Flat-Pack

Scenario
Your team has been recruited by a well-known furniture company to design and build a table and two chairs for their new homewares range of furniture. They must be cost effective, easily transportable and strong enough to withstand the weight of Ginger (the cat) and Spot (the dog) sleeping and playing on them.

Aim
The aim of this full-day activity is to make a profit.

The table and chairs that you build must be strong and represent good value to customers, but not cost too much to build (materials) and transport.

What to do
A table and two chairs must be built to support both Ginger and Spot.

Your team will build a chair in the morning session which will then be tested and scored. Following this, they will then be kept and dismantled by the Event Staff.

Using what you have learned, your team will then build a table and chair in the afternoon session. Both will then be tested towards the end of the this session.

The materials for the construction of the table and chairs can be ‘purchased’ from the shop throughout the day. Unused and undamaged materials can be returned for credit before the shop closes.

Rules
The top surface of the table must be at least 10cm above the ground. The chair must have a back support at least 5cm x 5cm in size and the horizontal part of the seat (that you sit on in a real chair) must be at least 5cm above the ground.

The chair built in the afternoon session needs to be able to fit under the table.

During the drop tests Spot must stay on the table/chairs, but Ginger need not.

Testing finishes when the table/chairs break, or when they withstand all the tests.

Attempts to damage the animals will be severely penalised.

Scoring
Income is generated if the animals can be supported on the table/chairs. Further income is generated if the table/chairs are able to support Ginger and Spot jumping onto them from various heights.

Profit is calculated by subtracting material and transport costs from income.

Tips
Be creative; a chair doesn’t have to be a platform on four vertical legs.

Pay careful attention to the joints of the table and chairs. Joints are the most common place where furniture fails during testing.

The table and chairs should be big enough to support Ginger and Spot sitting side by side.

In the afternoon session your team will need to keep in mind the minimum height of the table and the chair, as they are different.

Remember that your team’s performance is measured by the amount of profit, i.e. income minus expenses, not just the strength or mass of the table or chair.
**STUDENT NOTES**

**Flat-Pack**

**The problem**
The aim of this activity is to design furniture (a table and two chairs) that is sturdy and cost effective. Your team will earn income based on the quality of the table and chairs which will be tested by the family pets, Ginger, a cat weighing approx. 1kg, and Spot, a 2.5kg dog.

The table and chairs will need to support each pet individually and together, when they are sitting still and playing.

**Duration**
This activity runs for a full day (approximately 4 hours).

**Rules**
If the table/chairs do not comply with these rules they will not be tested and your team will not score any points.

1. The top surface of the table must be at least 10cm above the ground. The chairs must have a back support at least 5cm x 5cm in size and the horizontal part of the seat must be at least 5cm above the ground.
2. The chair built in the afternoon session needs to be able to fit under the table.
3. During the drop tests Spot must stay on the table/chairs, but Ginger need not.
4. Testing finishes when the table/chairs break, or when the table/chairs withstand all the tests.
5. Attempts to damage the animals will be severely penalised.

**Scoring**
Your final score will be determined by two tests. Firstly, by the cost of production of the table and chairs, which means the cost of materials purchased from the shop. Secondly, by the cost of transporting the table and chairs to your customers. As in the real world, transport costs are largely determined by the weight of the furniture.

The furniture may be destroyed during testing so it is important that the Event Staff measure the dimensions (minimum heights) and weigh the table/chairs prior to the strength tests.

The following tests will be conducted on your team’s table and chairs:

1. It costs $5 per gram, for transport. The table and chairs will be weighed to calculate this cost.
2. The total cost of the materials used to construct the table and chairs will be added together (less any returns).
3. The market value, or sale price, is the income that you derive from selling the chairs and table. Stronger furniture is more valuable than flimsy furniture.
The Event Staff will assess the strength of the chair and table using the following tests:

a. If the table/chairs support Ginger only, $500 is awarded.

b. If the table/chairs support Spot only, an additional $1500 is awarded.

c. If the table/chairs support BOTH Ginger and Spot side-by-side at the same time, an additional $2000 is awarded.

d. Spot is placed on the table/chairs. If it does not give way when Ginger is dropped from a height of 20cm from the ground an additional $2200 awarded. Spot must remain seated on the furniture but Ginger does not have to remain on the furniture after the test.

e. Spot is again placed on the table/chairs. If it does not give way when Ginger is dropped from a height of 30cm from the ground, an additional $2500 awarded. Spot must remain seated on the furniture after the drop test, but Ginger does not have to do so.

f. Spot is dropped from 25cm above the ground on to the table/chairs. If the table/chairs do not break, an additional $3000 is awarded. Spot does not have to remain on the furniture when dropped.

The profit will be calculated by subtracting costs from income (plus bonus and less penalties, if applicable).

Teams may take the table/chair from the afternoon session home with them at the end of the day.

**Tips**

- Be creative; a chair doesn’t have to be a platform on four vertical legs.

- Pay careful attention to the joints of the table and chairs. Just like in real furniture, joints are the most common failure location.

- The size and shape of the table and chairs should be big enough to support both Ginger and Spot sitting side by side.

- Think about what height you should make each piece of furniture, keeping in mind that the minimum height of the table and chairs are different, and the drop test heights are measured from ground level.

- The aim of this activity is to build the most profitable furniture, not necessarily the strongest. Ensure you consider all the costs when designing the table and chairs.
This page is intentionally blank so that the score sheet prints on a new page.
School name: ___________________________________________

EXPENSES (Record materials used for both the table and the chairs)

<table>
<thead>
<tr>
<th>Material</th>
<th>Limit</th>
<th>Cost each</th>
<th>Quantity purchased</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sticks - Wooden</td>
<td>20</td>
<td>$10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sticks - Plastic</td>
<td>30</td>
<td>$5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper, A4</td>
<td>6</td>
<td>$5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardboard, 30cm x 30cm</td>
<td>3</td>
<td>$25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber bands</td>
<td>30</td>
<td>$1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straws, standard</td>
<td>30</td>
<td>$5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straws, jumbo</td>
<td>12</td>
<td>$20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masking tape (no refunds)</td>
<td>6 x 1m</td>
<td>$5/m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper clips</td>
<td>30</td>
<td>$1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Materials cost sub-total (A) $____________

Test Description Cost
Materials Transfer cost sub-total A from above $ (A)
Cost of transport: Chair 1 Chair 1 weight _______ g x $5 = $ (B)
Cost of transport: Chair 2 Chair 2 weight _______ g x $5 = $ (C)
Cost of transport: Table Table weight _______ g x $5 = $ (D)
Add above expenses Total expenses = A +B + C + D $ (E)

INCOME (Circle the test achieved; cross out when the furniture fails)

<table>
<thead>
<tr>
<th>Test</th>
<th>Chair 1 $</th>
<th>Chair 2 $</th>
<th>Table $</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF Ginger is supported ONLY.</td>
<td>$ 500</td>
<td>$ 500</td>
<td>$ 500</td>
</tr>
<tr>
<td>IF Spot is supported ONLY.</td>
<td>$ 1500</td>
<td>$ 1500</td>
<td>$ 1500</td>
</tr>
<tr>
<td>IF Spot AND Ginger are supported seated together.</td>
<td>$ 2000</td>
<td>$ 2000</td>
<td>$ 2000</td>
</tr>
<tr>
<td>IF Spot is supported when Ginger is dropped from 20cm.</td>
<td>$ 2200</td>
<td>$ 2200</td>
<td>$ 2200</td>
</tr>
<tr>
<td>IF Spot is supported when Ginger is dropped from 30cm.</td>
<td>$ 2500</td>
<td>$ 2500</td>
<td>$ 2500</td>
</tr>
<tr>
<td>IF Spot is supported when dropped from 25cm.</td>
<td>$ 3000</td>
<td>$ 3000</td>
<td>$ 3000</td>
</tr>
</tbody>
</table>

Income awarded from above table $ (F) $ (G) $ (H)
Total income = F + G + H $ (I)

Pack up bonus of $50 if workspace is left clean and tidy $ (J)
Penalty of $5,000 each time animals are deliberately damaged $ (K)

FINAL SCORE = Income (I) + Bonus (J) – Expenses (E) - Penalty (K) __________

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