



# MILITARY TECHNOLOGICAL COLLEGE

ACADEMIC YEAR 2022-2023

## FOUNDATION PROGRAMME DEPARTMENT

### Resit MOCK Exam

Module name	Basic Mathematics	Module code	MTCG1016
Date:	Mock Exam	Duration of exam	90 Minutes

### STUDENT DETAILS

Student ID		Signature	
Seat Number			

#### Instructions:

- Complete the information required on the front page. Use blue / black ink or ball-point pen to answer ALL questions.
- Students should not keep any helping / study materials with them. Copying, cheating and any kind of malpractice in the examination are strictly prohibited.
- Use of only non-programmable calculators is allowed.
- Answer the questions in the space provided. Extra sheets will not be allowed or provided.
- All necessary solutions should be shown completely in Section B and C, otherwise marks for method will be lost.
- A short list of relevant **Formulas** is attached at the back.
- **Do not open** this question paper until the invigilator has told you to do so.
- **This exam carries 100% of the overall module mark.**

### MARK DISTRIBUTION

Section	No. of Questions $\times$ Marks per Question = Total Marks Allocated	1 <sup>st</sup> Marking	2 <sup>nd</sup> Marking
A	$20 \times 1 = 20$ Marks		
B	$10 \times 2 = 20$ Marks		
C	$5 \times 2 = 10$ Marks		
Total = 50 Marks			
Final Marks		/50	

1<sup>st</sup> Marker

2<sup>nd</sup> Marker

Name and Signature

Name and Signature

## Section A (Total Marks = 20)

Answer all the following 20 questions.

Each question carries 1 mark.

Circle the correct answer for each of the following questions  

- (1) The number  $\frac{7}{5}$  is
- a) Irrational and real
  - b) Rational and Real
  - c) Rational and Integer
- (2) The average of the prime numbers between 10 and 20 is
- a) 13
  - b) 14
  - c) 15
- (3) Rounding off the number **15.2385** to two decimal places is
- a) 15.23
  - b) 15.24
  - c) 15.239
- (4) 180 students appeared in an examination. 70% of the students passed the examination. The number of students who passed the examination is
- a) 54
  - b) 108
  - c) 126
- (5) Bashar has a road map with a scale of 1: 200000. He drives on a road for 400 *km*. The distance covered on the map is
- a) 1 *m*
  - b) 2 *m*
  - c) 4 *m*

(6) If  $a = 2$ ,  $b = -1$  and  $c = 2$ , then the value of  $(b^2 - 4ac)$  is

- a)  $-15$
- b)  $15$
- c)  $16$

(7)  $\frac{16^{x+3}}{4^{2x+4}} =$

- a)  $4^x$
- b)  $4$
- c)  $16$

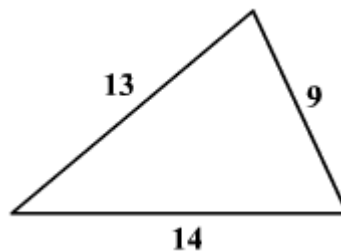
(8)  $\frac{10x+23}{x+2} - \frac{3}{x+2} =$

- a)  $10x$
- b)  $10 + x$
- c)  $10$

(9)  $\frac{x^2}{x-5} - \frac{25}{x-5} =$

- a)  $x + 5$
- b)  $x - 5$
- c)  $5x$

(10) The number of lines of symmetry in the following triangle is



- a)  $2$
- b)  $1$
- c)  $0$

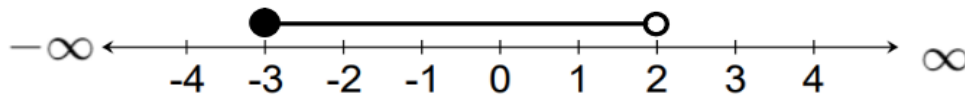
(11) A school team won 10 games last year and 14 games this year. The percentage increase is

- a) 10%
- b) 20%
- c) 40%

(12) If  $x : y = 5 : 2$ , then the value of  $(4x + y) : (3x - 2y)$  is

- a) 1
- b) 2
- c) 3

(13) The inequality form of the following number line is

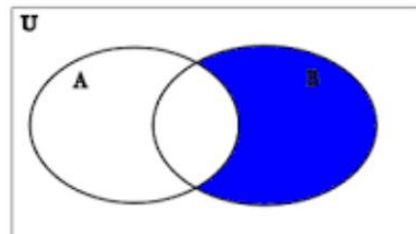


- a)  $-3 < x \leq 2$
- b)  $-3 \leq x \leq 2$
- c)  $-3 \leq x < 2$

(14) If  $\sqrt{(5x + 1)} + 2 = 6$ , then the value of 'x' is

- a) 3
- b) 2
- c) 1

(15) In the following Venn Diagram, the shaded portion is represented as



- a)  $B'$
- b)  $B - A$
- c)  $A - B$

(16) The solution of  $\frac{3x+1}{8} + \frac{x+3}{2} = 6$  is

- a) 5
- b) -5
- c) 4

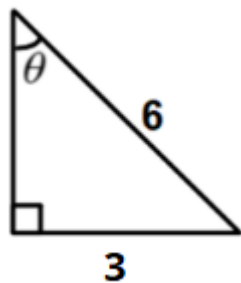
(17) The roots of the equation  $x^2 + 10x + 25 = 0$  are

- a) Real and unequal
- b) Real and equal
- c) Imaginary

(18) The angle  $315^\circ$  in Radians is

- a)  $\frac{3\pi}{4}$
- b)  $\frac{5\pi}{4}$
- c)  $\frac{7\pi}{4}$

(19) In the following right triangle, the value of  $\theta$  is



- a)  $60^\circ$
- b)  $45^\circ$
- c)  $30^\circ$

(20) The x-intercept of the straight-line  $2x + 3y = 24$  is

- a) 8
- b) 12
- c) -12

## **Section-B (Total Marks = 20)**

**Answer all the questions showing all necessary steps.**

**Each question carries 2 marks.**

- (1) In college, 20 teachers teach Mathematics or Computing. Of these, 12 teach Mathematics and 5 teach both Mathematics and Computing. How many teach only Computing?

(2) Simplify:  $\frac{2x+6}{x^2-9} + \frac{4}{x-3}$

- (3) The temperature of a city on a certain day is 95°F. What is the value of the same temperature in Celsius?

- (4) Find the value of 'x' in the following equations:  
 $2x + 3y = 7$  and  $3x + 2y = 3$

(5) Simplify:  $\frac{1 - \sin^2 x}{\csc^2 x - 1}$

- (6) The radius of a circle is 16 cm, and the arc length is 24 cm. Find the angle subtended at the center of the circle in degrees.  
(Write the answer to the nearest integer)

(7) Simplify:  $2\frac{3}{5} + \frac{9}{10} - \frac{5}{2}$

(8) Find the equation of the straight line passing through the points  $(1, -5)$  and  $(6, 5)$ .

(9) Find the equation of the straight line perpendicular to the straight line  $3x + y - 8 = 0$  and passing through the point  $(2, -3)$ .

(10) Find the equation of the circle with center at  $C(3, -5)$  and with tangent line  $y = 2$ .





- (4) The area of a rectangle is  $32 \text{ cm}^2$ . The length of the rectangle is  $4 \text{ cm}$  more than its width. Find the dimensions of the rectangle.

- (5) From the top of a tall building of height  $28 \text{ m}$ , the angle of depression of the top of another building is  $45^\circ$  whose height is  $12 \text{ m}$ . Find the distance between the two buildings.

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**End**

# Formula Sheet

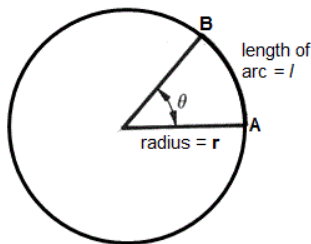
## 1. Temperature

- $K = ^\circ C + 273.15$
- $^\circ F = 1.8 ^\circ C + 32$

## 2. Angles (radians and degrees)

- $1 \text{ degree} = \frac{\pi}{180} \text{ radians}$
- $1 \text{ radian} = \frac{180}{\pi} \text{ degrees}$

## 3. Sector and Arc

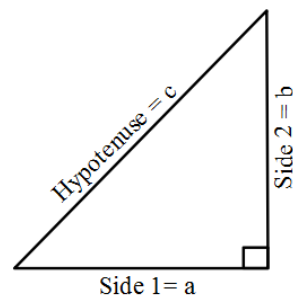


- Length of Arc:  $l = r\theta$  ( $\theta$  is in radians)
- Area of Sector:  $A = \frac{1}{2}r^2\theta$  ( $\theta$  is in radians)

## 4. Pythagoras theorem

$$(\text{Side 1})^2 + (\text{Side 2})^2 = (\text{Hypotenuse})^2$$

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

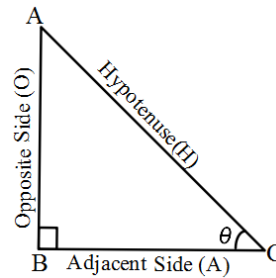


## 5. Trigonometry

$$\sin \theta = \sin C = \frac{AB}{AC} = \frac{O}{H}$$

$$\cos \theta = \cos C = \frac{BC}{AC} = \frac{A}{H}$$

$$\tan \theta = \tan C = \frac{AB}{BC} = \frac{O}{A}$$



### I. Reciprocal Relations

$$\begin{aligned} \bullet \quad \csc \theta &= \frac{1}{\sin \theta} & \sin \theta &= \frac{1}{\csc \theta} \\ \bullet \quad \sec \theta &= \frac{1}{\cos \theta} & \cos \theta &= \frac{1}{\sec \theta} \\ \bullet \quad \cot \theta &= \frac{1}{\tan \theta} & \tan \theta &= \frac{1}{\cot \theta} \end{aligned}$$

### II. Pythagorean Identities

- $\sin^2 \theta + \cos^2 \theta = 1$
- $1 + \tan^2 \theta = \sec^2 \theta$
- $1 + \cot^2 \theta = \csc^2 \theta$

### III. Quotients of Sine and Cosine

- $\frac{\sin \theta}{\cos \theta} = \tan \theta$
- $\frac{\cos \theta}{\sin \theta} = \cot \theta$

## 6. Straight line

- General equation of the straight line is  $Ax + By = C$ , where A, B and C are constants (with  $A \neq 0$  and  $B \neq 0$ ) and  $x$  and  $y$  are variables.
- Slope-intercept form of the straight line can also be written as  $y = mx + c$ , where,  $m = \frac{y_2 - y_1}{x_2 - x_1}$  = slope or gradient of the line and  $c = y$  -intercept.
- Equation of straight line passing through  $(x_1, y_1)$  and slope  $m$  is

$$y - y_1 = m(x - x_1)$$

## 7. Quadratic Formula

Solution of  $ax^2 + bx + c = 0$  is given by  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

## 8. Circle

Equation of circle with center  $C(h, k)$  and radius  $r$ , where  $r > 0$  is

$$(x - h)^2 + (y - k)^2 = r^2$$

## 9. Cartesian Plane

- The distance between **two points**  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

- Formula for coordinates of the midpoint of a line segment AB is

$$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

## **Rough Work/Draft work**

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