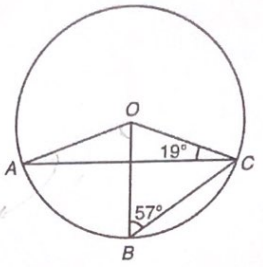
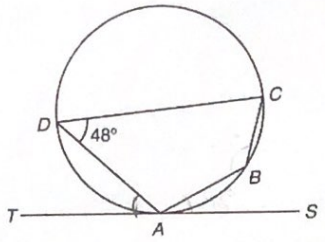
Section A (18 questions)

1. In the figure, $\angle ACO = 19°$ and $\angle CBO = 57°$. Find $\angle AOB$.



A. 38°
B. 66°
C. 76°
D. 85°

2. In the figure, CD is a diameter of the circle. TS is the tangent to the circle at A. If $\angle CDA = 48°$, find $\angle DAT$.

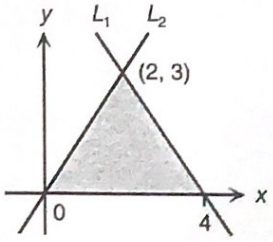


A. 42°
B. 44°
C. 46°
D. 48°

3. The greatest integer satisfying the compound inequality $-3(4-x) \le 9$ or $\frac{7x+2}{5} < -8$ is

A. –7.
B. –6.
C. 7.
D. 8.

4. Which of the following systems of inequalities has solutions that can be represented by the shaded region?



A. $\begin{cases} y \ge 0 \\ 3x + 2y \ge 12 \\ 3x - 2y \le 0 \end{cases}$

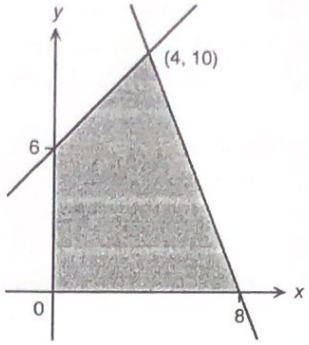
B. $\begin{cases} y \ge 0 \\ 3x + 2y \le 12 \\ 3x - 2y \ge 0 \end{cases}$

C. $\begin{cases} x \ge 0 \\ 3x + 2y \le 12 \\ 2x - 3y \ge 0 \end{cases}$

D. $\begin{cases} x \ge 0 \\ 3x + 2y \ge 12 \\ 2x - 3y \le 0 \end{cases}$

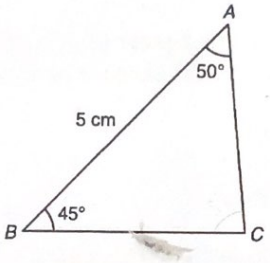
5. In the figure, find the point in the shaded region at which $P = 3x - 2y$ attains its maximum value.

A. (0, 0)
B. (0, 6)
C. (4, 10)
D. (8, 0)



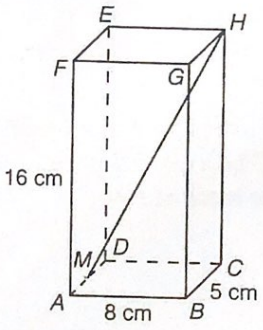
6. In the figure, $AC =$

A. $\dfrac{5\sin 45°}{\sin 50°}$ cm.
B. $\dfrac{5\sin 50°}{\sin 45°}$ cm.
C. $\dfrac{5\sin 85°}{\sin 45°}$ cm.
D. $\dfrac{5\sin 45°}{\sin 85°}$ cm.



7. In the figure, *ABCDEFGH* is a rectangular block and *M* is the mid-point of *AD*. Find the angle between the line *MH* and the plane *BCHG*, correct to 3 significant figures.

A. 26.3°
B. 26.6°
C. 27.6°
D. 59.5°



8. Consider the circle $(x+2)^2 + (y-5)^2 = 5$. Which of the following is/are NOT true?

I. The centre of the circle is (–2, 5).
II. The radius of the circle is 5.
III. The circle cuts the *x*-axis at two points.

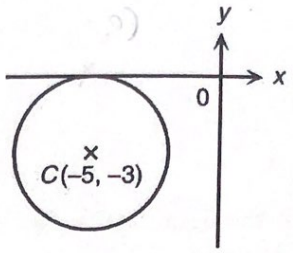
A. I and II only
B. I and III only
C. II and III only
D. I, II and III

9. If the centre of a circle is $(-2, 5)$, and the circle passes through $(2, 1)$, then the equation of the circle is

A. $x^2 + y^2 + 4x - 10y - 3 = 0$.
B. $x^2 + y^2 - 4x + 9y - 61 = 0$.
C. $x^2 + y^2 + 4x + 10y - 3 = 0$.
D. $x^2 + y^2 + 4x - 10y + 3 = 0$.

10. In the figure, the circle with centre $C(-5, -3)$ touches the negative x-axis. Find the equation of the circle.

A. $x^2 + y^2 + 10x + 6y - 25 = 0$
B. $x^2 + y^2 + 10x + 6y + 25 = 0$
C. $x^2 + y^2 + 10x + 6y - 9 = 0$
D. $x^2 + y^2 + 10x + 6y + 9 = 0$

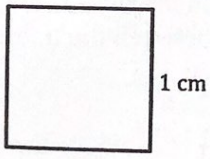


11. Let M be the mid-point of $A(3, -6)$ and $B(-5, 2)$. If P is a moving point in the rectangular coordinate plane such that the distance between P and M is 5, then the locus of P is

A. a circle.
B. a parabola.
C. a square.
D. a straight line.

12. Given a square of side 1 cm, a moving point P keeps a fixed distance of 1 cm from the nearest point on the square. Find the total length of the locus of P.

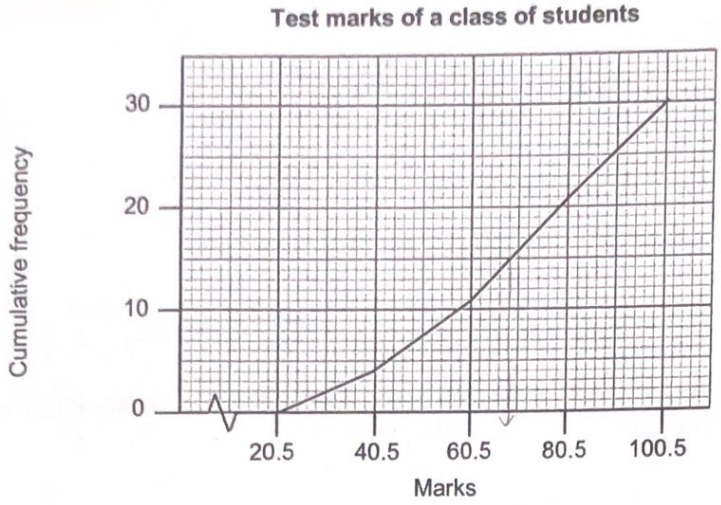
A. 4 cm
B. $(\pi + 2)$ cm
C. $(2\pi + 4)$ cm
D. $(2\pi + 8)$ cm



13. It is given that A and B are two distinct points on the straight line $4x - 7y + k = 0$, where k is a constant. Let P be a moving point in the rectangular coordinate plane such that $AP^2 + BP^2 = AB^2$. If the equation of the locus of P is $x^2 + y^2 - 8x - 6y + 21 = 0$, find the value of k.

A. -16
B. -5
C. 16
D. 5

14. The following cumulative frequency polygon shows the test marks of a class of students.

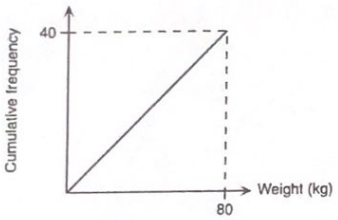


Find the median mark.

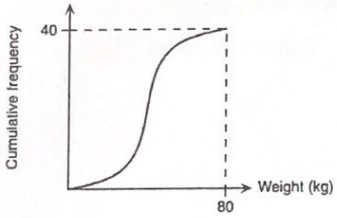
A. 50.5
B. 64.5
C. 68.5
D. 79.5

15. The following figures show the cumulative frequency curves of the weight distributions of three classes. Arrange the three distributions in descending order of standard deviations.

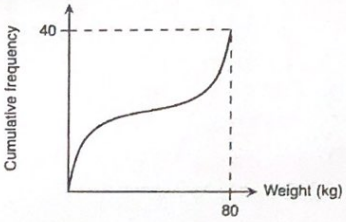
I.



II.



III.



A. I, II, III
B. I, III, II
C. II, I, III
D. III, I, II

16. Find the mean and the standard deviation of the data set $\{k-3, k-2, k, k+1\}$.

	Mean	Standard deviation
A.	$k-1$	$\sqrt{10}$
B.	$k-1$	$\frac{\sqrt{10}}{2}$
C.	$k+1$	$\sqrt{10}$
D.	$k+1$	$\frac{\sqrt{10}}{2}$

17. In a class of 40 students, 27 of them are the members of Mathematics club, 30 of them are the members of English club and 21 of them are the members of both clubs. Find the probability that a randomly selected student is neither the member of Mathematics club nor English club.

A. $\frac{3}{20}$

B. $\frac{1}{10}$

C. $\frac{3}{8}$

D. $\frac{9}{40}$

18. $12\blacktriangledown\blacklozenge$ is a 4-digit number, where $\blacktriangledown$ and $\blacklozenge$ are integers from 0 to 9 inclusive. Find the probability that the 4-digit number is divisible by 5 but not divisible by 10.

A. $\frac{1}{10}$

B. $\frac{9}{50}$

C. $\frac{1}{5}$

D. $\frac{49}{50}$

Section B (9 Questions)

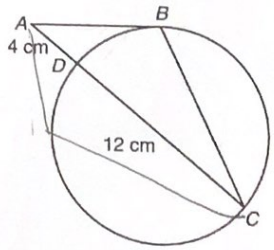
19. In the figure, AB is the tangent to the circle at B. ADC is a straight line. If $AD = 4$ cm and $CD = 12$ cm, find the length of AB.

A. 6 cm

B. 8 cm

C. 12 cm

D. 16 cm



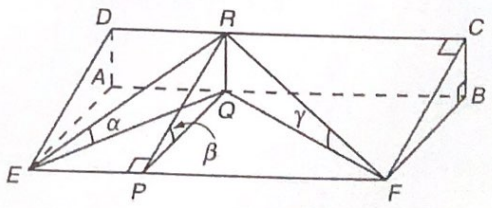
20. $EFCD$ is a rectangular inclined plane to the horizontal plane $EFBA$ with $\angle EAD = \angle FBC = 90°$. Q is vertically below R, $PR \perp EF$ and $CR > DR$. Arrange the inclinations of ER, PR and FR, i.e. α, β and γ, in ascending order of magnitude.

A. $\alpha < \gamma < \beta$

B. $\beta < \alpha < \gamma$

C. $\gamma < \beta < \alpha$

D. $\gamma < \alpha < \beta$



21. Two circles with equation $(x + 1)^2 + (y - 1)^2 = 25$ and $(x - 11)^2 + (y + 8)^2 = 100$ touch each other externally at a point P. Find the coordinates of P.

A. $\left(\frac{7}{5}, \frac{4}{5}\right)$

B. $\left(\frac{7}{5}, -\frac{4}{5}\right)$

C. $(-3, -2)$

D. $(3, -2)$

22. In how many ways can a team of 4 students be selected from a group of 15 students if one particular student must be included and one particular student must be excluded?

A. 286
B. 364
C. 715
D. 1001

23. There are 15 boys and 10 girls in a choir team. If a group of 5 students is selected from the team to participate in a singing contest and the group consists of at least one boy and at least one girl, how many different groups can be formed?

A. 49 875
B. 53 130
C. 242 364
D. 265 650

24. Martin shoots four arrows to a target. If the probability of each arrow hitting the target is $\frac{3}{5}$, find the probability that Martin misses at least one arrow to shoot the target.

A. $\frac{81}{625}$

B. $\frac{121}{625}$

C. $\frac{229}{625}$

D. $\frac{544}{625}$