Form 5

HKCEE 1981
Mathematics II

81 1. $\dfrac{(a^2b^{-3})^2}{a^{-2}b} =$

A. a^2b^{-7}
B. a^2b^{-5}
C. a^6b^{-2}
D. a^6b^{-6}
E. a^6b^{-7}

81 2. $\dfrac{1}{x+1} + \dfrac{1}{x-1} + \dfrac{x+\dfrac{1}{x}}{x-\dfrac{1}{x}} =$

A. $\dfrac{1}{x+1}$
B. $\dfrac{1}{x-1}$
C. $\dfrac{x+1}{x-1}$
D. $\dfrac{1}{(x+1)(x-1)}$
E. $\dfrac{x^2+4x+1}{(x+1)(x-1)}$

81 3. If $x = \dfrac{-bx+ay-c}{a+by}$, then $y =$

A. $\dfrac{ax+bx+c}{a-bx}$
B. $-\dfrac{ax+bx+c}{a-bx}$
C. $\dfrac{ax+bx+c}{a+bx}$
D. $-\dfrac{ax+bx+c}{a+bx}$
E. $\dfrac{ax-bx-c}{a-bx}$

81 4. $(2^x)^x =$

A. $2^{(x^x)}$
B. $2^x \cdot x^x$
C. $2x^x$
D. 2^{2x}
E. $2^{(x^2)}$

81 5. $\left(\dfrac{\dfrac{x}{y}+\dfrac{y}{x}+2}{\dfrac{x}{y}-\dfrac{y}{x}}\right)^{-1} =$

A. $\dfrac{x-y}{x+y}$
B. $\dfrac{x+y}{x-y}$
C. $-\dfrac{x+y}{x-y}$
D. $\dfrac{x^2+y^2}{x^2-y^2}$
E. $\dfrac{x^2-y^2}{x^2+y^2}$

81 6. If $H = K + \dfrac{M}{4\pi(r^2+l^2)^n}$ and $r > 0$, then $r =$

A. $\left\{\left[\dfrac{M}{4\pi(H-K)}\right]^{-n} - r^2\right\}^{\frac{1}{2}}$
B. $\left[\dfrac{M}{4\pi(H-K)}\right]^{-\frac{n}{2}} - l$
C. $\left\{\left[\dfrac{M}{4\pi(H-K)}\right]^{\frac{1}{n}} - l^2\right\}^{\frac{1}{2}}$

D. $\left[\frac{M}{4\pi(H-K)}\right]^{\frac{1}{2n}} - l$

E. $\left\{\left[\frac{4\pi}{M(H-K)}\right]^{\frac{1}{n}} - l^2\right\}^{\frac{1}{2}}$

81 7. If $f(x) = x^2 + x + 1$, then $f(x + 1) - f(x)$

A. 1
B. 3
C. $2x + 1$
D. $2x + 2$
E. $x^2 + x + 1$

81 8. If $\log_{10}x + \log_{10}4 = \log_{10}(x + 4)$, what is the value of x?

A. 0
B. 1
C. $\frac{4}{3}$
D. 4
E. x may be any positive number

81 9. It is given that $x(2x + 3) = x(3x - 4)$. $x = ?$

A. 0 only
B. 7 only
C. 0 or 7
D. $-\frac{3}{2}$ or $\frac{4}{3}$ only
E. 0, $-\frac{3}{2}$ or $\frac{4}{3}$

81 10. $2y - 3 > 4y + 2x + 5$ is equivalent to

A. $y > x + 4$
B. $y < x + 4$
C. $y > -x - 4$
D. $y < -x - 4$
E. $y > x + 1$

81 11. The nth term of the arithmetic progression 2, 6, 10, 14, … is

A. $2n^2$
B. $4n$
C. $4n - 2$
D. $4n + 2$
E. $6 - 4n$

81 12. If $3x - 2y = x + 3y$, then $x^2 : y^2 =$

A. 2 : 5
B. 5 : 2
C. 4 : 25
D. 25 : 4
E. 1 : 4

81 13. The marked price of a book is $\$x$. 30% of this price is profit. If the book is sold at a discount of 20%, what will the profit then be?

A. $\$0.04x$
B. $\$0.06x$
C. $\$0.1x$
D. $\$0.24x$
E. $\$0.56x$

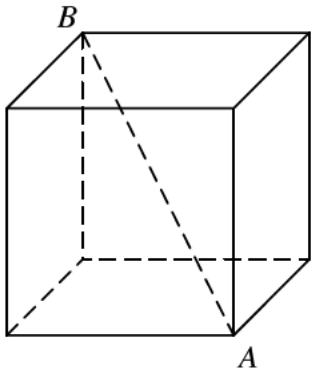
81 14. A group consists of n boys and n girls. If two of the girls are exceeded by two other boys, then 51% of the group members will be boys. What is n?

A. 50
B. 51
C. 52
D. 100
E. 102

81 15. If the surface area of a spherical soap bubble increases by 44%, its volume increases by

A. 20%
B. 33.1%
C. 60%
D. 66%
E. 72.8%

81
16.



The total area of the six faces of the solid cube in the figure is 96 cm^2. What is the length of the diagonal AB?

A. $6\sqrt{2}$ cm
B. $4\sqrt{3}$ cm
C. $4\sqrt{2}$ cm
D. $2\sqrt{6}$ cm
E. 4 cm

81
17. A merchant sold 100 chairs. 80 of them were sold at a profit of 30% on each chair, while 20 of them were sold at a loss of 40% on each chair. What is his percentage gain or loss on the whole stock?

A. A loss of 8%
B. A loss of 10%
C. A gain of 8%
D. A gain of 16 %
E. A gain of 24%

81
18. If $0^o < \theta < 90^o$ and $\sin\theta = \frac{k}{2}$, then $\cos\theta =$

A. $1 - \frac{k}{2}$
B. $\frac{2}{\sqrt{4+k^2}}$
C. $\frac{\sqrt{4+k^2}}{2}$
D. $\frac{2}{\sqrt{4-k^2}}$
E. $\frac{\sqrt{4-k^2}}{2}$

81
19. $\tan\theta \sin\theta - \frac{1}{\cos\theta} =$

A. 0
B. $\cos\theta$
C. $-\cos\theta$
D. $\frac{-1}{\cos\theta}$
E. $-\tan\theta \sin\theta$

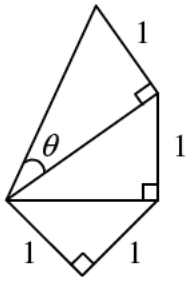
81
20. If $0^o \le \theta \le 360^o$, the number of roots of the equation $2\sin\theta\cos\theta - \cos\theta = 0$ is

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

81
21. An angle measures x radians. What is its measure in degrees?

A. $\left(\frac{\pi x}{180}\right)^o$
B. $\left(\frac{180x}{\pi}\right)^o$
C. $\left(\frac{\pi}{180x}\right)^o$
D. $\left(\frac{\pi x}{360}\right)^o$
E. $\left(\frac{360x}{\pi}\right)^o$

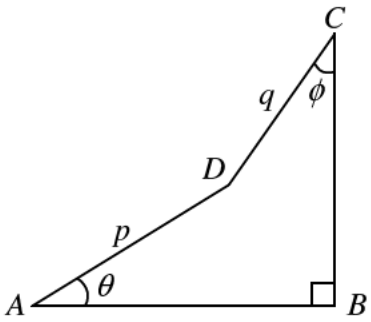
81
22.



In the figure, $\cos\theta =$

A. $\frac{1}{2}$
B. $\frac{2}{3}$
C. $\frac{3}{4}$
D. $\frac{\sqrt{3}}{2}$
E. $\frac{\sqrt{3}}{4}$

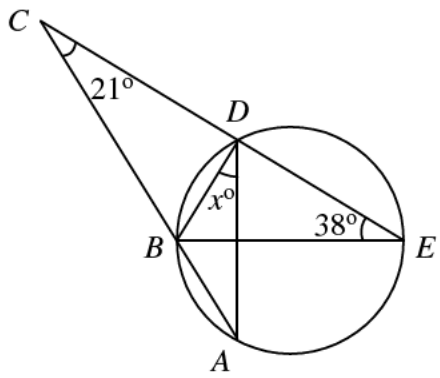
81
23.



In the figure, $AD = p$, $DC = q$, $\angle B = 90^{o}$. $AB =$

A. $p\sin\theta + q\sin\phi$
B. $p\cos\theta + q\cos\phi$
C. $p\sin\theta + q\cos\phi$
D. $p\cos\theta + q\sin\phi$
E. $(p + q)(\cos\theta + \cos\phi)$

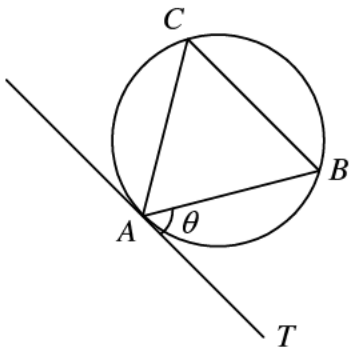
81
24.



In the figure, BE is a diameter of the circle. ABC and EDC are straight lines. $x^{o} =$

A. 21^{o}
B. 31^{o}
C. 38^{o}
D. 52^{o}
E. 59^{o}

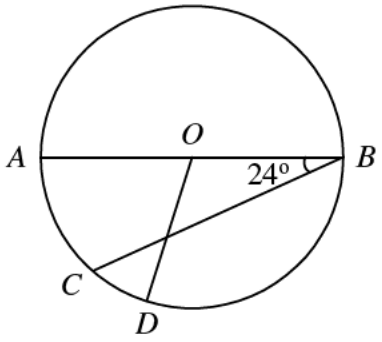
81
25.



In the figure, AT touches the circle at A. In ΔABC, $\angle A : \angle B : \angle C = 2 : 3 : 4$. $\theta =$

A. 40^{o}
B. 50^{o}
C. 60^{o}
D. 70^{o}
E. 80^{o}

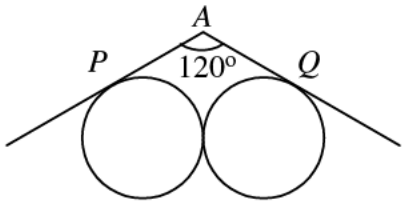
81
26.



In the figure, AB is a diameter of the circle with centre at O. The length of the minor arc AC in twice the length of the minor arc CD. $\angle BOD =$

A. 72°
B. 90°
C. 108°
D. 132°
E. 144°

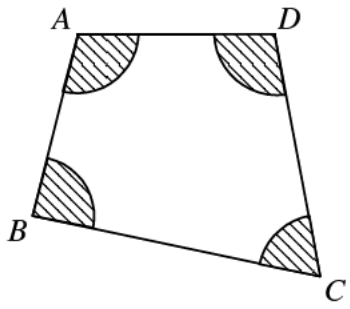
81
27.



In the figure, two circles both with radius
2 cm touch each other externally. AP and AQ are equal tangents to the two circles. AP =?

A. $\sqrt{3}$ cm
B. $2\sqrt{3}$ cm
C. 4 cm
D. $4\sqrt{3}$ cm
E. $\frac{4\sqrt{3}}{3}$ cm

81
28.



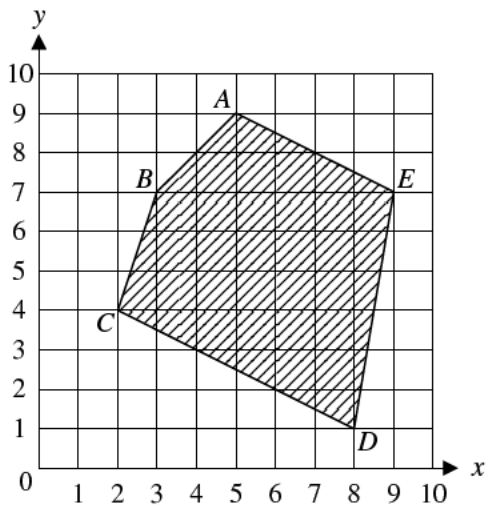
In the figure, $ABCD$ is a quadrilateral. The shaded portions are four sectors with centres at A, B, C and D. Their radii are all equal to a. What is the total area of the four sectors?

A. πa^2
B. $2\pi a^2$
C. $4\pi a^2$
D. $\sqrt{2}\,\pi a^2$
E. It cannot be determined

81
29. $2x^2 - 2 \le 0$ is equivalent to

A. $x \le 1$
B. $x \ge -1$
C. $-1 \le x \le 1$
D. $x \ge 1$ or $x \le -1$
E. $x \le 1$ or $x \ge -1$

81
30.



In the figure, which point in the shaded region will make the value of $x - 2y$ a minimum

A. A
B. B
C. C
D. D
E. E

81 31. $6x^2 + kx + 6 = 0$ is a quadratic equation in which k is a constant. Its roots α and β are positive. $\log_{10}\alpha + \log_{10}\beta =$

A. 0
B. 1
C. $\log_{10}6$
D. $\log_{10}(-k)$
E. $\log_{10}(-\frac{k}{6})$

81 32. $-3x^2 - 3x \equiv -3(x + a)^2 + b$ is an identity in x. What are the values of the constants a and b?

A. $a = 1$ and $b = 0$
B. $a = \frac{1}{2}$ and $b = \frac{3}{4}$
C. $a = \frac{1}{2}$ and $b = \frac{3}{4}$
D. $a = -\frac{1}{2}$ and $b = \frac{3}{4}$
E. $a = -\frac{1}{2}$ and $b = -\frac{3}{4}$

81 33. The H.C.F. and L.C.M. of three expressions are a^2b^2c and $a^4b^6c^4$ respectively. Two of the expressions are $a^2b^3c^4$ and $a^3b^2c^2$. The third expression is

A. a^3b^3c
B. $a^3b^6c^4$
C. a^4b^2c
D. a^4b^6c
E. $a^4b^6c^2$

81 34. The sum of the first five terms of an arithmetic progression is 15. If the fourth term is 7, the first term is

A. –5
B. –3
C. –1
D. 1
E. 10

81 35. Which of the following can be summed to infinity?

I. The arithmetic progression 4, 3, 2, 1, ……
II. The geometric progression 27, 9, 3, 1, ……
III. The geometric progression 16, –8, 4, –2, ……

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

81 36. The running speeds of three boys A, B and C are in the ratios $a : b : c$. The times that A, B and C take to complete a 1500 m race are in the ratios

A. $a : b : c$
B. $c : b :$ a
C. $b + c : a + c : a + b$
D. $\frac{1}{a} : \frac{1}{b} : \frac{1}{c}$
E. $\frac{a}{b} : \frac{b}{c} : \frac{c}{a}$

81 37. If n is a positive integer, which of the following numbers is/are odd?

I. 2^{2n+1}
II. $3(2^n)$
III. $(2n+1)^2$

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

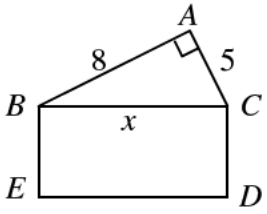
81 38. A factory employs x workers each working n hours a day. The whole factory produces k watches per day. If y workers go on leave, then how many hours a day should the remaining workers work in order to produce the same number of watches per day?

A. $\frac{nx}{y}$
B. $\frac{ny}{x}$
C. $\frac{nx}{4y}$
D. $\frac{nx}{x-y}$
E. $\frac{n(x-y)}{x}$

81 39. The daily wages of a man and a boy are in the ratio 2 : 1. In a day a man has to work 8 hours but a boy only 6 hours. The hourly wages of a man and a boy are in the ratio

A. 8 : 3
B. 2 : 1
C. 3 : 2
D. 4 : 3
E. 1 : 1

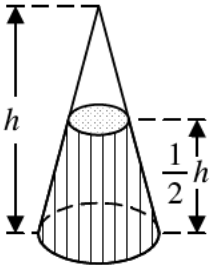
81 40.



In the figure, $\angle BAC = 90^{\circ}$, $AB = 8$, $AC = 5$ and $AX \perp BC$. $BCDE$ is a rectangle with $CD = AX$. What is the area of the rectangle $BCDE$?

A. 20
B. 40
C. 80
D. 89
E. $4\sqrt{89}$

81 41.

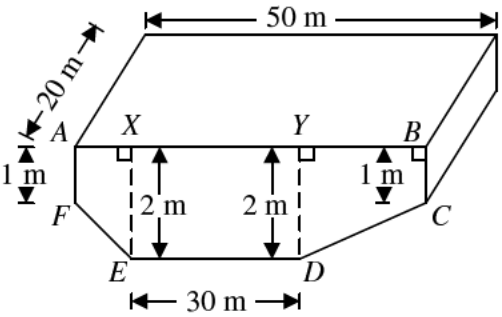


The height of the cone in the figure is h. It contains water to a depth of $\frac{1}{2}h$.

$\frac{\text{Volume of water}}{\text{Capacity of the cone}} =$

A. $\frac{1}{8}$
B. $\frac{1}{4}$
C. $\frac{1}{2}$
D. $\frac{3}{4}$
E. $\frac{7}{8}$

81 42.



The figure above represents a 50m × 20 m swimming pool. The pool is in the shape of a prism with a rectangular surface and four vertical walls. The dimensions of the sidewall $ABCDEF$ are as shown in the figure. What is the capacity of the pool in m^3?

A. 1200
B. 1500

C. 1800
D. 2000
E. It cannot be determined

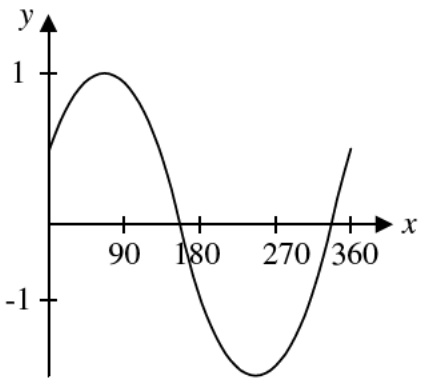
81 43. Given that $\sin\theta - \cos\theta = \frac{1}{2}$, what is the value of $\sin\theta\cos\theta$?

A. $\frac{1}{2}$
B. $\frac{1}{4}$
C. $\frac{3}{8}$
D. $\frac{3}{4}$
E. It cannot be determined

81 44. If $0^o \le \theta \le 360^o$, the minimum value of $1 + 2\cos\frac{\theta}{2}$ is

A. –2
B. –1
C. 0
D. 1
E. 2

81 45.



The figure above shows the graph of

A. $y = \sin(x^o + 30^o)$
B. $y = \sin(x^o - 30^o)$
C. $y = \sin(x^o + 150^o)$
D. $y = \sin(x^o - 150^o)$
E. $y = \sin(x^o + 60^o)$

81 46. The radius of a sector is 3 cm and the perimeter is 10 cm. What is the area of the sector?

A. 6 cm^2
B. 12 cm^2
C. 15 cm^2
D. 18 cm^2
E. 45 cm^2

81 47.

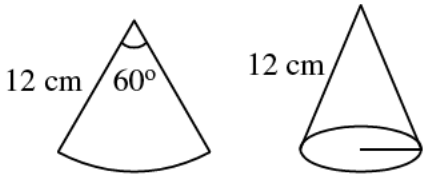
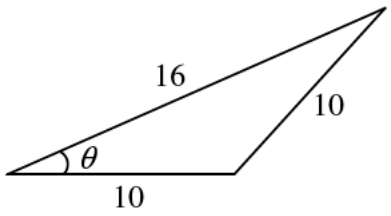


Figure (a) Figure (b)

The cone in Figure (b) is formed by bending the sector in Figure (a). The angle of the sector is 60^o and the radius is 12 cm. The radius of the base of the cone is

A. 2 cm
B. 4 cm
C. 6 cm
D. 2π cm
E. $\frac{360}{\pi}$ cm

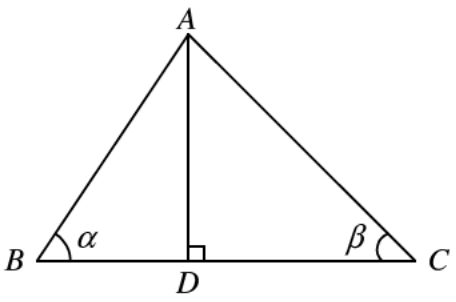
81 48.



In the figure, $\sin\theta =$

A. 0.5
B. 0.6
C. 0.625
D. 0.75
E. 0.8

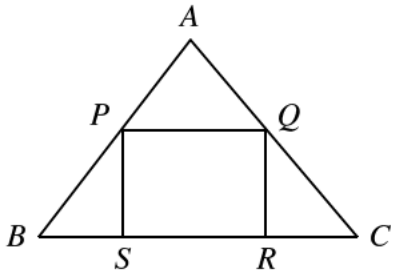
81
49.



In the figure, $AD \perp BC$. $CD =$

A. $h \sin \alpha \tan \beta$
B. $h \cos \alpha \tan \beta$
C. $h \tan \alpha \sin \beta$
D. $\dfrac{h \cos \alpha}{\tan \beta}$
E. $\dfrac{h \sin \alpha}{\tan \beta}$

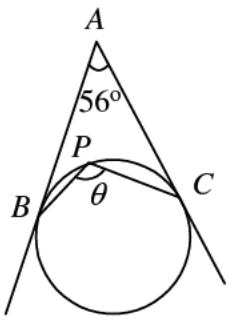
81
50.



In the figure, ABC is an equilateral triangle of side $2a$. P and Q are the mid-points of AB and AC respectively. $PQRS$ is a rectangle. What is the area of $PQRS$?

A. a^2
B. $\dfrac{1}{2}a^2$
C. $\dfrac{2}{3}a^2$
D. $\dfrac{1}{\sqrt{3}}a^2$
E. $\dfrac{\sqrt{3}}{2}a^2$

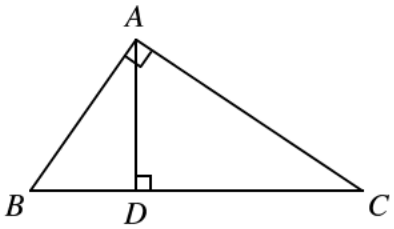
81
51.



In the figure, AB and AC touch the circle at B and C. If P is any point on the minor arc BC, what is θ?

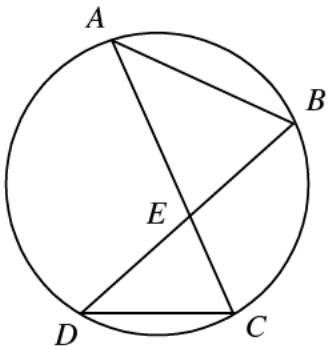
A. 112°
B. 118°
C. 124°
D. 146°
E. It cannot be determined

81 I
52.



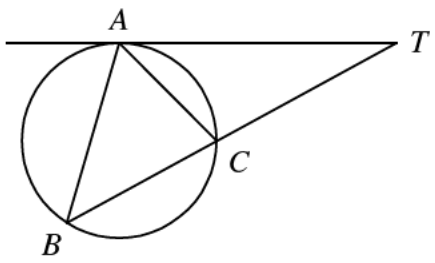
$\angle BAC = 90^\circ$
$AD \perp BC$.

II



AC and BC intersect at E.

III

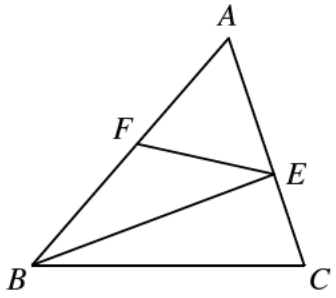


BC produced meets the tangent *AT* at *T*.

Which of the above figures contains one or more pairs of similar triangles?

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

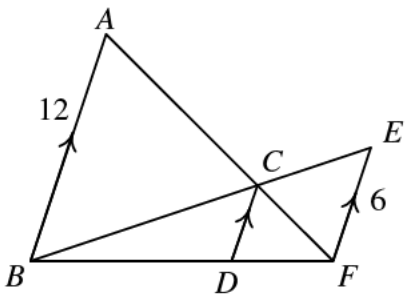
81
53.



In the figure, P is the mid-point of AB. E is a point on AC such that $AE : EC = 2 : 1$. $\dfrac{\text{Area of } \Delta BFE}{\text{Area of } \Delta BCE} =$

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

81
54.



In the figure, $AB \parallel CD \parallel EF$. ACF, BCE and BDF are straight lines. $AB = 12$, $EF = 6$. $CD = ?$

A. 4.5
B. 4
C. 3.6
D. 3
E. 2