**Volume and Surface Area of a Cylinder**



**Problem 1:** Calculate the surface area and the volume of a cylinder with height 25 cm and diameter 10 cm.

**Problem 2:** Determine the height of a cylinder with Volume 700 cm3 and radius of 9 cm.

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| Problem 1 – Card 1 |
| Volume = 10 851.84 cm3r = 8 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
|
| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 1 – Card 2 |
| Volume = 10 851.84 cm3r = 9 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
|
| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 1 – Card 3 |
| Volume = 10 851.84 cm3r = 12 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 1 – Card 4 |
| Volume = 10 851.84 cm3r = 16 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
|
| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 2 – Card 1 |
| Volume = 21 195 cm3r = 10 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 2 – Card 2 |
| Volume = 21 195 cm3r = 15 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 2 – Card 3 |
| Volume = 21 195 cm3r = 18 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 2 – Card 4 |
| Volume = 21 195 cm3r = 27 cmh = ? | Volume = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 3 – Card 1 |
| Volume = 36 624.96 cm3r = ?h = 54 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 3 – Card 2 |
| Volume = 36 624.96 cm3r = ?h = 48 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 3 – Card 3 |
| Volume = 36 624.96 cm3r = ?h = 36 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 3 – Card 4 |
| Volume = 36 624.96 cm3r = ?h = 24 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 4 – Card 1 |
| Volume = 50 240 cm3r = ?h = 50 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
|
| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 4 – Card 2 |
| Volume = 50 240 cm3r = ?h = 40 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
|
| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 4 – Card 3 |
| Volume = 50 240 cm3r = ?h = 32 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
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| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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| Problem 4 – Card 4 |
| Volume = 50 240 cm3r = ?h = 20 cm | Volume = \_\_\_\_\_\_\_\_ |
| Height = \_\_\_\_\_\_\_\_ |
| Radius = \_\_\_\_\_\_\_\_Calculations: |
|
| Surface Area = \_\_\_\_\_\_\_\_Calculations: |
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# **Optimization Lesson 5:** Optimizing the Surface Area of a Cylinder for a Given Volume

Dairy King wishes to sell 1350mL tubs of ice cream at all of their restaurant locations . The base and cylindrical part of the container will be made from specially coated cardboard. However, the lid is made from plastic. To ensure the lowest price for their product, Dairy King would like to minimize the cost of the cardboard needed to make each tub.

h

r

Complete the following table to determine what dimensions would minimize the amount of cardboard for one tub of ice cream.

Graph the results (Radius of Tub Base vs. Amount of Cardboard) on the grid on the back of this page.

(Recall: 1 mL = 1 cm3)

(Round your answers to two decimal places)

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| R | h | Amount of Cardboard (Area of Base and Tube) |
| **3 cm** |  |  |
| **4 cm** |  |  |
| **5 cm** |  |  |
| **6 cm** |  |  |
| **7 cm** |  |  |
| **8 cm** |  |  |

h

r

Graph your results on the grid below.

Draw a curve of best fit.

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|  3 4 5 6 7 81000900800700600**Radius (cm)**Amount of Cardboard (cm2) |  |  |  |  |  |  |  |  |  |  |  |  |  |
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**Recommendation to Dairy King:**