Practice Exam #3 – C2

Part A   **Questions 1 to 6**

In the *Student Booklet*, darken the letter that corresponds to your answer.

Each question is worth 4 marks.

1. Match the functions represented in the tables of values with the graphs below.

A)

x	y
4	126
7	72
9	56

B)

x	y
4	216
7	198
9	186

C)

x	y
4	112
7	196
9	252

D)

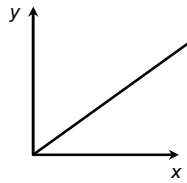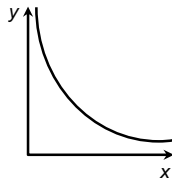| x	y
4	112
7	112
9	112

1)
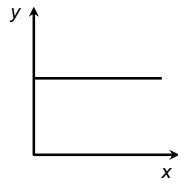
2)
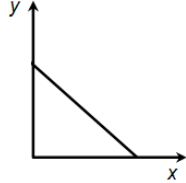
3)

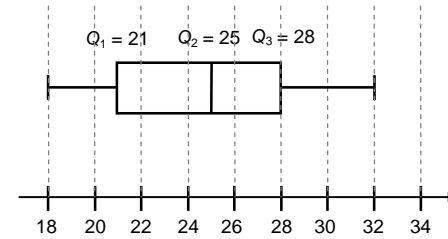4)

Among the following choices, which is the correct match?

A)   A4, B2, C3, D1

B)   A2, B4, C3, D1

C)   A4, B3, C2, D1

D)   A1, B2, C3, D4

2. Temperatures in four regions of Québec were collected in the month of August. One of the distributions was represented using a box-and-whisker plot.

$Q_1 = 21$ $Q_2 = 25$ $Q_3 = 28$

18   20   22   24   26   28   30   32   34

Identify the distribution that corresponds to the box-and-whisker plot above.

A)   18, 18, 21, 22, 24, 25, 26, 26, 28, 28, 31

B)   18, 19, 20, 22, 23, 24, 26, 28, 31, 32

C)   18, 20, 21, 22, 23, 27, 27, 28, 31, 32

D)   18, 19, 21, 22, 24, 24, 26, 26, 28, 28, 32
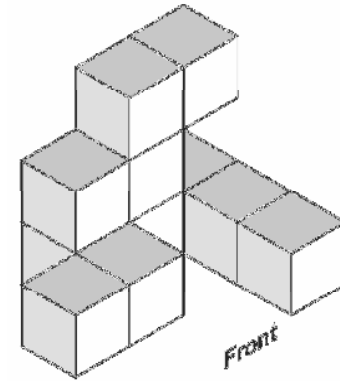
3. A figure of a cone is shown below.

The height corresponds to the algebraic expression $4x + 1$ and the radius of the base corresponds to the algebraic expression $3x$.
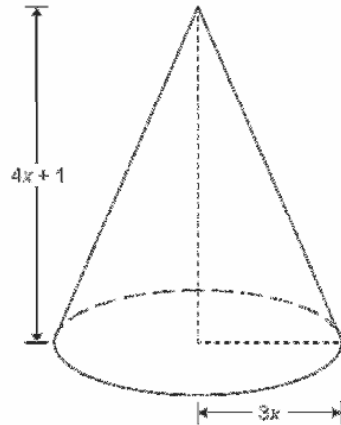
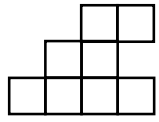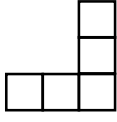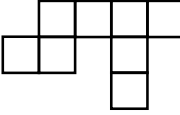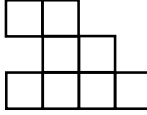**Which algebraic expression represents the volume of the cone?**

A) $36x^3 + 9x^2$

B) $12x^3 + 3x^2$

C) $(36x^3 + 9x^2)\pi$

D) $(12x^3 + 3x^2)\pi$

4. A solid is shown below.

Which of the following view of the solid is FALSE?

A)

Front

B)

Top

C)

Right

D)

Back

Secondary 3
Competency 2, Question Booklet (A, B)
Page 5

Secondary 3
Competency 2, Question Booklet (A, B)
Page 5

5. A car dealership is having a sale. The car on sale costs $18 500. There are two buying options available. The first option is to put no money down at the time of purchase, but pay $200 monthly. The second option is to pay $1000 at the time of purchase, and pay $150 monthly.

Let x = the number of months passed since purchasing the car

Let y = the amount that is left to pay for the car

Which system of equations would be used to find when the two payment options would have the same amount left to pay?
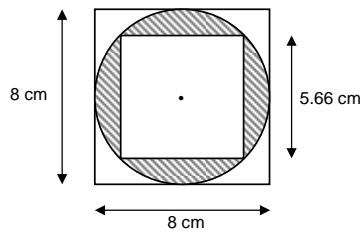
A) $y_1 = 200x + 18\ 500$
    $y_2 = 150x + 17\ 500$

C) $y_1 = 200x - 18\ 500$
    $y_2 = 150x + 1000$

B) $y_1 = -200x + 18\ 500$
    $y_2 = -150x + 17\ 500$

D) $y_1 = 200x$
    $y_2 = 150x + 1000$

6. A dart is thrown at random and lands on the target. The target is a circle inscribed in a larger square with a smaller square taken out.

8 cm

5.66 cm

8 cm

What is the probability the dart will hit the shaded zone?

A) ≈ 28%

C) ≈ 18%

B) ≈ 50%

D) ≈ 36%

Part B   Questions 7 to 10

In the *Student Booklet*, write your answer in the space provided.
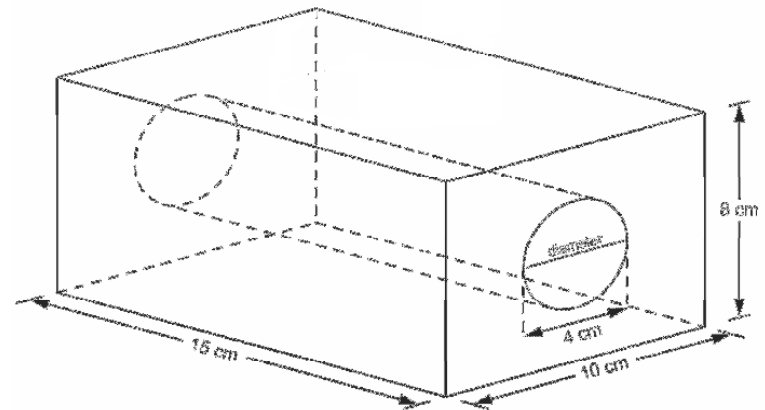
Each question is worth 4 marks.

7. **What is the simplified inequality below?**

$$-8(x - 2) \geq 2(2x + 4) + 44$$

8. A cylindrical hole is drilled into a solid shaped as a rectangular prism.

What is the total volume of this solid?
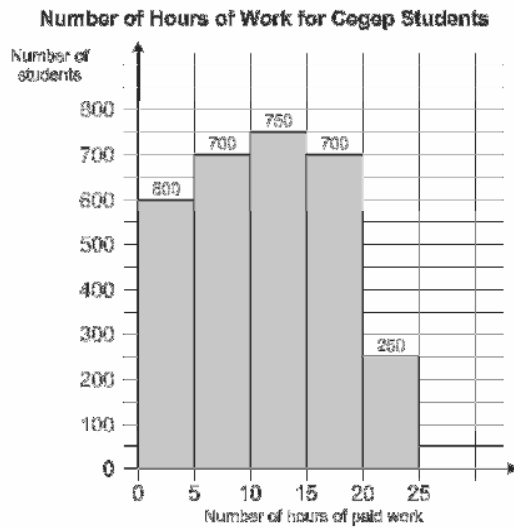
Use π = 3.14

8 cm

16 cm

4 cm

10 cm

9. Place the following 4 numbers in increasing order:

$$13\,036 \times 10^{-3} \qquad 0.001467 \times 10^{4} \qquad 156.21 \times 10^{-2} \qquad 0.020013 \times 10^{5}$$

10. A Cegep with 8000 students decided to do a survey on the number of hours its students spent on paid work. A sample of 3000 students was chosen.

The histogram below shows the results.

Number of Hours of Work for Cegep Students

Calculate the average number of hours spent on paid work per student from the data collected in the Cegep.

	A	B	C	D
1.	☐	☐	☐	☐
2.	☐	☐	☐	☐
3.	☐	☐	☐	☐
4.	☐	☐	☐	☐
5.	☐	☐	☐	☐
6.	☐	☐	☐	☐

Part B   **Questions 7 to 10**

Write your answer in the space provided.

Each question is worth 4 marks.

7. The simplified inequality is : _____. | 4 | 0 |

8. The total volume of the solid is: _____. | 4 | 0 |

9. _____   _____   _____   _____ | 4 | 0 |

10. The average number of hours spent on paid work per student is: _____ | 4 | 0 |

Part C   This part of the examination consists of **Questions 11 to 16**.

For each question, you must show all your work to justify your answer. The work you show on all the pages of Part C will be considered.

Your work must be organized and clearly presented; it cannot simply involve listing the calculator applications or programs used to obtain results or information.

Each question in Part C is worth 10 marks.

11. Hybrid Corn

A farmer needs to purchase new corn seeds. He is looking for the varieties that will grow the fastest. His regular supplier has suggested two new hybrid varieties. The supplier presents the farmer with data collected on plant growth.

For **hybrid A**, the study of seed growth was modeled. The equation describing the expected growth is:

$h = 2.25d - 13$ where d represents the number of days passed since planting the seeds
                            h represents the height of the plant in cm

For **hybrid B**, data was presented in the graph below:

Growth of Hybrid B

Height of
Plant (cm)

Q = (16, 22)

P = (10, 7)

Number of Days
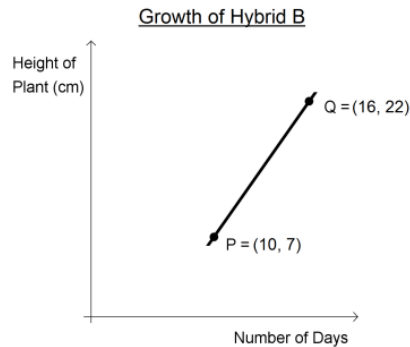
Knowing that the farmer would like to begin harvesting once the plants have reached a minimum height of 167 cm, which of the two hybrids would you recommend?
Justify your answer.

12. A Chocolate Surprise

Sophie works in a chocolate boutique. To make chocolate mousse, she must mix melted chocolate and cream in a pot. One "surprise of the week" toy will be thrown into this mixture.

Sophie must then pour the mixture into 2 different types of containers.

Type A container is in the shape of a right square based pyramid with 12 cm sides and a slant height of 11.66 cm.

11.66 cm

12 cm

5 cm
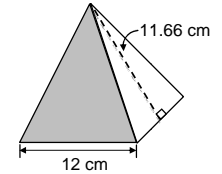
Type B container is in the shape of a half sphere with a radius of 5 cm.

Sophie must fill 52 type A containers and 30 type B containers with the mixture.

Given the volume of each container, what is the probability that the surprise toy will be in a Type A container?

13. The Unquestioned Mathematical Truth

Using the laws of exponents, show that the following expression is true.

$$\frac{\left(\left(a^3 \bullet b^5\right)^8\right)^{\frac{1}{2}} \bullet \left(a^2 \bullet c^3\right)^5 \bullet \left(c^5 \bullet b\right)^{-2} \bullet a^3}{\left(a^3 \bullet c^{-1}\right)^{-5} \bullet \left(b^2\right)^{-7} \bullet \left(\left(b^4 \bullet a^5\right)^{24}\right)^{\frac{1}{3}}} = 1$$

14. The Treasure Hunt

Richard is participating in a treasure hunt. The treasure has been hidden at the intersection of Sugar Street, Maple Street and Oak Street. The scale of the graph is in kilometres.

> - The treasure is located at point T.
> - Oak Street is parallel to Wood Street.

Richard is located at point A. He plans a route to get to the treasure by travelling down Wood Street, turning left on Birch Street and then turning left on Maple Street.

What is the distance Richard travels to reach the treasure?

Secondary 3
Competency 2, Student Booklet (A, B, C)
Page 7

Secondary 3
Competency 2, Student Booklet (A, B, C)
Page 9
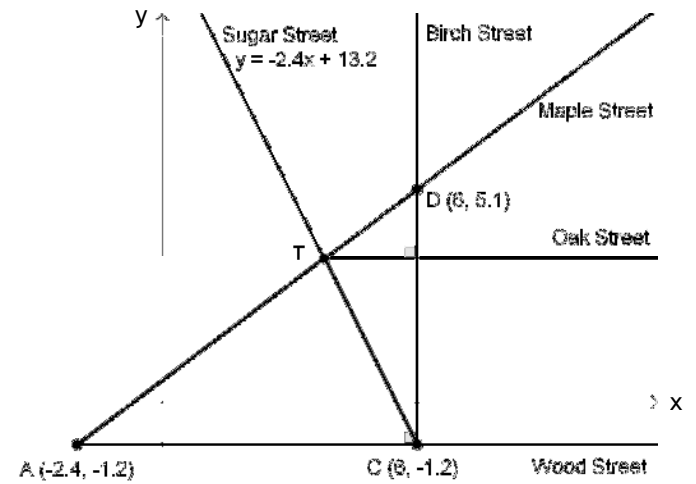
15. Lawn Wars

Mr. Samsom and Mr. Tonga live in the same neighbourhood. Mr. Samson's lawn is in the shape of an isosceles trapezoid and Mr. Tonga's is a closed 6 sided polygon.

After looking at city plans it was determined that both their lawns have equivalent areas.
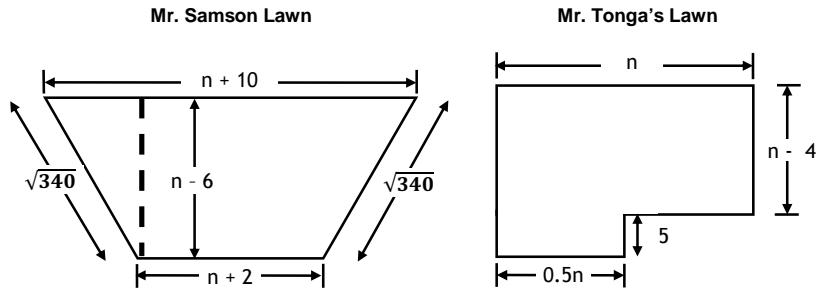
The cost of fencing the perimeter of the lawn is $40/m.

Mr. Samson Lawn

Mr. Tonga's Lawn

Whose lawn cost the most to fence and by how much?

16. Garden of Eden Juice

The *Garden of Eden* juice company is launching a new kind of juice. They hire you to calculate the amount of cardboard used for the containers of their new product. Here are the specifications:

➢ The family size has a capacity of 2 litres.

➢ The individual size has a capacity of 250 mL.

➢ The containers are similar.

➢ The base of the family size is a square with 0.8 dm sides.
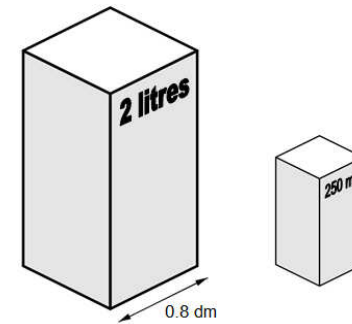
In one day, the company produces 3000 units of the family size container and 6000 units of the individual size container.

Determine the quantity of cardboard needed for the production of the containers in one day.

Secondary 3
Competency 2, Student Booklet (A, B, C)
Page 11

Secondary 3
Competency 2, Student Booklet (A, B, C)
Page 13

PARTS A AND B

Part A	Questions 1 to 6
	4 marks or 0 marks

1. **A**   [4 | 0]

2. **C**   [4 | 0]

3. **D**   [4 | 0]

4. **B**   [4 | 0]

5. **B**   [4 | 0]

6. **A**   [4 | 0]

Part B	Questions 7 to 10
	0 or 4 marks

7. The simplified inequality is: $x \leq -3$ [4 | 0]

8. The total volume of the solid is: **1011.6 cm³**   [4 | 0]

9. **156.21×10^{-2}**   **$13\ 036 \times 10^{-3}$**   **0.001467×10^{4}**   **0.020013×10^{5}**   [4 | 0]

                     OR

    1.5621   13.036   14.67   2001.3

10. The average number of hours spent on paid work per student is: [4 | 0]
11.3 hours or **11 hours 20 minutes**

11. Hybrid Corn

Example of an appropriate solution

➢ **Hybrid A:**

Find the number of days needed to reach a height of 167 cm.

$$h = 2.25d - 13$$
$$167 = 2.25d - 13$$
$$180 = 2.25d$$
$$80\ days = d$$

It would take 80 days to reach a height of 167 cm.

➢ **Hybrid B:**

Find the equation of the line that passes through the points (10, 7) and (16, 22).

$$y = ax + b$$
$$a = \frac{22 - 7}{16 - 10}$$
$$a = 2.5$$

$$y = 2.5x + b$$
$$7 = 2.5(10) + b$$
$$b = -18$$

$$y = 2.5x - 18$$

The number of days for hybrid B to reach a height of 167 cm is:

$$y = 2.5x - 18$$
$$167 = 2.5x - 18$$
$$185 = 2.5x$$
$$74 = x$$

It takes approximately 74 days for hybrid B to reach a height of 167 cm.

Answer: **It is recommended that the farmer use hybrid B, which takes 6 fewer days to obtain the desired height.**

12. A Chocolate Surprise

Example of an appropriate solution

The probability that the surprise toy is in container A is given by the ratio of the volume of type A container and the total volume of all of the containers.

1) **Volume of the Pyramid:**

Height of the pyramid using the Pythagorean Theorem.

$$c^2 = a^2 + b^2$$

$$b = \sqrt{(11.66)^2 - (6)^2}$$

$$b = 10$$

Volume of the pyramid

$$V = \frac{A_b h}{3}$$

$$V = \frac{12 \times 12 \times 10}{3}$$

$$V = \frac{1440}{3}$$

$$V = 480 \, \text{cm}^3$$

2) **Volume of the half sphere:**

$$V = \frac{1}{2} \times \frac{4\pi r^3}{3}$$

$$V = \frac{1}{2} \times \frac{4\pi 5^3}{3}$$

$$V = 261.66 \, \text{cm}^3$$

4) **Probability calculation:**

$$P(\text{A}) = \frac{\text{volume container A}}{\text{total volume}}$$

$$P(\text{A}) = \frac{(52 \times 480)}{(52 \times 480) + (30 \times 261.66)}$$

$$P(\text{A}) = \frac{24960}{32810}$$

$$P(\text{A}) = 0.76$$

Answer: Given the volume of each container, the probability that the surprise toy will be in a type A container is **76%.**

13. The Unquestioned Mathematical Truth

Example of an appropriate solution:

$$\frac{\left(\left(a^3 \bullet b^5\right)^8\right)^{\frac{1}{2}} \bullet \left(a^2 \bullet c^3\right)^5 \bullet \left(c^5 \bullet b\right)^{-2} \bullet a^3}{\left(a^3 \bullet c^{-1}\right)^{-5} \bullet \left(b^2\right)^{-7} \bullet \left(\left(b^4 \bullet a^5\right)^{24}\right)^{\frac{1}{3}}} = 1$$

$$\frac{a^{12} \bullet b^{20} \bullet a^{10} \bullet c^{15} \bullet c^{-10} \bullet b^{-2} \bullet a^3}{a^{-15} \bullet c^5 \bullet b^{-14} \bullet b^{32} \bullet a^{40}} = 1$$

$$\frac{a^{25} \bullet b^{18} \bullet c^5}{a^{25} \bullet c^5 \bullet b^{18}} = 1$$

$$\frac{a^{25} \bullet b^{18} \bullet c^5}{a^{25} \bullet b^{18} \bullet c^5} = 1$$

$$1 = 1$$

14. The Treasure Hunt

Example of an appropriate solution

➢ **The equation of line AD:**

$$a = \frac{5.1 - -1.2}{6 - -2.4}$$

$$a = \frac{6.3}{8.4}$$

$$a = 0.75$$

$$y_1 = 0.75x + b$$
$$5.1 = 0.75(6) + b$$
$$b = 0.6$$

$$y_1 = 0.75x + 0.6$$

➢ **The coordinates of point T:**

$$y_1 = y_2$$
$$0.75x + 0.6 = -2.4x + 13.2$$

$$3.15x = 12.6$$
$$x = 4$$

$$y = 0.75(4) + 0.6$$
$$y = 3.6$$

The coordinates of point T are (4, 3.6)

➢ **The distance traveled:**

$$\text{Distance traveled} = m\overline{AC} + m\overline{CD} + m\overline{DT}$$

$$= 8.4 + 6.3 + \sqrt{(5.1 - 3.6)^2 + (6 - 4)^2} \quad (\text{Pythagoras})$$

$$= 8.4 + 6.3 + 2.5$$

$$= 17.2 \text{ km}$$

Answer: The distance that Richard travels to reach the treasure is **17.2 km**.

15. Lawn Wars

Example of an appropriate solution #1

➢ **Let the Area of Mr. Samson's lawn equal that of Mr. Tonga's:**

$$\frac{(b_1 + b_2)h}{2} = (l \cdot w) + (l \cdot w)$$

$$\frac{(n + 10 + n + 2)(n - 6)}{2} = (n)(n - 4) + 5(0.5n)$$

$$\frac{(2n + 12)(n - 6)}{2} = (n^2 - 4n) + 2.5n$$

$$\frac{2n^2 - 12n + 12n - 72}{2} = n^2 - 1.5n$$

$$\frac{2n^2 - 72}{2} = n^2 - 1.5n$$

$$n^2 - 36 = n^2 - 1.5n$$

$$-36 = -1.5n$$

$$\frac{36}{1.5} = \frac{1.5n}{1.5}$$

$$n = 24$$

➢ **The perimeter of Mr. Tonga's lawn:**

$$P = n + (n - 4) + n + 5 + 5 + (n - 4)$$
$$= 4n + 2$$
$$= 4(24) + 2$$
$$= 96 + 2$$
$$= 98 \ m$$

➢ **The perimeter of Mr. Samson's lawn:**

$$P = n + 10 + n + 2 + 18.44 + 18.44$$
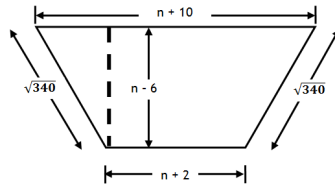$$= 2n + 48.88$$
$$= 2(24) + 48.88$$
$$= 96.88$$

➢ **The costs for fence:**

Mr. Tonga	Mr. Samson	Difference
$98 \times 40 = \$3920$	$96.88 \times 40 = \$3875.20$	$3920 - 3875.20 = \$44.80$

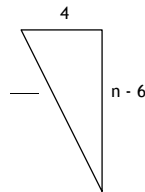Answer: **Mr. Tonga's** fence costs the most. It costs **$44.80** more to fence this lawn compared to the neighbour's**.**

Example of an appropriate solution #2

➤ **The base of the right triangle within the trapezoid:**

➤ **The value of 'n' using the Pythagorean theorem:**

$\underline{}$

$\underline{}$

➤ **The perimeter of Mr. Tonga's lawn:**

$P = n + (n-4) + n + 5 + 5 + (n-4)$
$= 4n + 2$
$= 4(24) + 2$
$= 96 + 2$
$= 98 \ m$

➤ **The perimeter of Mr. Samson's lawn:**

$P = n + 10 + n + 2 + 18.44 + 18.44$
$= 2n + 48.88$
$= 2(24) + 48.88$
$= 96.88$

➤ **The costs for fence:**

Mr. Tonga	*Mr. Samson*	*Difference*
$98 \times 40 = \$3920$	$96.88 \times 40 = \$3875.20$	$3920 - 3875.20 = \$44.80$

Answer: **Mr. Tonga's** fence costs the most. It costs **$44.80** more to fence this lawn compared to the neighbour's**.**

---

16. Garden of Eden Juice

Example of an appropriate solution

Note: $1\ell = 1 \ dm^3$
$\therefore$ Family size $= 2\ell = 2 \ dm^3$

➤ **The height of the large rectangular prism (family size):**

Volume = Area of square base x height
$2 = 0.8^2$ x height
height $= 3.125$ dm

➤ **The total area of the large rectangular prism (family size):**

Total area $= 2(\text{area of base}) + P_b h$
$= 2(0.8 \times 0.8) + (4 \times 0.8 \times 3.125)$
$= 1.28 + 10$
$= 11.28 \ dm^2$

➤ **Similarity ratio**

The ratio of the volumes is $k^3 = \dfrac{2}{0.25} = 8$

The ratio of the areas is $k^2 = \left(\sqrt[3]{8}\right)^2 = 4$

➤ **The area of the small rectangular prism (individual size):**

Area of small container $= \dfrac{\text{Area of large container}}{4}$
$= \dfrac{11.28}{4}$
$= 2.82 \ dm^2$

➤ **Amount of cardboard needed:**

Total Area $= 3000(11.28) + 6000(2.82)$
$= 33840 + 16920$
$= 50760 \ dm^2$

Answer: **50 760 dm²** more cardboard is needed.