**Boat Design** taskName: Advisory:

**Must be signed off before beginning building boat.** Group Name

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| AUSTRALIAN CURRICULUM CONTENT DESCRIPTORS |
| **Mathematics** |
| Calculate the surface area and volume of cylinders and solve related problems (ACMMG217) Solve problems involving the surface area and volume of right prisms (ACMMG218) Investigate very small and very large time scales and intervals (ACMMG219) |

**Planning Sketches**

Draw upon all you’ve learnt so far, from the tips from professional shipwrights to your understanding of volume and density in designing your boat.

Use the space below to sketch 3 possible designs and list the pros and cons of each. Show measurements in your design.

Design may be drawn on Sketch Up or another computer program (Attach sheets if necessary).

|  |  |  |
| --- | --- | --- |
| Design 1 | Design 2 | Design 3 |
|  |  |  |
| Pros | Pros | Pros |
| Cons | Cons | Cons |

**Scale Drawing of your boat**

Decide on your best boat design.

Your boat will be around 1metre wide and around 2 metres long (roughly). What scale would be most suitable for the model to draw it on the page below? 1:50, 1:100, 1:200? Label the scale on your diagram.

When converting a measurement from actual size to scaled size you divide by the scale number. *Hint: first convert metres to centimetres i.e. 2m =200cm, then it will be more simple to scale down your design.*

You must also label the real-life lengths of your boat. Label all measurements in millimetres.

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| --- |
| Scale=  |

**Construction Planning**

The Cardboard we are using has the core strength running along its length. Consider this when working out your cutting out plans.
The Cardboard Sheets are 2300mm by 900mm, these boxes are drawn to a scale of 10:1

**Cutting out Plans**

**Cutting out Plans**

**Tape Usage**

Calculate how many Metres of tape you will need to hold the pieces together: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m

**Volume Calculations**

Assume your boat has a flat bottom to simplify these calculations

1. Show your calculations for where the waterline will sit when you are in the boat – ***Plimsoll Line***

*You know your* ***Mass****; the* ***Volume*** *can be the a little higher, giving you a* ***Density*** *less than water.*

e.g. $D=\frac{m}{V} \frac{210000g^{}}{220000cm^{3}}=0.9g/cm^{3}$

**Show calculations here**

*Then divide this* ***Volume*** *by the* ***Area*** *of your boat – this gives the* ***plimsoll line****. (How much of your boat is under the water)*

e.g. $\frac{V}{A}=h$ $\frac{220000cm^{3}}{18000cm^{2}}=12.2cm$

**Show calculations here**

1. What is the Draft and Freeboard of the Boat? Hint – check out the video on the website. <https://9ailbhs.weebly.com>

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1. If your boat does not have a flat bottom discuss how this will affect this measurement. See if you can calculate the difference by using an average of the difference. Also would this design need ballast for stability?

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1. Have your calculations checked by a teacher.

Signed ………………………………………………….

**Achievement Standards Rubric**

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| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |
| Sketches | 3 different designs. Accurate, easy to understand sketches. All pros and cons considered | 3 different designs Mostly Accurate with most pros and cons considered. | 3 different designs with some pros and cons completed. | 2 designs completed. A few pros and cons considered | 1 design, no consideration of pros and cons |
| Volume calculations | Accurate all factors considered | Approximate. Most factors considered | Basic. Some factors considered | Inaccurate calculations  | No or minimal calculations attempted |
| Plan | An appropriate scale has been used Accurately with all dimensions shown clearly. | An appropriate scale has been used effectively. Most dimensions shown | An appropriate scale has been used. Some t dimensions shown | An attempt at using scale | No scale |
|  |  |  |  |  |  |

**Checklist before signing of by teacher**

3 Designs completed

3 Pros and cons completed

Scale drawing accurately completed

Cutting plans completed to scale

Volume calculations completed and seem accurate

Self-assessment completed below

**Student Assessment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |
| Sketches |  |  |  |  |  |
| Volume calculations |  |  |  |  |  |
| Plan |  |  |  |  |  |
|  |  |  |  |  |  |

**Teacher Assessment and approval**

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| --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E |
| Sketches |  |  |  |  |  |
| Volume calculations |  |  |  |  |  |
| Plan |  |  |  |  |  |
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Teachers Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_