

# Practice Exam #1 - C2

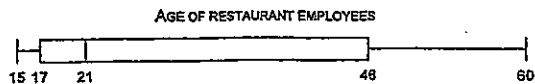
## PART A

This part of the examination consists of Questions 1 to 6.

Each question in this part of the examination is worth 4 marks.

On page 5 of your *Student Booklet*, fill in the box under the letter that corresponds to your answer.

1. The following box-and-whisker plot is based on the ages of the 9 employees in a restaurant. The 9 employees are all of different ages.

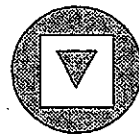


Which of the following statements is necessarily true?

- A) One of the employees is 17 years old.
- B) One of the employees is 21 years old.
- C) None of the employees is 60 years old.
- D) There are fewer employees under the age of 17 than employees over the age of 46.

2. A game of chance involves throwing a dart at a circular target on which a triangle and a square are drawn.

If the dart lands in a shaded area, the player will win a prize.



Which expression below must be used to calculate the probability of winning a prize in this game?

- A)  $1 - \frac{\text{Area of the square}}{\text{Area of the circle}}$
- B)  $\frac{\text{Area of the circle} + \text{Area of the triangle}}{\text{Area of the circle}}$
- C)  $\frac{\text{Area of the circle} - \text{Area of the triangle} + \text{Area of the square}}{\text{Area of the circle}}$
- D)  $\frac{\text{Area of the circle} - \text{Area of the square} + \text{Area of the triangle}}{\text{Area of the circle}}$

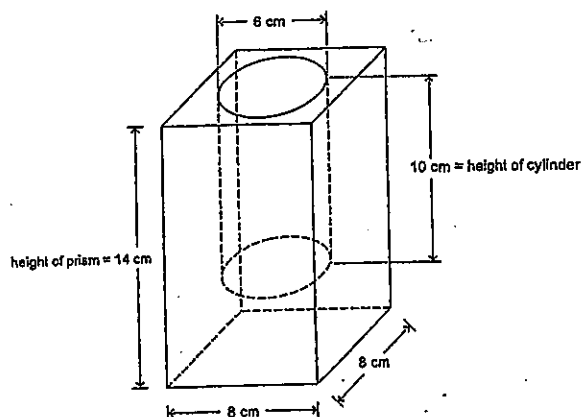
3. Consider the following five numbers:

$$\sqrt{6} \quad \sqrt{1} \quad \sqrt{2} \quad \sqrt{3} \quad \sqrt{4}$$

How many of these numbers are irrational?

- A) 2
- B) 3
- C) 4
- D) 5

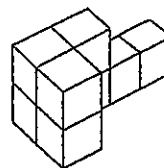
4. A pencil holder was made by hollowing out a right circular cylinder in a block of wood in the shape of a right prism with a square base.



What is the volume of this pencil holder to the nearest  $\text{cm}^3$ ?

- A)  $165 \text{ cm}^3$
- B)  $519 \text{ cm}^3$
- C)  $613 \text{ cm}^3$
- D)  $802 \text{ cm}^3$

5. Below is an arrangement of 8 congruent cubes using axonometric perspective.



Which of the following diagrams shows the top view of this arrangement?

- A)
- B)
- C)
- D)

6. Which of the following four containers has the greatest capacity?

- A) A  $0.03 \text{ m}^3$  container
- B) A  $0.4 \text{ daL}$  container
- C) A  $27.5 \text{ L}$  container
- D) A  $28\,000 \text{ cm}^3$  container

### PART B

This part of the examination consists of Questions 7 to 10.

Each question in this part of the examination is worth 4 marks.

Write each of your answers in the space provided on page 5 of your *Student Booklet*.

7. The following table shows the distribution of the 90 000 adults in a town according to its three boroughs.

	Borough			Total
	Lakeland	Bluefield	Hilltop	
Men	15 000	13 500	16 000	44 500
Women	18 000	13 500	14 000	45 500
Total	33 000	27 000	30 000	90 000

A sample of 1 350 adults from this town is required. This sample must be representative of the data mentioned in the table.

How many men from the Hilltop borough should be in this sample?

8. A group of people rented a skating rink for an evening. The amount of money each person paid is represented by function  $f$  described below.

$$f(x) = \frac{2500}{x}$$

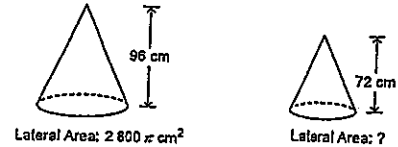
$x$  : number of people in the group

$f(x)$  : amount of money paid by each person, in dollars

Each person paid \$12.50 to rent the skating rink.

How many people were in the group?

9. Two right circular cones are similar. The lateral area of the bigger cone is  $2800\pi \text{ cm}^2$ . The height of the bigger cone is 96 cm. The height of the smaller cone is 72 cm.



What is the lateral area of the smaller cone to the nearest  $\text{cm}^2$ ?

10. The following frequency table indicates the finishing times of the 100 runners in a marathon.

FINISHING TIMES OF THE 100 RUNNERS IN A MARATHON	
Finishing Time (minutes)	Number of Runners
[120, 130[	4
[130, 140[	20
[140, 150[	36
[150, 160[	24
[160, 170[	16
Total	100

What was the mean finishing time of the runners in this marathon?

### 11. RAYMOND'S DRIVEWAY

Raymond wants to have his driveway paved. He contacted two paving companies to find out how much it would cost. He was given the following information:

#### COMPANY A

The cost of paving a driveway is represented by function  $f$  described below.

$$f(x) = 35x + 25 \text{ where } x : \text{area of the driveway, in } \text{m}^2$$

$f(x)$  : price, in \$, charged by Company A to pave the driveway

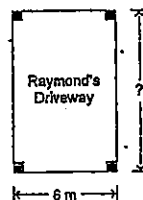
#### COMPANY B

The paving cost includes a base price of \$145 plus an amount proportional to the area of the driveway.

For example, Raymond's neighbour paid Company B \$1 696 to pave his  $47 \text{ m}^2$  driveway. Note: \$1 696 includes the base price.

Raymond has a rectangular driveway that is 6 m wide.

It just so happens that both Company A and Company B would charge Raymond the same price to pave his driveway.



How long is Raymond's driveway?

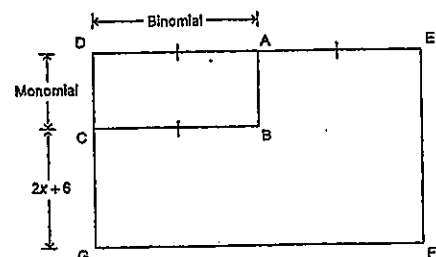
### 12. THE PERIMETER OF RECTANGLE DEFG

In the figure below, quadrilaterals ABCD and DEFG are rectangles.

The lengths of the sides of rectangles ABCD and DEFG can be represented by polynomials in which the coefficients of the terms and the constant terms are integers.

Note that:

- the length of segment DA is represented by a binomial
- the length of segment DC is represented by a monomial
- the area of rectangle ABCD is represented by the binomial  $21x^2 + 15x$
- the perimeter of rectangle ABCD is represented by the binomial  $20x + 10$
- $m \overline{DA} = m \overline{AE}$
- $m \overline{CG} = 2x + 6$



What binomial represents the perimeter of rectangle DEFG?

### 13. IT'S A WRAP!

A piece of candy comes in a wrapper.

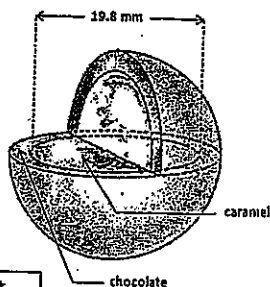
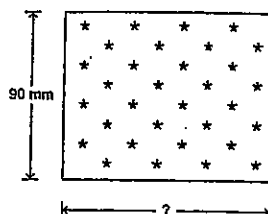


The piece of candy consists of a spherical piece of caramel covered with an even layer of chocolate.

The diameter of the spherical piece of caramel is 19.8 mm.

In this piece of candy, the similarity ratio between the volumes of the two spheres is equal to 2.

The candy wrapper is rectangular and 90 mm wide.



The area of the candy wrapper is 5 times the area of the piece of candy.

What is the length of the candy wrapper to the nearest tenth of a millimetre?

### 14. THE MINIATURE BUILDING EXHIBIT

Gabriel will be renting space to exhibit miniature buildings.

Gabriel's profit is represented by function  $f$  described below.

$f(x) = ax - 1000$  where  $a \neq 0$

$f(x)$  : Gabriel's profit, in dollars

$x$  : number of visitors to the exhibit

$a$  : admission fee, in dollars

Gabriel wants to know how many visitors he needs to break even.

Formulate a conjecture describing the change in the number of visitors Gabriel needs to break even after the admission fee is doubled.

Note: use your own values of " $a$ " to create 3 examples and find a conclusion.

### 15. SARAH'S TRIANGLES

Sarah studied three triangles with the following characteristics:

- They are right triangles.
- In each triangle, the lengths of the two longest sides are two consecutive integers.

The following table indicates the lengths of the sides of the three triangles Sarah studied.

	Lengths of the Two Longest Sides	Length of the Shortest Side
Triangle 1	13 m and 12 m	5 m
Triangle 2	25 dm and 24 dm	7 dm
Triangle 3	41 cm and 40 cm	9 cm

After calculating the length of the shortest side of each of the three triangles she studied, Sarah drew the following conclusion:

*"If the lengths of the two longest sides of any right triangle are consecutive integers, then the length of the shortest side of the triangle will also be an integer."*

Is Sarah's conclusion true or false? Explain why.

### 16. A SQUARE

A square ABCD is divided into three sections: one black, one white and one grey.

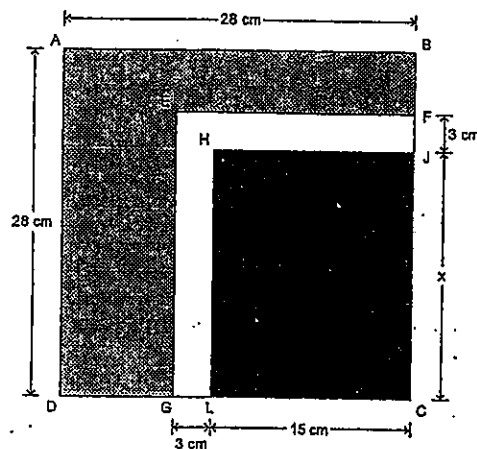
Each side of the square measures 28 cm.

Quadrilaterals EFCG and HJCL are rectangles.

In addition:

$m\overline{LC} = 15$  cm

$m\overline{FJ} = m\overline{GL} = 3$  cm



The area of the white surface is less than the area of the black surface.

Find the range of the possible lengths of segment JC.

## PART A

	A	B	C	D
1.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## PART B

7. There should be 240 men from the Hilltop borough in this sample.
8. There were 200 people in the group.
9. To the nearest  $\text{cm}^2$ , the lateral area of the smaller cone is  $1575\pi$   $\text{cm}^2$ .  $= 4948$
10. The mean finishing time of the runners in this marathon was 147.8 minutes.

# 11.

A:  $f(x) = 35x + 25$

B:  $f(x) = ax + 145$

$(47, 1696)$

So  $1696 = a(47) + 145$   
 $-145$

$1551 = a(47)$   
 $47$

$a = 33$

B:  $f(x) = 33x + 145$

$f(x) = f(x)$

$35x + 25 = 33x + 145$   
 $-33x$

$2x = 145$   
 $-25$

$2x = 120$

Area  $\rightarrow x = 60$

l  
l x w

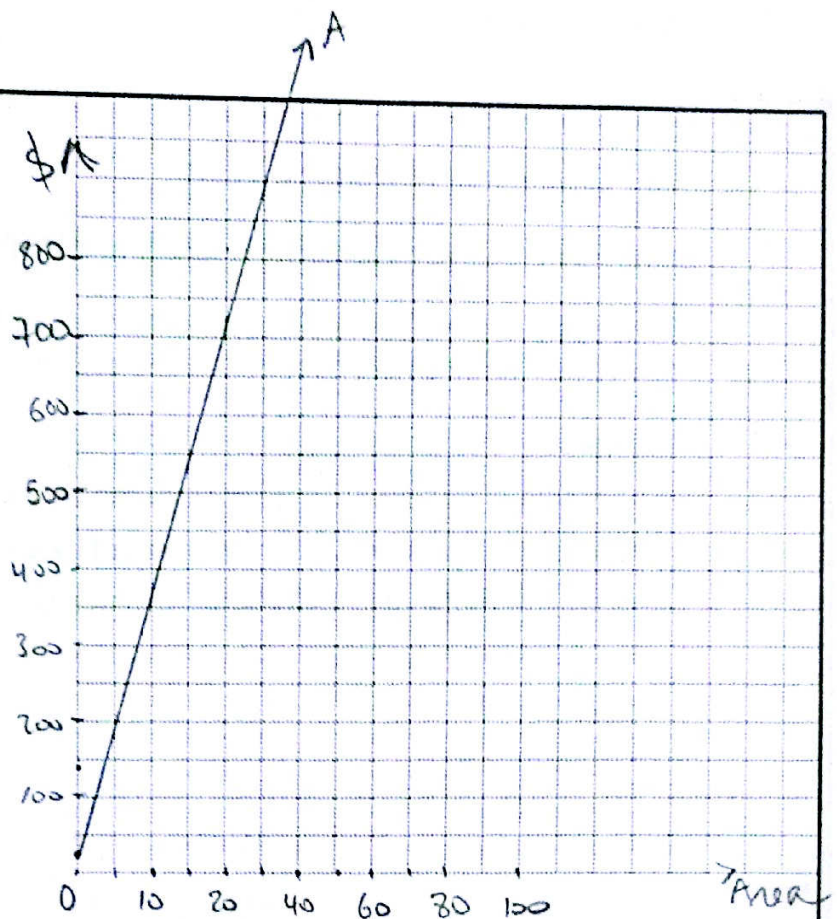
Area = l x w

$60 = 6 \times$

$l = 10 \text{ m}$

$\rightarrow y_A = \$2125$

$y_B = \$2125$



For the scorer's use only

Uses mathematical reasoning					
Evaluation criteria	Observable indicators corresponding to level				
	A	B	C	D	E
Cr. 3	40	32	24	16	8
Cr. 2	40	32	24	16	8
Cr. 4 Cr. 5	20	16	12	8	4

Raymond's driveway is 10 m long.

# 12.

In ABCD :

$$\begin{aligned}\text{Area} &= 21x^2 + 15x \\ &= 3x(7x + 5) \\ &= w \times l\end{aligned}$$

$$P = 20x + 10$$

$$l + w = 10x + 5$$

check if  $\boxed{\begin{aligned}w &= 3x \\ l &= 7x + 5\end{aligned}}$

$$\begin{aligned}P &= 2(3x + 7x + 5) \\ &= 2(10x + 5) \\ &= 20x + 10 \quad \checkmark\end{aligned}$$

In DEFG :  $l = 2(7x + 5)$

$$l = 14x + 10$$

$$w = 3x + 2x + 6$$

$$w = 5x + 6$$

$$\begin{aligned}\text{Perimeter} &= 2(14x + 10 + 5x + 6) \\ &= 2(19x + 16) \\ &= 38x + 32\end{aligned}$$

The binomial  $38x + 32$  represents the perimeter of rectangle DEFG.

For the scorer's use only

Uses mathematical reasoning					
Evaluation criteria	Observable indicators corresponding to level				
	A	B	C	D	E
Cr. 3	40	32	24	16	8
Cr. 2	40	32	24	16	8
Cr. 4 Cr. 5	20	16	12	8	4



# 13.

Small sphere:  $d = 19.8 \text{ mm}$   
 $r = 9.9 \text{ mm}$

S. Volume =  $\frac{4\pi r^3}{3}$   
*Caramel*  
 $= \frac{4\pi (9.9^3)}{3}$   
 $= 1293.732 \pi$   
 $= 4064.38 \text{ mm}^3$

B. Volume =  $2 \times 4064.38$   
 $= 8128.76 \text{ mm}^3$   
*Choc. Candy*

Volume =  $\frac{4\pi r^3}{3}$

$8128.76 = \frac{4\pi r^3}{3}$

$1940.498 = r^3$

$r = 12.47 \text{ mm}$

OR

$K^3 = 2$        $K = 1.26$

Big  $r = 1.26 \times 9.9$

$r = 12.47$

$K^3 = 1.59$

B. Area =  $4\pi r^2$   
 $= 4\pi (12.47^2)$   
 $= 1955.09$   
*Choc. Candy*

Wrapper's Area =  $1955 \times 5$   
 $= 9775.45 \text{ mm}^2$

length =  $9775.45 \div 90 = 108.6$

To the nearest tenth of a millimetre, the length of the candy wrapper is

108.6 mm.

For the scorer's use only

Uses mathematical reasoning		Observable indicators corresponding to level				
Evaluation criteria						
		A	B	C	D	E
Cr. 3		40	32	24	16	8
Cr. 2		40	32	24	16	8
Cr. 4 Cr. 5		20	16	12	8	4

#14.

To Break even :  $aX = 1000$   
 $X = \frac{1000}{a}$

IF

$a$	$X$	$2a$	$X$
1	1000	2	500
1.5	666. $\bar{6}$	3	333. $\bar{3}$
4	250	8	125
5	200	10	100

Conjecture

After the admission fee is doubled, the number of visitors Gabriel

needs to break even, decreases by  
half

For the scorer's use only

Uses  
mathematical reasoning

Evaluation criteria	Observable indicators corresponding to level				
	A	B	C	D	E
Cr. 3	40	32	24	16	8
Cr. 2	20	16	12	8	4
Cr. 4 Cr. 5	20	16	12	8	4
Cr. 1	20	16	12	8	4



# 15

She is wrong because

Try a right triangle with  
the 2 longest sides  
being : 5 and 6.

then the shortest side will be:

$$\begin{aligned} a^2 &= c^2 - b^2 \\ &= 6^2 - 5^2 \\ &= 36 - 25 \end{aligned}$$

$$a^2 = 11$$

$$a = \sqrt{11}$$

$$= 3.32 \rightarrow \text{Not an integer.}$$

☐ Sarah's conclusion is true.

☒ Sarah's conclusion is false.

Explanation

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For the scorer's use only

Uses mathematical reasoning					
Evaluation criteria	Observable indicators corresponding to level				
	A	B	C	D	E
Cr. 3	40	32	24	16	8
Cr. 2	40	32	24	16	8
Cr. 4 Cr. 5	20	16	12	8	4

# 16.

Area of EF CG : (White + 18)

$$18(x+3) = 18x + 54$$

Area of HJCL (Black)

$$15x$$

Area of white part :

$$18x + 54 - 15x$$

$$= 3x + 54$$

$A_{\text{white}} < A_{\text{black}}$

$$18x + 54 < 15x$$

-3x

-3x

$$\frac{54}{-12} < \frac{12x}{-12}$$

$$4.5 < x$$

Also:  $x + 3 \leq 28$   
 $x \leq 25$

The possible lengths of segment JC are

$$]4.5, 25]$$

OK: Range is 20.5 cm.

For the scorer's use only

Uses mathematical reasoning					
Evaluation criteria	Observable indicators corresponding to level				
	A	B	C	D	E
Cr. 3	40	32	24	16	8
Cr. 2	40	32	24	16	8
Cr. 4 Cr. 5	20	16	12	8	4