# Practice Exam -5- C2

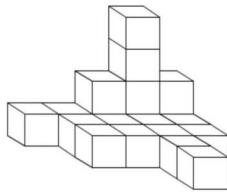**Part A    Questions 1 to 6**

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

Each question is worth 4 marks.

1.    Which of the following expresses $(3.2 \times 10^8) \times (7.1 \times 10^6)$ in scientific notation?

A)   $22.72 \times 10^{14}$           C)   $22.72 \times 10^{48}$

B)   $2.272 \times 10^{15}$           D)   $10.3 \times 10^{14}$
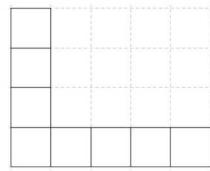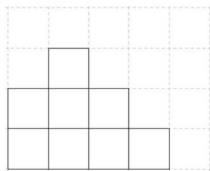
2.    Which view correctly represents this sold?



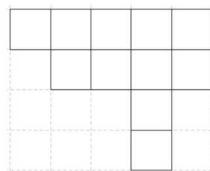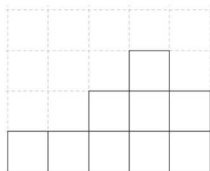A)        **Back View**          C)        **Left View**



B)        **Front View**          D)        **Top View**



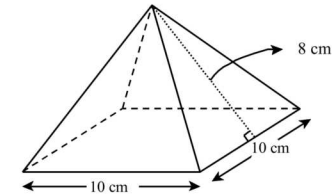3.    To help with the study of pyramids, your teacher asks you to construct the pyramid shown in the sketch below.
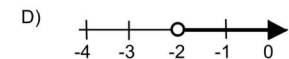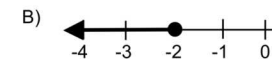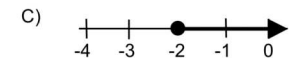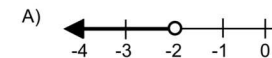


What total surface area of cardboard would be needed to make this pyramid?

A)   160 cm$^2$           C)   360 cm$^2$

B)   260 cm$^2$           D)   460 cm$^2$

4.    Which number line represents the solution set of the simplified inequality?

$$3(4x + 2) + 10x \geq -2(-5x + 4) - 10$$

5. Place the following units in order from LEAST to GREATEST area
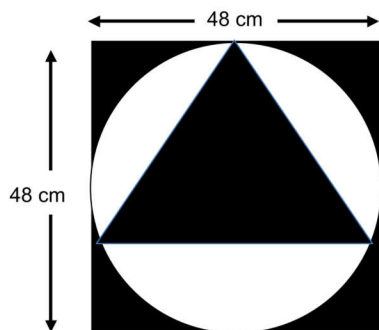
| W | X | Y | Z |
|---|---|---|---|
| 2500 dm² | 0.6 dam² | 39 000 cm² | 9 m² |

A) Z - W - X - Y

B) Y - X - W - Z

C) Y - X - Z - W

D) Y - Z - W - X

6. A dart is randomly thrown at a square board with sides 48 cm. A black triangle with an area of 768 cm² is inscribed within a white circle or diameter 48 cm.



48 cm

48 cm

What is the probability of the dart hitting the black region?

A) 55%

B) 67%

C) 33%

D) 45%

---

| Part B | Questions 7 to 10 |
|---|---|
| | In the *Student Booklet*, write your answer in the space provided. Each question is worth 4 marks. |

7. Expand and/or simplify the following expressions

a) $\left(2x^3\right)^3$

b) $(12a-3b)-(4a-6b)$

c) $\dfrac{30x^5y^9 - 20x^8y^7 + 5x^2y^4}{5x^2y^4}$

d) $\dfrac{\left(m^3n^5\right)\left(mn^4\right)}{m^{-3}n^2}$

8. Below is a frequency table of all Secondary III science test marks

**Science Students Marks**

| Overall Test Mark % | Frequency |
|---|---|
| [50 , 60[ | 2 |
| [60 , 70[ | 26 |
| [70 , 80[ | 42 |
| [80 , 90[ | 14 |
| [90 , 100[ | 8 |
| Total | |

**What is the overall mean of the test marks?**

Secondary III Mathematics
Competency 2, Question Booklet (A, B)
Page 4

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

9.     Emily is painting a mural in the school library. The number of hours it takes to complete the mural depends on the number of people painting.

**Painting a School Mural**

Time to Complete the Painting (hours)

(5,12)

(10,6)

# of People
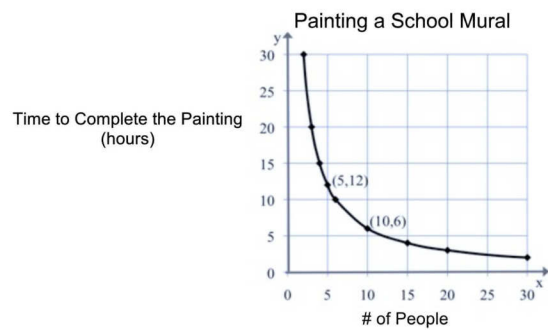
The principal is only allowing 7.5 hours for the project to be completed. **How many volunteers will be needed to paint the mural?**

10.    Two triangular based prisms are similar. The area of the base of the smaller prism is 15.6 cm$^2$. What is the volume of the larger prism?

Small Prism

23 cm

$A_{base}$=15.6 cm$^2$

Large Prism

34.5 cm
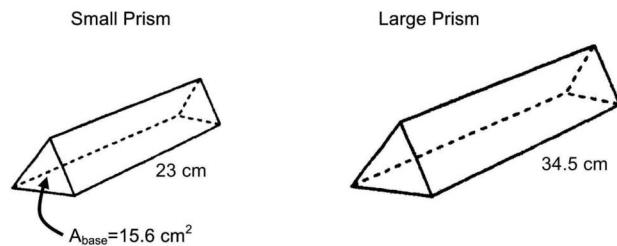
## 11. Elevator Action

A new high-rise building has two high speed elevators. Both elevators start moving at the same time, but move at different speeds.

*Elevator A*

The function for elevator A's floor number with respect to time is

$y = -2.5x + 66$

Where x is time in seconds

and y is the floor number

*Elevator B*

The function for Elevator B is unknown but some information is available.

After 5 seconds Elevator B is at floor 22.

After 8 seconds Elevator B is at floor 28.

At some point both the elevators will be at the exact same floor.

If Elevator B continues to move up, 31.5 seconds later, it will reach the top floor of the building.

**How many floors does the building have?**

## 12. Plastic MEGO Blocks

MEGO wants to cover some blocks in green paint. Each block is made up of 6 identical cylinders on top of a rectangular based prism.

➢   The bottom of the block will not be painted

➢   A bucket of paint covers 38 000 cm$^2$



1 cm

0.6 cm

1.2 cm

4.2 cm

2.4 cm
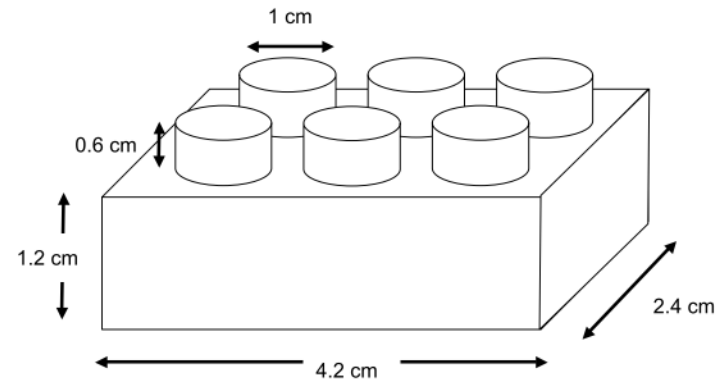
**How many buckets of green paint will be needed to cover 5000 of these blocks?**

Secondary III Mathematics
Competency 2 Student Booklet (A,B,C)
Page 4

Secondary III Mathematics
Competency 2 Student Booklet (A,B,C)
Page 6

## 13. The Blue Whale Dive

Ringo is an oceanographer and is tracking the migration patterns of blue whales. Ringo's submarine travels to the bottom of the ocean with a blue whale. Both dives are shown below.

Ringo's Dive

$y$

Meters Above
Ocean Floor
(m)

A (12,1500)

B (22,750)
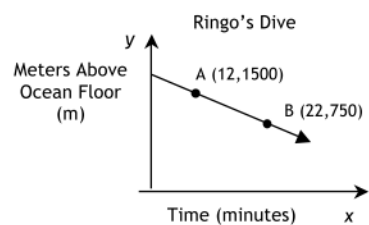
Time (minutes)    $x$

Whale's Dive

| Time (minutes) | Meters Above Ocean Floor ( |
|---|---|
| 0 | 2460 |
| 3 | 2214 |
| 10 | 1640 |

**Who reaches the bottom of the ocean first? How long will they have to wait for the other to arrive?**

## 14. Archie's Ice Cream Cone

Archie is buying an ice cream cone with two spherical scoops. Last time he had an ice cream cone, he got distracted and the ice cream melted in the cone. He noticed that the melted ice cream filled up the cone completely.

- The cone has a height of 12 cm and a slant length of 12.5 cm
- Assume an ice cream scoop is in the shape of a perfect sphere and its' radius is different than that of the cone.

12.5 cm    12 cm
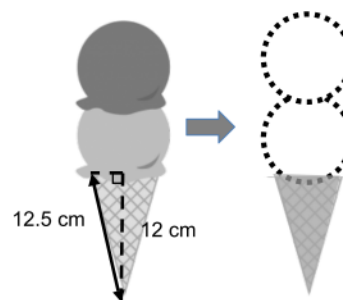
**What is the radius of one of the spherical ice cream scoops?**

## 15. Team Canada Hockey

The following box and whisker plot contain weight data for players on the defensive and forward lines on Canada's hockey team. The data used to construct the box-and-whikser plot is shown in the two tables below. Six of the data points are missing,
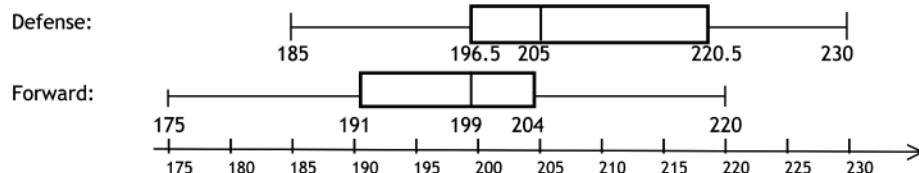
### Box-and Whisker Plot: Player's Weight by Position (lbs)



Defense:
185    196.5  205    220.5    230

Forward:
175    191    199  204    220

175  180  185  190  195  200  205  210  215  220  225  230

| Defensive Line | |
|---|---|
| **Name** | **Weight (lbs)** |
| Chris | ? |
| Duncan | 194 |
| Edward | 199 |
| Phil | ? |
| Kyle | ? |
| Dion | 217 |
| Jay | 218 |
| Luke | 223 |
| Marc | 230 |

| Forward Line | |
|---|---|
| **Name** | **Weight (lbs)** |
| Hopper | 175 |
| Jordan | 182 |
| Evander | 189 |
| Max | 193 |
| Patrick | 197 |
| ? | 198 |
| Alexandre | 199 |
| Andrew | 200 |
| ? | 200 |
| John | 201 |
| ? | 207 |
| Corey | 209 |
| Tim | 220 |

**Defense : 3 player's weights are missing**
➤ Chris is the lightest player on defense
➤ Defense players' mean weight is 208 lbs
➤ Kyle's weight is the median of the defensive line

**Forwards : 3 players names are missing**
➤ Teddy's weight is the mode of the forwards
➤ Jamie's weight is located in the 4$^{th}$ quarter
➤ Ryan's weight is above the mean but below the median

**Determine the weights of the 3 defensemen and names of the 3 forward that are missing.**

## 16. An Old Key

Alan has an old key he found in the attic. The key's left half (shaded area) and the right half have the same area. The outline of the old key is shown below.



Area
2.55 cm²

6 cm

4 cm

x + 2

x - 2

2 cm

2.5 cm

h

3 cm
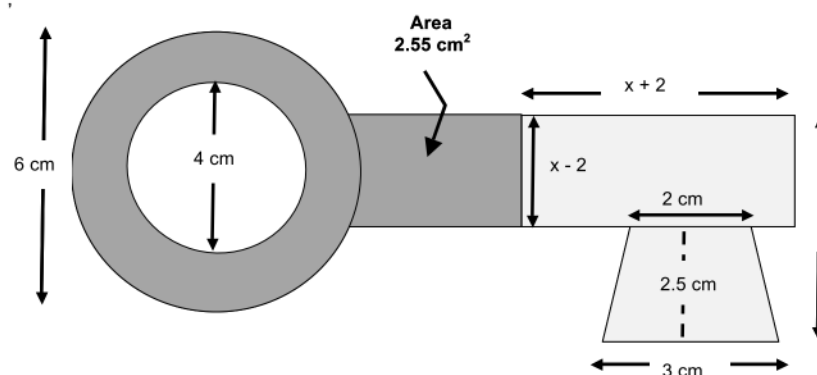
**What is the height of the key indicated by the letter h in the diagram?**

**Answer Key**
**Part A and B**

**Part A    Questions 1 to 6**

Each question is worth 4 marks.

Fill in the box under the letter that corresponds to your answer.

|  | A | B | C | D |
|---|---|---|---|---|
| **1.** | ☐ | ■ | ☐ | ☐ |
| **2.** | ☐ | ☐ | ■ | ☐ |
| **3.** | ☐ | ■ | ☐ | ☐ |
| **4.** | ☐ | ☐ | ■ | ☐ |
| **5.** | ☐ | ☐ | ☐ | ■ |
| **6.** | ■ | ☐ | ☐ | ☐ |

**Part B    Questions 7 to 10**

Each question is worth 4 marks.

Write your answer in the space provided.

**7.   a. $8x^9$ or $2^3x^9$     b. $8a + 3b$     c. $6x^3y^5 - 4x^6y^3 + 1$     d. $m^7n^7$**

| 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|

**8.   The mean test score is 75%**

| 4 | 0 |
|---|---|

**9.   They will need 8 volunteers**

| 4 | 0 |
|---|---|

**10.  The volume of the triangular based prism is 1211 cm³**

| 4 | 0 |
|---|---|

**\* Accept answer not rounded to the nearest cm³**

## ■ 11. Elevator Action

**A. Example of an appropriate solution**

➢ **Elevator A**

$y = ax + b$ where $x$ = time in seconds   $y$ = floor number

$$y = -\frac{5}{2}x + 66$$

➢ **Elevator B**

(20, 24) and (38, 45) are points on the line

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{28 - 22}{8 - 5} = \frac{6}{3} = 2$$

$b = y - ax$
$b = 28 - 2 \cdot 8$
$b = 28 - 16$          $y = 2x + 12$
$b = 12$

$y = 2x + 12$

➢ **System of Equations**

Elevator A:          $y = -2.5x + 66$

Elevator B:          $y = 2x + 12$

➢ **Solving the System of Equations**

-2.5x + 66 = 2x + 12
-4.5 x = 54
x = 12 seconds

➢ **Check for the Floor Number**

y = 2(12) +12 = 36th floor
y = -2.5(12) +66 = 36th floor

➢ **Determine Top Floor**

y = 2(12+31.5) + 12
y = -2.5(12) +66 = 36th floor

➢ **Conclusion**

The building has 99 floors.

## ■ 12. Plastic MEGO Blocks

**A. Example of an appropriate solution**
**Solution & Answer:**

➢ **Lateral surface area of the rectangular based prism**

$$A_{LAT} = P_b h$$
$$= (2l + 2w)h$$
$$= (2 \cdot 4.2 + 2 \cdot 2.4)1.2$$
$$= 15.84 \ cm^2$$

➢ **Area of the 6 cylinders**

$$A_{LAT} = \pi r^2 + 2\pi rh$$
$$= \pi(0.5)^2 + 2\pi(0.5)(0.6)$$
$$= 2.669 \ cm^2$$

since 6 cylinders 6x 2.669 cm$^2$ is 16.014 cm$^2$

➢ **Surface area top of prism**

$$A_{TOP} = l \cdot w - 6\pi r^2$$
$$= (4.2)(2.4) - 6\pi(0.5)^2$$
$$= 5.37 \ cm^2$$

➢ **Total surface area for a block**

$$A_T = 15.84 + 16.014 + 5.37$$
$$= 37.224 \ cm^2$$

➢ **Determine the volume of paint needed for the blocks**

$$\frac{5000 \cdot 37.224 cm^2}{38\ 000 \ cm^2 / Bucket} = 4.9 \ Buckets$$

Therefore 5  buckets of green paint are needed. 4.9 buckets is also acceptable.

## ■ 13. The Blue Whale Dive

### A. Example of an appropriate solution

➢ Determine the slope / rate of the oceanographer's descent

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{750 - 1500}{22 - 12} = \frac{-750}{10} = -75 \quad \text{m/minute}$$

➢ Determine the initial value for the oceanographers path (Ringo):

$$b = y - ax$$
$$b = 750 - (-75)(22)$$
$$b = 2400$$

➢ The equation for the oceanographer is:
$$y = -75x + 2400$$

➢ Let y=0 to find when he reaches the bottom
$$0 = -75x + 2400$$
$$75x = 2400$$
$$x = 32 \text{ min}$$

➢ Determine the whale's rate of descent

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1640 - 2214}{10 - 3} = \frac{-574}{7} = -82 \quad \text{m / min}$$

➢ Identifty the initial value from the table
$$b = 2460$$

➢ The equation for the oceanographer is:
$$y = -82x + 2460$$

➢ Let y=0 to find when the reach the bottom
$$0 = -82x + 2460$$
$$82x = 2460$$
$$x = 30 \text{ min}$$

**The whale** reaches the bottom of the ocean first. He waits 2 minutes.

## 14. Archie's Ice Cream Cone

### A. Example of an appropriate solution

➢ Determine the radius of the cone
$$r^2 = SL^2 - h^2$$
$$r^2 = 12.5^2 - 12^2$$
$$r^2 = 12.25$$
$$r = 3.5 \ cm$$

➢ Calculate the volume of the cone
$$V = \frac{\pi r^2 h}{3} = \frac{\pi (3.5^2)(12)}{3} = 153.86 \ cm^3$$

➢ Calculate radius of the sphere

The volume of two spheres equals the volume of the cone

$$V = 2 \times \frac{4}{3}\pi r^3$$
$$153.86 = \frac{8}{3}\pi r^3$$
$$r^3 = \frac{153.86 \cdot 3}{8\pi}$$
$$r = \sqrt[3]{18.375}$$
$$r = 2.64 \ cm$$

➢ Diameter is twice the radius

The radius of a spherical ice cream scoop is 2.64 cm.

## 15. Team Canada Hockey

A. **Example of an appropriate solution**

> ➤ **Finding the player's names on the defensive line from the box-and-whisker plot**
>
> Chris is the lightest --- he is 185 ( the minimum on the box and whiskers plot)
>
> Kyle is the median--- he is 205 ( Q2 on the box and whiskers plot)

> ➤ **Phil's weight by using the average weight of the players**

$$\frac{194 + 217 + 218 + 230 + 223 + 199 + 185 + 205 + x}{9} = 208$$

$$\frac{1671 + x}{9} = 208$$

$1671 + x = 1872$

$x = 1872 - 1671$

$x = 201$

> ➤ **Forwards weight from the box and whisker plot**
>
> Teddy is the mode. 200 (from the table) So he weighs 200 lbs
>
> Jamie weighs more than 75% of the Forwards players
>
> He weighs more than 204 (Q3) but less than 220 (the maximum)
>
> So he weighs 207 lbs

> > ➤ Ryan is above the average but below the median.
> >
> > He is more than 197.7 but less than 199 (Q2)
> >
> > So he weighs 198 lbs. This can also be determined by order of elimination.

**Conclusion: The names that correspond to the weights in lbs are shown below.**

| Chris | 185 |
|-------|-----|
| Kyle  | 205 |
| Ryan  | 201 |

| Jamie | 207 |
|-------|-----|
| Teddy | 200 |
| Ryan  | 198 |

## ■ 16. An Old Key

A. **Example of an appropriate solution**

> ➤ **The area of the ring**
> $A = \pi r^2 - \pi r^2$
> $= 3.14(3)^2 - 3.14(2)^2$
> $= 15.7 \text{ cm}^2$

> ➤ **Total area of the left portion**
>
> $A_1 = 15.7 + 2.55 = 18.25 \text{ cm}^2$

> ➤ **Area of the trapezoid**
>
> $$A = \frac{(b_1 + b_2)h}{2}$$
> $$= \frac{(2+3)2.5}{2}$$
> $$= 6.25 \; cm^2$$

> ➤ **Area of the rectangle**
> $A = l \cdot w$
> $$= (x-2)(x+2)$$
> $$= x^2 - 2x + 2x - 4$$
> $$= x^2 - 4$$

> ➤ **Let the two areas equal each other and solve for x**
>
> $$18.25 = x^2 - 4 + 6.25$$
> $$18.25 = x^2 + 2.25$$
> $$x^2 = 16$$
> $$x = 4$$

> ➤ **The height of the key is**
>
> $$4 - 2 + 2.5 = 4.5 \; cm$$

Conclusion: The height of the key is 4.5 cm..