UNIVERSITY OF GHANA

(All rights reserved)

DEPARTMENT OF TEACHER EDUCATION
SCHOOL OF EDUCATION AND LEADERSHIP
COLLEGES OF EDUCATION
END OF YEAR TWO SEMESTER TWO EXAMINATIONS, 2022/2023
B.ED. PROGRAMME

COURSE CODE: TEJS 232
COURSE TITLE: LEARNING, TEACHING AND APPLYING EUCLIDEAN
GEOMETRY AND TRIGONOMETRY

Instruction: Answer **all** questions in Section A and any **three** questions in Section B.

Time: 2 Hours

SECTION A

[25 Marks]

Answer all the questions in this section.

In this section, each question is followed by four options lettered A to D. Read each question carefully and circle the letter that corresponds with the best option on the question paper. Each question carries (**1 mark**).

1. A branch of mathematics that involves the study of plane and solid figures based on proofs, axioms and theorems is referred to as _____ geometry.

   A. Elliptical
   B. Euclidean
   C. Hyperbolic
   D. Spherical

2. What method uses algebraic equations to find missing measures in geometric figures?

   A. Algebraic Geometry
   B. Analytic Geometry
   C. Coordinate Geometry
   D. Synthetic Geometry

3. Find the gradient of the line AB which is perpendicular to the line joining P (p, p²) and Q (q, q²).

    A. $p + q$

    B. $-\dfrac{1}{q+P}$

    C. $\dfrac{p^2-q^3}{p-q}$

    D. $\dfrac{p+q}{p-q}$

4. Any straight line that divides a circle into parts and is terminated at each end by the circumference is known as a/an_____.

    A. arc

    B. chord

    C. diameter

    D. segment
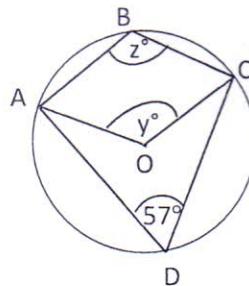
5. If $\tan\theta = \dfrac{-5}{3}$ and θ is in quadrant two, find $\sec\theta$.

    A. $\sec\theta = \dfrac{\sqrt{34}}{2}$

    B. $\sec\theta = \dfrac{\sqrt{34}}{3}$

    C. $\sec\theta = -\dfrac{3}{4}$

    D. $\sec\theta = -\dfrac{\sqrt{34}}{3}$

6. Given the diagram:

    Calculate the value of y.

    A. 57°

    B. 67°

    C. 114°

    D. 115°

7. Given one of the Pythagoras triplets as 15, what are the other two members?
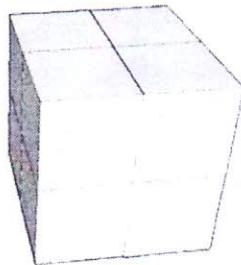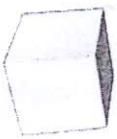
    A. 8, 17

    B. 9, 13

    C. 11, 8

    D. 12, 17

8. The lengths of the sides of a triangle are x cm, $(x + 1)$ cm and $(x + 2)$ cm. What is the value of x, if the triangle is right angled?

    A. 6 cm
    B. 5 cm
    C. 4 cm
    D. 3 cm

9. What is the slope of the line that passes through the points (-1, 4) and (3, -2)?

    A. $\frac{-3}{2}$
    B. $\frac{-3}{4}$
    C. $\frac{3}{4}$
    D. $\frac{3}{2}$

10. What is the equation of the line that is tangent to the circle $x^2 + y^2 = 25$ at the point $(-3, 4)$?

    A. $y = -\frac{4}{3}x + \frac{25}{3}$

    B. $y = \frac{3}{4}x + \frac{25}{4}$

    C. $y = -\frac{3}{4}x + \frac{25}{4}$

    D. $y = -\frac{3}{4}x - \frac{25}{4}$

11. What is the equation of a circle with centre (2, -3) and radius 5?
    A. $(x - 2)^2 + (y + 3)^2 = 25$
    B. $(x - 2)^2 + (y - 3)^2 = 25$
    C. $(x + 2)^2 + (y - 3)^2 = 25$
    D $(x + 2)^2 + (y + 3)^2 = 25$

12. A pendulum swings through an angle of $42°$ in describing an arc of length 55cm. What is the length of the pendulum?
    A. 56 cm
    B. 60 cm
    C. 75 cm
    D. 88 cm

13. What is the angle between the hour hand and the minute hand of a clock at half past four?
    A. 45^0
    B. 63^0
    C. 72^0
    D. 75^0

14. What is the equation of the line that is perpendicular to the line $y = -2x + 7$ and passes through the point $(1, -1)$?

    A. $y = -\frac{x}{2} - \frac{3}{2}$
    B. $y = -\frac{x}{2} + \frac{3}{2}$
    C. $y = \frac{x}{2} - \frac{3}{2}$
    D. $y = -\frac{x}{2} - \frac{3}{2}$

15. Find the slope of the line that passes through the points $(-4, 3)$ and $(6, -2)$.
    A. -2
    B. $-\frac{1}{2}$
    C. $\frac{1}{2}$
    D. 2

16. Given that $\sin x = \frac{3}{5}$, where $0 < x < \frac{\pi}{2}$, find $\sin 2x$.
    A. $\frac{24}{7}$
    B. $\frac{7}{25}$
    C. $\frac{24}{25}$
    D. $\frac{7}{25}$

17. Determine the period of the function $y = \frac{1}{2}\cos(4x + \pi)$.
    A. $\frac{\pi}{2}$
    B. $\frac{\pi}{4}$
    C. 4
    D. 3

18. Find the sum of the interior angles of a regular polygon which has 14 sides?
    A. 2880
    B. 2150
    C. 2160
    D. 1800

4

19. The smaller box shown below has a volume of $125cm^3$. What is the volume of the second box, given that its dimensions are twice the first box's?

   A. $5.00cm^3$
   B. $62.50cm^3$
   C. $500.00cm^3$
   D. $1000.00cm^3$

20. Convert 120^0 to a measure in radians.

   A. $\frac{\pi}{4}$ rad

   B. $\frac{2\pi}{3}$ rad

   C. $\frac{25\pi}{18}$ rad

   D. $\frac{16\pi}{9}$ rad

21. What is the value of $(Sin\ 30° + Cos30°) - (Sin\ 60° + Cos60°)$?
   A. 1
   B. $\frac{\sqrt{3}}{2}$
   C. $\frac{1}{2}$
   D. 0

22. Determine the phase shift of the function $y = \frac{1}{2}\cos(4x + \pi)$.
   A. π
   B. $\frac{\pi}{2}$
   C. $-\frac{\pi}{4}$
   D. $\frac{\sqrt{3}}{2}$

23. Determine the amplitude of the function $y = \frac{1}{2}\cos(4x + \pi)$.
   A. $\frac{1}{2}$
   B. 2
   C. 4
   D. π

24. An exterior angle of a regular polygon is 45°, find the number of sides of the polygon.
    A. 10
    B. 8
    C. 6
    D. 4

25. If a boy is standing at point X, which is 10 units away from a building, making an angle of elevation of 45° with point Y, find the height of the building.
    A. 10 units
    B. 11 units
    C. 8 units
    D. 9 units
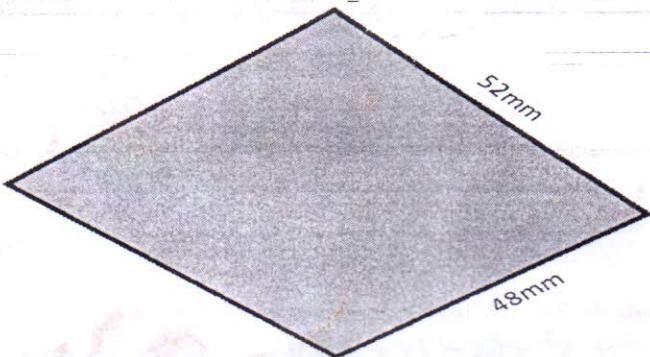
SECTION B

[75 Marks]

Answer any **THREE** questions in this section.

1. (a) A circle has a centre (4, 7) and radius 10. Find the coordinates of the points on the circle where $y = 13$.   **10 Marks**

    (b) Given that $\tan A = \frac{21}{20}$ and that $180° < A < 270°$, find sin2A using identities.   **10 Marks**

    (c)   i. What is the maximum number of points that two circles can ever intersect?   **1 Mark**

        ii. What rule or formula is stated as $\frac{a}{\text{SinA}} = \frac{b}{\text{SinB}}$?   **1 Mark**

        Given the information below:

        A and B are two end points of a segment in a circle. C and D are points on the circumference of the circle with segment AB. A student draws a straight line to join AC and BC to form a triangle. He again joins AD and BD to form another triangle. He measures angle ACB and angle ADB.

       iii. Sketch the diagram.   **2 Marks**

       iv. What conclusion would you expect the student to draw?   **1 Mark**

2. (a)   i. Show that the line $y = 2x + 1$ intersects the circle with equation: $x^2 + y^2 - 6x - 7y + 9 = 0$ **7 Marks**

        ii. Determine the points of intersection.   **3 Marks**

    (b) In triangle ABC, $a = 12cm, b = 10cm$ and $c = 5cm$. Calculate to the nearest degree, the angles of the triangle.   **10 Marks**

    (c) If the first number of a Pythagoras triplet is 16, find the other two elements of the family.   **5 Marks**

3. (a) Write the slope-intercept form for the equation of the line through the points (4, 3) and (-2, 5).   **8 Marks**

    (b) Find the equation of the line that passes through the point (4, 1) and is perpendicular to another line whose gradient is 3.   **6 Marks**

    (c)   i. Simplify $\frac{1}{1-Cos\theta} + \frac{1}{1+Cos\theta}$ **6 Marks**

        ii. Show that $1 + Cot^2\theta = Cosec^2\theta$ **5 Marks**

4. (a) Prove that $Sin\left(\frac{\alpha}{2}\right) = \pm\sqrt{\frac{1-cos\alpha}{2}}$ **10 Marks**

7

(b) If $Sin\ x = \frac{12}{13}$ and $0 < x < \frac{\pi}{2}$, find the three half angles.   15 Marks

5   (a)   i.   A man is at a point 18m away from the foot of a tree. From that   5 Marks
point, the angle of elevation of the top of the tree is 29°. Calculate
the height of the tree to 3 significant figures.   9 Marks
ii.   Prove that $Sin(3x) = 3Sinx - 4Sin^3x$

(b)   i.   Differentiate between the congruency and similarity of two   4 Marks
triangles.
ii.   Here are two similar shapes. Calculate the length marked c.   3 Marks

(c) Here are two similar cuboids. If the volume of the smaller cuboid is   4 Marks
63cm³, what is the volume of the larger cuboid?

8