

MTH-4153

**Geometric representation in
a general context**

AGE RALLY



CSLSJ

Translation : Lester B Pearson School Board

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AGE Rally

You and another student from your Centre have been chosen to participate in the famous AGE Rally that will take place in Morocco in the Sahara Desert. This rally brings together all the Adult Education Centres from across Québec.

The rally consists of: a return trip in the desert that follows a route you will have drawn to scale ahead of time; choosing your vehicle in line with certain characteristics; and completing the journey within a given time period.

There is a wonderful prize to be had: winners will receive an all-expenses paid trip around the world and their future education will be entirely paid for.

This is the first time this rally is being held and everyone is looking forward to it. Below is some information that will be most helpful to you as you prepare for your trip.

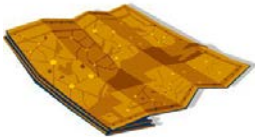
The rally starts and ends in Casablanca. Thus, you will have to pass through Checkpoint #4 on both your outbound and return journeys.

- ✓ Your outbound route must be different from your return route.
- ✓ The rally winners are the first to arrive back in Casablanca, safe and sound.
- ✓ The rally must take place over 2 days. All participants must make an overnight stop of a minimum of 6 hours. Thus, you must include the place where you will be sleeping on your itinerary. You can spend the night at any of the checkpoints where there are gas stations. All equipment needed to do this can be found on site.

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- ✓ The rally starts on Saturday at 6 a.m. and finishes, at the latest, on Sunday at 3 p.m. Those who miss this deadline will automatically be disqualified.
- ✓ There are several gas stations along the route. Thus, in the interest of safety, you are not required to carry extra gas with you. You can have a full tank of gas.
- ✓ You must choose your car from among 3 different models. Each has distinct characteristics. In calculating your time, take note of the average speed of each of the vehicles.
- ✓ You can choose between different routes, but remember that your time counts.

You depart in a week's time. Today, you are being given the map with the different routes, the checkpoints where you can refuel, as well as some measurements. It should be noted that you must follow the routes marked on the map so as to avoid any obstacles that might be found in the desert.



Your challenge starts now. It consists of choosing the route that you will follow on the big day. Bear in mind that the map you have been given is not to scale and that you are only allowed to use your calculator to calculate distances (round up your results to the nearest hundredth). No GPS this time around. That's no small feat!

Your route must be submitted to the director of the rally in advance. Thus, you must make several calculations before filling in the distances not included on the map before choosing what you think is the best route to take.

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Before leaving, you must hand in to the rally director:

- The model of car you have chosen.
- A plan, drawn to scale, of your chosen route.
- The name of the town where you will sleep.
- The total number of kilometers to be traveled.
- The amount of time needed to drive the route. You must include at least 6 hours for sleeping, and build in an extra 15% for unforeseen problems.

Once your work is finished, the rally director must be able to clearly understand your directions and all your calculations. Thus, your work must be well-organized.

Having read these instructions, can you describe in just one sentence the task that you must carry out before leaving the city?

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You have just been presented with several items of information. Before starting your work, we strongly suggest that you pull out all essential information, noting not only what is relevant, but also the constraints to be respected.



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Choice of 4x4 for the rally

Car A:



Fuel tank capacity: 70 litres
 Average fuel consumption: 26 l/100 km.
 Average speed of 70 km/h.

Don't forget, we are in the desert and the cars must be modified before venturing there. Consequently, you may find that some data does not necessarily represent what we would usually expect to see in everyday life.

Car B:



Fuel tank capacity: 64 litres.
 Average fuel consumption: 7,4 l/100 km.
 Average speed of 40 km/h.

Car C:



Fuel tank capacity: 51 litres.
 Average fuel consumption: 13,2 l/100 km.
 Average speed of 63 km/h.

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Helpful formulas for calculating your itinerary.**Sine Law**

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine Law

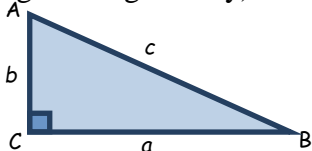
$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Distance between two points $\overline{AB} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ **Trigonometric ratios**

(Right triangles only)



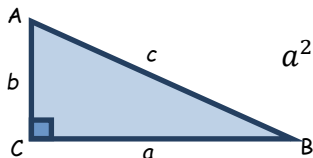
$$\sin A = \frac{\text{length of the side opposite to angle } A}{\text{length of the hypotenuse}} = \frac{a}{c}$$

$$\cos A = \frac{\text{length of the side adjacent to angle } A}{\text{length of the hypotenuse}} = \frac{b}{c}$$

$$\tan A = \frac{\text{length of the side opposite to angle } A}{\text{length of the side adjacent to angle } A} = \frac{a}{b}$$

Pythagorean theorem

In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the other sides.

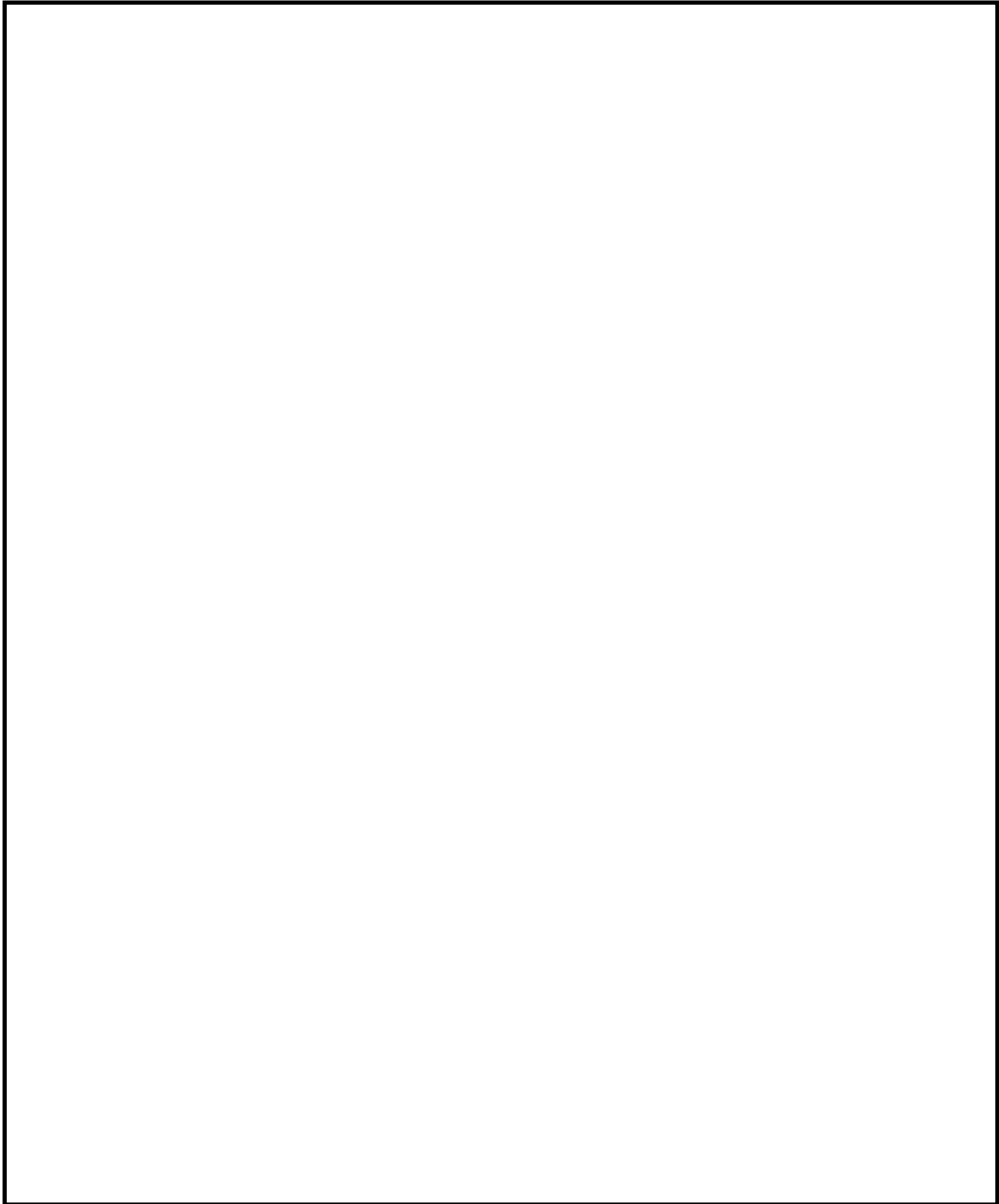


$$a^2 + b^2 = c^2$$

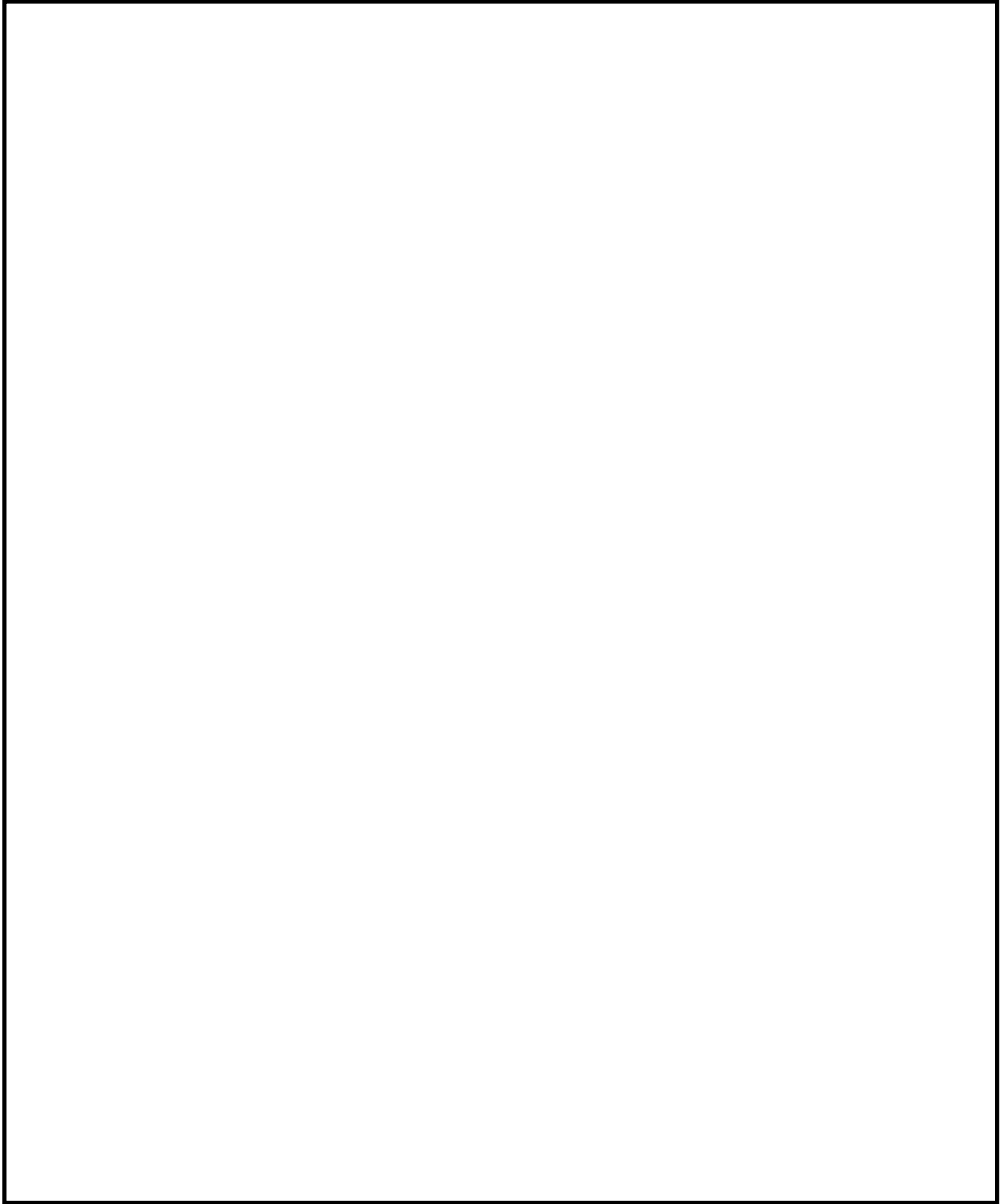
Important concepts regarding triangles:

- The sum of the angles of a triangle always equal 180° .
- In a right triangle, where one of the angles measures 30° , the length of the side opposite an angle of 30° is equal to half the length of the hypotenuse.
- An isosceles right triangle has an angle that measures 45° . It has two angles of 45° and two sides are the same length.

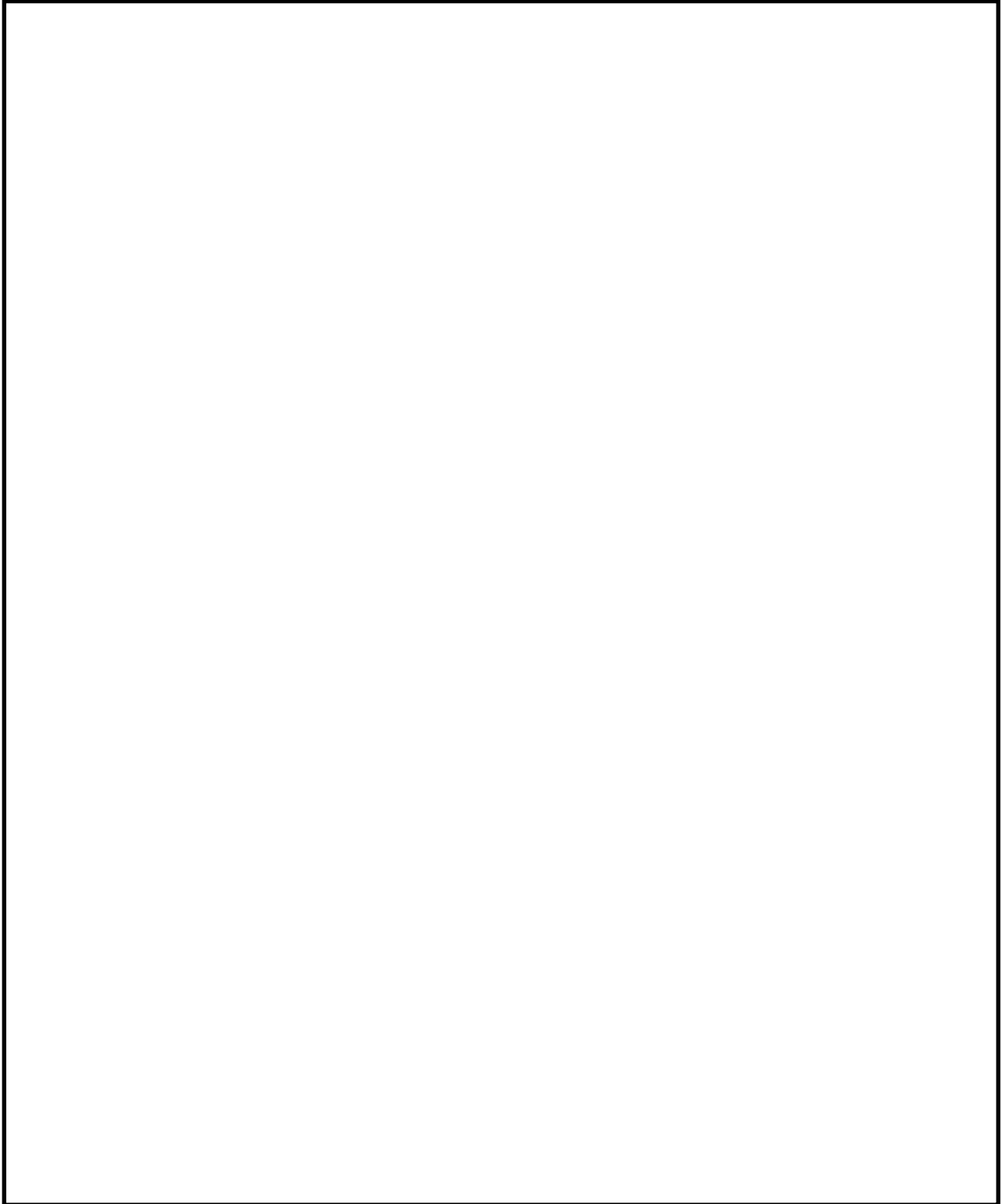
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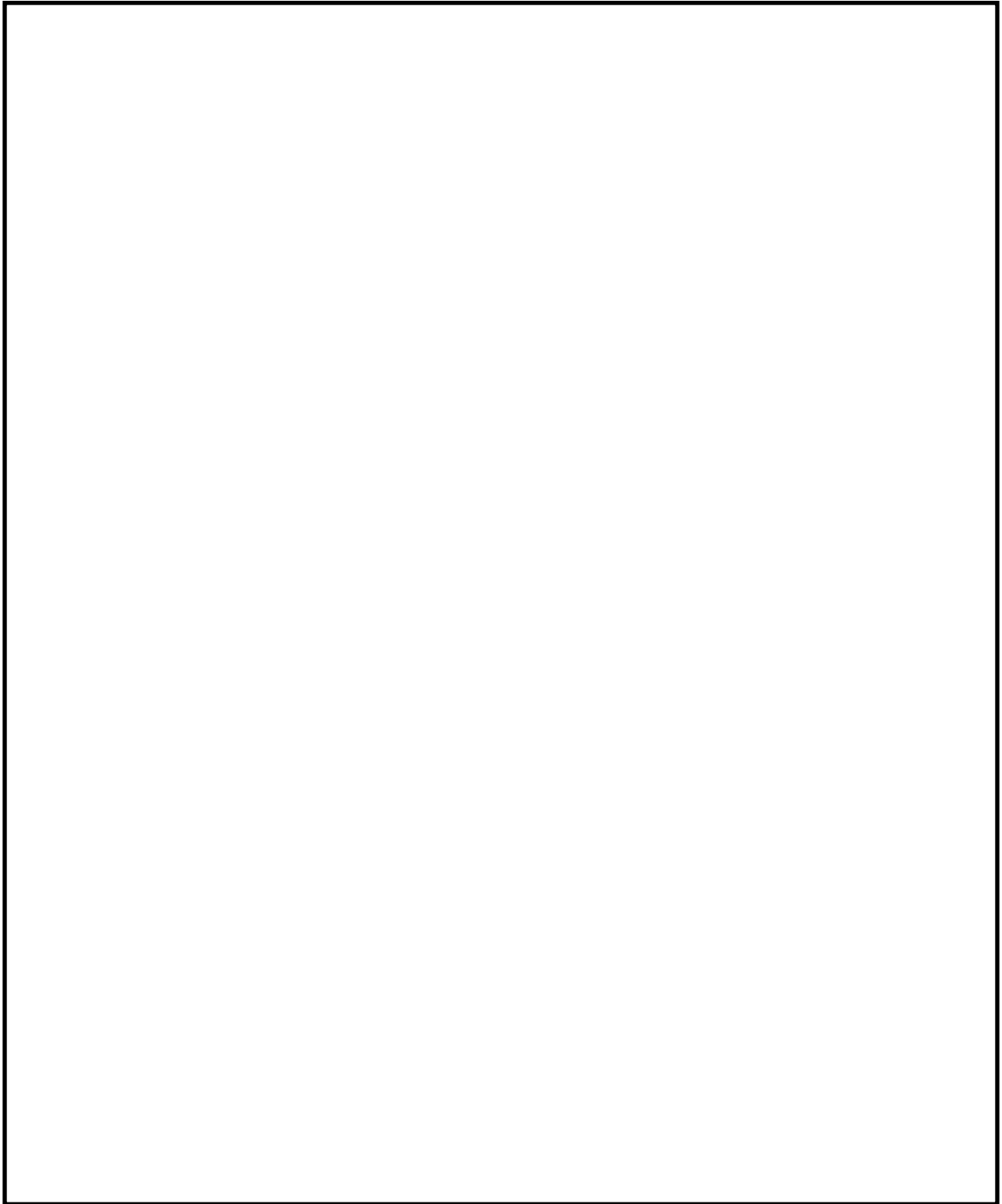
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Final data for the rally director.

Chosen car: _____

Number of the checkpoint where you will spend the night:

Total number of kilometers traveled:

Total number of hours scheduled for the rally:

Don't forget to include a **scaled plan of the route you have chosen to take**. Your director must have this so he can find you if you need assistance on the journey.



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Now you have finished your work, what would you do differently if you had to redo it?

