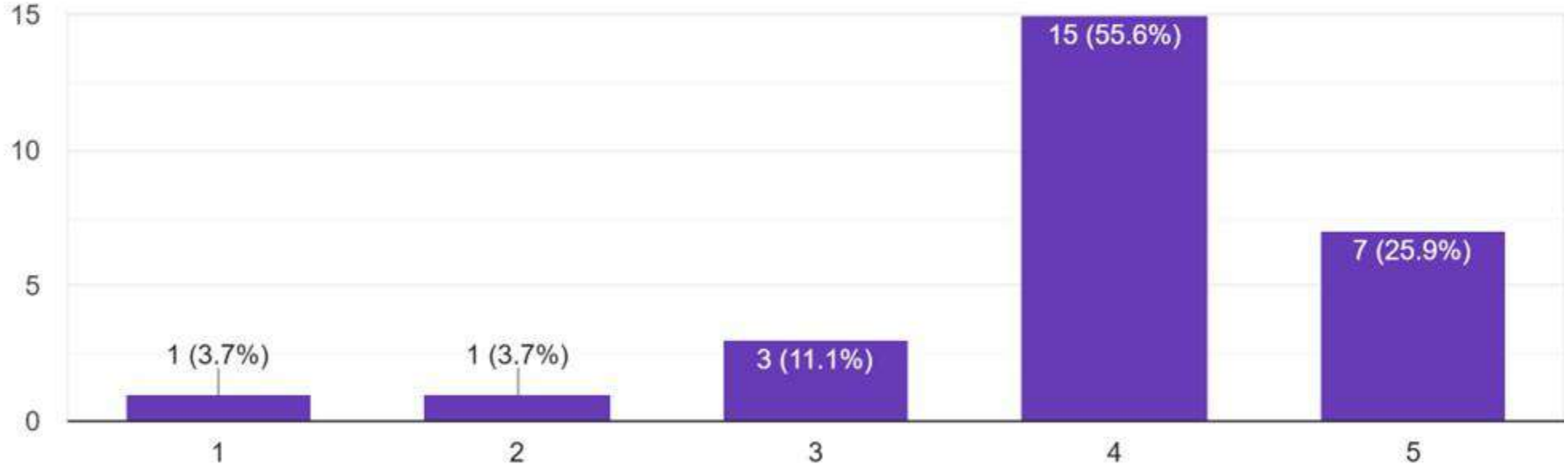
27 responses



Students' feedback

4. I can effectively plan my approach to solving mathematical modelling problems.

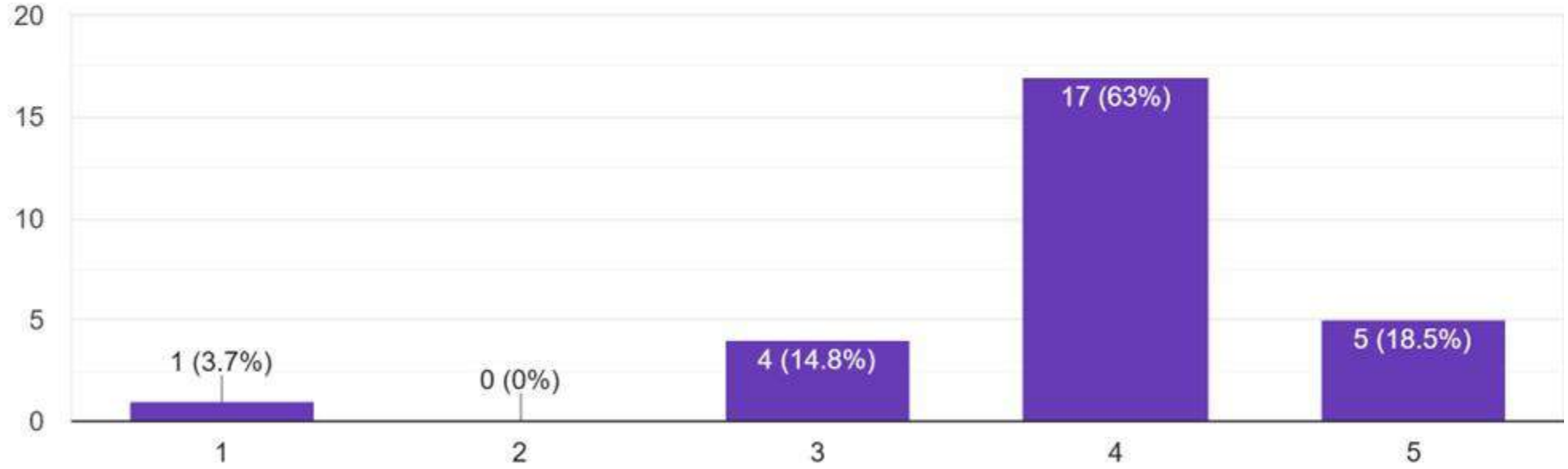
27 responses



Students' feedback

5. I am able to manage tasks efficiently when working on mathematical modelling projects.

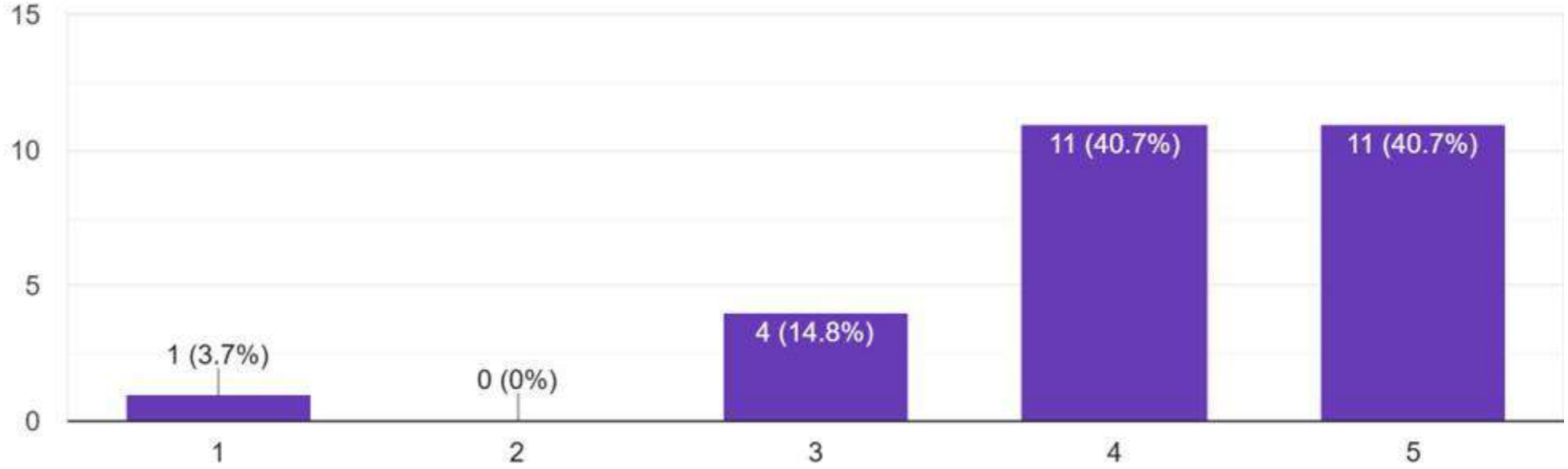
27 responses



Students' feedback

6. I persist in solving mathematical modelling problems even when they are challenging.

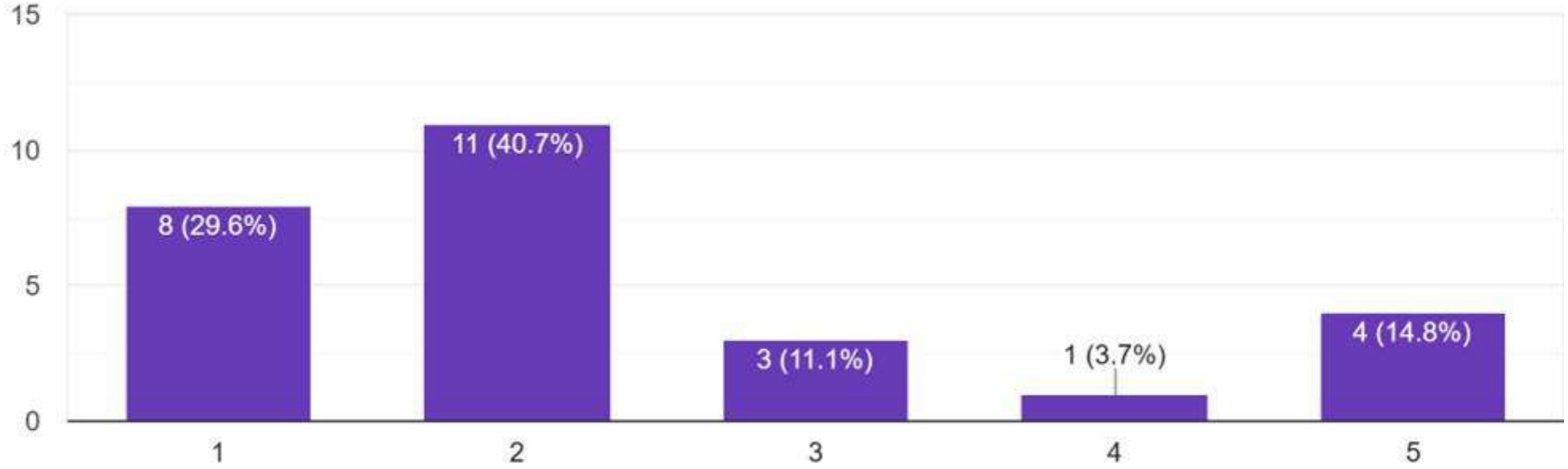
27 responses



Students' feedback

7. I feel anxious when working on mathematical modelling tasks.

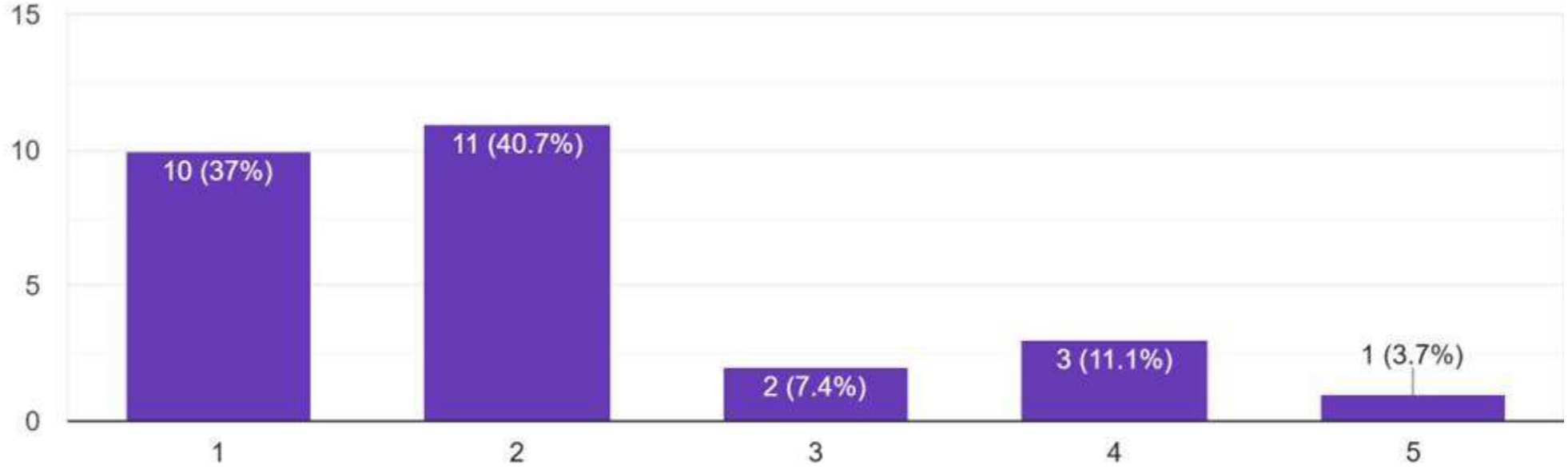
27 responses



Students' feedback

8. I tend to avoid tasks related to mathematical modelling if I fear failure.

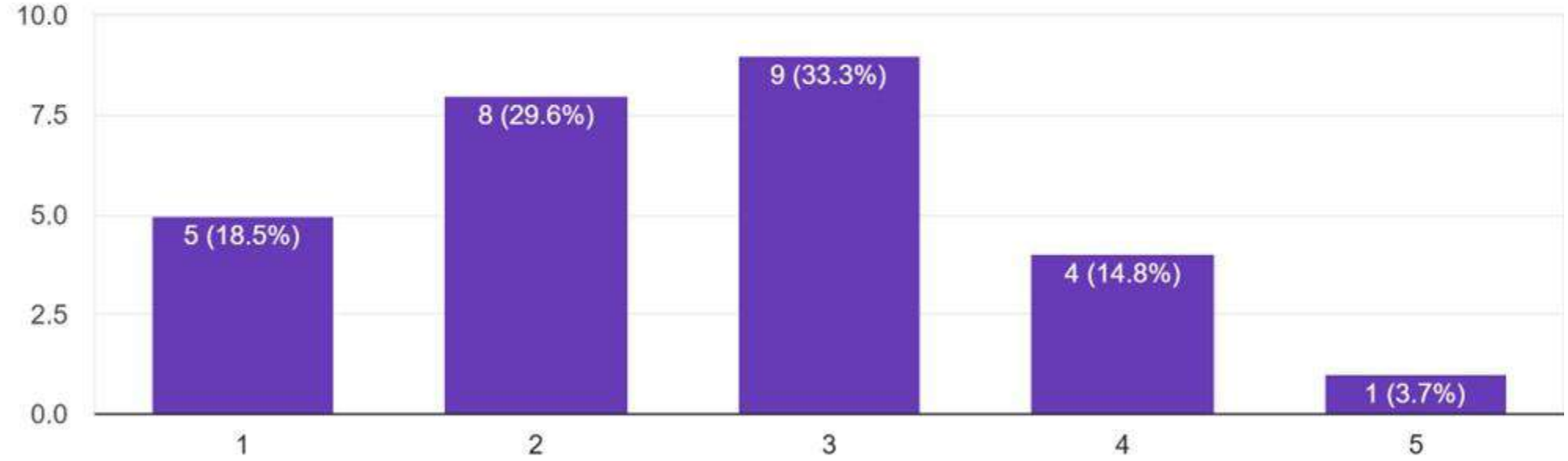
27 responses



Students' feedback

9. I sometimes feel uncertain about my control over mathematical modelling tasks.

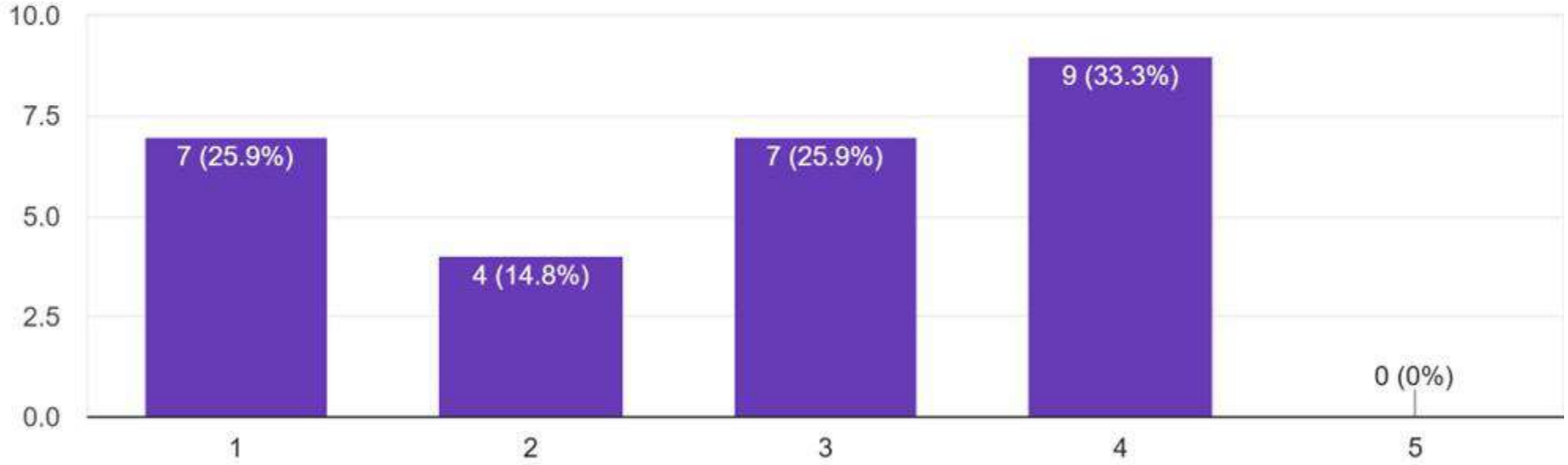
27 responses



Students' feedback

10. I sometimes engage in behaviors that hinder my progress when working on mathematical modelling projects.

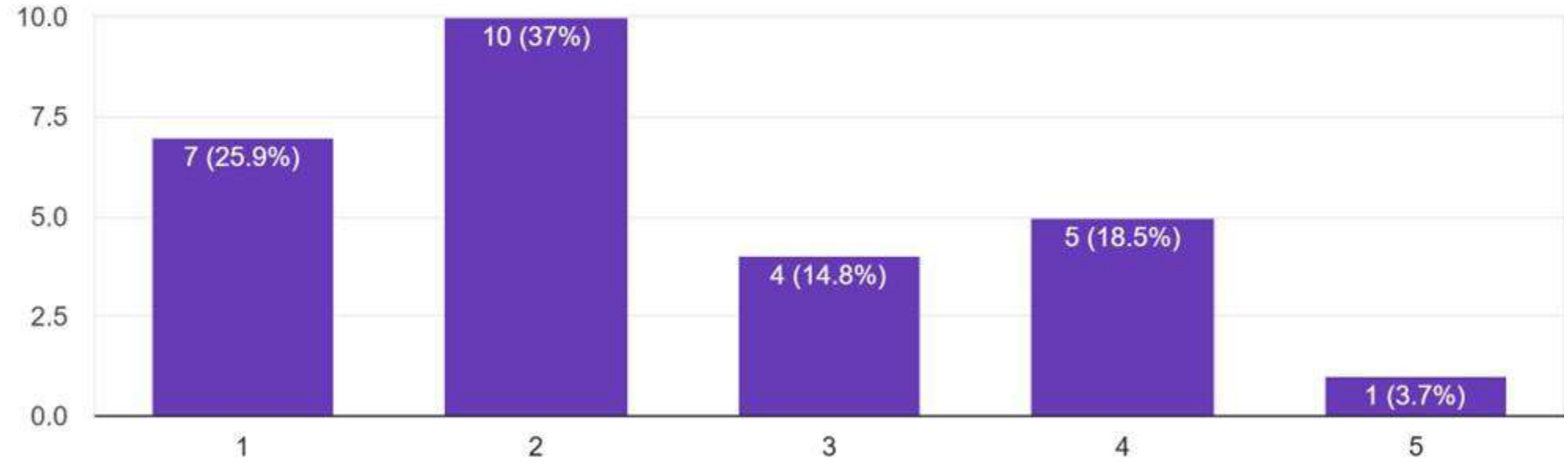
27 responses



Students' feedback

11. I sometimes disengage or lose interest when working on mathematical modeling tasks.

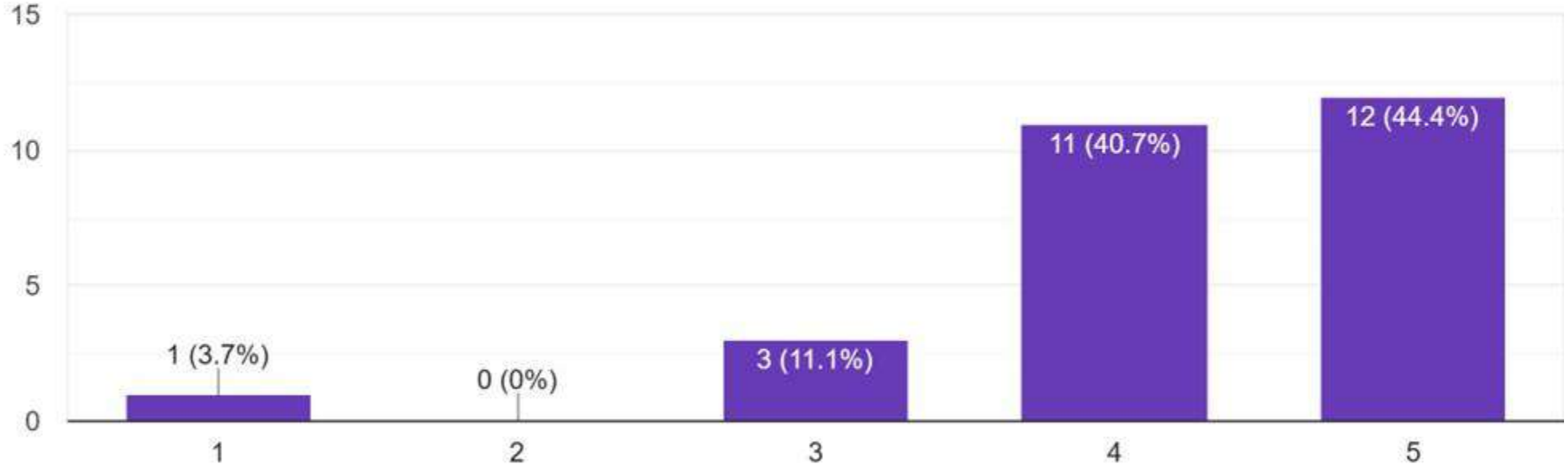
27 responses



Students' feedback

12. Compared to a typical math lesson, I find mathematical modelling lessons more engaging.

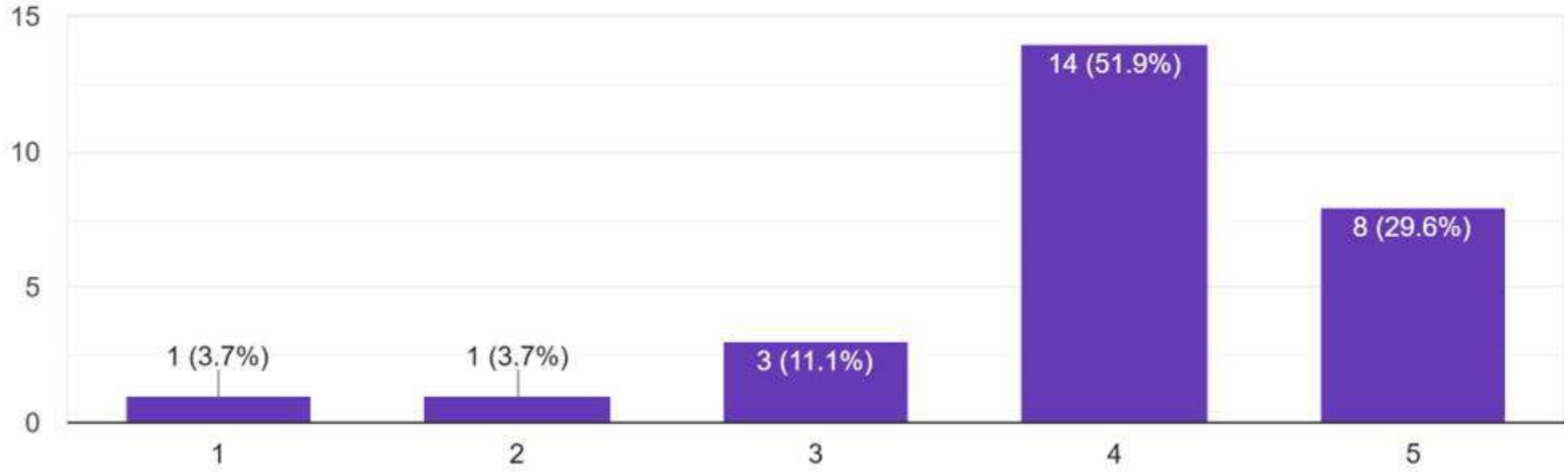
27 responses



Students' feedback

13. I feel more motivated to learn when working on mathematical modelling tasks compared to traditional math lessons.

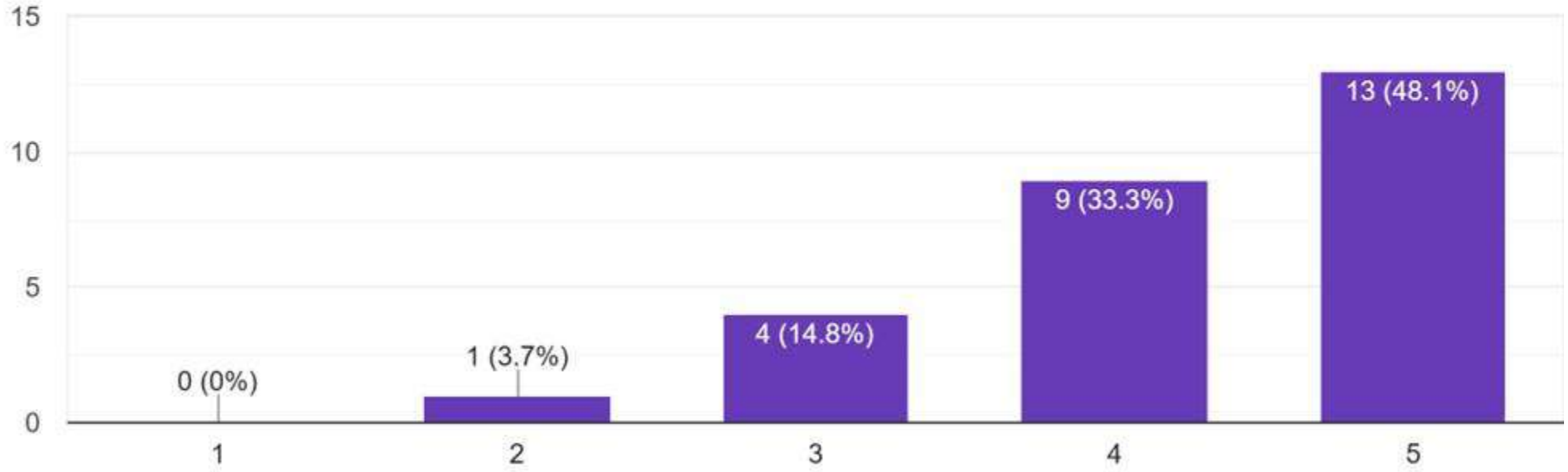
27 responses



Students' feedback

14. I find that mathematics is more connected to real-life situations and practical when engaging in mathematical modelling tasks, in comparison to solving regular math textbook questions.

27 responses



Students' feedback

15. How did the car parking problem mathematical modelling activity differ from a typical math lesson for you?

You need to make it work in real life	More real-life situation
It is fun	The car parking problem is more intresting
It does not need to calculate to much math	The car parking problem made maths more interesting than just reading from the textbook.
more intresting and fun	It involved more problem solving
It let me think about real life problems	It is a bit more challenging as it has a more personal answer
Understand real life problems	We have to make assumption
I need to think harder and is a lot more difficult	more interesting and fun
It was fun	It is more related to real life.
We learned about more enhanced topics.	It is more related to real life
It was harder	We can make assumptions and solve problems physically
I could work with my classmates than working alone	More interesting, easier to understand and motivating
You can group work in math modelling	We could have multiple times to test and try
it can let me use critical thinking and asumptions	We worked in groups
We had to find a solution then carry it out and then if we fail we have to restart	

Students' feedback

16. After the lessons, what did you learn from the car parking problem mathematical modelling activity?

You need to devise a plan before trying it	There are many variables in real-life
We have to concentrate on what we do	Area and perimeter
Car parking is very complicated	I learned that we cannot jump to conclusion without any facts
planning	You have to do it very carefully to solve the problem.
How to make the most of a space	I learned not to give up and think out of the box
Need to leave some space for the school bus to go out	Make assumption
Our school campus is actually not big and needs time to figure out how to park buses in it	planning
I learnt to sort models	I learnt that many things in math is related to real life.
I learned about problem solving cycles.	I learn that real life situation is more complicate
Improving my assumption	I learnt that there is not just one perspective when solving a problem
Area and perimeter	Maths problems really do happen in real life and designing skills
That math could be used in real life	I learnt that selfworking is sometimes better than working in a group.
math is really important in daily life	Makeing assumptions
Many different situations in real life require mathematics problem solving.	

Students' feedback

17. In what ways did working in a group enhance your understanding of mathematical modelling?

Real life situation thinking	It was much easier to work in a group rather than alone
Using a powerpoint	More statements/variables
We work together	Teamwork
more fun	To work together and cooperate with each other
My teammates helped together	We worked together to solve the problem.
Teamwork	It made us share our own opinions instead of doing it all by myself
I can communicate and imteract to solve different problems	Searching online
So we can find different solutions and work together	more fun
In in-depth knowledge.	We have different ideas of placing school buses.
Working together to solve problem	In a group,other pupil can help me.
Teamwork	We can work together to find the solution
Listening to groupmates ideas	By checking if everyone understands with asking related questions
we can divide the problem and do the smaller tasks first induvidualy	None. I did all the work.
	Teamwork

Students' feedback

18. Reflect on a moment during the activity when you felt particularly inspired and motivated.

Putting the cars correctly	The group worked very hard
When we found out the number of school buses that can be parked	Cauculating the how many bus can put in the parking area
When we were doing the presentation	The moment when the teacher said that we were going to do a presentation
presentation	When we could use the many pieces of paper to Simulate the buses. And the. Parking. Space.
When i found the answer	When we were doing the presentation
When i found that i can put more school buses	Present
I felt motivated when i was doing the pix formula	presentation
When finding solutions	When placing the school buses.
When it was time to present Padlets.	When other classmate ask us question.
When I solved the problem	Checking the answer
When we were forming places for the buses	The moment when we could fit the school buses in, I was particularly interested
When we are almost done	When we cooperated and tested the parking spaces
when we found a way to let the school bus out	Placing the scool buses
Working with my group	

Students' feedback

19. Which part of the mathematical modelling activity you found the most challenging?

Make it leave orderly	Real-life variables
When we calculate the safety problem	Presentation
Putting the bus in to the picture	How to calculate the answer
caculating the area	Finding the most mumber of buses that can fit
Planning where the cars would go	Plan the whole project
Leaving space for the school buses	Every thing
Solving the proplems	caculating area
How to fit all the buses	When placing the school buses.
Trying to fit as many as possible school bses into the small area.	Finding the solution
Making and understanding the model	Finding the final answer
Cauculating the total space for buses	The part when we have to measure the areas and fit the school buses in
Almost everything	Making everything by myself, expecially the powerpoint, padlet, and the script.
placing the bus in a free way	Sharing the results
Creating a plan to solve the problem	

Students' feedback

20. Which part of the mathematical modelling activity you enjoyed the most?

Build the mathmatical model	Presenting
The searching part	Putting the bus
The group work	Presentation
presentation	When we could use the many pieces of paper to Simulate the buses. And the. Parking. Space.
Putting the orange things on the grids	When we were putting buses on the map and when the whole group is drawing dots on the map just to find the area of the parkable place
Precentation	Assuming
During the time we had to plan how to park the buses	presentation
When we were doing the presentation	When placing the school buses and sharing ideas.
The presentation to the class.	The presentation
Working as a group	Presenting
Working together	When we present our solution to the class and teachers
Everything	I did all the work and i enjoyed it all.
I enjoyed wirking with friends	Placing the school buses
Carrying out the solution	

Teacher's reflection

- A critical challenge: how to make situations simple through assumptions and represent them mathematically and how to revise and read their results.
- Professional training in modelling expertise and instruction of modelling skills.
- Being able to refer to day-to-day practical applications, especially those more directly related to the everyday experiences of the students, can increase the motivation of students.
- Teachers' ability to create model-eliciting tasks that utilize this skill effectively.