

MATHEMATICS
(Three hours and a quarter)

(The first 15 minutes of the examination are for reading the paper only. Candidate must NOT start writing during this time).

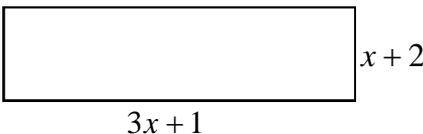
In this paper, there are three sections: Section A, Section B and Section C. You are expected to answer ALL the questions in Section A and Section B. Under Section C, there are 7 questions (question numbers 13 -19). Each question has two parts, I and II. Attempt either I or II from each question. The intended marks for a question or its parts are stated in the brackets.

Section A [10 × 2 = 20 marks]

Answer all questions

Question 1

Direction: Each question is followed by four possible choice. Choose the correct answer and write it in the answer sheet.

- i). The value of n for the expression $15^0 \times (15^4)^3 = 15^n$ is
- 10
 - 11
 - 12
 - 13
- ii). Which of the following is not true?
- $a^r \times a^s = a^{r+s}$
 - $a^r \div a^s = a^{r-s}$
 - $(a^r)^s = a^{rs}$
 - $(ab)^r = a^r b$
- iii). The following are not polynomials EXCEPT
- $3 - 2m^3 + p^5$
 - $6k^{-2} - 6k$
 - $\frac{3}{x^2}$
 - $4x^{\frac{1}{3}}$
- iv). The area of the rectangle is
- 

$3x + 1$

$x + 2$
- $3x^2 + 6x + 2$
 - $3x^2 + 7x + 2$
 - $3x^2 + 8x + 2$
 - $3x^2 + 9x + 2$
-

v). An expression of the form $ax^2 + bx + c$ is called

- a) Linear equation
- b) Quadratic equation
- c) Exponential equation
- d) All of these

vi). The probability of drawing a heart and then spade from a deck of card is

- a) $\frac{1}{2704}$
- b) $\frac{16}{2704}$
- c) $\frac{169}{2704}$
- d) $\frac{32}{2704}$

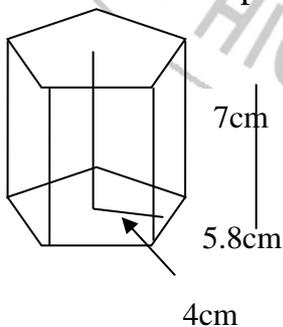
vii). Thinley rolled a die 10 times and each time it came up 6. The probability that he gets 6 on the next roll is

- a) Less than $\frac{1}{6}$
- b) Greater than $\frac{1}{6}$
- c) Exactly $\frac{1}{6}$
- d) All of these

viii). The total surface area of the cone with diameter 12cm and height 7cm is about

- a) 286cm
- b) 298cm
- c) 275cm
- d) 241cm

ix). The volume of the pentagon-based prism is



- a) 406cm^3
- b) 348cm^3
- c) 330cm^3
- d) 528cm^3

- x). Manju spends Nu.5000 on food each month. This represents 32% of her income. What is her monthly income?
- Nu.15,000
 - Nu.15,248
 - Nu.15,625
 - Nu.15,027

Section B [38 marks]

Answer *all* questions.

Question 2

Solve for n . (a). $3^6 \times 3^8 \div 3^n = 3^9$ (b). $2^n = \left(\frac{1}{4}\right)^{-3}$ [3]

Question 3

Express each in scientific notation. (a). 0.03584 (b). 73 billion (c). $(1.4 \times 10^{20}) \times (2 \times 10^{-7})$ [3]

Question 4

Explain why $a^0 = 1 (a \neq 0)$. Provide an example using the quotient law of exponents to support your explanation. [2]

Question 5

Simplify (a). $(2x+5)(-4x-5)$ (b). $3x(-2y-4)$ (c). $(6x^3 + 16x^2 - 6x) \div (6x-2)$ [3×2]

Question 6

Show how each could occur (a). the sum of two trinomials is a binomial. (b). the product of two binomials is a binomial. [2×2]

Question 7 Tell whether each relationship between x and y is linear, quadratic or exponential. How do you know? [2×2]

a).

x	3	-1	1	3	5	7
y	16	4	0	4	16	36

b).

x	-1	1	3	5	7
y	0.11	1	9	81	729

Question 8

Sketch the graph for each. a). $y = 3x - 4$ b). $y = \frac{2}{3}x + 1$ [2×2]

Question 9

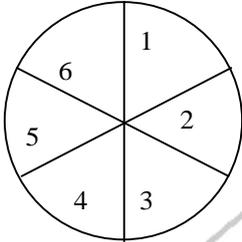
- a) Construct a box and whisker plot for the following set of data. [3]
- | | | | | |
|------|------|------|------|------|
| 12.8 | 12.1 | 13.5 | 11.8 | 13.2 |
| 12.6 | 12.3 | 13.0 | 11.9 | 11.5 |
| 12.5 | 12.7 | 13.9 | 14.0 | 13.2 |

11.8 12.0 13.1 13.8 12.4

b) What conclusions can you make?

Question 10

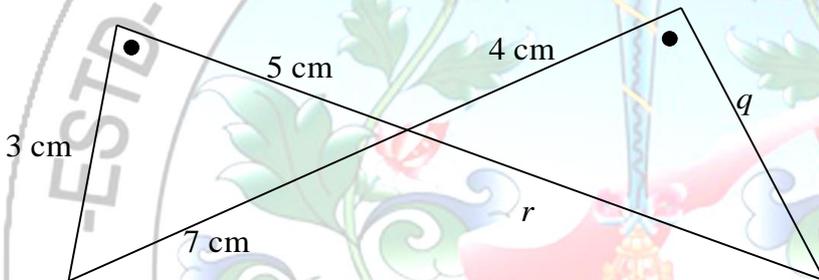
The spinner below is spun and the coin is tossed. Use an outcome chart to determine each probability. [3]



- a) $P(6 \text{ and Tashi-Tagye})$ b). $P(\text{odd and Khorlo})$ c). $P(\text{less than 5 and Khorlo})$

Question 11

In the given triangles, find the unknown lengths q and r . Show your work. [2]



Question 12

Calculate the annual income for each. [2]

- a) Monthly income of Nu.12,600
b) Weekly income of Nu.2530

Section C [42 marks]

Under this section, there are 7 questions (question 13 – 19). Each question has two parts, I and II. Attempt either I or II from each question.

Question 13 (I)

a) Solve each equation. [3]

- i). $2x + 5 = 18$
ii). $-3x - 4 = 10.4$
iii). $\frac{2}{3}m + 6 = \frac{4}{5}$

b) $\triangle ABC$ has three vertices: $A(1, 3)$, $B(3, -1)$ and $C(7, 6)$. [3]

- i). What will be the image of $\triangle ABC$ after the translation $[2, -5]$?
ii). What will be the image of $\triangle ABC$ after a reflection in the y -axis

OR

Question 13 (II)

a) $\triangle PQR$ has the vertices $P(-3, 4)$, $Q(0, 3)$ and $R(-3, 0)$. Describe the transformation that would give each image. [3]

i). $\Delta P'Q'R' : P'(3,-4), Q'(0,-3), R'(3,0)$

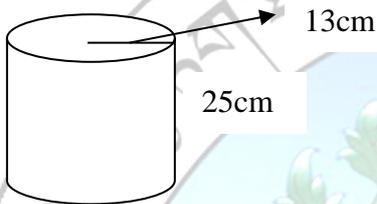
ii). $\Delta P'Q'R' : P'(0,3), Q'(3,2), R'(0,-1)$

- b) Construct a circle graph for this data. Time allocated to each activity. [3]

Activity	Time spent (%)
Homework	25
Watching TV	20
Games	15
Other	40

Question 14(I)

- a) Determine the total surface area of the cylinder. [3]



- b) Karma's family earned 5% interest this year on a bank invested of Nu. 15,200. They also own Nu. 22,000 worth of shares of a company that paid a 10% annual dividend. Which income is more and by how much? [3]

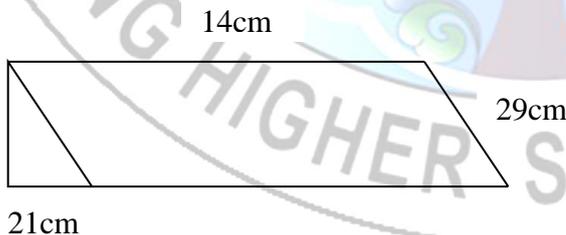
OR

Question 14(II)

- a) Show a budget chart for Pema's mother if her monthly income and expenses as follows. [3]

- Monthly salary : Nu.15,500
- Monthly Allowances : 10% of the salary
- Monthly Rent : Nu. 5,500
- Monthly Food : Nu. 4000
- Monthly Loan payment : Nu. 2,400
- Monthly Phone, TV, etc : Nu. 1,000

- b) Find the volume of the triangle-based prism. [3]



Question 15(I)

- a) Dori's family income is Nu. 19,000 a month. How much would they spend each month in each category of expenditures if these are the percentage? [3]

- i). Rent : 31%
- ii). Food : 25%
- iii). Car : 9%

- b) The diameter of a ball (in the shape of a sphere) is 5cm. [3]
 i). Find the volume of a ball.
 ii). Find its total surface area.

OR

Question 15(II)

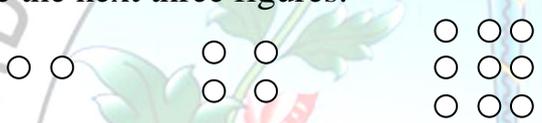
- a) Determine the diameter of a sphere with total surface area 212 cm^2 . [3]
 b) The vertices of $\triangle XYZ$ are $X(7, 8)$, $Y(-4, 5)$ and $Z(0, 9)$. What are the vertices of the final image if $\triangle XYZ$ is reflected in the x-axis and then translated $[2, -1]$? [3]

Question 16(I)

- a) You roll two dice. Determine each theoretical probability. [3]
 i). Sum is greater than 7.
 ii). Difference is less than 2.
 b) Add $(-3y - 2xy + x^2) + (-y + 3xy + x^2)$ [3]

OR

Question 16(II)

- a) Create the next three figures. [3]
- 
- Fig. 1 Fig. 2 Fig. 3

- b) Subtract $(3x - 6x^2 + 8x^3) - (-x + x^2 - y^2)$ [3]

Question 17(I)

- a). There are seven Lower Secondary Schools in a dzongkhag with an average of 485 students per school. If about 55% of the students are male about how many females, attend these schools? [3]

- b). Find the value of b in the relation : $-\frac{4}{5}b + 1 = -15$ [3]

OR

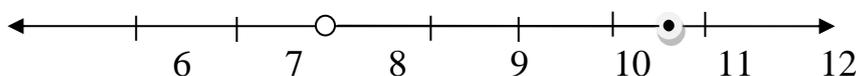
Question 17(II)

- a). Draw the graph of the relation $y = x^2$. [3]
 b). All congruent triangles are similar but not all similar triangles are congruent. Justify. [3]

Question 18(I)

- a). What is the radius of the cylinder with height 54cm and a capacity of 18L? [3]

- b). Write an inequality statement for the graph below. [3]



OR

Question 18(II)

a). Solve $[4.5 + (-7.5^2 \div 3)] + 1.2^3$ [3]

b). $\triangle ABC$ has vertices $A(3, -1)$, $B(5, 0)$ and $C(4, 7)$. [3]

i). What are the vertices of the images after the translation of $[-3, 5]$?

ii). Use mapping notation to represent the translation

Question 19(I)

a). A line has equation $3x + 2y = 6$. [3]

i). Determine the coordinates of the y -intercept.

ii). Determine the coordinates of the x -intercept.

iii). Write the slope and y -intercept form of the equation.

b). State whether the following statements are true or false. [3]

i). Similar triangles are the same size.

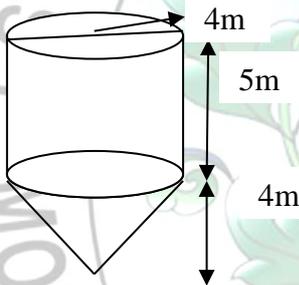
ii). Corresponding angles in similar triangles are equal.

iii). Corresponding sides in similar triangles are equal in length.

OR

Question 19(II)

a) Determine the total surface area of the composite shape below. [3]



b) Solve $\frac{3}{4}x + 1 = \frac{1}{2}x + 4$ [3]