F1 in Schools

v1 F1 in Schools MINI PROJECT

TEACHER'S NOTES

F1 in Schools

Help and guidance may be found by exploring F1 in Schools Primary Class Guidebook or the Denford Primary STEM Project on line resources. Both available FOC online.

To view 'What is F1in Schools?' Video CLICK HERE

To view F1 in Schools Videos: CLICK HERE and HERE

To view F1 in Schools Primary STEM Project Video: CLICK HERE

To view F1 in Schools Primary Class Guidebook: CLICK HERE

To view Denford Primary STEM Project Resources: CLICK HERE

INTRODUCTION

Welcome to the world of F1 in Schools!

Help your students to enjoy dipping their toes into the world of F1 in Schools by building their own mini F1 team and racing their way to victory.

Using STEM (**S**cience, **T**echnology, **E**ngineering, **M**athematics) subjects, teams will follow the process of Research –Design –Analyse –Make –Test –Race to compete with their own miniature F1 cars.

The students work in groups of 4, each taking on a different responsibility within the team, exploring activities such as design, testing, manufacturing, marketing, promotion and finance–basically, all the essential roles in a real F1 team.

The challenge: Identify specific roles for each team member, then work collaboratively as a team to create the following items:

A team brand, logo and identity
Team uniform (apparel)
An aerodynamic F1 in Schools race car
A budget and team sponsorship presentation

Students will:
Each team will be given 100 PITCOIN (**PC)** to start their adventure. This will not be sufficient to complete the project. By giving teams the opportunity to present their team to potential sponsors they could earn vital PITCOIN to put towards the cost of manufacturing their car and producing team uniforms.

At the end of this Mini Project, the students will race their cars against the other teams to find out who has designed and manufactured the fastest car.

There should be **awards** and **prizes** on offer to recognise the teams' hard work. Every team member should contribute equally to ensure that the team as a whole performs at its best!

F1 in Schools should be fun and is a great way to build social skills and self-confidence. The most effective teams are the ones who help each other achieve their joint goals.

Using the Teacher's Notes and the Student Workbook will help you and your students navigate through the process of designing and racing a miniature F1 style racing car.

..... so welcome to **F1 in Schools!** Have fun finding your passion, we'll see you at the track...

SESSION PLANNING

The Mini Project is broken down into a series of sessions, each containing specific learning objectives, to ensure each team is in a position to race their finished car at the end of the course.

Sessions start off with all teams working together as a group to help group bonding and encourage teamwork, before each team member takes on individual responsibilities and is encouraged to work independently on their own tasks, finally, coming back together as a team towards the end of the course.

All teams will take part in a celebration race event to complete the course, with prizes awarded to recognise the teams' various achievements throughout the course.

Downloadable, Student Workbooks are available to accompany this course, offering a place for teams to find the information they need to support their learning and record their journey. These are suitable to be printed out either A3 or A4.

It is a good idea to keep the workbook loose pages clipped together until the Mini Project is completed, allowing extra sheets to be added if necessary and individual pages to be easily worked on by individual students.

Alternatively, worksheets, included at the back of these Teacher's Notes which can be printed out to support each session.

OPTION 1 requires a Project Starter Pack, an Air Launch System with Pump and a 10m Roll-Out Track.

OPTION 2 requires a Project Starter Pack, F1 Race System Package with 24m Roll-Out Race Track. The cars are powered by 4gm compressed gas cartridges.

All equipment can all be purchased from the Denford Webshop:
https://denfordwebshop.com/

Additional materials needed, may include:

colouring materials
(felt tipped pens, crayons, paint etc.)
thin card
plain white T shirts
plain baseball caps
glue
sticky tape
sticker sheets
oil based modeling clay eg. plasticine
drinking straws
chalk spray paint

SESSION 1
TEAMWORK

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
1 (ALL)	What is F1 in Schools?	Play F1 in Schools video Understand the competition structure and opportunities on offer. Read the F1 in Schools Mini Project introduction and design brief to understand the challenge set over the duration of the project. Summarise F1 in Schools and what they think they will need to make a successful team
	Form the team	Who does what in an F1 team? Introduce different job roles. What roles are necessary in an F1 in Schools team? Discuss who in each team is suitable for these roles. For example: Team manager – how will they keep the team on track? What are the deadlines / targets to work to? Generate responsibilities for all team members – what does everyone need to work on?
	Name the team	Create a suitable team name. What's in a name? Discuss words that you can use to create a suitable team name. Decide on a team name for the project, discuss what will make the team appear focussed, professional and attractive to potential partners and sponsors. Introduce a team and structure to each group – who is taking each role?
	RESOURCES REQUIRED	What is F1 in Schools? Video F1 in Schools Mini Project Design Brief A2 paper / felt tips for team name ideas

CLASS GROUP

- Start the session by showing the whole class a video of the F1 in Schools competition (links to appropriate videos are included at the front of this document and in the Student Workbook PowerPoint).
- Discuss what they have seen. Explain the rules and regulations and parameters that the students can work within.
- Discuss the introduction page. Divide students into teams of 3 or 4.
- Distribute one Student Workbook to each team or a printed copy of the design brief and team roles sheet. Alternatively use the PowerPoint to display information.
- As a whole class, discuss working as a team and what makes good teamwork

TEAM

- Complete '**WORKING AS A TEAM**' worksheet and then fill in the '**TEAMWORK**' sheet.
- Roles should be decide within the team, with each student putting forward their role preference and why they feel that they are suitable for the particular role. Teams should democratically decide who is the best person for each job.
- Fill in the '**MEET THE TEAM**' sheet.
- Once team roles have been decided, students need to generate ideas for a team name. The '**BRAINSTORMING & MIND MAPS**' exercise is a good starting point.
- Introduce the '**TASK LOG**' and encourage the team to generate tasks to be added to the task log. Use the task log to fill in tasks that need to be completed, who will be responsible for completing the tasks and ticked off once completed.

SESSION 2
AERODYNAMICS

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
2 (ALL)	Research	What makes a fast object? Understanding how to influence acceleration using aerodynamics. Make a paper aeroplane using a single piece of A4 paper and no additional fixings. Nominate a pilot per team, fly the planes and work out which ones are the most efficient and why. Understand how the F1 in Schools equipment works. See demonstration of equipment and sample car, discuss what factors are controlled and which can be influenced.
		Research how different objects are designed to travel fast. Produce a research poster explaining the science of speed, focussing on the three principles of aerodynamics: thrust, drag and lift. Present research to group, focus on describing which objects the team will look to use as inspiration for their designs and why.
	RESOURCES REQUIRED	A4 paper for aeroplane challenge F1 in Schools 24m Roll-Out Race Track and Race System / example F1 branded cars for racing demonstration / 4gm compressed gas canisters Or 10m Roll-Out Race Track with the Air Launch System and Pump / sample cars A2 paper / felt tips for research poster

CLASS GROUP

- Look at speed and what techniques can be used to maximise speed. Look at land and sea animals, birds, vehicles and other things designed to move fast. What characteristics are common to all these things?

- Use the aeroplane challenge to demonstrate and reinforce the principles of aerodynamics.

- Demonstrate the race equipment for either **OPTION 1** or **OPTION 2** using a car chassis. As a class discuss the shape of the chassis and what could be done to improve its aerodynamic qualities.

TEAMS

- Teams should be given time to research aerodynamics and objects and animals that use aerodynamics to their advantage, starting with brainstorming. Based upon this research each team should produce a poster explaining the science of speed.

- Each team should then present their findings to the rest of the class.

SESSION 3
3D SKETCHING

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
3 (ALL)	Sketching basics	Back-to-back challenge (one student explains a shape, the other draws what they hear) Learn about basic 3D isometric drawing. Watch IsoSketch video, sketch a perfect cube Learn how to draw in isometric 3D and produce a series of drawings. Use IsoSketch to draw a basic 3D dice / toaster / mug / bird box using the tutorial videos. Create an F1 shape design in 3D. Use an F1 in Schools chassis template to sketch an F1-style car using IsoSketch and/or freehand skills. Speed cube race – use IsoSketch to draw a cube in the fastest possible time
	RESOURCES REQUIRED	A4 paper / pencils for starter A3 paper / IsoSketch 3D drawing tools / pencils / rubbers for sketching activity IsoSketch video tutorials (DrawingToolCo YouTube channel) F1 in Schools chassis template (A4) **NOTE: If you have not purchased IsoSketch 3D Drawing Tools, this lesson could be taught using isometric drawing paper.** *Isometric drawing paper can be downloaded or purchased online.

PAIRS

- **'BACK TO BACK CHALLENGE'**: students face away from each other and take it in turns to describe an everyday object whilst their partner draws it, blind. A selection of everyday objects could be used, or alternatively printed out visual prompt cards (see '**PRINTABLE RESOURCES**' section at the back of this booklet). The student describing the item must not say what the object is or what it does, but should break it down into its component shapes. This task will encourage students to focus on the shapes that are used to construct a 3 dimensional object.

CLASS GROUP

- Discuss the differences between 2 dimensional and 3 dimensional shapes.
- Watch Youtube Video introducing IsoSketch and follow tutorial on how to draw a dice. https://thedtco.com/videos.html#/
  (or demonstrate how to use isometric drawing paper if IsoSketch is not available).
- Students should individually follow instructions to draw a cube. This can be embellished using shading and/or spots to make a die.

TEAMS

- Using the chassis template as a guide to build on, sketch initial designs for a racing car -either using IsoSketch or freehand.

SESSION 4
MARKETING

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
4 (ALL)	Business plan/ Sponsorship	Upsell a standard classroom object (e.g. a pencil, paper recycling bin etc). Decide budget and deadlines. Create required budget for project – what do we need? Discuss with all team members and complete order form. Discuss and generate ROI (return on investment) proposal for potential sponsors. Write introductory pitch to deliver to potential sponsors. Create tiered chart for different levels of support. Upsell your own team brand to the group
	Graphics (BRAND)	Logo sample recognition quiz. Design a team logo and uniform. Create several options for the team logo and share these with the team for feedback. Apply chosen design to a uniform template. Generate car graphics to match the other branding elements, thinking about how these will be produced and applied to the final product. Reflect: what does your name / logo say about you?
	Iterative design (DESIGN)	Rapid sketching warm up – 3D shapes / cubes in a minute Create at least 3 different concepts for the design of the car. Create designs for the car in isometric, showing the evolution of a basic idea. Model designs using basic modelling materials. Use chassis forms to model aerodynamic body shape using plasticine and adding card wings. Review ideas according to research and photograph all solutions. Evaluate and choose preferred option(s) to take to next stage
	Material Investigation (ENGINEER)	Assemble the standard chassis net using instructions provided. Create the rolling chassis. Add the axles / axle bushes / wheels / propulsion tube and tether guides to the chassis. Test the alignment of the axles and fitment of the wheels on a smooth, flat surface. Review performance of chassis and make any changes to the setup.
	RESOURCES REQUIRED	Team baseball cap and/or T-shirt template (A4) Component order form (A4) Stationery / A4/A3 paper for generating ideas Standard chassis kit

TEAMS

- '**UPSELL A CLASSROOM OBJECT**'. Display a collection of objects found around the classroom. Teams should select an object and attempt to 'upsell' it to the rest of the class. The students should use positive language and try to be as persuasive as possible. ('**THE PITCH**' sheets in the workbook or on the PowerPoint can offer tips for this).
- Teams can vote for the most persuasive pitch
- After researching succesful branding, student should work together as a team to develop team branding and a team logo.
- Re-cap 3D drawing skills by each student quickly drawing a cube.
- Assemble a complete standard chassis.
- Use an oil based modelling clay to mould shapes that would improve the aerodynamics of the basic chassis shape and sketch out these ideas.

SESSION 5
SPONSORSHIP PITCH

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
5 (ALL)	The Pitch	Speak clearly from the opposite side of the room. Gain sponsorship in the form of manufacturing materials and stickers to apply to the car livery. Present the team, members designs and sponsorship opportunities to potential sponsors. Offer logo placement options, ROI opportunities, speak clearly and convincingly. Review pitches and award sponsorship where appropriate (options – various colours of card for manufacturing, sheets for producing transfers or stickers etc.)
	RESOURCES REQUIRED	Sticker sheets Drawing materials

CLASS GROUP

- Allow each team the opportumity to earn extra PITCOIN (**PC)** by pitching for sponsorship. Introduce the session by watching an episode of '**Dragons Den**' or similar programme.

TEAMS

- Teams should be given time to prepare and then given an opportunity to pitch for sponsorship to earn extra PITCOIN to spend on their car construction and uniform. Teams must present a sales and marketing pitch. This should be approximately 5 minutes. Every team member must contribute.
- If possible, someone unfamiliar to the student could act as a potential sponsor.'The Dragons' should have PITCOIN to buy sponsorship from the teams. Alternatively, familiar big brand companies or fictional companies could be used to pitch to.

SESSION 6
TEAM IDENTITY

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
6 (ALL)	Budget	Review sponsorship gained and calculate final project cost Produce a budget summary. Create a full team budget summary sheet, using the order form to work out how many PITCOIN the team has spent, how much they raised and how much they have remaining. Discuss what the team would spend any additional funds on, or how they could raise more.
	Uniform (BRAND)	Team uniform recognition quiz Produce the team uniform (apparel) for race day. Apply team logo, sponsor logos and graphic elements to white team baseball cap using fabric pens and/ or use transfer paper to add logos to a T-shirt. Review completed uniform with the team, focus on quality control and brand exposure
	Present (DESIGN)	Match the car to the team brand quiz Create ideas for car livery in 2D. Translate onto the body components, working with the Engineering Team to complete components when they are ready. Review completed car with the team, focus on quality control and brand exposure
	Manufacturing (ENGINEER)	Top 5: What makes a high-quality finished product? Manufacture the car body using card. Using basic modelling materials, create the body of your final design. Order any additional materials required through the finance department. Quality check: is the product in need of alteration / finessing? Make checklist of areas to finish / improve
	RESOURCES REQUIRED	Budget Summary sheets White team baseball caps or T-shirts/ fabric pens Transfer paper. Car livery design template sheets A4 card sheets

CLASS GROUP

- Recap on previous lesson and review budget summary sheet.

TEAMS

- Complete, buget summary sheet.
- Design team apparel and apply designs to either a baseball cap, a T-shirt or both. (alternatively illustrate ideas using templates supplied.)
- Design and make a body shell to cover the chassis and apply livery and logos to car design, stressing the importance of the quality of the finish.

SESSION 7
TESTING

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
OPTIONAL LESSON 7 (ALL)	Smoke tunnel testing	Smoke tunnel demonstration - explain what to look for, what causes vortices and how to overcome turbulence. Test the car using a smoke tunnel. Run visual smoke test with team's car and discuss possible improvements to the design. As a team, agree what changes (if any) will be made to the design.
	Aerodynamic developments	Develop design using smoke tunnel testing research. Use feedback to make any changes needed to the design before submitting to Parc Ferme. Take votes from all teams as to which car they think will perform best on track and why.
	RESOURCES REQUIRED	Denford Air Visualisation Tunnel Air Trace Smoke Generator

CLASS

- Set up the Denford Air Visualisation Tunnel according to manufacturer's instructions.
- Demonstrate a visual smoke test using a sample car chassis or a team's car.
- Discuss as a class where improvements could be made to the aerodynamic performance of the chassis/car.
- The Denford Air Trace Smoke Generator will produce a steady stream of smoke-like vapour so that you can clearly see the air flow pattern.

TEAMS

- should be given the opportunity to test their own car and decide what improvements could be made.

If a wind tunnel is not available, videos can be found on line which demonstrate how a smoke tunnel works and how it is used in the motorsport industry to improve a car's performance.

Instruction on how to make a simple smoke tunnel can be found on line, using easily accessible materials.

SESSION 8
LET'S RACE

Session	Learning outcomes	Outline description: Starter / Objective / Main activity / Plenary
8 (ALL)	Racing	Welcome the teams, play F1 music and reveal the track. Teams race their cars head-to-head over 2 rounds of racing. Race cars once in each lane, head-to-head recording the result of each pair. Race results (win/lose) are added to a tally chart. If there is a tie at the end of racing, teams race against each other in sudden death format, with ultimate winner recorded. Top three calculated using either race results or sudden death competitors. Drivers set a reaction time. Teams nominate a driver to set a reaction time using the online system, their best of 4 attempts is added to a separate leader board, this is kept out of sight to keep suspense. Prize-giving. Reaction time (driver) podium, Race win (team) podium. Team brand award, Sponsorship pitch award, Car design award, Finance award (most CREDITS left)
	RESOURCES REQUIRED	F1 in Schools Roll-Out Race Track and Race System / 4gm Compressed Gas Cartridges or 10m Roll-Out Race Track and Air Launch System, Reaction timer (online system – project onto board) Prizes

RACE DAY SET UP

On Race Day, each team should prepare the following:

- A Portfolio of work containing design developments, test chassis and development of bodyshell and all research.
- A Table Top display of all that they have learned over the project. This could include the team's portfolio, posters, photographs, examples of team logo and team uniform etc.

BEFORE RACING BEGINS

- All cars should be submitted to parc fermé before the race. Here they should be scrutinized to ensure that they meet the guidelines and comply with the rules.
- Set up the race track and launch system
- You may wish to consider using a video recorder or a mobile phone to record the finish line. Some races may need a photo finish. Use a chart, whiteboard or digital screen to record results.

RACING

Each team should race every other team, head to head and keep a tally of the wins. Teams can also be awarded points for their portfolio, table top 'pit display' and team identity. By adding all these points together, an overall winning team can be decided. There can also be awards for best portfolio, best marketing pitch, best team identity, fastest car etc.

POST RACE

When the races are complete, hold an Awards Ceremony and a debrief, followed by a project evaluation.

PRINTABLE RESOURCES

WORKING AS A TEAM

To successfully compete in the F1 in Schools Mini Project you will need to work together as a team.

What qualities are important for good teamwork?
Try to think of 5 qualities which are important when working as a team.
Why are they important? List them below and explain why?

1

2

3

4

5

MEET THE TEAM

Decide on roles within your team and fill in the grid.

Say what qualities make you the right person for the job.

You could even add a picture of yourselves.

TEAM MANAGER

.....

MANUFACTURING ENGINEER

.....

DESIGN ENGINEER

.....

GRAPHIC DESIGNER

.....

.....

DESIGN BRIEF

Your task is to make, test and race a miniature F1® racing car made from card, which will race down the F1 in Schools 24m Roll-Out Race Track, powered by a compressed gas Power Pack.
Or your car will be raced down the 10m Roll-Out Race Track using the Air Launch System and Pump.
Working as a team you must use a range of techniques to show design work, including freehand 3D sketches and card modelling skills.

TEAM ROLES:

TEAM MANAGER: The Team Manager will work closely with all members of the team, helping out where needed and keeping the team on track.

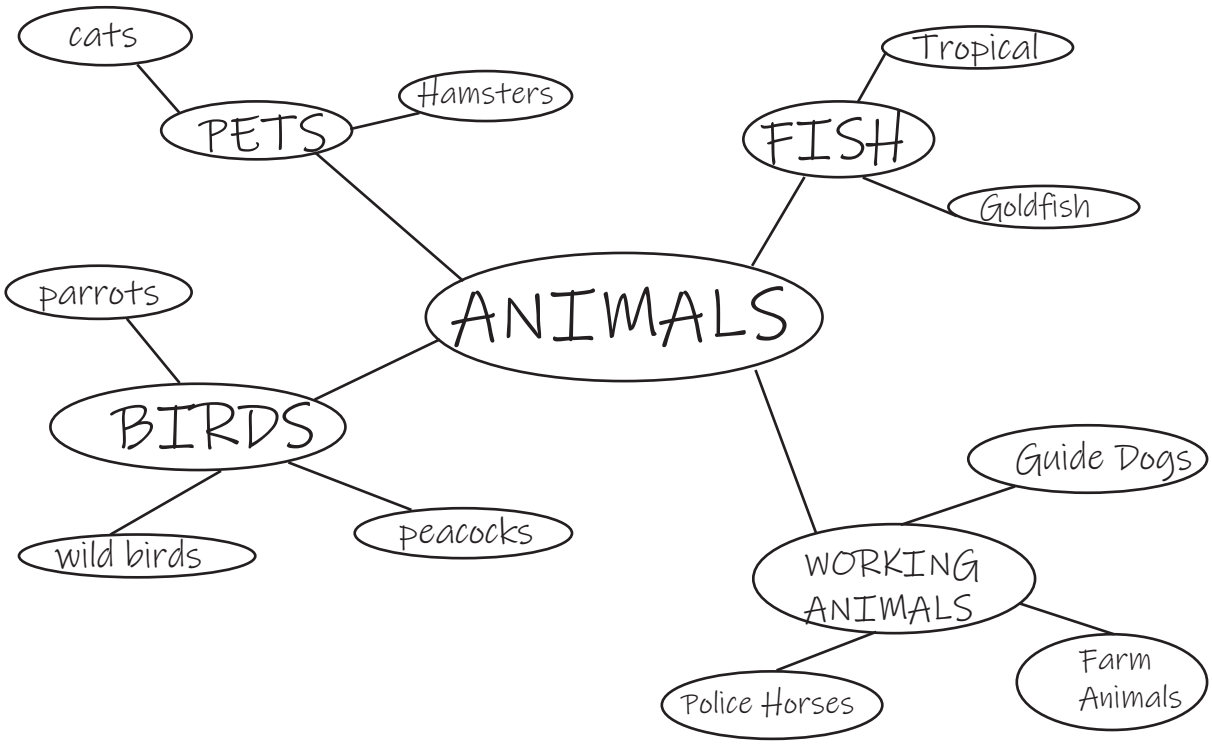
MANUFACTURING ENGINEER: The Manufacturing Engineer is responsible for making the car, based on the ideas of the Design Engineer.

DESIGN ENGINEER: The Design Engineer is responsible for designing an aerodynamic body shell for the car. The Design Engineer will need to discuss ideas with the Manufacturing Engineer to make sure that their ideas are possible.

GRAPHIC DESIGNER: The Graphic Designer is responsible for how the car looks and will oversee the design of the team's logo and uniform.

BRAINSTORMING & MIND MAPS

Brainstorming is a group discussion to produce ideas or to solve problems. A good place to start is by creating a mind map. Mind maps are a way to explore a topic or idea. Start with a mind map heading. Write this in the middle of a piece of paper. Think of everything you can about the subject. You can go wild! Keep adding to the map until you have exhausted your ideas. Working this way can help you to generate new ideas.



The mind map above explores the title 'Animals'.

Using a suitable title as a starting point create a mind map exploring a topic that will help generate ideas for a team name.

Starting points to consider:

SPEED **MOVEMENT** **FORMULA 1** **AERODYNAMIC** **TEAMWORK** **COLOURS**

TRANSPORT **MYTHOLOGY** **NATURE** **SCIENCE** **ELEMENTS** **SPACE**

.....or choose one of your own.

RULES & REGULATIONS

Overall body length - Min: 200mm / Max: 250mm
The total length, measured between the front and rear extremities of the car, including any styling features.

Overall body width - Max: 80mm
The overall body width at its widest part should not exceed 80mm.

Total car weight - Min: 40g
The minimum weight the complete car must be to race, including wheels, axles, stickers etc.

Car construction material -
Only card should be used to manufacture the car chassis, engine housing, body and wings.

Graphics -
To make your car easy to identify, some graphic (visual) elements should be clearly displayed on the car. These must include the team name / team logo.

Portfolio of work-
You must produce a 5-page (10 sides) Design & Engineering Portfolio. This should explain how you designed, tested and made your F1 in Schools racing car.
Your Design & Engineering Portfolio should contain evidence of the following:

- **Initial ideas** – including 3D freehand sketches
- **Design development** – including images of any models and testing
- **Team Graphic Identity** – including team name, logo and car livery (colour scheme and patterns)
- **Manufacturing** – including photos and descriptions of how you cut and assembled the parts of your race car
- **Testing** – showing / explaining how you tested your car, what you found out and what you then changed
- **Project Management** – who did what, how you planned your time and how you think it turned out (good and bad!)
  You may choose to include the following sections, which do NOT count towards your 5-page limit:
- **Budget Summary**-showing how much PITCOIN was spent on each part of the project and how the PITCOIN was aquired.

You may choose to include the following sections, which do NOT count towards your 5-page limit:

- **Decorative Front Cover**-This can be any design that you like but must include the team name and reflect the team identity.
- **Contents Page**

TASK LOG

SESSION	TASKS	DATE	TEAM MEMBER	COMPLETED
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2				
3				
4				

SESSION	TASKS	DATE	TEAM MEMBER	COMPLETED
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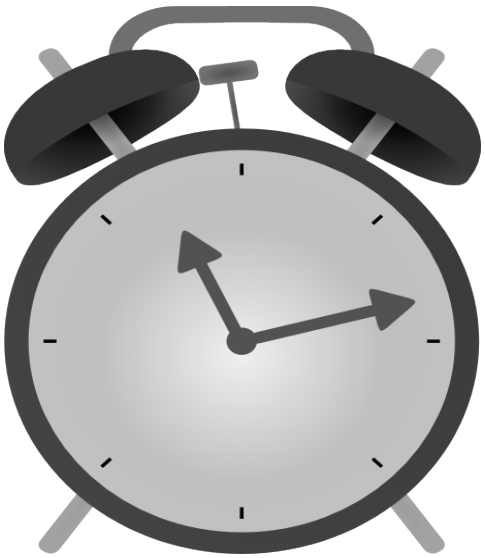

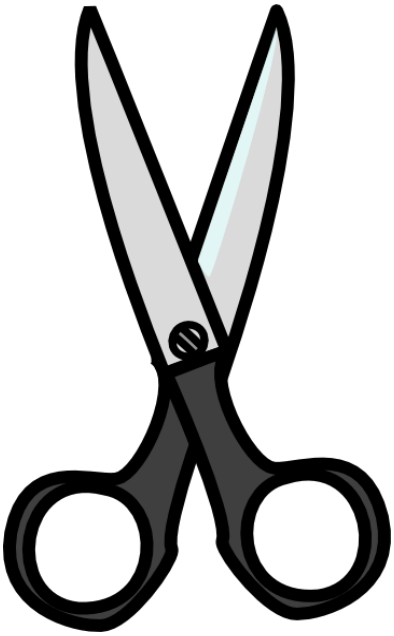

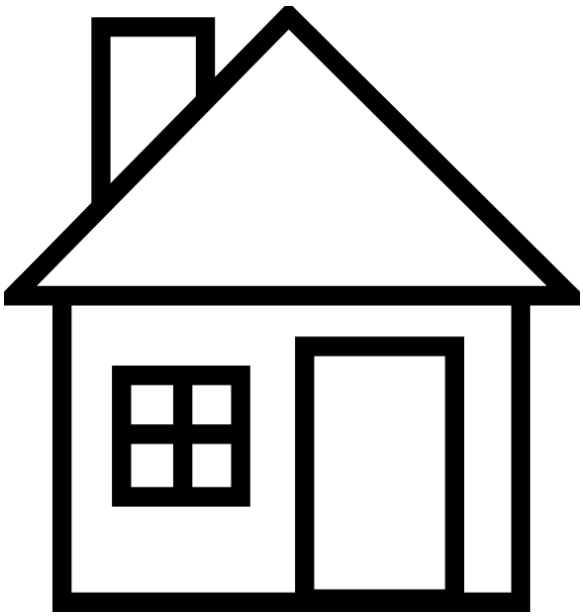

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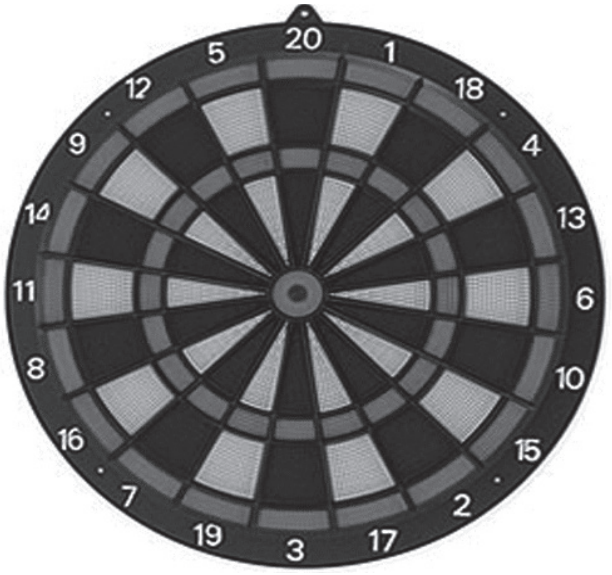
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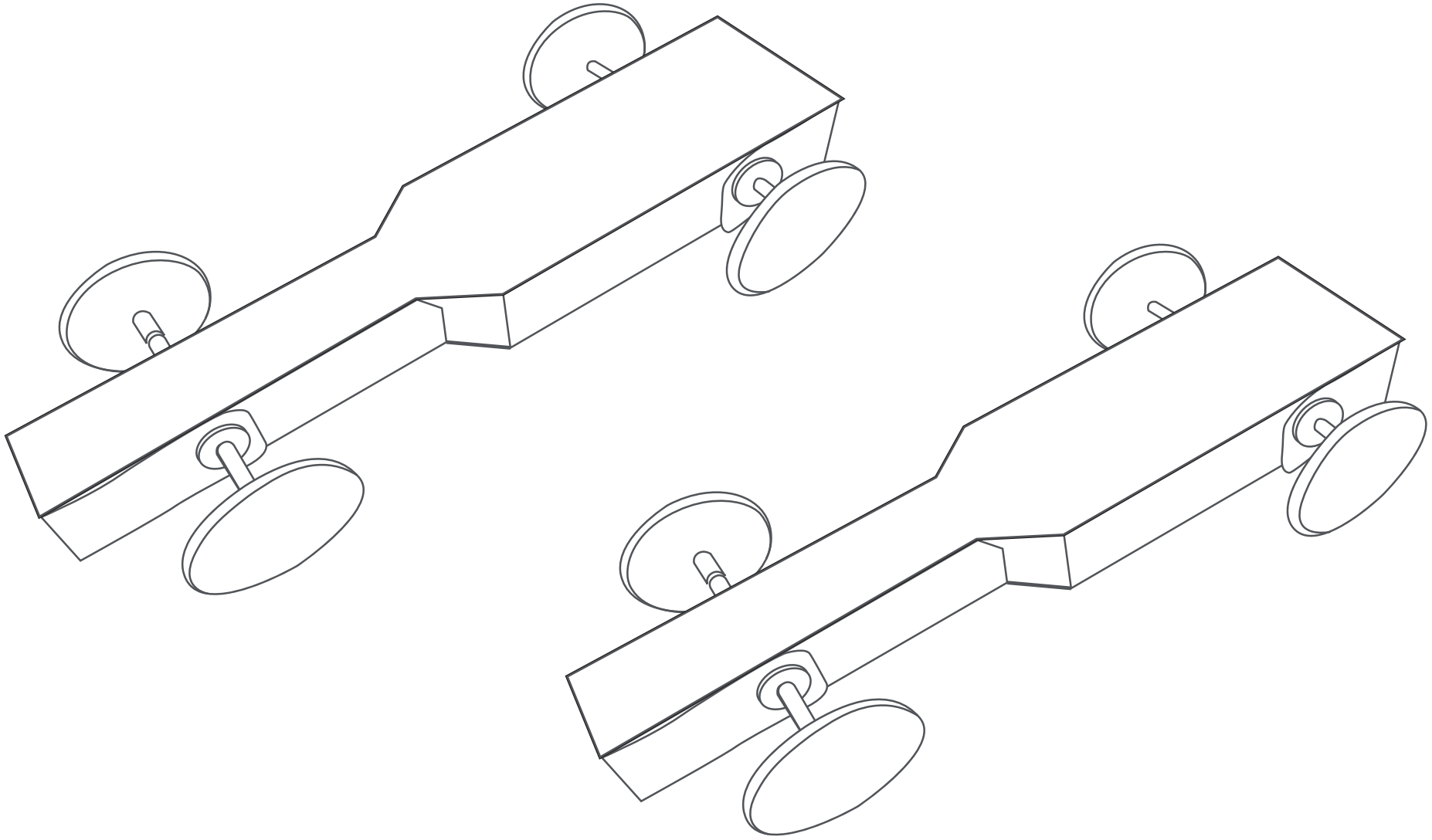
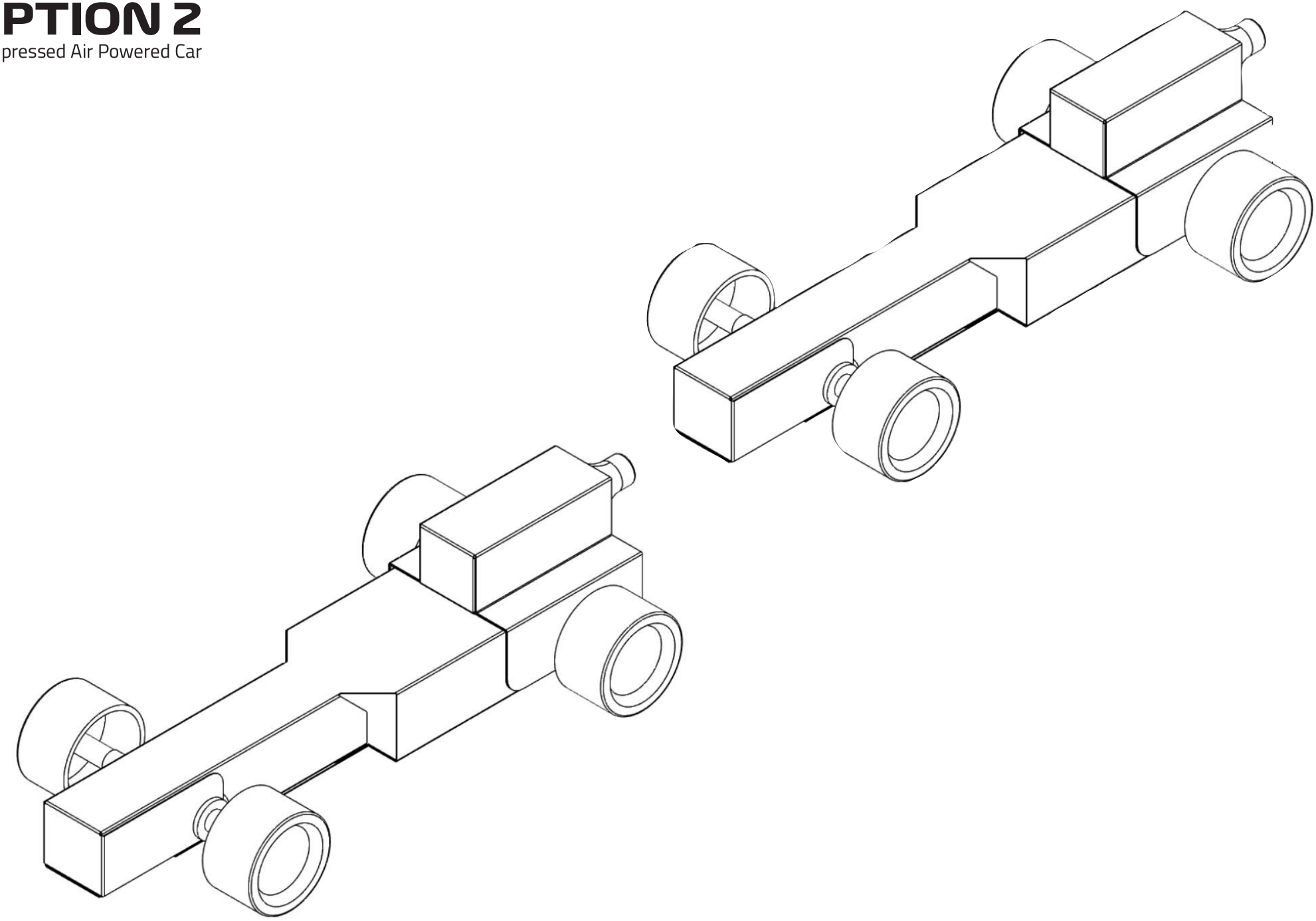
OPTION 1

Air Powered Car



OPTION 2

Compressed Air Powered Car



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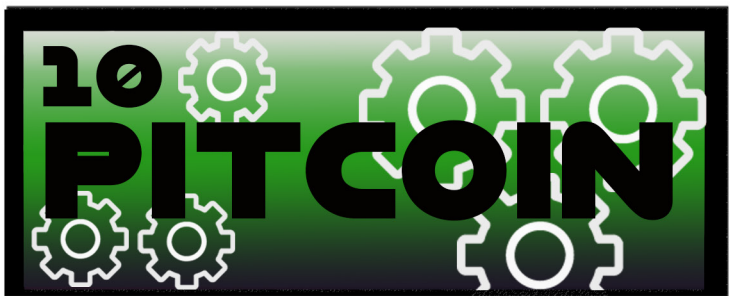
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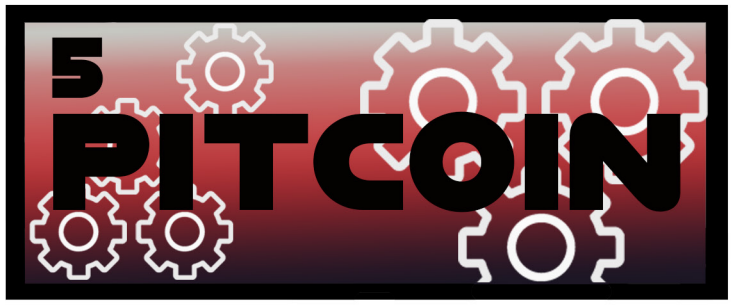
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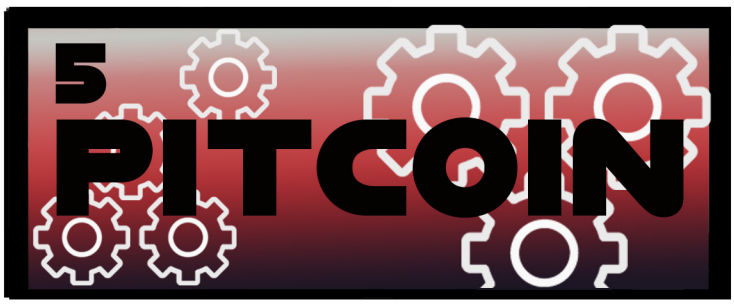
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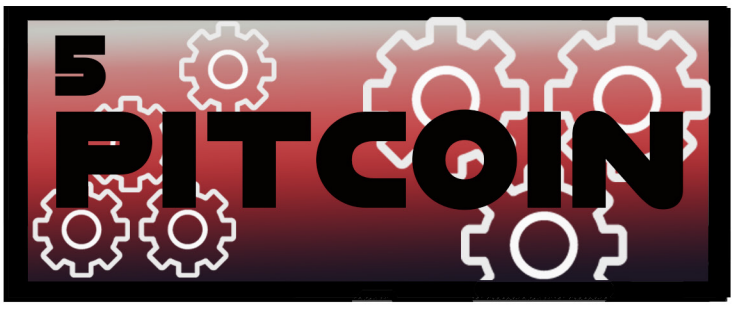
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PITCOIN

BUDGET SUMMARY

ITEMS	PITCOIN IN	PITCOIN OUT
TOTAL		

RACE DAY ASSESMENT SHEET

TEAM NAME		POINTS
RACE WINS	TALLY	
PORTFOLIO	COMMENTS	
TABLE TOP PIT DISPLAY	COMMENTS	
TEAM IDENTITY	COMMENTS	
	TOTAL	

RACE DAY ASSESMENT SHEET

TEAM NAME		POINTS
RACE WINS	TALLY	
PORTFOLIO	COMMENTS	
TABLE TOP PIT DISPLAY	COMMENTS	
TEAM IDENTITY	COMMENTS	
	TOTAL	