
GEOMETRY: MATHEMATICALLY SIMILAR SOLIDS

Best Guess Mastery Worksheet (Target Grade 7/8)

I Do

20 Solid **A** and solid **B** are mathematically similar.

The total surface area of solid **A** is $45\pi\text{ cm}^2$.

The total surface area of solid **B** is $80\pi\text{ cm}^2$.

The volume of solid **A** is 810 cm^3 .

Calculate the volume of solid **B**.

..... cm^3

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We Do

Solid **P** and solid **Q** are mathematically similar.

The total surface area of solid **P** is $50\pi\text{ cm}^2$.

The total surface area of solid **Q** is $72\pi\text{ cm}^2$.

The volume of solid **P** is 500 cm^3 .

Calculate the volume of solid **Q**.

..... cm^3

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Solid **X** and solid **Y** are mathematically similar.

The total surface area of solid **X** is $32\pi \text{ cm}^2$.

The total surface area of solid **Y** is $162\pi \text{ cm}^2$.

The volume of solid **X** is 320 cm^3 .

Calculate the volume of solid **Y**.

..... cm^3

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Solid **C** and solid **D** are mathematically similar.

The total surface area of solid **C** is $12\pi \text{ cm}^2$.

The total surface area of solid **D** is $75\pi \text{ cm}^2$.

The volume of solid **C** is 160 cm^3 .

Calculate the volume of solid **D**.

..... cm^3

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Challenge 1

Solid **E** and solid **F** are mathematically similar.

The volume of solid **E** is 135 cm^3 .

The volume of solid **F** is 320 cm^3 .

The total surface area of solid **E** is $45\pi\text{ cm}^2$.

Calculate the total surface area of solid **F**.

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Two solid metal statues, **A** and **B**, are mathematically similar.

The height of statue **A** is 15 cm and the height of statue **B** is 25 cm.

Statue **A** has a total surface area of 270 cm².

Statue **B** has a mass of 6.25 kg.

Calculate the total surface area of statue **B**, and the mass of statue **A**.

Surface Area of **B** = cm²

Mass of **A** = kg

Answers & Worked Solutions

I Do:

1. Area Scale Factor (ASF) = $\frac{80\pi}{45\pi} = \frac{80}{45} = \frac{16}{9}$.
2. Linear Scale Factor (LSF) = $\sqrt{\left(\frac{16}{9}\right)} = \frac{4}{3}$.
3. Volume Scale Factor (VSF) = $\text{LSF}^3 = \left(\frac{4}{3}\right)^3 = \frac{64}{27}$.
4. Volume of **B** = $810 \times \frac{64}{27} = 30 \times 64 = \mathbf{1920 \text{ cm}^3}$.

We Do:

1. ASF = $\frac{72\pi}{50\pi} = \frac{36}{25}$.
2. LSF = $\sqrt{\left(\frac{36}{25}\right)} = \frac{6}{5}$.
3. VSF = $\left(\frac{6}{5}\right)^3 = \frac{216}{125}$.
4. Volume of **Q** = $500 \times \frac{216}{125} = 4 \times 216 = \mathbf{864 \text{ cm}^3}$.

You Do 1:

1. ASF = $\frac{162\pi}{32\pi} = \frac{81}{16}$.
2. LSF = $\sqrt{\left(\frac{81}{16}\right)} = \frac{9}{4}$.
3. VSF = $\left(\frac{9}{4}\right)^3 = \frac{729}{64}$.
4. Volume of **Y** = $320 \times \frac{729}{64} = 5 \times 729 = \mathbf{3645 \text{ cm}^3}$.

You Do 2:

1. ASF = $\frac{75\pi}{12\pi} = \frac{25}{4}$.
2. LSF = $\sqrt{\left(\frac{25}{4}\right)} = \frac{5}{2}$.
3. VSF = $\left(\frac{5}{2}\right)^3 = \frac{125}{8}$.
4. Volume of **D** = $160 \times \frac{125}{8} = 20 \times 125 = \mathbf{2500 \text{ cm}^3}$.

Challenge 1:

$$1. \text{VSF} = \frac{320}{135} = \frac{64}{27}.$$

$$2. \text{LSF} = \sqrt[3]{\left(\frac{64}{27}\right)} = \frac{4}{3}.$$

$$3. \text{ASF} = \left(\frac{4}{3}\right)^2 = \frac{16}{9}.$$

$$4. \text{Area of } \mathbf{F} = 45\pi \times \frac{16}{9} = 5\pi \times 16 = \mathbf{80\pi \text{ cm}^2}.$$

Challenge 2:

$$1. \text{LSF} = \frac{25}{15} = \frac{5}{3}.$$

$$2. \text{ASF} = \left(\frac{5}{3}\right)^2 = \frac{25}{9}.$$

$$3. \text{Surface Area of } \mathbf{B} = 270 \times \frac{25}{9} = 30 \times 25 = \mathbf{750 \text{ cm}^2}.$$

$$4. \text{Mass is proportional to volume. } \text{VSF} = \left(\frac{5}{3}\right)^3 = \frac{125}{27}.$$

$$5. \text{Mass of } \mathbf{A} = 6.25 \div \frac{125}{27} = 6.25 \times \frac{27}{125} = \mathbf{1.35 \text{ kg}}.$$