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.**

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<th>Section</th>
<th>No. of Questions × Marks per Question = Total Marks Allocated</th>
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<td>20 × 1 = 20 Marks</td>
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<td>B</td>
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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

   ![Number Line]

   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

   ![Venn Diagram]

   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° 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°
b) 45°
c) 30°

(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:
\[ 2x + 3y = 7 \quad \text{and} \quad 3x + 2y = 3 \]

(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: \[ \frac{3}{5} + \frac{9}{10} - \frac{5}{2} \]
(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 \(y = 2\).
Section-C (Total Marks = 10)

Answer all the questions showing all necessary steps.

Each question carries 2 marks.

(1)  The side of an equilateral triangle is 4 cm. Find the height of the equilateral triangle. (Write the answer correct to 1 decimal place)

(2)  Avenues mall runs its movies in two different halls. The duration of one movie is 120 minutes and the duration of another movie is 160 minutes. Both movies start at 11:00 AM. At what time the movies start again at the same time?

(3)  The age of a father is 4 times the age of a son. After 5 years, the ratio of fathers age to the sons age is 3:1. Find their present ages.
(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.

End
1. **Temperature**
   - \( K = °C + 273.15 \)
   - \( °F = 1.8 °C + 32 \)

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**

   ![Sector and Arc Diagram]

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

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**

- \( \csc \theta = \frac{1}{\sin \theta} \)
- \( \sec \theta = \frac{1}{\cos \theta} \)
- \( \cot \theta = \frac{1}{\tan \theta} \)

\[
\sin \theta = \frac{1}{\csc \theta}
\]
\[
\cos \theta = \frac{1}{\sec \theta}
\]
\[
\tan \theta = \frac{1}{\cot \theta}
\]

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 \( c = y - \text{intercept} \).

- 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