



## Year 9 Worksheet 5: Length, Area, Surface Area and Volume

Question 1: Answer the following.

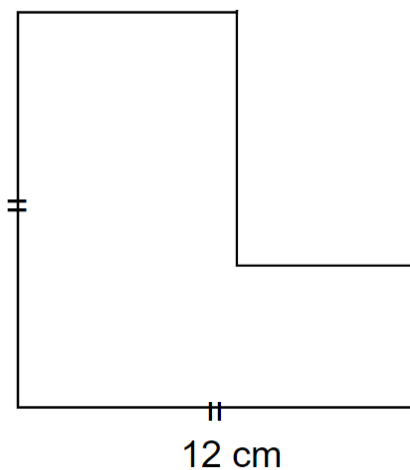
(1) If the perimeter of a square field is 40 km, its area is:

- A. 400 km<sup>2</sup>    B. 300 km<sup>2</sup>    C. 200 km<sup>2</sup>    D. 100 km<sup>2</sup>    E. 50 km<sup>2</sup>

(2) Convert 5.1 m<sup>2</sup> to mm<sup>2</sup>:

- A. 0.0051    B. 510    C. 5100    D. 51000    E. 510000

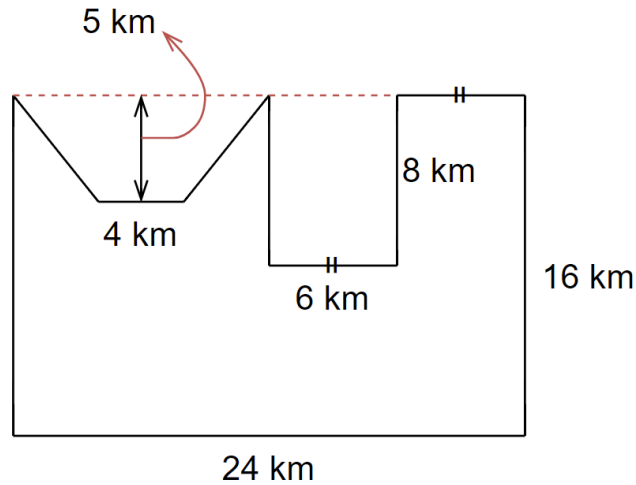
(3) Find the perimeter of this shape:



- A. 48 cm    B. 144 cm    C. 24 cm    D. 120 cm    E. N/A



(4) Find the area of this composite shape below:

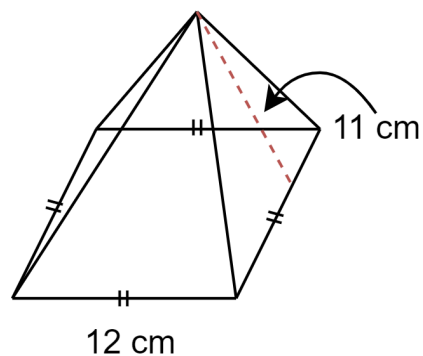


- A.  $202 \text{ km}^2$     B.  $198 \text{ km}^2$     C.  $384 \text{ km}^2$     D.  $316 \text{ km}^2$     E.  $296 \text{ km}^2$

(5) A semicircular goal area has a radius 15 m. What is its perimeter to the nearest meter?

- A. 47 m    B. 77 m    C. 94 m    D. 353 m    E. 706 m

(6) Find the surface area of the figure below.



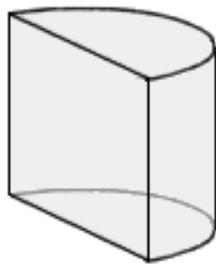
- A.  $132 \text{ cm}^2$     B.  $264 \text{ cm}^2$     C.  $396 \text{ cm}^2$     D.  $408 \text{ cm}^2$     E.  $528 \text{ cm}^2$



(7) Find the parallelogram perpendicular height if it has area  $40 \text{ cm}^2$  and base  $5 \text{ cm}$ .

- A.  $200 \text{ cm}^2$     B.  $8 \text{ cm}^2$     C.  $200 \text{ cm}$     D.  $20 \text{ cm}$     E.  $8 \text{ cm}$

(8) What is the surface area of a half-cylinder with radius  $4 \text{ mm}$  and height  $15 \text{ mm}$ ?



- A. 132.56    B. 188.49    C. 358.76    D. 376.99    E. 15.524

(9) A pentagon with a base area of  $50 \text{ cm}^2$ . If its volume is  $700 \text{ cm}^3$ , what is its total height?

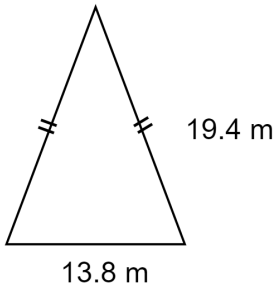
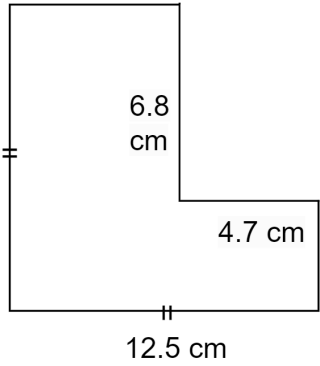
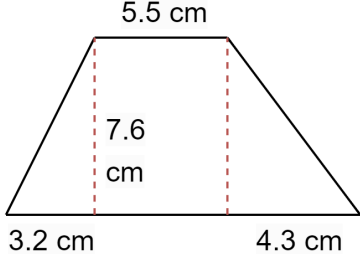
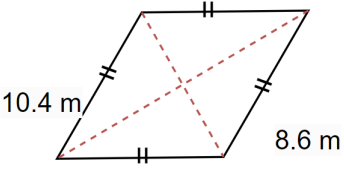
- A.  $14 \text{ cm}$     B.  $50 \text{ cm}$     C.  $70 \text{ cm}$     D.  $400 \text{ cm}$     E.  $650 \text{ cm}$

(10) The exact volume of a cylinder with radius  $5 \text{ m}$  and height  $8 \text{ m}$  is:

- A.  $25\pi \text{ m}^3$     B.  $40\pi \text{ m}^3$     C.  $200\pi \text{ m}^3$     D.  $320\pi \text{ m}^3$     E.  $64\pi \text{ m}^3$



Question 2: Answer the following.

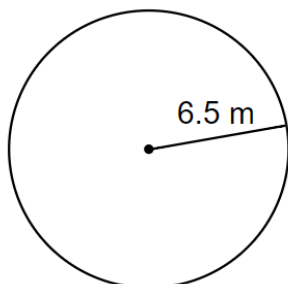
1	<p>Convert the following units.</p> <p>a. <math>2.35 \text{ km} = \underline{\hspace{2cm}} \text{ m}</math>      b. <math>407 \text{ m} = \underline{\hspace{2cm}} \text{ cm}</math></p> <p>c. <math>189 \text{ mm}^2 = \underline{\hspace{2cm}} \text{ cm}^2</math>      d. <math>6.8 \text{ m}^2 = \underline{\hspace{2cm}} \text{ cm}^2</math></p> <p>e. <math>3.2 \text{ cm}^3 = \underline{\hspace{2cm}} \text{ mm}^3</math>      f. <math>250 \text{ cm}^3 = \underline{\hspace{2cm}} \text{ L}</math></p>
2	<p>Find the area and perimeter of the following shapes.</p> <p>a. </p> <p>b. </p> <p>c. </p> <p>d. </p>



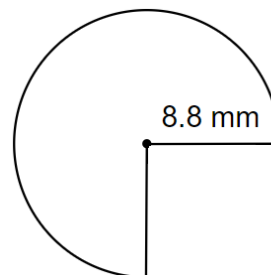
3

Find the area of sector and arc length (if possible) of the following shapes.

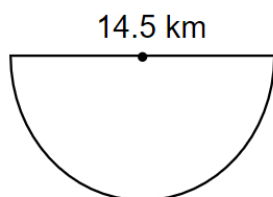
a.



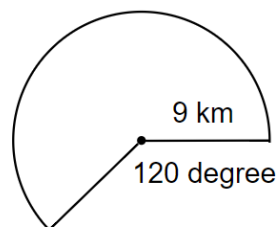
b.



c.



d.

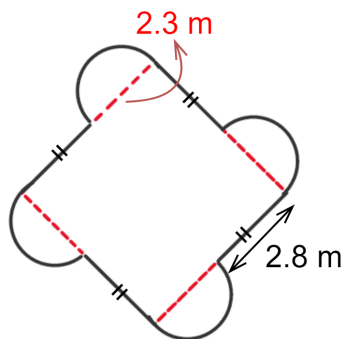




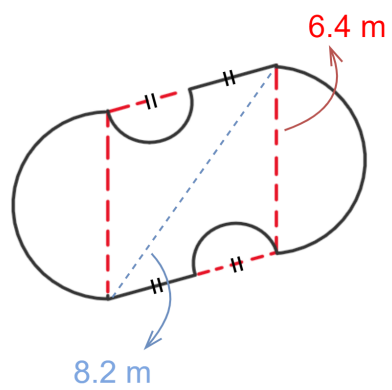
4

Find the perimeter and area of the following composite shapes correct to 2 d.p.

a.



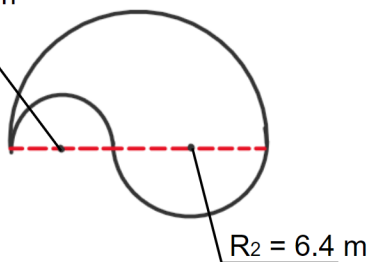
b.





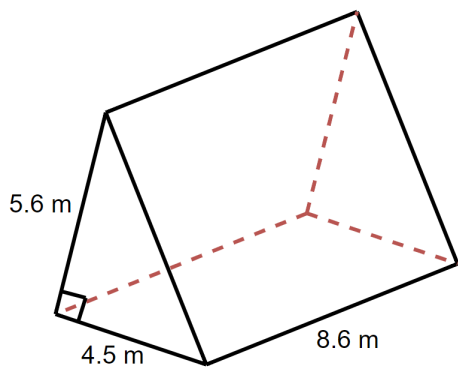
c.

$R_1 = 2.8 \text{ m}$



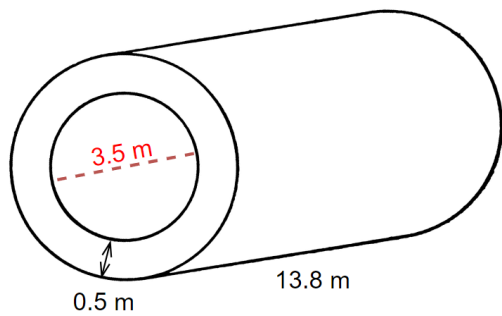
5 Find the surface area and volume of the following objects.

a.

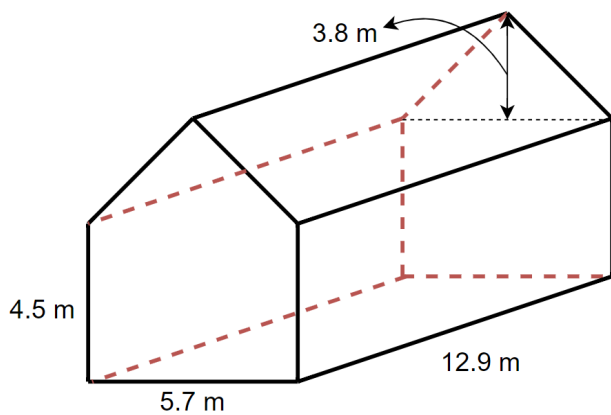




b.



c.







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# Answer Key

Question 1: Answer the following.

(1) If the perimeter of a square field is 40 km, its area is:

- A. 400 km<sup>2</sup>    B. 300 km<sup>2</sup>    C. 200 km<sup>2</sup>    D. 100 km<sup>2</sup>    E. 50 km<sup>2</sup>

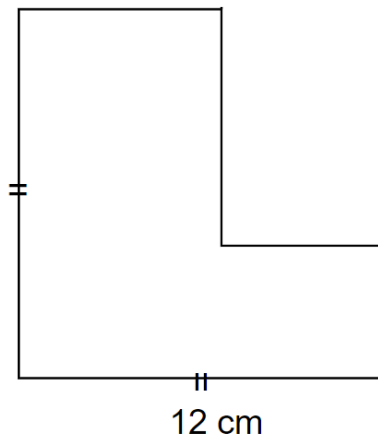
**Answer: D. 100 km<sup>2</sup>**

(2) Convert 5.1 m<sup>2</sup> to mm<sup>2</sup>:

- A. 0.0051    B. 510    C. 5100    D. 51000    E. 510000

**Answer: D. 51000**

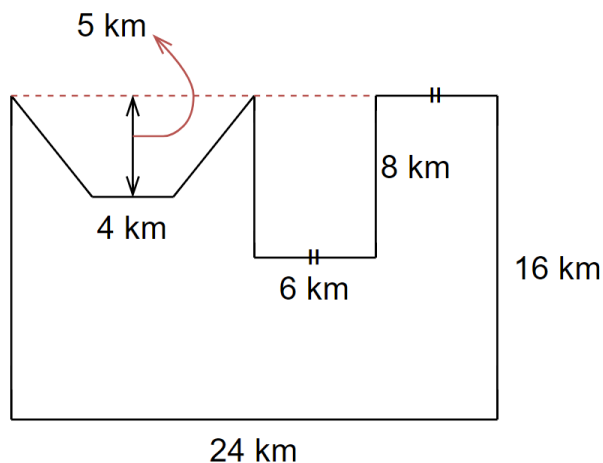
(3) Find the perimeter of this shape:



- A. 48 cm    B. 144 cm    C. 24 cm    D. 120 cm    E. N/A

**Answer: A. 48**

(4) Find the area of this composite shape below:



- A.  $202 \text{ km}^2$     B.  $198 \text{ km}^2$     C.  $384 \text{ km}^2$     D.  $316 \text{ km}^2$     E.  $296 \text{ km}^2$

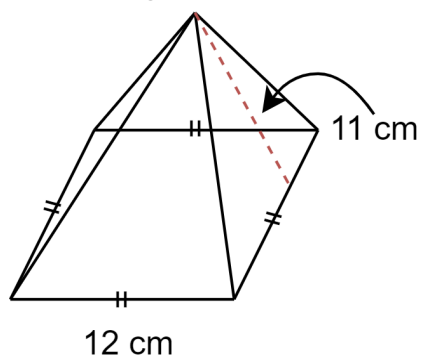
**Answer: E.  $296 \text{ km}^2$**

(5) A semicircular goal area has a radius 15 m. What is its perimeter to the nearest meter?

- A. 47 m    B. 77 m    C. 94 m    D. 353 m    E. 706 m

**Answer: B. 77 m**

(6) Find the surface area of the figure below.



- A.  $132 \text{ cm}^2$     B.  $264 \text{ cm}^2$     C.  $396 \text{ cm}^2$     D.  $408 \text{ cm}^2$     E.  $528 \text{ cm}^2$

**Answer: D.  $408 \text{ cm}^2$**

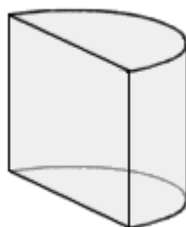


(7) Find the parallelogram perpendicular height if it has area  $40 \text{ cm}^2$  and base  $5 \text{ cm}$ .

- A.  $200 \text{ cm}^2$     B.  $8 \text{ cm}^2$     C.  $200 \text{ cm}$     D.  $20 \text{ cm}$     E.  $8 \text{ cm}$

**Answer: E.  $8 \text{ cm}$**

(8) What is the surface area of a half-cylinder with radius  $4 \text{ mm}$  and height  $15 \text{ mm}$ ?



- A.  $132.56$     B.  $188.49$     C.  $358.76$     D.  $376.99$     E.  $15.524$

**Answer: C.  $358.76$**

(9) A pentagon with a base area of  $50 \text{ cm}^2$ . If its volume is  $700 \text{ cm}^3$ , what is its total height?

- A.  $14 \text{ cm}$     B.  $50 \text{ cm}$     C.  $70 \text{ cm}$     D.  $400 \text{ cm}$     E.  $650 \text{ cm}$

**Answer: A.  $14 \text{ cm}$**

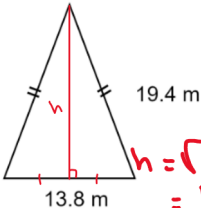
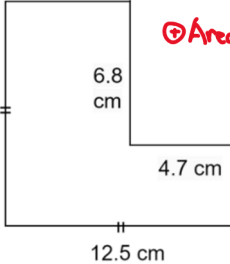
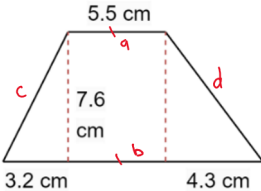
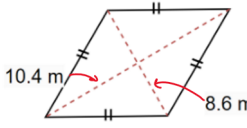
(10) The exact volume of a cylinder with radius  $5 \text{ m}$  and height  $8 \text{ m}$  is:

- A.  $25\pi \text{ m}^3$     B.  $40\pi \text{ m}^3$     C.  $200\pi \text{ m}^3$     D.  $320\pi \text{ m}^3$     E.  $64\pi \text{ m}^3$

**Answer: D.  $320\pi \text{ m}^3$**



Question 2: Answer the following.

1	<p>Convert the following units.</p> <p>a. 2.35 km = <u>2,350</u> m</p> <p>b. 407 m = <u>40,700</u> cm</p> <p>c. 189 mm<sup>2</sup> = <u>1.89</u> cm<sup>2</sup></p> <p>d. 6.8 m<sup>2</sup> = <u>68,000</u> cm<sup>2</sup></p> <p>e. 3.2 cm<sup>3</sup> = <u>3,200</u> mm<sup>3</sup></p> <p>f. 250 cm<sup>3</sup> = <u>0.25</u> L</p>
2	<p>a.</p>  $h = \sqrt{19.4^2 - (13.8 \div 2)^2} = 18.13 \text{ m}$ <p>⊕ Area = <math>\frac{1}{2}(\text{base} \times \text{height})</math>  <math>= \frac{1}{2}(13.8 \times 18.13) = \underline{125.107 \text{ m}^2}</math></p> <p>⊕ Perimeter = <math>19.4 \times 2 + 13.8 = \underline{52.6 \text{ m}}</math></p> <p>b.</p>  <p>⊕ Area = Big - Small  <math>= (12.5 \times 12.5) - (6.8 \times 4.7)</math>  <math>= \underline{124.29 \text{ cm}^2}</math></p> <p>⊕ Perimeter = <math>12.5 \times 4 = \underline{50 \text{ cm}}</math></p> <p>c.</p>  <p>⊕ Area = <math>\frac{1}{2} h (a+b)</math> where <math>b = 3.2 + 5.5 + 4.3 = 13 \text{ cm}</math>  <math>= \frac{1}{2} \times 7.6 \times (5.5 + 13) = \underline{70.3 \text{ cm}^2}</math></p> <p>⊕ Perimeter = <math>a + b + c + d = \underline{35.48 \text{ cm}}</math></p> <p><math>a = 5.5 \text{ cm}</math>, <math>b = 13 \text{ cm}</math>  <math>c = \sqrt{7.6^2 + 3.2^2} = 8.25 \text{ cm}</math>  <math>d = \sqrt{7.6^2 + 4.3^2} = 8.73 \text{ cm}</math></p> <p>d.</p>  <p>⊕ Area = <math>\frac{1}{2} d_1 \times d_2</math>  <math>= \frac{1}{2} \times 10.4 \times 8.6 = \underline{44.72 \text{ m}^2}</math></p> <p>Side = <math>\sqrt{\left(\frac{10.4}{2}\right)^2 + \left(\frac{8.6}{2}\right)^2} = 6.75 \text{ m}</math></p> <p>⊕ Perimeter = <math>6.75 \times 4 = \underline{27 \text{ m}}</math></p>



3

a.

$$A = \pi r^2 = \pi \cdot 6.5^2 \approx 132.73229$$

$$C = 2 \pi r = 2 \cdot \pi \cdot 6.5 \approx 40.8407$$

b.

**Results:**

Sector Area (A)

60.821

Arc Length (s)

13.823

Chord Length (a)

12.445

c.

**Results:**

Sector Area (A)

330.26

Arc Length (s)

45.553

Chord Length (a)

29

d.

**Results:**

Sector Area (A)

84.823

Arc Length (s)

18.85

Chord Length (a)

15.588



4

(a) ⊕ Perimeter :

↳ 2 circles

$$C = \pi d = (2.3 \times \pi) \times 2 = 14.45 \text{ m}$$

$$\text{Perimeter} = 14.45 + (2.8 \times 4) = \underline{25.65 \text{ m}}$$

⊕ Area

$$\text{↳ 2 circles } \Sigma A = 2\pi r^2 = 2 \times \pi r^2 = 8.31 \text{ m}^2$$

$$\text{↳ Square } A = (2.8 + 2.3)^2 = 26.01 \text{ m}^2$$

$$\text{Area} = 8.31 + 26.01 = \underline{34.32 \text{ m}^2}$$

(b) ⊕ Perimeter

$$\text{↳ 1 large circle : } C_1 = \pi d = 6.4\pi = 20.11 \text{ m}$$

$$\text{1 small circle : } C_2 = \pi d = 3.2\pi = 10.05 \text{ m}$$

$$\text{Perimeter} = 20.11 + 10.05 + (3.2 \times 2) = \underline{36.56 \text{ m}}$$

⊕ Area

$$\text{↳ 1 large circle : } A_1 = \pi r^2 = (3.2)^2 \pi = 32.17 \text{ m}^2$$

$$\text{1 small circle : } A_2 = \pi r^2 = \left(\frac{3.2}{2}\right)^2 \pi = 8.04 \text{ m}^2$$

$$\text{1 rhombus : } A_3 = d_1 \times d_2 = 9.83 \times 8.2 = 80.59 \text{ m}^2$$

$$\text{where } d_2 = 2 \times \sqrt{6.4^2 - (8.2/2)^2} = 9.83 \text{ m (diagonal)}$$

$$\text{Area} = 32.17 + 80.59 - 8.04 = \underline{104.72 \text{ m}^2}$$



ⓐ ⊕ Perimeter

$$\hookrightarrow \text{Circle 1: } P_1 = \frac{1}{2} \pi (2r) = 2.8\pi = 8.796 \text{ m}$$

$$\text{Circle 2: } P_2 = 6.4\pi = 20.106 \text{ m}$$

$$\text{Big circle: } P_3 = \frac{1}{2} \pi (2.8 + 6.4) \times 2 = 9.2\pi = 28.903 \text{ m}$$

$$\text{Perimeter} = 20.106 + 28.903 - 8.796 = \underline{40.213 \text{ m}}$$

⊕ Area

$$\hookrightarrow \text{Circle 1: } A_1 = \frac{1}{2} \pi r^2 = \frac{1}{2} \pi 2.8^2 = 12.315 \text{ m}^2$$

$$\text{Circle 2: } A_2 = \frac{1}{2} \pi r^2 = \frac{1}{2} \pi 6.4^2 = 64.34 \text{ m}^2$$

$$\text{Big circle: } A_3 = \frac{1}{2} \pi r^2 = \frac{1}{2} \pi (6.4 + 2.8)^2 = 132.952 \text{ m}^2$$

$$\text{Area} = 132.952 + 64.34 - 12.315 = \underline{184.977 \text{ m}^2}$$

5

ⓐ ⊕ Surface Area

$$c = \sqrt{a^2 + b^2} = \sqrt{5.6^2 + 4.5^2} = 7.184 \text{ m}$$

$$A = (5.6 \times 4.5) + (4.5 \times 8.6) + (5.6 \times 8.6) + (7.184 \times 8.6) \\ = \underline{173.84 \text{ m}^2}$$

⊕ Volume

$$\text{Base area: } A = \frac{1}{2} (5.6 \times 4.5) = 12.6 \text{ m}^2$$

$$\text{Volume: } V = A \times h = 12.6 \times 8.6 = \underline{108.36 \text{ m}^3}$$





(b) ⊕ Surface Area

$$\text{Big Cylinder} = C_1 \times h = (3.5 + 0.5 \times 2) \pi \times 13.8 = 195.093 \text{ m}^2$$



$$\text{Small Cylinder} = C_2 \times h = (3.5 \times \pi) \times 13.8 = 151.739 \text{ m}^2$$



$$\text{Front Area} = \pi r_{\text{big}}^2 - \pi r_{\text{small}}^2 = \pi (2.25^2 - 1.75^2) = 6.283 \text{ m}^2$$



$$\text{Total SA} = 195.093 + 151.739 + 6.283 = \underline{353.115 \text{ m}^2}$$

⊕ Volume

$$\text{Base area: } A = 6.283 \text{ m}^2$$



$$\text{Volume: } V = A \times h = 6.283 \times 13.8 = \underline{86.71 \text{ m}^3}$$

(c) ⊕ Surface Area

$$\text{Side of triangle: } s = \sqrt{3.8^2 + (5.7/2)^2} = 4.75 \text{ m}$$

$$A = 2 \times (4.5 \times 12.9) + (5.7 \times 12.9) + (2 \times 4.75 \times 12.9) = \underline{312.18 \text{ m}^2}$$

⊕ Volume

$$\text{Base area: } A = (4.5 \times 5.7) + \left(\frac{1}{2} \times 3.8 \times 5.7\right) = 36.48 \text{ m}^2$$

$$\text{Volume: } V = 36.48 \times 12.9 = \underline{470.592 \text{ m}^3}$$