1. (83) $\sin^2\theta - (\sin^2\theta \cos^4\theta + \sin^4\theta \cos^2\theta) =$

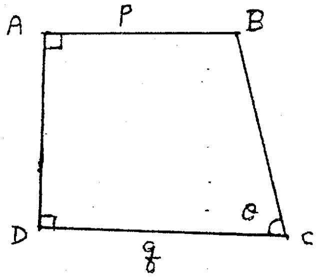
A. $\sin^4\theta$ B. $\cos^4\theta$ C. $-\sin^4\theta$ D. $-\cos^4\theta$ E. $\sin^2\theta \cos^2\theta$

2. (83) $\dfrac{\cos(90^\circ - \theta)}{\tan(180^\circ - \theta)} =$

A. $\cos\theta$ B. $-\cos\theta$ C. $-\sin^2\theta/\cos\theta$ D. $-\cos^2\theta/\sin\theta$
E. $\sin^2\theta/\cos\theta$

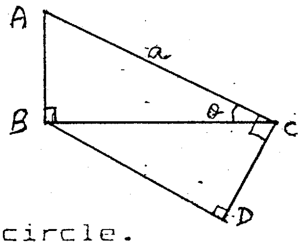
3. (83) In the figure, AB = p, DC = q and $\angle A = \angle D = 90^\circ$. BC =

A. $(q - p)\sin\theta$
B. $(q - p)\cos\theta$
C. $(q - p)\tan\theta$
D. $(q - p)/\sin\theta$
E. $(q - p)/\cos\theta$



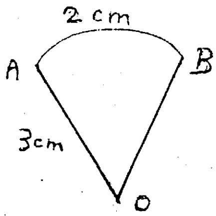
4. (83) In the figure, $\angle ABC = \angle ACD = \angle BDC = 90^\circ$. AC = a, CD =

A. $a \sin^2\theta$
B. $a \cos^2\theta$
C. $a \tan\theta$
D. $a \sin\theta \cos\theta$
E. $a \cos\theta/\sin\theta$



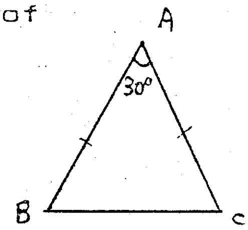
5. (83) In the figure, OAB is a sector of a circle. Radius OA is 3 cm long and arc AB = 2 cm. The area of the sector is

A. 3 cm^2
B. 6 cm^2
C. 9 cm^2
D. 3π cm^2
E. 6π cm^2



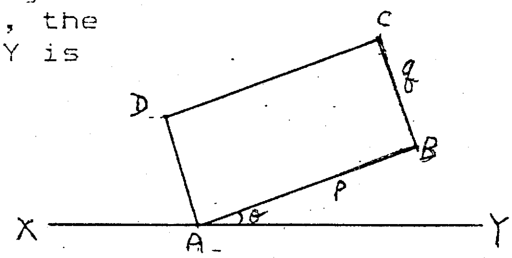
6. (83) In the figure, AB = AC. If the area of $\triangle ABC$ is 64 cm^2, then AB =

A. 32 cm
B. $16\sqrt{2}$ cm
C. 16 cm
D. $8\sqrt{2}$ cm
E. 4 cm



7. (83) In the figure, ABCD is a rectangle. AB = p and BC = q. If $\angle BAY = \theta$, the distance of C from the line XAY is

A. $(p + q)\sin\theta$
B. $(p + q)\cos\theta$
C. $\sqrt{p^2 + q^2}\,\sin\theta$
D. $p \cos\theta + q \sin\theta$
E. $p \sin\theta + q \cos\theta$



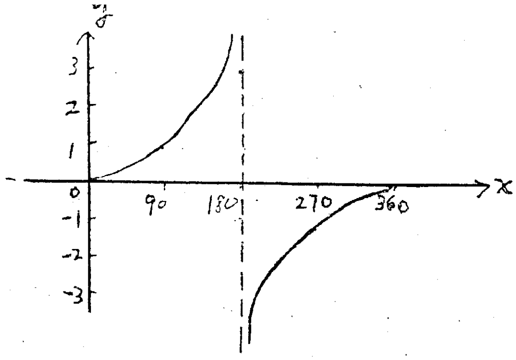
8. (83) If $0^\circ \le \theta < 360^\circ$, the number of roots of the equation $4 \sin^2\theta \cos\theta = \cos\theta$ is

A. 2 B. 3 C. 4 D. 5 E. 6

9. (83) The maximum value of $\cos^2 3x$ is

A. 1 B. 2 C. 3 D. 6 E. 9

10. (83) The figure shows the graph of a tangent function from 0° to 360°, the function is

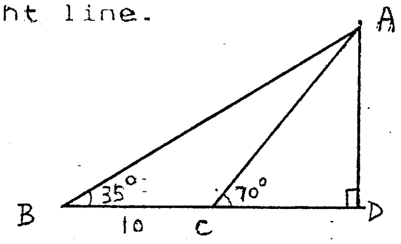


A. $y = \tan x°/2$
B. $y = \tan x°$
C. $y = \tan 2x°$
D. $y = \tan(x - 90)°$
E. $y = \tan(x + 90)°$

11. (84) $\dfrac{\tan^2\theta}{1 + \tan^2\theta} + \cos^2\theta =$

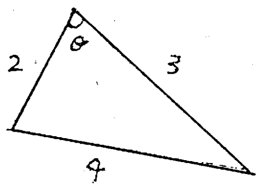
A. 1 B. $\frac{1}{2} + \cos^2\theta$ C. $\cos^2\theta$ D. $1 + \tan^2\theta$ E. $1 + \cos^2\theta$

12. (84) In the figure, BCD is a straight line. $\angle ADC = 90°$ and $BC = 10$. $AD =$



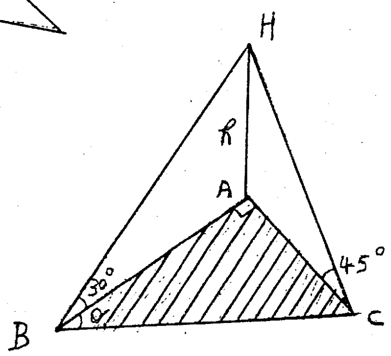
A. $10 \cos 70°$
B. $10 \sin 70°$
C. $10 \tan 70°$
D. $10 \sin 20°/\sin 55°$
E. $10 \tan 20°/\sin 55°$

13. (84) In the figure, $\cos\theta =$



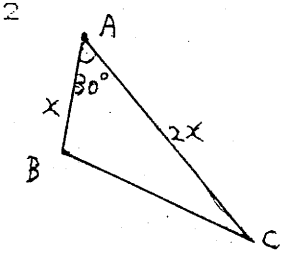
A. $-1/4$
B. $-1/2$
C. $1/4$
D. $1/2$
E. $3/4$

14. (84) In the figure, ABC lies in a horizontal plane. $\angle BAC = 90°$. HA is vertical and $HA = h$, $\tan\theta =$



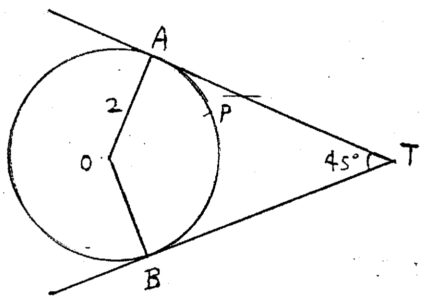
A. 1
B. $\tan 30°$
C. $1/\tan 30°$
D. $h \tan 30°$
E. $h/\tan 30°$

15. (84) In the figure, $AB = x$ and $AC = 2x$. The area of $\triangle ABC$ is 16. x (correct to 2 decimal places) is



A. 2.83
B. 4.00
C. 4.30
D. 5.66
E. 6.08

16. (84) In the figure, O is the centre of the circle. TA and TB touch the circle at A and B respectively. $OA = 2$. The length of the arc APB is



A. $\pi/4$
B. $\pi/2$
C. $3\pi/4$
D. $3\pi/2$
E. 3π

17. (84) The greatest value of $\dfrac{3}{4 + 2\cos\theta}$ is

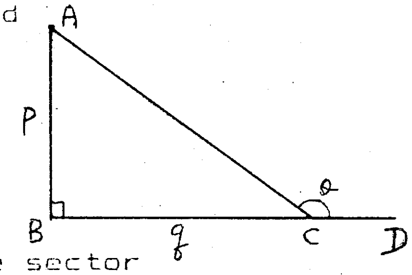
A. 3 B. 3/2 C. 3/4 D. 3/5 E. 1/2

18. (84) If $0° \le \theta < 360°$, the number of roots of the equation $2\sin\theta + 1/\sin\theta = 3$ is

A. 0 B. 1 C. 2 D. 3 E. 4

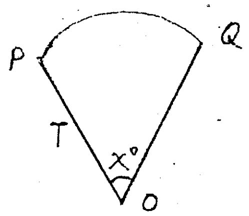
19. (84) In the figure, $\angle B = 90°$ and BCD is is a straight line. If AB = p and BC = q, then $\cos\theta$ =

A. p/q
B. $p/\sqrt{p^2 + q^2}$
C. $q/\sqrt{p^2 + q^2}$
D. $-p/\sqrt{p^2 + q^2}$
E. $-q/\sqrt{p^2 + q^2}$



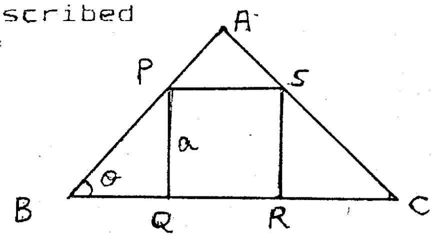
20. (84) In the figure, the radius of the sector is r and $\angle POQ = x°$. If the area of the sector is A, then x =

A. $2A/r^2$
B. $360A/r^2$
C. $360A/\pi r^2$
D. $180A/r^2$
E. $180A/\pi r^2$



21. (84) In the figure, PQRS is a square inscribed in △ ABC. AB = AC and PQ = a. AB =

A. $a(\sin\theta + \frac{1}{2}\cos\theta)$
B. $a(\cos\theta + \frac{1}{2}\sin\theta)$
C. $a(1/\sin\theta + 1/2\cos\theta)$
D. $a(1/\cos\theta + 1/2\sin\theta)$
E. $2a/\sin\theta$

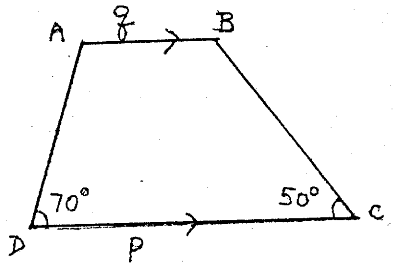


22. (84) In the figure, AB DC. AB = q and DC = p. BC =

A. $\dfrac{(p+q)\sin 50°}{2\sin 70°}$ B. $\dfrac{(p+q)\sin 70°}{2\sin 50°}$

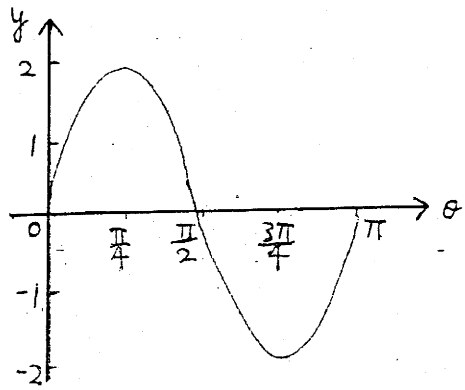
C. $\dfrac{(p-q)\sin 70°}{\sin 60°}$ D. $\dfrac{(p-q)\sin 70°}{\sin 50°}$

E. $\dfrac{(p-q)\sin 50°}{\sin 70°}$



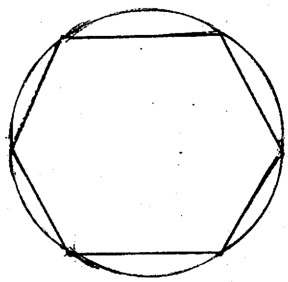
23. (84) The figure shows the graph of of $y = a\sin k\theta$. What are the values of the constants a and k ?

A. a = 1 and k = 1
B. a = 1 and k = 2
C. a = 1 and k = 1/2
D. a = 2 and k = 2
E. a = 2 and k = 1/2



24. (84) In ABC, BC = a, AC = b, AB = c and a > b > c. Which of the following must be true ?
(1) A > B > C (2) b+c > a (3) B + C > A
A. (1) only B. (2) only C. (1) and (2) only
D. (2) and (3) only E. (1), (2) and (3)

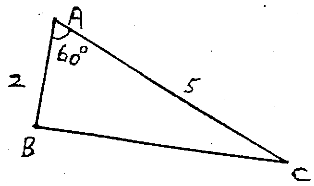
25. (85) In the figure, a regular hexagon of side 2 cm is inscribed in a circle. The area of the circle is greater than the area of the hexagon by
A. $(3\pi - 6)$ cm^2
B. $(3\pi - 3\sqrt{3})$ cm^2
C. $(4\pi - 6)$ cm^2
D. $(4\pi - 3\sqrt{3})$ cm^2
E. $(4\pi - 6\sqrt{3})$ cm^2



26. (85) $\tan\theta \cdot \left(\frac{1}{\sin\theta} - \sin\theta\right) =$
A. 1 B. $\cos\theta$ C. $\sin\theta$ D. $1/\cos\theta$ E. $1/\sin\theta$

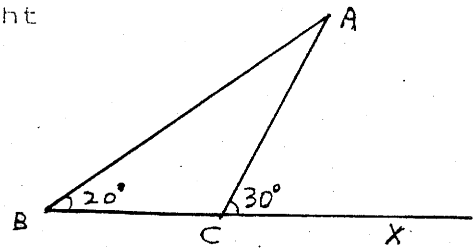
27. (85) If $\tan\theta = \frac{2ab}{a^2 - b^2}$ and $0° < \theta < 90°$, then $\cos\theta =$
A. $\frac{a^2+b^2}{a^2-b^2}$ B. $\frac{a^2-b^2}{a^2+b^2}$ C. $\frac{a^2-b^2}{\sqrt{a^2+b^2}}$ D. $\frac{\sqrt{a^2-b^2}}{a^2+b^2}$ E. $\sqrt{\frac{a^2-b^2}{a^2+b^2}}$

28. (85) In the figure, AB = 2 and AC = 5. BC =
A. $\sqrt{39}$
B. $\sqrt{29}$
C. $\sqrt{24}$
D. $\sqrt{20}$
E. $\sqrt{19}$

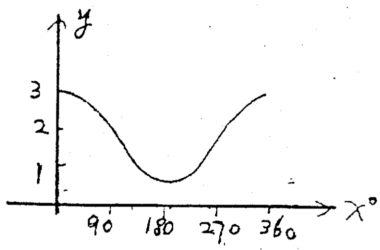


29. (85) In $\triangle ABC$, $\angle A = 30°$, AB = 6 cm. If the area of $\triangle ABC$ is 15 cm^2, AC =
A. 2.5 cm B. 5 cm C. 10 cm D. 12 cm E. 15 cm

30. (85) In the figure, BCX is a straight line. AC = 1. AB =
A. 2 sin20°
B. 2 cos20°
C. $\sqrt{2}$ cos20°
D. 1/(2 sin20°)
E. $\sqrt{3}$/(2 sin20°)



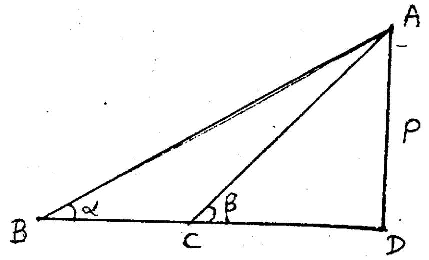
31. (85) The figure shows the graph of
A. y = 3 cosx°, 0 ≤ x ≤ 360
B. y = 3 sinx°, 0 ≤ x ≤ 360
C. y = 2 + sinx°, 0 ≤ x ≤ 360
D. y = 2 + cosx°, 0 ≤ x ≤ 360
E. y = 3 + sinx°, 0 ≤ x ≤ 360



32. (85) If $0° \le \theta \le 360°$, then the largest value of $2\sin^2\theta + \cos^2\theta + 2$ is
A. 1 B. 2 C. 3 D. 4 E. 5

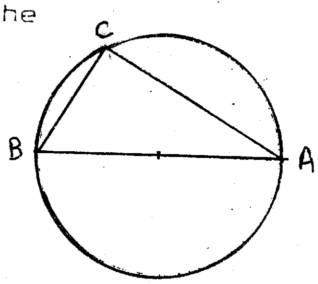
33. (85) In the figure, BCD is a straight line. $AD \perp BD$. If $AD = p$, then $BC =$

A. $p\tan(\beta - \alpha)$
B. $p(\tan\alpha - \tan\beta)$
C. $p(\tan\beta - \tan\alpha)$
D. $p\left(\dfrac{1}{\tan\alpha} - \dfrac{1}{\tan\beta}\right)$
E. $p\left(\dfrac{1}{\tan\beta} - \dfrac{1}{\tan\alpha}\right)$



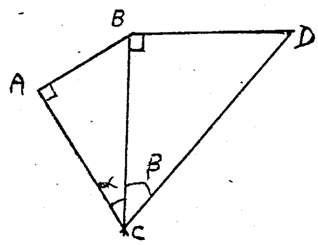
34. (85) In the figure, AB is a diameter of the circle ABC. If arc AC has the same length as AB, then $\angle CAB =$

A. $\pi/2$ radians
B. $(\pi/2 - 1/2)$ radians
C. $(\pi/2 - 1)$ radians
D. $(\pi/2 - 2)$ radians
E. $(\pi - 1/2)$ radians



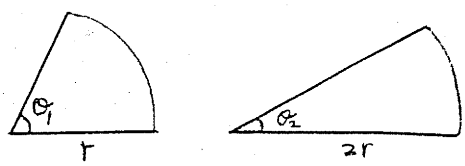
35. (85) In the figure, $\angle CAB = \angle CBD = 90°$. $BC = 2$. The area of quadrilateral ABDC =

A. $2\sin(\alpha + \beta)$
B. $2(\tan\alpha + \tan\beta)$
C. $2(\sin\alpha\cos\beta + \sin\beta\cos\beta)$
D. $2(\tan\alpha + \sin\beta\cos\beta)$
E. $2(\sin\alpha\cos\alpha + \tan\beta)$



36. (86) The figure shows two sectors with radii r and $2r$. If these two sectors are equal in area, then $\theta_1 : \theta_2 =$

A. 2 : 1
B. 3 : 1
C. 4 : 1
D. 5 : 1
E. 6 : 1

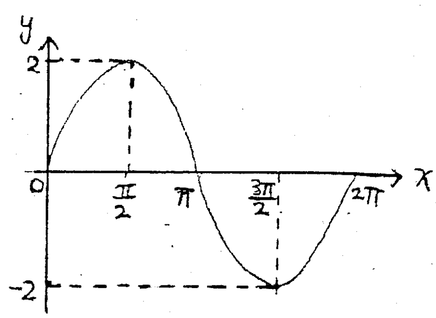


37. (86) If $\sin\theta\cos\theta = 1/4$, then $(\sin\theta + \cos\theta)^2 =$

A. 2 B. 3/2 C. 1 D. 1/2 E. 1/4

38. (86) Which of the following functions may be represented by the above graph in the interval 0 to 2π ?

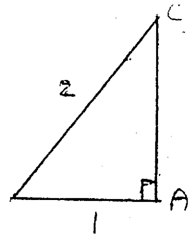
A. $y = \cos 2x$
B. $y = 2\cos x$
C. $y = \frac{1}{2}\cos x$
D. $y = \sin 2x$
E. $y = 2\sin x$



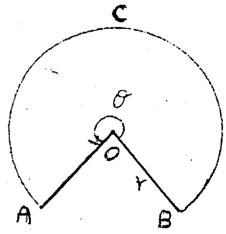
39. (86) $\sin^4\theta - \cos^4\theta =$

A. -1
B. $1 - 2\cos^4\theta$
C. $\sin\theta - \cos\theta$
D. $\sin^2\theta - \cos^2\theta$
E. $2\sin 4\theta - 1$

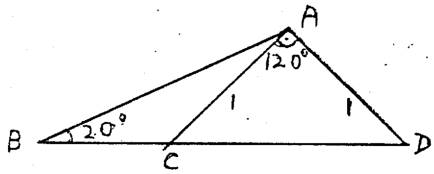
40. In the figure, $\angle A : \angle B : \angle C =$
(86) A. $2 : \sqrt{3} : 1$
B. $4 : 3 : 1$
C. $3 : 2 : 1$
D. $\sqrt{3} : \sqrt{2} : 1$
E. $1 : 2 : \sqrt{3}$



41. In the figure, if the area of the
(86) sector is x, then $\overset{\frown}{ACB}$ =
A. $2x/r$
B. x/r
C. $2x/r^2$
D. $\pi x/90r$
E. $90x/\pi r$



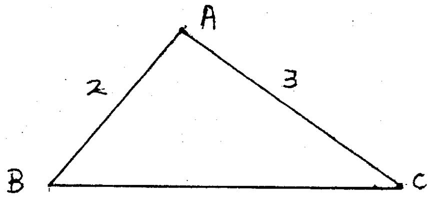
42. In the figure, AC = AD = 1, $\angle ABD = 20^\circ$
(86) and $\angle CAD = 120^\circ$, find AB.
A. $2\cos 20^\circ$
B. $\dfrac{1}{2\sin 20^\circ}$ C. $\dfrac{\sqrt{3}}{2\sin 20^\circ}$
D. $\sqrt{3}\cos 20^\circ$
E. $2\sin 20^\circ$



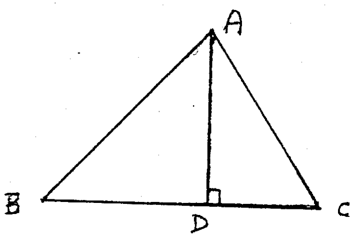
43. The bearing of a lighthouse as observed from an ocean liner
(86) is N37°E; the bearing of the ocean liner as observed from the lighthouse is
A. N37°E B. N53°W C. S37°E D. S37°W E. S53°W

44. Let p be a positive constant such that $p\sin\theta = \sqrt{3}$ and
(86) $p\cos\theta = 1$. Find the values of θ in the interval 0 to 2π.
A. $\pi/3$ B. $\pi/6$ C. $\pi/3,\ 4\pi/3$ D. $\pi/6,\ 7\pi/6$
E. Cannot be determined.

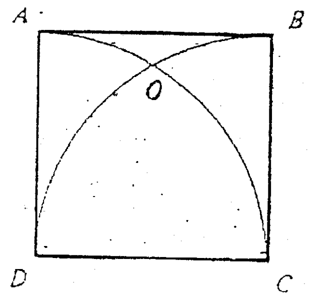
45. In $\triangle ABC$, AB = 2, AC = 3 and
(86) $\sin B = 3/4$, then $\cos^2 C =$
A. 9/16
B. 9/13
C. 1/4
D. 1/2
E. 3/4



46. In the figure, BD : DC =
(86) A. sinC : sinB
B. cosC : cosB
C. tanC : tanB
D. sinB : sinC
E. cosB : cosC

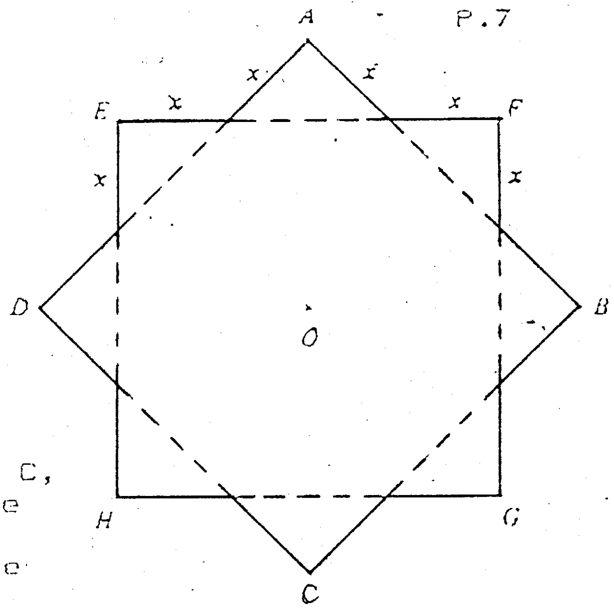


47. In the figure, ABCD is square. Arcs
(86) AC and BD are drawn with centres D
and C respectively, intersecting at
O. $\overset{\frown}{AO} : \overset{\frown}{OC} =$
A. $1 : \sqrt{2}$
B. $1 : \sqrt{3}$
C. $1 : 2$
D. $1 : 3$
E. $2 : 3$



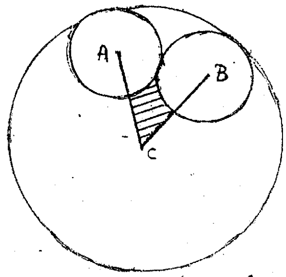
48. (86) In the figure, ABCD and EFGH are two squares of side 1. They are placed one upon the other with their centres both at O to form a star with 16 sides, each of length of x. Find x.

A. 2/7
B. 1/3
C. 2/5
D. $1/(2+\sqrt{2})$
E. $1/(1+\sqrt{2})$



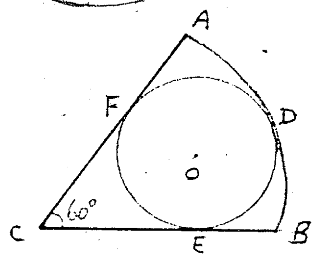
49. (86) Three circles, centres A, B and C, touch each other at shown in the figure. The radii of the two circles with centres A and B are both 1 cm and the radius of the circle with centre C is 3 cm. Find the area of the shaded part in cm^2.

A. $\sqrt{3}-\pi/3$
B. $\sqrt{3}-\pi/6$
C. $2\sqrt{3}-\pi/3$
D. $2\sqrt{3}-\pi/6$
E. It cannot be determined.



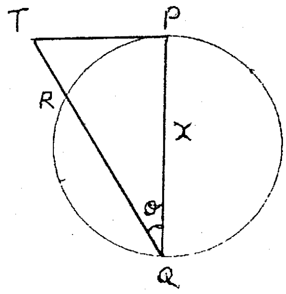
50. (86) A circle, centre O, touches the sector ABC internally at D, E and F. $\angle C = 60°$ and AC = 18. Find the radius of the circle.

A. 9
B. 5
C. 3
D. 6
E. 4



51. (86) In the figure, PQ is a diameter and PT is a tangent of the circle. QT cuts the circle at R. Let $\angle Q = \theta$ and PQ = x, then TR =

A. $x/\cos\theta$
B. $x/\sin\theta$
C. $x/(\sin\theta \tan\theta)$
D. $x \sin\theta \tan\theta$
E. $x \cos\theta \tan\theta$

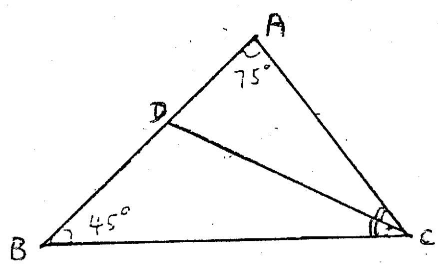


52. (87) The circumference of a circle is 6π cm. The length of an arc of the circle which subtends an angle of 1/3 radian at the centre is

A. 1 cm B. 3/2 cm C. 2 cm D. π cm E. 2π cm

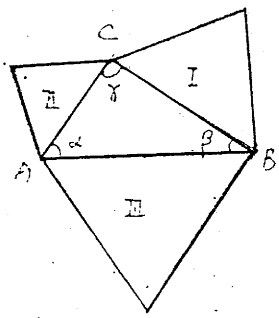
53. (87) In the figure, $\angle A = 75°$, $\angle B = 45°$ and CD bisects $\angle ACB$. BD/CD =

A. 2/3
B. $1/\sqrt{2}$
C. $\sqrt{2}$
D. $\sqrt{2/3}$
E. $\sqrt{3/2}$

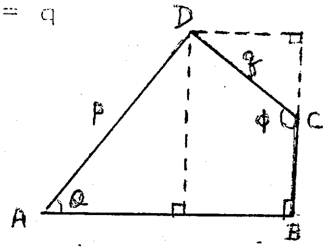


54. A rectangle is 6 cm long and 8 cm wide. The acute angle
(87) between its diagonals, correct to the nearest degree is
A. 37° B. 41° C. 49° D. 74° E. 83°

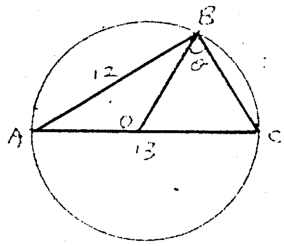
55. In the figure, I, II and III
(87) are equilateral triangles.
Area of I:Area of II:Area of III=
A. $\alpha : \beta : \gamma$
B. $\sin\alpha : \sin\beta : \sin\gamma$
C. $\sin^2\alpha : \sin^2\beta : \sin^2\gamma$
D. $\cos\alpha : \cos\beta : \cos\gamma$
E. $\cos^2\alpha : \cos^2\beta : \cos^2\gamma$



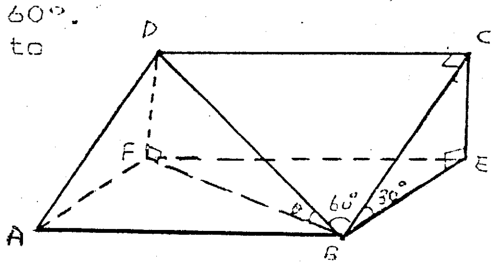
56. In the figure, AD = p, CD = q
(87) and B = 90°. BC =
A. $p \sin\theta - q \sin\phi$
B. $p \sin\theta - q \cos\phi$
C. $p \cos\theta - q \sin\phi$
D. $p \sin\theta + q \cos\phi$
E. $p \cos\theta + q \sin\phi$



57. In the figure, O is the centre of the
(87) circle. If AB=12 and AC=13, then $\cos\theta$=
A. 5/12
B. 5/13
C. 12/13
D. 12/25
E. 13/25



58. In the figure, ABCD is a rectangle
(87) inclined at an angle of 30° to the
horizontal plane ABEF. ∠CBD = 60°.
Let θ be the inclination of BD to
the horizontal plane. $\sin\theta$ =
A. 1/4
B. 1/2
C. $\sqrt{3}/2$
D. $\sqrt{3}/3$
E. $\sqrt{3}/4$

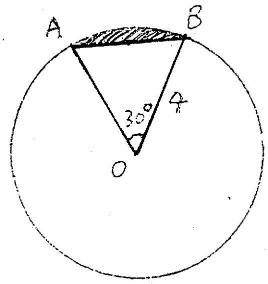


59. How many different values of x between 0° and 360° will
(87) satisfy the equation $(\sin x + 1)(2\sin x + 1) = 0$?
A. 0 B. 1 C. 2 D. 3 E. 4

60. If $0° \le x < 360°$, the number of points of intersection of
(87) the graphs of $y = \sin x$ and $y = 1 + \cos x$ is
A. 0 B. 1 C. 2 D. 3 E. 4

61. In ABC, if AB : BC : CA = 4 : 5 : 6, then cosA =
(87) A. 1/8 B. 1/5 C. 3/10 D. 9/16 E. 3/4

62. In the figure, O is the centre of
(87) the circle of radius 4. The area
of the shaded region is
A. $4\pi/3 - 4$
B. $4\pi/3 - 8$
C. $4\pi/3 - 4\sqrt{3}$
D. $2\pi/3 - 4$
E. $8\pi/3 - 8$



63. (88) Given that $\sin\theta\cos\theta > 0$, which of the following is/are true ?

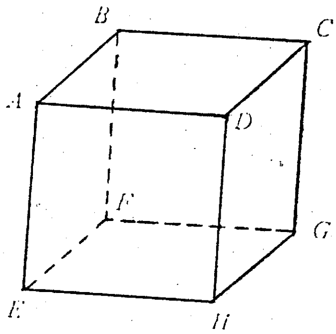
(1) $0^\circ < \theta < 90^\circ$ (2) $90^\circ < \theta < 180^\circ$ (3) $180^\circ < \theta < 270^\circ$

A. (1) only B. (2) only C. (3) only
D. (1) and (2) only E. (1) and (3) only

64. (88) In the figure, ABCDEFGH is a cube. Which of the following is a right angle/are right angles ?

(1) ∠DHG (2) ∠AHG (3) ∠BEH

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (1), (2) and (3)

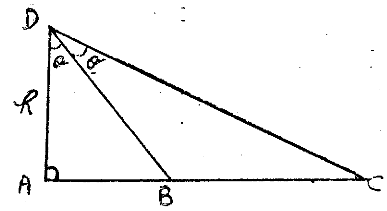


65. (88) If $\tan A = -\frac{5}{4}$, then $\frac{2\sin A - 3\cos A}{3\sin A + 2\cos A} =$

A. −22/7 B. −22/23 C. −2/23 D. 2/23 E. 22/7

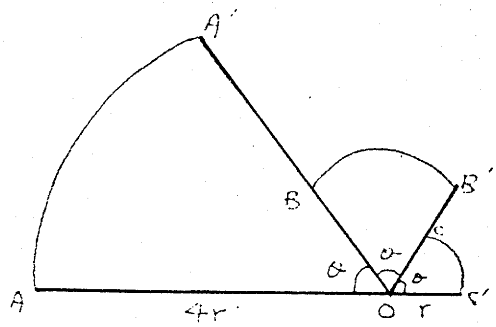
66. (88) In the figure, AC/AB =

A. 2
B. $\tan\theta$
C. $\tan 2\theta/\tan\theta$
D. $\sin 2\theta/\sin\theta$
E. $\cos 2\theta/\cos\theta$



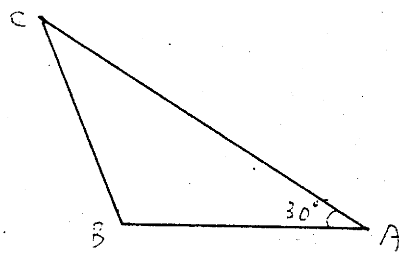
67. (88) In the figure, AOC′ is a straight line. OAA′, OBB′ and OCC′ are 3 sectors. If OA = 4r, OB = 2r and OC′ = r, find the total area of the sectors in terms of r.

A. $7\pi r^2$
B. $\frac{7}{2}\pi r^2$
C. $\frac{7}{4}\pi r^2$
D. $\frac{7}{6}\pi r^2$
E. $\frac{7}{12}\pi r^2$



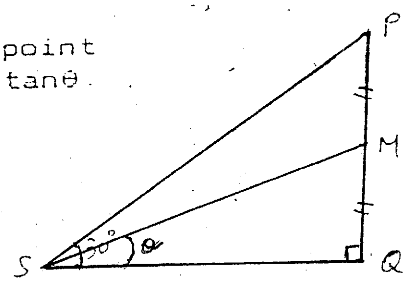
68. (88) In the figure, the area of △ABC is 15 cm² and A = 30°. AC is longer than AB by 4 cm. AC =

A. 6 cm
B. 8.8 cm
C. 10 cm
D. 11.5 cm
E. 14 cm

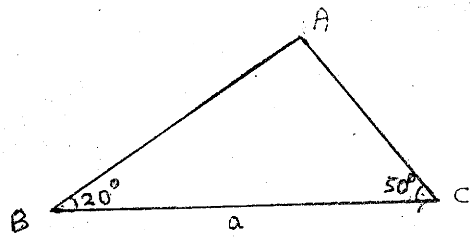


69. In the figure, M is the mid-point
(88) of PQ and $\angle PSQ = 30°$. Find $\tan\theta$.

A. 0.268
B. $\sqrt{3}/6$
C. $\sqrt{3}/2$
D. $\sqrt{3}/4$
E. $\sqrt{3}/8$

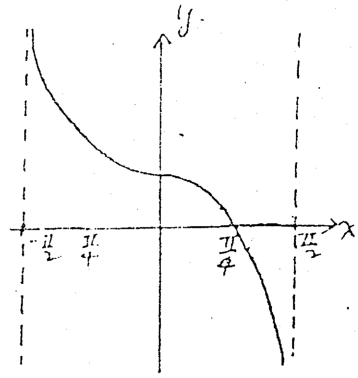


70. In the figure, BC = a. AB =
(88) A. 5a/11
B. a sin50°
C. $\dfrac{a \sin 70°}{\sin 50°}$
D. $\dfrac{a \sin 50°}{\sin 70°}$
E. $\dfrac{a \sin 50°}{\sin 20°}$

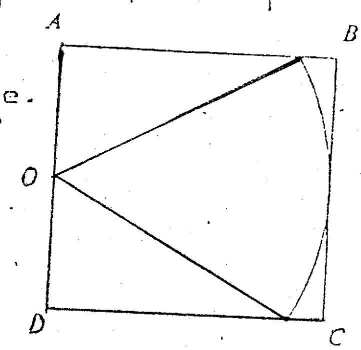


71. If x and y can take any value between 0 and 360, what is the
(88) greatest value of $2 \sin x° - \cos y°$?
A. 1 B. 2 C. 3 D. 5
E. It cannot be found.

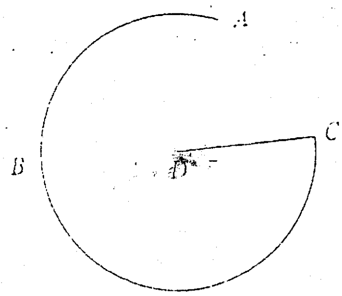
72. The figure shows the graph of
(88) the function
A. $y = -\tan x$
B. $y = 1 - \tan x$
C. $y = 1 + \tan x$
D. $y = \cos x - \sin x$
E. $y = \cos x + \sin x$



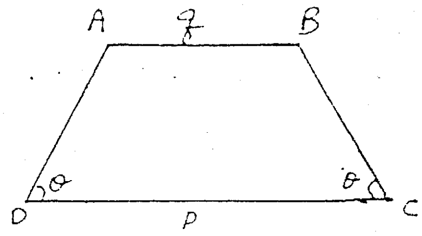
73. ABCD is a square of side 2 cm. O
(88) is the midpoint of AD. A sector
with centre O is inscribed in
the square as shown in the figure.
What is the area of the sector ?
A. $\pi/2$ cm²
B. $2\sqrt{3}\pi$ cm²
C. $\sqrt{3}\pi$ cm²
D. $2\pi/3$ cm²
E. $4\pi/3$ cm²



74. In the figure, ABCD is a G-shaped curve, where ABC is an arc
(88) of a circle and DC is a radius. If the length of the curve
ABCD is the same as that of the complete circle, find, in
radians, the angle subtended by the arc ABC at the centre.
A. $3\pi/2$ rad
B. $(\pi + 1)$ rad
C. $4\pi/3$ rad
D. $(2\pi - 1)$ rad
E. $7\pi/4$ rad



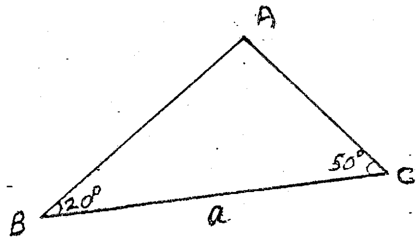
75. (83) In the figure, ABCD is a trapezium in which AB // DC and $\angle C = \angle D = \theta$. If CD = p and AB = q, then the area of the trapezium is



A. $\frac{1}{2}(p+q)^2\tan\theta$ B. $\frac{1}{4}(p^2+q^2)\tan\theta$
C. $\frac{1}{2}(p^2-q^2)\tan\theta$ D. $\frac{1}{4}(p^2-q^2)\tan\theta$

E. $\dfrac{p^2-q^2}{4}\tan\theta$

76. (83) In the figure, BC = a, AB =



A. $a\sin 20°$

B. $\dfrac{a\sin 20°}{\sin 70°}$ C. $\dfrac{a\sin 20°}{\sin 50°}$

D. $\dfrac{a\sin 50°}{\sin 20°}$ E. $\dfrac{a\sin 50°}{\sin 70°}$

ANSWERS

1. A	2. B	3. E	4. D	5. A	6. C	7. E	8. E	9. A	10.A
11.A	12.B	13.A	14.B	15.D	16.D	17.B	18.D	19.E	20.C
21.C	22.C	23.D	24.C	25.E	26.D	27.B	28.E	29.C	30.D
31.D	32.D	33.D	34.C	35.E	36.C	37.B	38.E	39.D	40.C
41.A	42.B	43.D	44.A	45.E	46.C	47.C	48.D	49.A	50.D
51.D	52.A	53.B	54.D	55.C	56.D	57.B	58.A	59.D	60.C
61.D	62.A	63.E	64.E	65.E	66.C	67.B	68.C	69.B	70.D
71.C	72.B	73.D	74.D	75.D	76.E				

$\sin^2\theta - (\sin^2\theta\cos^4\theta + \sin^4\theta\cos^2\theta)$

$\sin^2\theta - \sin^2\theta\cos^2\theta(\cos^2\theta + \sin^2\theta)$

$= \sin^2\theta - \sin^2\theta\cos^2\theta(1)$

$= \sin^2\theta(1 - \cos^2\theta)$

$= (\sin^2\theta)(\sin^2\theta)$

$= \sin^4\theta$. (A.)

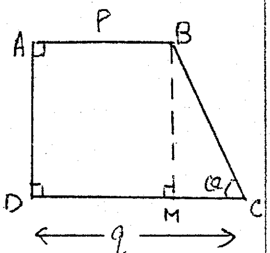
$\dfrac{\cos(90^\circ - \theta)}{\tan(180^\circ - \theta)}$

$= \dfrac{\sin(\theta)}{-\tan\theta}$

$= \sin\theta\left(-\dfrac{\cos\theta}{\sin\theta}\right)$

$= -\cos\theta$. (B.)

3.

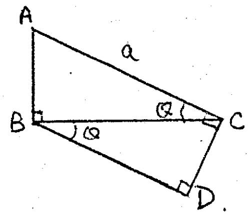


$MC = q - p$.

$\dfrac{MC}{BC} = \cos\theta$.

$\therefore BC = \dfrac{MC}{\cos\theta}$

$= \dfrac{(q-p)}{\cos\theta}$ (E.)



$\angle CBD$

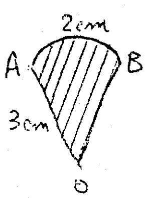
$\angle ACB = \theta$.

$\dfrac{BC}{AC} = \cos\theta$.

$BC = a\cos\theta$.

$\dfrac{CD}{BC} = \sin\theta$.

$CD = a\sin\theta\cos\theta$. (D.)



$\therefore$ area of sector

$= \frac{1}{2} r s$

$= \frac{1}{2}(2)(3)\ cm^2$.

$= 3\ cm^2$ (A.)

6. Let $AB = AC = x$.

$\therefore \frac{1}{2}(AB)(AC)\sin A = 64$

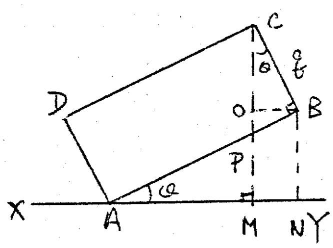
$\frac{1}{2}x^2 \sin 30^\circ = 64$

$\frac{1}{4}x^2 = 64$

$x^2 = 256$

$x = 16$ cm. (C.)

7.



$CM = OC + OM$.

$= q\cos\theta + BN$.

$= q\cos\theta + p\sin\theta$. (E.)

8. $4\sin^2\theta\cos\theta = \cos\theta$

$4\sin^2\theta\cos\theta - \cos\theta = 0$

$\cos\theta(4\sin^2\theta - 1) = 0$.

$\cos\theta = 0$.

or $\sin^2\theta = \frac{1}{4}$

$\sin\theta = \pm\frac{1}{2}$.

since each value have two answers. $\therefore$ there are 6 soln. (E.)

9. $-1 \le \cos 3x \le 1$

$\cos^2 3x \le 1$.

$\therefore$ max value $= 1$. (A.)

10. since $\tan 0^\circ = 0$

$\tan 90^\circ \to \infty$.

for $x = 0$, $y = 0$.

$x = 180^\circ$ $y \to \infty$

$\therefore$ the function is $y = \tan\frac{x^\circ}{2}$ (A.)

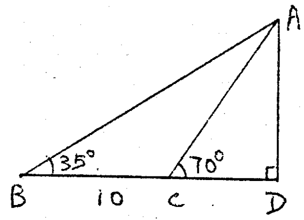
11. $\dfrac{\tan\theta}{1 + \tan^2\theta} + \cos^2\theta$.

$= \dfrac{\sin^2\theta}{\cos^2\theta}\left(\dfrac{\cos^2\theta}{\cos^2\theta + \sin^2\theta}\right) + \cos^2\theta$

$= \sin^2\theta + \cos^2\theta$

$= 1$. (A.)

12.



$\angle BAC + \angle ABC = \angle ACD$.

$\angle BAC + 35^\circ = 70^\circ$

$\angle BAC = 35^\circ$

$= \angle ABC$.

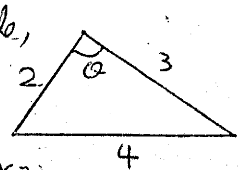
$\therefore \triangle ABC$ is isos. $\triangle$.

$\therefore AC = BC = 10$.

$\therefore \dfrac{AD}{AC} = \sin 70^\circ$

$AD = 10\sin 70^\circ$ (B.)

13 By cosine rule,



$4^2 = 2^2 + 3^2 - 2(2)(3)\cos\theta$

$16 = 4 + 9 - 12\cos\theta$

$\cos\theta = -\frac{1}{4}$ (A.)

14. since $\angle HCA = 45^\circ$.

$= \angle AHC$

$\therefore AC = AH = h$.

$\dfrac{AH}{AB} = \tan 30^\circ$.

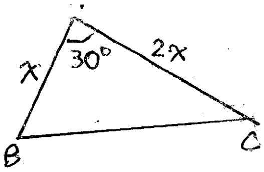
$AB = \dfrac{h}{\tan 30^\circ}$.

$\dfrac{AC}{AB} = \tan\theta$

$\tan\theta = \dfrac{h}{h/\tan 30^\circ}$

$= \tan 30^\circ$. (B.)

area $= \frac{1}{2}ab\sin C$.

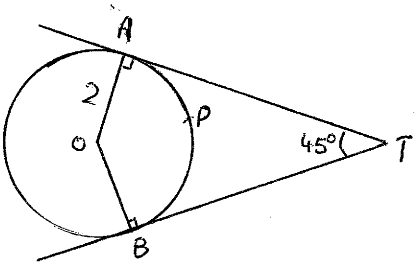


$16 = \frac{1}{2}(x)(2x)\sin 30^\circ$.

$\therefore\ x^2 = 32$

$x = 5.66$ (D.)

16.



$\angle AOB = 180^\circ - 45^\circ$

$= 135^\circ = \frac{3}{4}\pi$.

$\therefore$ length of arc APB

$= r\theta^c$

$= 2(\frac{3}{4}\pi)$

$= \frac{3}{2}\pi$. (D.)

17. $-1 \le \cos\theta \le 1$

$\frac{3}{4+2\cos\theta}$ is greatest.

$\therefore\ 4+2\cos\theta$ is minimum.

$-2 \le 2\cos\theta \le 2$

$2 \le 4+2\cos\theta \le 6$

$\therefore\ \left.\frac{3}{4+2\cos\theta}\right|_{max} = \frac{3}{2}$. (B.)

8. $2\sin\theta + \frac{1}{\sin\theta} = 3$.

$2\sin^2\theta + 1 - 3\sin\theta = 0$

$2\sin^2\theta - 3\sin\theta + 1 = 0$

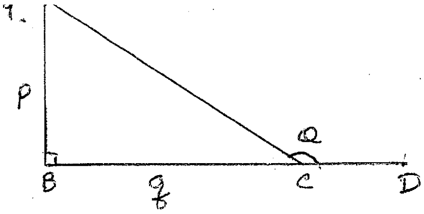
$(2\sin\theta - 1)(\sin\theta - 1) = 0$

$\sin\theta = \frac{1}{2}$ or 1.

$\theta = 30^\circ, 150^\circ$ or 90°.

$\therefore$ there are 3 roots. (D.)

19.



$AC^2 = AB^2 + BC^2$

$AC = \sqrt{p^2+q^2}$

$\cos\angle ACB = \frac{q}{\sqrt{p^2+q^2}}$

$\cos(180^\circ - \theta) = \frac{q}{\sqrt{p^2+q^2}}$

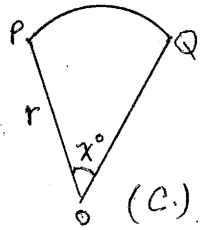
$-\cos\theta = \frac{q}{\sqrt{p^2+q^2}}$

$\cos\theta = \frac{-q}{\sqrt{p^2+q^2}}$ (E.)

20.

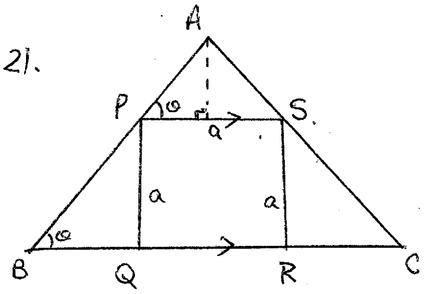
$A = \pi r^2\left(\frac{x^\circ}{360^\circ}\right)$.

$x = \frac{360A}{\pi r^2}$



(C.)

21.



$AB = AP + PB$

$\frac{\frac{1}{2}a}{AP} = \cos\theta$

$AP = \frac{a}{2\cos\theta}$.

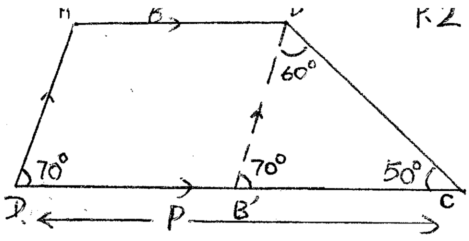
$\frac{PQ}{PB} = \sin\theta$.

$PB = \frac{a}{\sin\theta}$

$AB = \frac{a}{2\cos\theta} + \frac{a}{\sin\theta}$

$= a\left(\frac{1}{\sin\theta} + \frac{1}{2\cos\theta}\right)$ (C.)

K2



$B'C = p - q$. $\angle B'BC = 180^\circ - 70^\circ - 50^\circ$

$= 60^\circ$

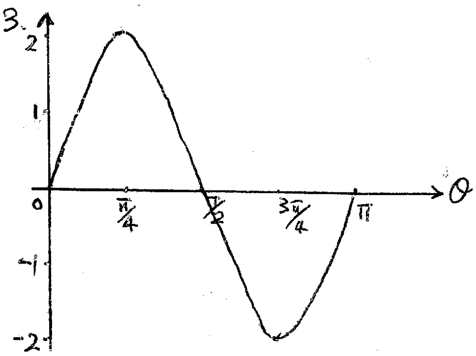
In $\Delta BB'C$

By sine rule,

$\frac{BC}{\sin 70^\circ} = \frac{B'C}{\sin 60^\circ}$

$BC = \frac{(p-q)\sin 70^\circ}{\sin 60^\circ}$ (C.)

23.



$y = a\sin k\theta$.

since $-2 \le y \le 2$

$-1 \le \sin k\theta \le 1$

$\therefore\ a = 2$.

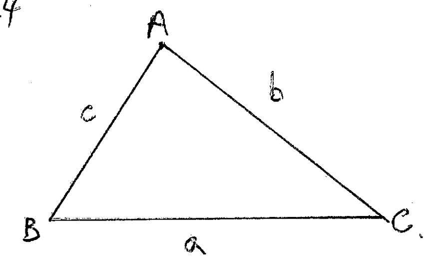
Check: $\sin \frac{\pi}{2} = 1$.

$\sin k(\frac{\pi}{4}) = 1$

$\therefore\ k(\frac{\pi}{4}) = \frac{\pi}{2}$

$k = 2$. (D.)

24



(1) $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$.

since $a > b > c$

$\sin A > \sin B > \sin C$

$A > B > C$ (true).

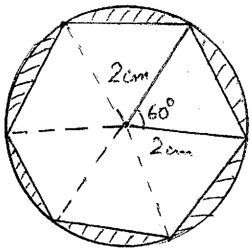
(2) sum of two sides is longer than the other side.

$b + c > a$ (true.)

(3) $B + C > A$ is not true

if $A > 90^\circ$. (C.)

area of a triangle



$= \frac{1}{2}(2)(2)\sin 60°$

$= \sqrt{3}\ cm^2$.

the shaded area

= the area of circle − the area of hexagon

$= (\pi(2)^2 - 6 \times \sqrt{3})\ cm^2$

$= (4\pi - 6\sqrt{3})cm^2$ (E.)

26. $\tan\alpha\left(\frac{1}{\sin\alpha} - \sin\alpha\right)$

$\frac{\sin\alpha}{\cos\alpha}\left(\frac{1}{\sin\alpha} - \sin\alpha\right)$

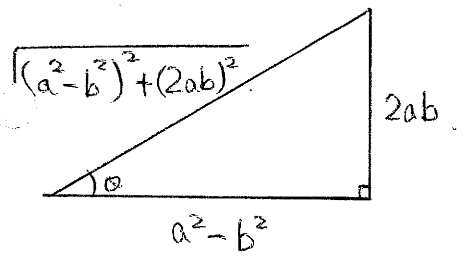
$= \frac{1}{\cos\alpha} - \frac{\sin^2\alpha}{\cos\alpha}$

$= \frac{\cos^2\alpha}{\cos\alpha}$

$= \cos\alpha$. (B.)

27. $\tan\alpha = \frac{2ab}{a^2 - b^2}$

where $0° < \alpha < 90°$



$\sqrt{(a^2-b^2)^2 + (4a^2b^2)}$

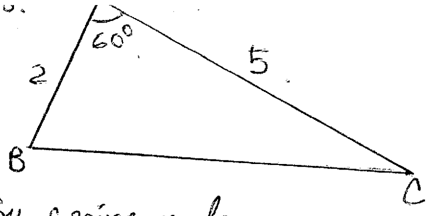
$= \sqrt{a^4 - 2a^2b^2 + b^4 + 4a^2b^2}$

$= \sqrt{a^4 + 2a^2b^2 + b^4}$

$= \sqrt{(a^2+b^2)^2}$

$= a^2 + b^2$.

$\therefore \cos\alpha = \frac{a^2 - b^2}{a^2 + b^2}$ (B)



By cosine rule,

$BC^2 = AB^2 + BC^2 - 2(AB)(BC)\cos A$

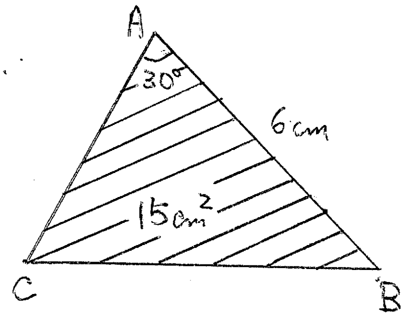
$= 2^2 + 5^2 - 2(5)(2)\cos 60°$

$= 29 - 10$

$= 19$

$\therefore BC = \sqrt{19}$. (E.)

29.

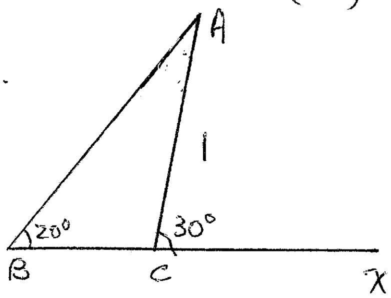


area of $\Delta = \frac{1}{2}ab\sin C$.

$15 = \frac{1}{2}(6)(AC)\sin 30°$.

$\therefore AC = 10$ (C.)

30.



$\angle BCA = 180° - \angle ACx$

$= 180° - 30°$

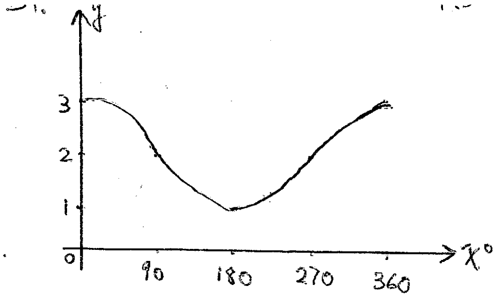
$= 150°$.

In ΔABC,
By since rule,

$\frac{AB}{\sin C} = \frac{AC}{\sin B}$

$\frac{AB}{\sin 150°} = \frac{1}{\sin 20°}$

$AB = \frac{1}{2\sin 20°}$. (D.)



since y is max at 0° & 360°,

∴ it is a cosine curve.

$1 \le y \le 3$

$-1 \le \cos x° \le 1$

$1 \le 2 + \cos x° \le 3$

$\therefore\ y = 2 + \cos x°$ (D.)

32. $2\sin^2\alpha + \cos^2\alpha + 2$.

$= \sin^2\alpha + (\sin^2\alpha + \cos^2\alpha) + 2$.

$= \sin^2\alpha + 1 + 2$

$= 3 + \sin^2\alpha$.

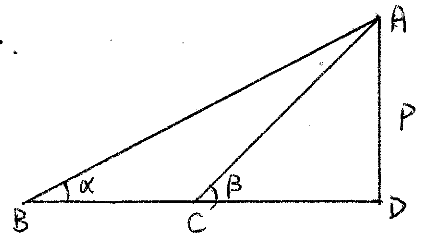
$-1 \le \sin\alpha \le 1$

$0 \le \sin^2\alpha \le 1$

$\therefore\ 2\sin^2\alpha + \cos^2\alpha + 2 \mid_{max}$

$= 3 + 1 = 4$ (D.)

33.



$BC = BD - CD$.

$\frac{AD}{BD} = \tan\alpha$

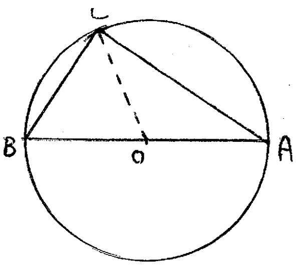
$BD = \frac{P}{\tan\alpha}$

$\frac{AD}{CD} = \tan\beta$

$CD = \frac{P}{\tan\beta}$.

$\therefore BC = \frac{P}{\tan\alpha} - \frac{P}{\tan\beta}$

$= P\left[\frac{1}{\tan\alpha} - \frac{1}{\tan\beta}\right]$ (D.)



Let O be the centre of the circle.
the radius be r.

$\angle AOC = \frac{\widehat{AC}}{r}$

$= \frac{2r}{r}$

$= 2$ (in radians)

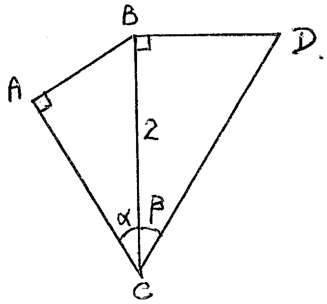
$\angle OAC = \angle OCA$
since $OA = OC$.

$\angle OAC = \frac{\pi - \angle AOC}{2}$

$= \frac{\pi - 2}{2}$ (C.)

$= (\frac{\pi}{2} - 1)$ radians.

35.



$\frac{AC}{BC} = \cos\alpha$.

$AC = 2\cos\alpha$.

$\frac{BC}{DC} = \cos\beta$.

$\therefore DC = \frac{2}{\cos\beta}$.

area of ABCD

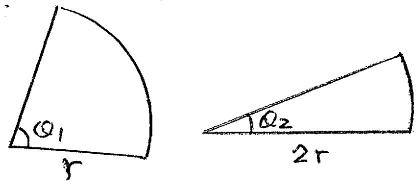
= area of $(\Delta ABC + \Delta BCD)$

$= \frac{1}{2}(AC)(BC)\sin\alpha + \frac{1}{2}(BC)(CD)\sin\beta$

$= \frac{1}{2}(2\cos\alpha)(2)\sin\alpha + \frac{1}{2}(2)(\frac{2}{\cos\beta})\sin\beta$.

$= 2\sin\alpha\cos\alpha + 2\tan\beta$.

$= 2(\sin\alpha\cos\alpha + \tan\beta)$ (E.)



$A = \frac{1}{2}r^2\theta_1$ $A = \frac{1}{2}(2r)^2\theta_2$.

$\therefore \frac{1}{2}r^2\theta_1 = \frac{1}{2}(4r^2)\theta_2$

$\theta_1 = 4\theta_2$.

$\therefore \theta_1 : \theta_2 = 4 : 1$. (C.)

37. $\sin\theta\cos\theta = \frac{1}{4}$.

$(\sin\theta + \cos\theta)^2$.

$= \sin^2\theta + 2\sin\theta\cos\theta + \cos^2\theta$

$= 1 + 2\sin\theta\cos\theta$

$= 1 + 2(\frac{1}{4})$

$= \frac{3}{2}$. (B.)

38. since y is max at $\pi/2$ & min at $3\pi/2$.

$y = 0$ at 0 and 2π.

$\therefore$ it is a sine curve.

$-2 \leq y \leq 2$

$-1 \leq \sin x \leq 1$

$y = 2\sin x$. (E.)

39. $\sin^4\theta - \cos^4\theta$

$= (\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$

$= (1)(\sin^2\theta - \cos^2\theta)$

$= \sin^2\theta - \cos^2\theta$. (D.)

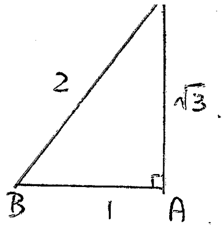
40 $\angle A = 90°$

$\cos B = \frac{1}{2}$

$\angle B = 60°$

$\sin\angle C = \frac{1}{2}$

$\therefore \angle C = 30°$



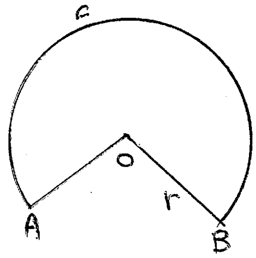
$\therefore \angle A : \angle B : \angle C = 90 : 60 : 30$

$= 3 : 2 : 1$ (C.)

41.

area of sector

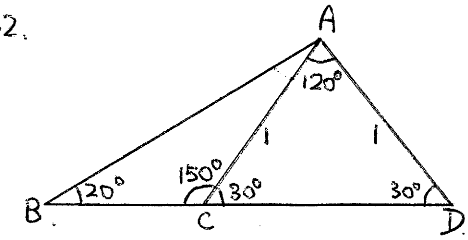
$= \frac{1}{2}rs$.



$\therefore x = \frac{1}{2}rs$

$\therefore S = \frac{2x}{r}$. (A.)

42.



$AC = AD$.

$\therefore \angle ACD = \angle ADC$.

$\angle ACD = \frac{180° - 120°}{2}$

$= 30°$.

$\angle ACB = 180° - 30° = 150°$.

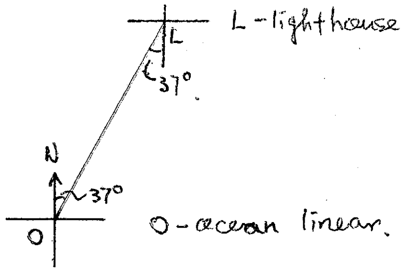
By sine rule,

$\frac{AB}{\sin C} = \frac{AC}{\sin B}$.

$AB = \frac{1(\sin 150°)}{\sin 20°}$.

$= \frac{1}{2\sin 20°}$ (B.)

43.



the bearing $= S37°W$. (D.)

44.

$$\begin{cases} p\sin\theta = \sqrt{3} \\ p\cos\theta = 1 \end{cases}, \quad p > 0$$

$$\therefore \frac{p\sin\theta}{p\cos\theta} = \frac{\sqrt{3}}{1}$$

$$\tan\theta = \sqrt{3}$$

$$\theta = \frac{\pi}{3} \text{ or } \frac{4\pi}{3} \text{ (rejected)}$$

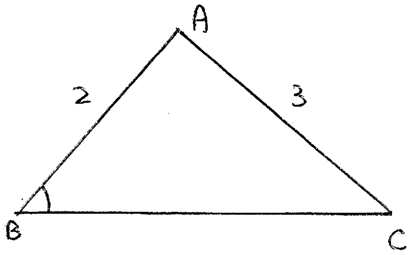
if $\theta = \frac{4\pi}{3}$

$$\therefore \sin\theta = -\frac{\sqrt{3}}{2}$$

$$\therefore p = -2 \text{ (rejected)}$$

$$\therefore \theta = \frac{\pi}{3} \qquad \text{(A.)}$$

45.



By sine rule,

$$\frac{AB}{\sin C} = \frac{AC}{\sin B}$$

$$\therefore \sin C = \frac{2}{3}\sin B$$

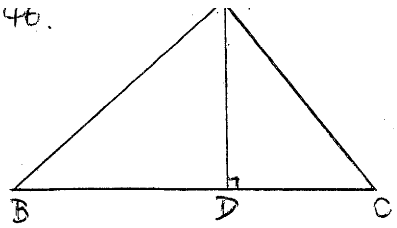
$$= \frac{2}{3}\left(\frac{3}{4}\right) = \frac{1}{2}$$

$$\cos^2 C = 1 - \sin^2 C$$

$$= 1 - \left(\frac{1}{2}\right)^2$$

$$= \frac{3}{4} \qquad \text{(E.)}$$

46.



$$\frac{AD}{BD} = \tan B$$

$$BD = \frac{AD}{\tan B}$$

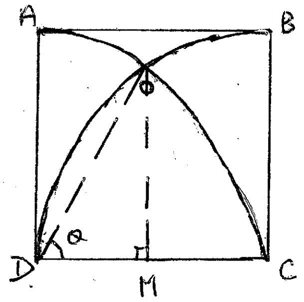
$$\frac{AD}{DC} = \tan C$$

$$DC = \frac{AD}{\tan C}$$

$$BD : DC = \frac{AD}{\tan B} : \frac{AD}{\tan C}$$

$$= \tan C : \tan B \qquad \text{(C.)}$$

47.



$$OD = AD = DC$$

$$DM = \frac{1}{2}DC$$

$$\therefore \cos\theta = \frac{\frac{1}{2}DC}{DC} = \frac{1}{2}$$

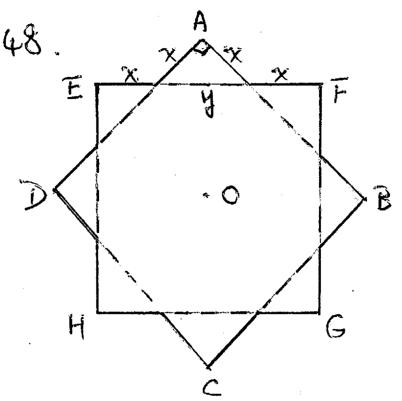
$$\theta = 60° = \frac{\pi}{3}$$

$$\overset{\frown}{AO} : \overset{\frown}{OC} = r\angle ADO : r\angle ODM$$

$$= \frac{\pi}{6} : \frac{\pi}{3}$$

$$= 1 : 2 \qquad \text{(C.)}$$

48.



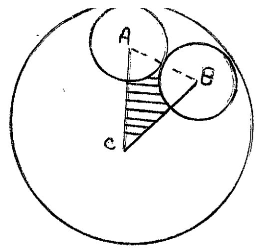
$$y = \sqrt{x^2 + x^2} = x\sqrt{2}$$

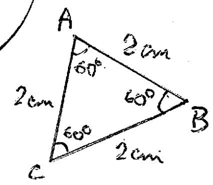
$$EF = x + y + x$$

$$1 = 2x + x\sqrt{2}$$

$$\therefore x = \frac{1}{2 + \sqrt{2}} \qquad \text{(D.)}$$

49.





the shaded area

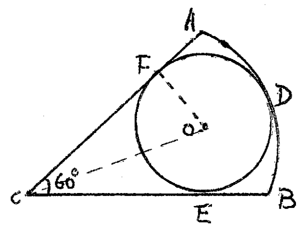
= the area of $\triangle ABC$ − the area of two sectors

$$= \frac{1}{2}(2)(2)\sin 60° - 2\cdot\frac{1}{2}(1)^2\frac{\pi}{3}$$

$$= \left(2\cdot\frac{\sqrt{3}}{2} - \frac{\pi}{3}\right)\text{cm}^2$$

$$= \left(\sqrt{3} - \frac{\pi}{3}\right)\text{cm}^2 \qquad \text{(A.)}$$

50.



Let the radius be r.

$$OC = CD - OD$$

$$= 18 - r$$

$$OF = r$$

$$\frac{OF}{OC} = \sin 30°$$

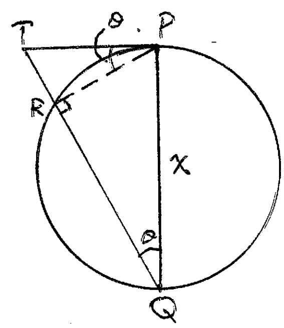
$$\frac{r}{18 - r} = \frac{1}{2}$$

$$2r = 18 - r$$

$$3r = 18$$

$$r = 6 \qquad \text{(D.)}$$

51.



since PQ is diameter, $\angle PRQ = 90°$.

$\angle TPR = \theta$.

$$\frac{TP}{PQ} = \tan\theta$$

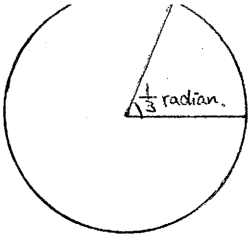
$$TP = x\tan\theta$$

$$\frac{TR}{TP} = \sin\theta$$

$$TR = x\sin\theta\tan\theta \qquad \text{(D.)}$$

52.

Let r be radius.



$2\pi r = 6\pi$

$\therefore r = 3.$

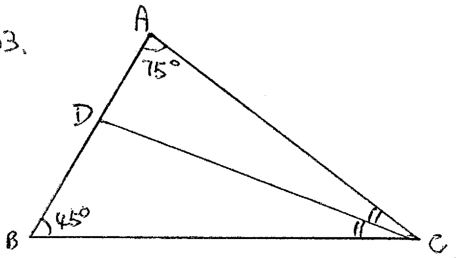
the arc length.

$= r\theta.$

$= (3)(\frac{1}{3})$ cm.

$= 1$ cm. (A.)

53.



$\angle ACB = 180° - 75° - 45°$

$= 60°$

$\angle DCB = \frac{60°}{2} = 30°.$

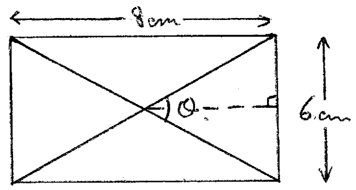
By sine rule,

$\frac{BD}{\sin\angle DCB} = \frac{CD}{\sin\angle DBC}.$

$\frac{BD}{CD} = \frac{\sin 30°}{\sin 45°}$

$\frac{BD}{CD} = \frac{\frac{1}{2}}{\sqrt{2}/2}$

$= \frac{1}{\sqrt{2}}.$ (B.)

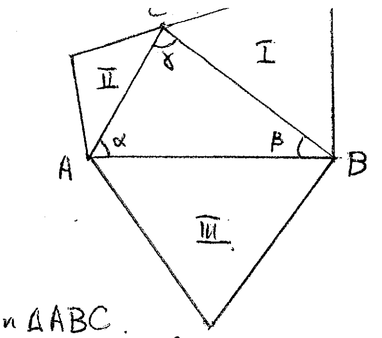


$\tan\frac{\theta}{2} = \frac{6/2}{8/2} = \frac{3}{4}$

$\frac{\theta}{2} = 36.87°$

$\theta = 73.74°$ (D.)

$= 74°$ (nearest degree)



In ΔABC.

By sine rule,

$\frac{AB}{\sin\gamma} = \frac{BC}{\sin\alpha} = \frac{AC}{\sin\beta}$

$AB : BC : AC = \sin\gamma : \sin\alpha : \sin\beta.$

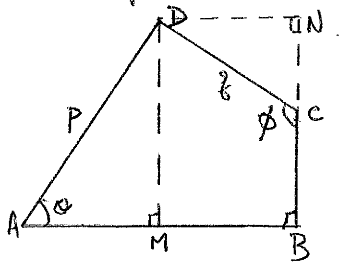
area I : II : III.

$= \frac{1}{2}(BC)^2\sin 60° : \frac{1}{2}(AC)^2\sin 60° : \frac{1}{2}(AB)^2\sin 60°$

$= BC^2 : AC^2 : AB^2$

$= \sin^2\alpha : \sin^2\beta : \sin^2\gamma.$ (C.)

56.



$\frac{DM}{AD} = \sin\theta.$

$DM = p\sin\theta.$

$\frac{NC}{DC} = \cos(180° - \phi).$

$\frac{NC}{q} = -\cos\phi.$

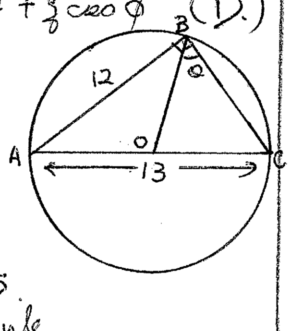
$NC = -q\cos\phi.$

$BC = DM - NC$

$= p\sin\theta - (-q\cos\phi)$

$= p\sin\theta + q\cos\phi$ (D.)

57.



$\angle ABC = 90°.$

$\therefore BC = \sqrt{13^2 - 12^2}$

$= 5.$

$OC = OB = 6.5$

By cosine rule,

$OC^2 = OB^2 + BC^2 - 2(OB)(BC)\cos\theta$

$6.5^2 = 6.5^2 + 5^2 - 2(5)(6.5)\cos\theta$

$\cos\theta = \frac{25}{65} = \frac{5}{13}$ (B.)

... and DC = x.

$\frac{CE}{BC} = \sin 30°$

$CE = x \cdot \frac{1}{2} = \frac{1}{2}x.$

$\frac{CB}{BD} = \cos 60°$

$BD = \frac{x}{1/2} = 2x.$

$\sin\theta = \frac{DF}{BD} = \frac{CE}{BD}$

$= \frac{\frac{1}{2}x}{2x}$

$= \frac{1}{4}$ (A.)

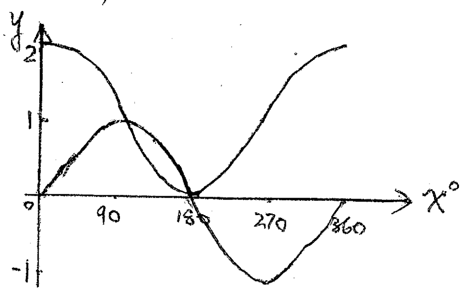
59. $(\sin x + 1)(2\sin x + 1) = 0.$

$\therefore \sin x = -1$ or $-\frac{1}{2}$

$x = 270°$ or $210°, 330°.$

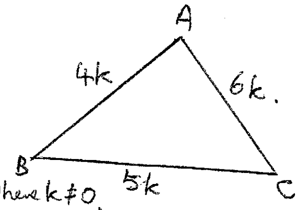
$\therefore$ there are 3 soln. (D.)

60. $\begin{cases} y = \sin x \\ y = 1 + \cos x. \end{cases}$



From the graph, there are 2 intersecting pts. (C.)

61.



Let $\begin{cases} AB = 4k \\ BC = 5k \\ AC = 6k, \text{ where } k \neq 0. \end{cases}$

By cosine rule,

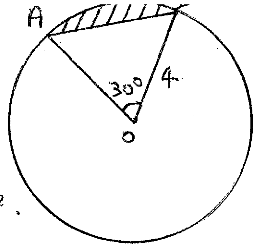
$BC^2 = AB^2 + AC^2 - 2(AB)(AC)\cos A.$

$(5k)^2 = (4k)^2 + (6k)^2 - 2(4k)(6k)\cos A.$

$\therefore \cos A = \frac{16 + 36 - 25}{2 \cdot 4 \cdot 6}$

$= \frac{27}{48} = \frac{9}{16}$ (D.)

the shaded area
= area of sector − area of triangle.



$= \pi r^2\left(\frac{x^\circ}{360^\circ}\right) - \frac{1}{2}ab\sin C$

$= \pi(4)^2\left(\frac{30}{360}\right) - \frac{1}{2}(4)(4)\sin 30^\circ$

$= \frac{4\pi}{3} - 4$ (A.)

63. $\sin\theta \cdot \cos\theta > 0$

$\therefore \begin{cases}\sin\theta > 0\\ \cos\theta > 0\end{cases}$ or $\begin{cases}\sin\theta < 0\\ \cos\theta < 0\end{cases}$

$\therefore 0 < \theta < 90^\circ$ $180^\circ < \theta < 270^\circ$

$\therefore$ (1) & (3) are true. (E.)

64. (I) In square CDGH.
$\angle DHG = 90^\circ$

(II) $\angle AHG = 90^\circ$

(III) $\angle BEH = 90^\circ$. (E.)

65. $\tan A = -5/4$.

$\frac{2\sin A - 3\cos A}{3\sin A + 2\cos A}$

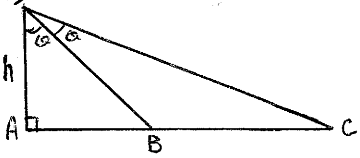
$= \frac{2\tan A - 3}{3\tan A + 2}$

$= \frac{2(-5/4) - 3}{3(-5/4) + 2}$

$= \frac{-10 - 12}{-15 + 8} = \frac{-22}{-7}$

$= \frac{22}{7}$ (E.)

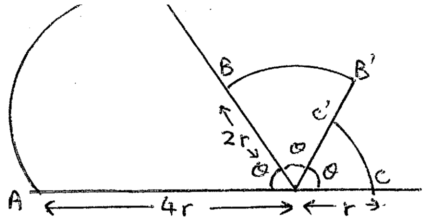
66.



$\frac{AB}{h} = \tan\theta$.

$\frac{AC}{h} = \tan 2\theta$.

$\therefore \frac{AC}{AB} = \frac{\tan 2\theta}{\tan\theta}$. (C.)



$3\theta = \pi$

$\theta = \pi/3$.

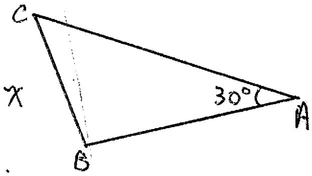
$\therefore$ the total area of sectors.

$= \frac{1}{2}(4r)^2(\frac{\pi}{3}) + \frac{1}{2}(2r)^2(\frac{\pi}{3}) + \frac{1}{2}r^2(\frac{\pi}{3})$

$= \frac{8}{3}\pi r^2 + \frac{2}{3}\pi r^2 + \frac{1}{6}\pi r^2$

$= \frac{7}{2}\pi r^2$. (B.)

68.



Let AC be x

$AB = x - 4$.

area of triangle $= 15\text{ cm}^2$

$15 = \frac{1}{2}(x)(x-4)(\sin 30^\circ)$

$60 = x^2 - 4x$

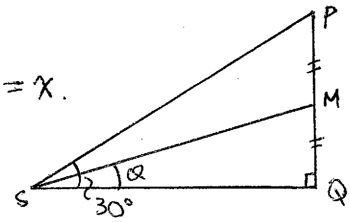
$x^2 - 4x - 60 = 0$.

$(x-10)(x+6) = 0$ (C.)

$\therefore x = 10$ or -6 (rejected.)

69.

Let $MQ = x$.



$\tan\theta = \frac{x}{SQ}$.

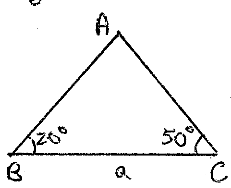
$\tan 30^\circ = \frac{PQ}{SQ} = \frac{2x}{SQ}$.

$\therefore \frac{x}{SQ} = \frac{1}{2}\cdot\frac{\sqrt{3}}{3}$

$\tan\theta = \frac{\sqrt{3}}{6}$ (B.)

70.

$\angle A = 180^\circ - 20^\circ - 50^\circ$
$= 110^\circ$.



By sine rule,

$\frac{AB}{\sin C} = \frac{BC}{\sin A}$ [$\sin(180^\circ - \theta) = \sin\theta$]

$\therefore AB = \frac{a\cdot\sin 50^\circ}{\sin 110^\circ}$.

$= \frac{a\sin 50^\circ}{\sin 70^\circ}$ (D.)

71. $2\sin x - \cos y$ | max

$\therefore \begin{cases}\sin x^\circ \text{ is max.}\\ \cos y \text{ is min.}\end{cases}$

$-1 \le \sin x^\circ \le 1$

$-1 \le \cos y^\circ \le 1$

$\therefore 2\sin x^\circ - \cos y^\circ |_{max}$

$= 2 - (-1) = 3$. (C.)

72. the curve is $\tan x$.

$y \to +\infty$ at $x = -\frac{\pi}{2}$.

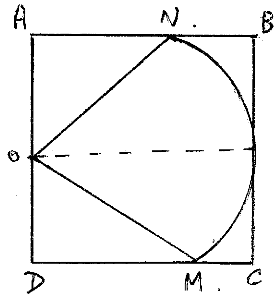
$y \to -\infty$ at $x = \frac{\pi}{2}$.

$\therefore -\tan x \to +\infty$ at $x = -\frac{\pi}{2}$
and $\to -\infty$ at $x = \frac{\pi}{2}$.

at $x = 0$, $y = 1$.

$\therefore y = 1 - \tan x$. (B.)

73.



$OM = AB = 2$

$\cos\angle DOM = \frac{OD}{OM}$
$= \frac{1}{2}$

$\angle DOM = 60^\circ = \angle AON$

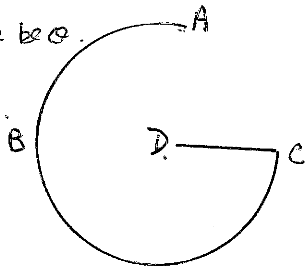
$\therefore MON = 180^\circ - 60^\circ - 60^\circ$
$= 60^\circ = \pi/3$.

the area of sector.

$= \frac{1}{2}(2)^2(\frac{\pi}{3})$

$= \frac{2}{3}\pi\text{ cm}^2$. (D.)

74. Let the angle be θ.



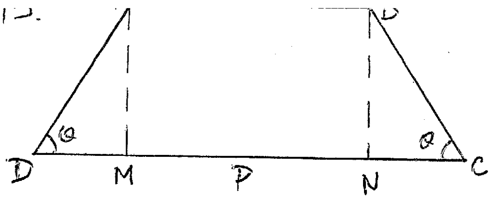
$\widehat{ABC} + CD = 2\pi r$.

$r\theta + r = 2\pi r$.

$\theta + 1 = 2\pi$.

$\theta = (2\pi - 1)$ radians. (D.)

15.



DM = NC

$\therefore DM = \frac{P-q}{2}$.

$\frac{AM}{DM} = \tan\theta$.

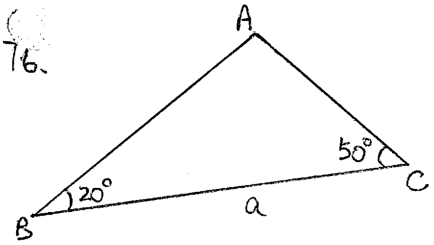
$AM = \frac{P-q}{2}\tan\theta$.

$\therefore$ the area of trapezium.

$= \frac{1}{2}(q+p)\left(\frac{P-q}{2}\tan\theta\right)$

$= \frac{1}{4}(p^2-q^2)\tan\theta$. (D.)

76.



$\angle A = 180° - 50° - 20°$.

$= 110°$.

By sine rule,

$\frac{AB}{\sin C} = \frac{BC}{\sin A}$

$AB = \frac{a\sin 50°}{\sin 110°}$.

$= \frac{a\sin 50°}{\sin 70°}$. (E.)

$\left[\begin{array}{l} \sin(180°-70°) = \sin 110° \\ \sin 70° = \sin 110°. \end{array}\right]$