

Part A Questions 1 to 6

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

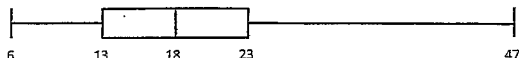
Each question is worth 4 marks.

1. Consider the expression $\frac{(4.5 \times 10^{-3})(6.8 \times 10^9)}{(2.3 \times 10^2)}$

Which of the following is the best approximation of the answer in scientific notation?

- A) 13.304×10^4
- B) 1.3304×10^4
- C) 13.304×10^{10}
- D) 1.3304×10^5

2. At a restaurant, 29 customers experienced different wait times after placing their food order. The box and whisker plot, shown below, illustrates the wait time in minutes.

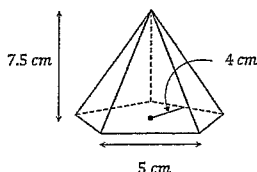


Which of the following statements is necessarily true?

- A) The mean wait time is 18 minutes.
- B) There are as many customers who waited between 13 and 23 minutes, than customers who waited between 23 and 47 minutes.
- C) At least one customer waited exactly 18 minutes.
- D) There are fewer customers who waited between 13 and 18 minutes, than customers who waited between 23 and 47 minutes.

5. The following pentagonal pyramid has the following measurements:

- edge = 5 cm
- apothem = 4 cm
- height = 7.5 cm

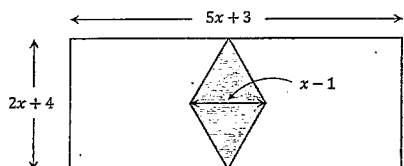


What is the total surface area of this pyramid?

- A) 156.25 cm^2
- B) 287 cm^2
- C) 312.50 cm^2
- D) 143.75 cm^2

6. The figure below shows a rhombus inside a rectangle.

Determine the algebraic expression of the white area of this figure.



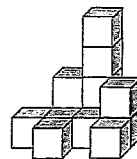
- A) $8x^2 + 24x + 16$
- B) $9x^2 + 27x + 10$
- C) $10x^2 + 27x + 10$
- D) $9x^2 + 25x + 14$

3. Consider the inequality $3x + 2(3x - 4) > x + 8$

Which of the following bracket notation best represents the solution to the inequality?

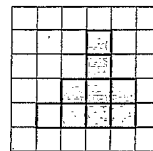
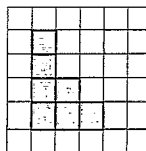
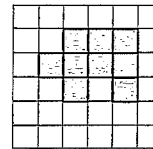
- A) $[2, +\infty[$
- B) $]1.5, +\infty[$
- C) $[2, +\infty[$
- D) $]1.5, +\infty[$

4. The following cubes are shown in oblique perspective.



Which view is false?

- A) Right
- B) Top
- C) Left
- D) Front



Part B Questions 7 to 10

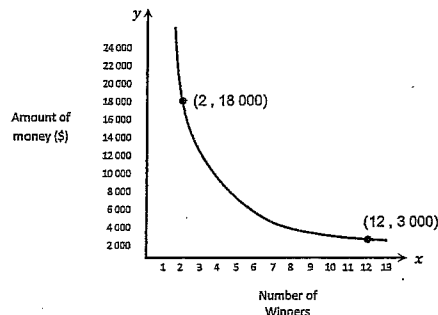
In the *Student Booklet*, write your answer in the space provided.
Each question is worth 4 marks.

7. Expand and/or simplify the following expressions

a) $(-8m + 3n) + (4m - 5n)$ b) $6x(3x + 4)$

c) $\frac{42x^6y^4 + 14x^5y^3}{-7x^4y^{-2}}$ d) $\frac{(2a^2b^4)^3}{4ab^5}$

8. Two weeks ago, 2 winning tickets from a jackpot each received \$18,000. Last week 12 winning tickets were drawn and they each received \$3000.



This week there were 5 winning tickets. What amount did each winning ticket receive?

9. Sally received her report card. The weighted average was missing, but she is confident she can figure out what it is.

Title	Weighting	Mark (%)
Quiz #1	5%	73
Quiz #2	10%	68
Assignment	15%	89
Project	20%	92
Test #1	20%	63
Test #2	30%	76
Total (100%)		?

Determine Sally's weighted average on her report card

10. A sphere is placed inside a cylinder. They share the same height and diameter.

- The sphere has an area of 153.86 cm^2 .



What is the volume of the cylinder to the nearest cm^3 ?

Part A Questions 1 to 6

Darken the letter that corresponds to your answer.

Each question is worth 4 marks.

- [A] [B] [C] [D]
- [A] [B] [C] [D]
- [A] [B] [C] [D]
- [A] [B] [C] [D]
- [A] [B] [C] [D]
- [A] [B] [C] [D]

Part B Questions 7 to 10

Write your answer in the space provided.

Each question is worth 4 marks.

7. Write the simplified expressions in the space provided.

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

- a) _____ b) _____
c) _____ d) _____

8. The amount that each winning ticket received is: _____

4	0
---	---

9. Sally's weighted average is: _____

4	0
---	---

10. The volume of the cylinder to the nearest cm^3 is: _____

4	0
---	---

11. Air Traffic Controller

Fred, an air traffic controller, is in charge of monitoring the altitude of two planes. One is in the air getting ready to land, and the other is about to take off from the airport.



Plane A

Plane A is lifting off and is increasing altitude at a constant rate. The path of this plane is identified by the following equation.

$$y = 550x$$

where x is time in minutes

y is the height above the ground in meters

Plane B

Plane B is descending at a constant rate. The following information is tracked by Fred.

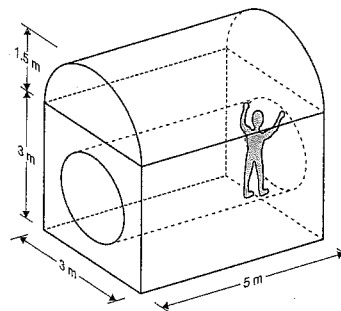
- After 2 minutes the plane is at an altitude of 14 300 m above the ground.
- After 7 minutes the plane is at an altitude of 11 050 m above the ground.

At some point, both planes will be at the same height above the ground.

How many minutes after the two planes achieve the same height will Plane B land safely on the ground?

12. The Play Structure

A toy company has designed a giant play structure composed of a rectangular prism topped by a half cylinder. A cylindrical tunnel allows children to walk through the structure. The total volume of foam required to build the structure is 55.9 m^3 .



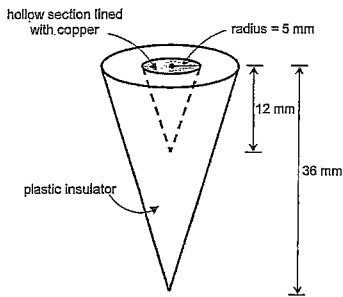
Referring to the diagram shown above, what is the diameter of the cylindrical tunnel?

Show all your work.

13. Robotic Design

Electrical insulators are needed for the construction of a high-tech robot. The insulators are cone shaped and made up of solid plastic with a similar cone shaped hollow section. The hollow section requires a copper lining.

- The cost of plastic is \$0.03 per cm^3
- The cost of copper for the lining of the hollow section is \$0.14 per cm^2



What will be the cost for 5000 of these electrical insulators?

15. Mobile Phone Companies

Mary and Thomas are employees at two big cell phone companies.

Mary works at Banana UPhone where she gets paid \$15 per cellphone that she sells plus an additional \$200 per week.



Thomas works at Blueberry Inc. and the following table shows his earnings as a linear function of the number of cellphones he sells per week.

# of cellphones sold per week	Money Earned \$
40	850
56	1 130
62	1 235

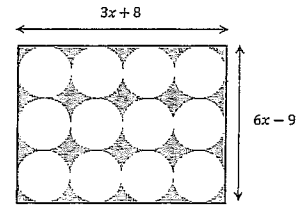
One week Thomas earned \$937.50. That same week, Mary sold 6 more cellphones than Thomas did.

How much money did Mary earn that week?

14. Precision Throw

Below is a diagram of twelve congruent circles that fit exactly in a rectangle.

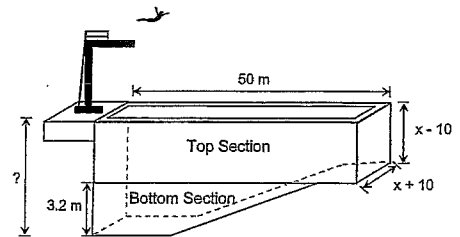
- Length of the rectangle is $3x + 8$
- Width of the rectangle is $6x - 9$
- Perimeter of the rectangle is 70 cm



Emilie thinks that the probability of hitting the shaded region is greater than 25%. Is she correct?

16. Diving in the Olympics

An engineer is drawing a blueprint for a new Olympic swimming pool. The pool is divided into two parts: A top section and a bottom section. All dimensions are in meters.



- The pool has a total volume of $7\ 000\ \text{m}^3$.
- The pool must be at least 7 meters deep to make sure it is safe for diving.

Top Section This section is a rectangular based prism with dimensions shown above.

Bottom Section This section is a trapezoid based prism with a volume of $2\ 200\ \text{m}^3$. The depth of the bottom section is 3.2 m.

Does this pool design meet safety requirements?

Practice Exam-7-C2 - Solution

PARTS A AND B

Part A Questions 1 to 6

1. D 4 0
 2. C 4 0
 3. A 4 0
 4. B 4 0
 5. A 4 0
 6. D 4 0

Part B Questions 7 to 10

7. Write the simplified expressions in the space provided. 4 3 2 1 0
 a) $-4m - 2n$ b) $18x^2 + 24x$
 c) $-6x^2y^6 - 2xy^5$ d) $2a^5b^7$
8. The amount that each winning ticket received is: **\$ 7 200.00** 4 0
9. Sally's weighted average is: **77.6%** (Accept also 78%) 4 0
10. The volume of the cylinder to the nearest cm^3 is: **269 cm^3 or 85.75 π** 4 0
 (Do not penalize student if they don't round)

Secondary 3
Competency 2, Teacher Guide

12. The Play Structure

Example of an appropriate solution

> Define the Variables

Half Cylinder	Rectangular Prism	Cylinder
$r = 1.5$	$l = 5$	$h = 5$
$h = 5$	$w = 3$	$r = ?$
	$h = 1.5$	

> Determine the Plan, plug-in variables and solve for unknown radius

$$\begin{aligned} \frac{1}{2} \text{ cylinder} + \text{rectangular prism} - \text{cylinder} &= 55.9 \\ \frac{1}{2} (\pi r^2 h) + (l \times w \times h) - (\pi r^2 h) &= 55.9 \\ \frac{1}{2} \pi (1.5)^2 5 + (5 \times 3 \times 3) - (\pi r^2 5) &= 55.9 \\ 17.6625 + 45 - 15.7 r^2 &= 55.9 \\ -15.7 r^2 + 62.6625 &= 55.9 \\ -15.7 r^2 &= -6.7625 \\ r^2 &= 0.4307 \\ r &= 0.6563 \end{aligned}$$

> Determine the diameter

$$2 \times 0.6563 = 1.3126$$

The diameter of the tunnel is **1.3 m**.

(Do not penalize a student who does not round to the nearest tenth)

Secondary 3
Competency 2, Teacher Guide

11. Air Traffic Controller

Example of an appropriate solution

> Plane A:

$$y = 550x$$

> Plane B:

$$(2, 14300)$$

$$(7, 11050)$$

Find Rate of Change

$$a = \frac{\Delta y}{\Delta x}$$

$$a = \frac{11050 - 14300}{7 - 2}$$

$$a = \frac{-3250}{5}$$

$$a = -650$$

Find initial value

$$y = ax + b$$

$$14300 = -650(2) + b$$

$$14300 = -1300 + b$$

$$b = 15600$$

Equation for Plane B

$$y = -650x + 15600$$

> System of Equations

$$550x = -650x + 15600$$

$$1200x = 15600$$

$$x = 13$$

$$y = 550x$$

$$y = 550(13)$$

$$y = 7150$$

$$y = -650x + 15600$$

$$y = -650(13) + 15600$$

$$y = 7150$$

Solution Point - after 13 min they are at the same altitude of 7150 meters
(13, 7150)

> Solve when Plane B Lands

$$y = -650x + 15600$$

$$0 = -650x + 15600$$

$$-15600 = -650x$$

$$x = 24$$

24 min to land - 13 min to be at same altitude
= 11 minutes

> Solve when Plane B Lands

Plane B will land **11 minutes** after the two planes reach the same altitude.

Secondary 3
Competency 2, Teacher Guide

13. Robotic Design

Example of an appropriate solution

> Determine the value of K

$$\frac{\text{Height of big cone}}{\text{Height of small cone}} = \frac{36}{12} \text{ therefore; } k = 3$$

> Determine the copper Lining

Find slant height	lateral area of cone	Conversion to cm^2
$a^2 + b^2 = c^2$	$= \pi r s$	$204.1 \text{ mm}^2 \rightarrow 2.041 \text{ cm}^2$
$5^2 + 12^2 = c^2$	$= \pi (5)(13)$	
$c = 13$	$= 204.1 \text{ mm}^2$	

> Cost for Copper Lining

$$2.041 \text{ cm}^2 \times \$0.14 / \text{cm}^2 \times 5000 = \$1428.70$$

> Determine the plastic

Big cone	Small cone	Big Cone,	Small Cone,
$r = 15$	$r = 5$	$\pi r^2 h + 3$	$\pi r^2 h + 3$
$h = 36$	$h = 12$	$(\pi 15^2 (36) + 3)$	$(\pi 5^2 (12) + 3)$
		8478	314
		$= 8164 \text{ mm}^3$	
*k-factor of 3 applied to radius			Conversion to cm^3
			$8164 \text{ mm}^3 \rightarrow 8.164 \text{ cm}^3$

> Cost for Plastic

$$8.164 \text{ cm}^3 \times \$0.03 / \text{cm}^3 \times 5000 = \$1224.60$$

> Total Cost for Plastic and Copper Lining

$$\$1428.70 + \$1224.60 = \$2653.30$$

The total cost of plastic and copper lining for 5000 electrical insulators is

\$2 653.30, or **\$ 2 654.64** if the pi button is used

Secondary 3
Competency 2, Teacher Guide

14. Precision Throw

Example of an appropriate solution #1

> Let the Perimeter equal 70 units and solve for x

$$\begin{aligned}
2(l + w) &= \text{perimeter} \\
2(3x + 8 + 6x - 9) &= 70 \\
2(9x - 1) &= 70 \\
18x - 2 &= 70 \\
18x &= 72 \\
x &= 4
\end{aligned}$$

> The perimeter of the rectangle

$$\begin{array}{lll}
l = 3(4) + 8 & w = 6(4) - 9 & \text{Verify} \\
l = 20 & w = 15 & 2(20 + 15) = 70
\end{array}$$

> The area of the rectangle

$$\begin{aligned}
A &= l \times w \\
&= 20 \times 15 \\
&= 300 \text{ cm}^2
\end{aligned}$$

> The area of the circles

* 4 circles make up the length, therefore; $20 \div 4 = 5$
 * 3 circles make up the width, therefore; $15 \div 3 = 5$

Diameter is 5 cm
 Radius is 2.5 cm

$$\begin{aligned}
12 \text{ circles} \\
12 (\pi r^2) \\
12 (\pi (2.5)^2) \\
235.5 \text{ cm}^2
\end{aligned}$$

> Probability of hitting shaded region

$$\frac{\text{Want}}{\text{Total}} = \frac{\text{shaded}}{\text{Total}} = \frac{\text{total} - 12 \text{ circles}}{\text{Total}} = \frac{300 - 235.5}{300} = 0.215 = 21.5\%$$

The probability of hitting the shaded region is 21.5%. NO Emilie is not correct.

16. Diving in the Olympics

Example of an appropriate solution

Example of an appropriate solution

> Volume of upper section :

$$7000 \text{ m}^3 - 2200 \text{ m}^3 = 4800 \text{ m}^3$$

> Solve for x:

$$\begin{aligned}
V &= l \times w \times h \\
V &= 50(x+10)(x-10) \\
4800 &= 50(x^2 - 10x + 10x - 100) \\
4800 &= 50(x^2 - 100) \\
96 &= x^2 - 100 \\
196 &= x^2 \\
x &= 14
\end{aligned}$$

> The depth of the pool

$$\begin{aligned}
\text{depth} &= (x - 10)m + 3.2 \text{ m} \\
\text{depth} &= (14 - 10)m + 3.2 \text{ m} \\
\text{depth} &= 4 \text{ m} + 3.2 \text{ m} \\
\text{depth} &= 7.2 \text{ m}
\end{aligned}$$

Yes, the pool is safe because 7.2 m is > 7 m as required.

15. Mobile Phone Companies

Example of an appropriate solution

> Linear Equation for Mary:

$$y = 15x + 200$$

> Linear Equation for Thomas:

$$\begin{aligned}
(40, 850) \\
(56, 1130)
\end{aligned}$$

Find Rate of Change (\$ per phone) Find initial value (\$ per week) Equation for Thomas

$$a = \frac{\Delta y}{\Delta x} \quad y = ax + b \quad y = 17.5x + 150$$

$$a = \frac{1130 - 850}{56 - 40} \quad 850 = 17.5(40) + b$$

$$a = \frac{280}{16} \quad 850 = 700 + b$$

$$a = 17.5 \quad b = 150$$

> # of Phones Thomas Sold

$$\begin{aligned}
y &= 17.5x + 150 \\
937.50 &= 17.5x + 150 \\
787.50 &= 17.5x \\
x &= 45
\end{aligned}$$

Thomas sold 45 phones that week,
 Therefore; Mary sold $45 + 6 = 51$ phones.

> Money Earned by Mary

$$\begin{aligned}
y &= 15x + 200 \\
y &= 15(51) + 200 \\
y &= 965
\end{aligned}$$

The amount of money Mary earned during that week is \$ 965.00