Form 5

HKCEE 1984
Mathematics II

84 1. $\dfrac{4}{(x-2)(x+1)} - \dfrac{3}{x^2-1}$

A. $\dfrac{1}{(x-1)^2(x+1)}$
B. $\dfrac{x+2}{(x-2)(x+1)(x-1)}$
C. $\dfrac{x+10}{(x-2)(x+1)(x-1)}$
D. $\dfrac{x-10}{(x-2)(x+1)(x-1)}$
E. $\dfrac{x^2-3x-10}{(x-2)(x+1)(x-1)^2}$

84 2. If $a = \dfrac{2b(2y-x)}{x-3y}$, then $y =$

A. $\dfrac{a+2b}{3a+4b}x$
B. $\dfrac{a-2b}{-3a+4b}x$
C. $-\dfrac{a+2b}{3a+4b}x$
D. $\dfrac{3a+4b}{a+2b}x$
E. $\dfrac{-3a+4b}{a-2b}x$

84 3. $(2^{n+1})^2 \times (2^{-2n-1}) \div 4^n =$

A. 1
B. 2^{2n-1}
C. 2^{n^2+2n}
D. 2^{n^2-2n}
E. 2^{-2n+1}

84 4. If $x + 2$ is a factor of $x^2 + ax + b$, then $2a - b + 3 =$

A. –7
B. –1
C. 0
D. 1
E. 7

84 5. If α and β are the roots of $3x^2 - x - 1 = 0$, then $\dfrac{1}{\alpha^2} + \dfrac{1}{\beta^2} =$

A. 7
B. 3
C. 1
D. –1
E. –5

84 6. If $(\sqrt{3}-\sqrt{2})x = 1$, then $x =$

A. $\sqrt{3}+\sqrt{2}$
B. $\dfrac{1}{\sqrt{3}+\sqrt{2}}$
C. $\dfrac{1}{\sqrt{3}}+\dfrac{1}{\sqrt{2}}$
D. $\dfrac{1}{\sqrt{3}}-\dfrac{1}{\sqrt{2}}$
E. $\dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

84 7. What is/are the root(s) of $\sqrt{5-x} = x - 3$?

A. 4 only
B. 1 and 4 only
C. –1 and –4 only
D. –4 and 4 only
E. –4, –1, 1 and 4

84 8. The sum of the first ten terms of an arithmetic progression is 120. If the common difference is 4, then the first term is

A. -12 .
B. -6 .
C. -2 .
D. 2 .
E. 6 .

84 9. $10 000 is invested for 2 years at 10% per annum, compounded half-yearly. The compound interest, correct to the nearest dollar, is

A. $12 155 .
B. $2155 .
C. $2100.
D. $2000 .
E. $1025 .

84 10. The equation $x^2 + kx + k = 0$ has equal roots (k being a constant). $k =$

A. 4 only
B. –4 only
C. 0 or 4
D. 0 or –4
E. 4 or –4

84 11. If $\frac{3x+2y}{x+5y} = 1$, then $\sqrt{x+y} : \sqrt{x-y} =$

A. $1 : \sqrt{5}$
B. $3 : 2$
C. $\sqrt{5} : \sqrt{6}$
D. $\sqrt{5} : 1$
E. $\sqrt{7} : 2$

84 12. A is 25% taller than B. B is 25% shorter than C. A's height : C's height =

A. 1 : 1
B. 5 : 4
C. 3 : 4
D. 5 : 3
E. 15 : 16

84 13. A rectangular box, without a lid, is 40 cm long, 30 cm wide and 10 cm height. The area of the external surface of the box is

A. 2600 cm^2 .
B. 3400 cm^2 .
C. 3500 cm^2 .
D. 3800 cm^2 .
E. 12 000 cm^2 .

84 14. A man drives a car at 30 km/h for 3 hours and then at 40 km/h for 2 hours. His average speed for the whole journey is

A. 14 km/h .
B. 30 km/h .
C. 34 km/h .
D. 35 km/h .
E. 70 km/h .

84 15. A alone can complete a job in 8 hours. B alone takes 12 hours and C alone takes 6 hours. After A and B have worded together on the job for 3 hours, C joins them. How much longer will they take to complete the job?

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

84 16. The marked price of a book is 20% above the cost price. If the book is sold at a discount of 10% off the marked price, what is the gain per cent based on the cost price?

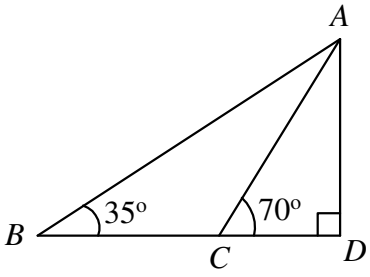
A. 8%
B. 10%
C. 12%

D. 18%
E. None of the above.

84
17. $\dfrac{\tan^2\theta}{1+\tan^2\theta} + \cos^2\theta =$

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

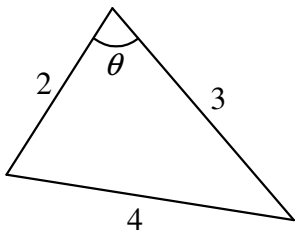
84
18.



In the figure, BCD is a straight line. $\angle ADC = 90^\circ$ and $BC = 10$. $AD =$

A. $10\cos 70^\circ$
B. $10\sin 70^\circ$
C. $10\tan 70^\circ$
D. $\dfrac{10\sin 20^\circ}{\sin 55^\circ}$
E. $\dfrac{10\tan 20^\circ}{\sin 55^\circ}$

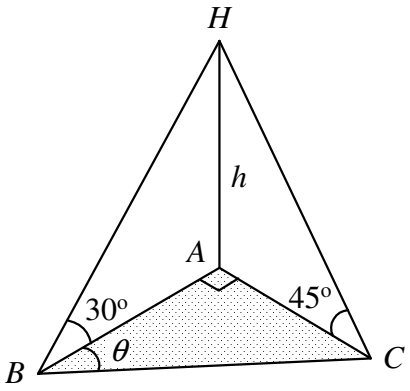
84
19.



In the figure, $\cos\theta =$

A. $-\dfrac{1}{4}$
B. $-\dfrac{1}{2}$
C. $\dfrac{1}{4}$
D. $\dfrac{1}{2}$
E. $\dfrac{3}{4}$

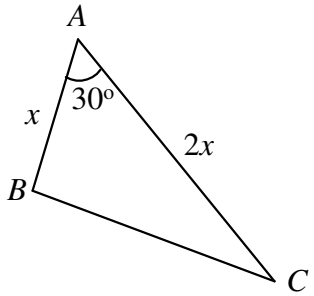
84
20.



In the figure, ΔABC lies in a horizontal plane. $\angle BAC = 90^\circ$. HA is vertical and $HA = h$. $\tan\theta =$

A. 1
B. $\tan 30^\circ$
C. $\dfrac{1}{\tan 30^\circ}$
D. $h\tan 30^\circ$
E. $\dfrac{h}{\tan 30^\circ}$

84
21.



In the figure, $AB = x$ and $AC = 2x$. The area of ΔABC is 16. x (correct to 2 decimal places) is

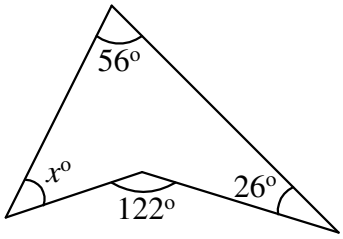
A. 2.83 .
B. 4.00 .
C. 4.30 .
D. 5.66 .

E. 6.08 .

84 22. The sum of the interior angles of a convex polygon is greater than the sum of the exterior angles by 360^o. How many sides has the polygon?

A. 3
B. 4
C. 5
D. 6
E. 8

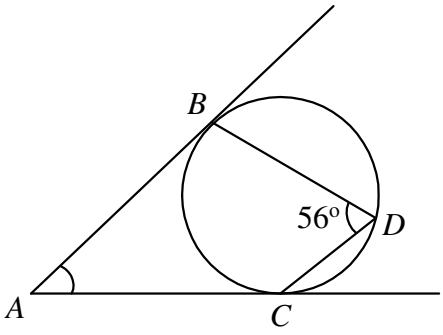
84 23.



In the figure, x = ?

A. 31
B. 34
C. 40
D. 48
E. It cannot be determined.

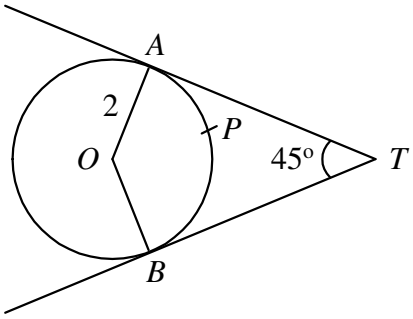
84 24.



In the figure, AB and AC touch the circle at B and C respectively. $\angle A$ =

A. 30^o
B. 40^o
C. 50^o
D. 80^o
E. 85^o

84 25.



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. $\frac{\pi}{4}$.
B. $\frac{\pi}{2}$.
C. $\frac{3\pi}{4}$.
D. $\frac{3\pi}{2}$.
E. 3π.

84 26. The point P divides AB internally so that $AP : PB = 2 : 1$. The coordinates of A and B are (x_1, y_1) and (x_2, y_2) respectively. The coordinates of P are

A. $\left(\frac{2x_1 + x_2}{3}, \frac{2y_1 + y_2}{3}\right)$.
B. $\left(\frac{x_1 + 2x_2}{3}, \frac{y_1 + 2y_2}{3}\right)$.
C. $\left(\frac{2x_1 - x_2}{3}, \frac{2y_1 - y_2}{3}\right)$.
D. $\left(\frac{x_1 - 2x_2}{3}, \frac{y_1 - 2y_2}{3}\right)$.
E. $\left(\frac{x_1 + x_2}{3}, \frac{y_1 + y_2}{3}\right)$.

84 27. The line $x + y + k = 0$ (k being a constant) passes through the centre of the circle
$x^2 + y^2 - 2x + 4y - 6 = 0$. k =

A. –2
B. –1
C. 0
D. 1
E. 2

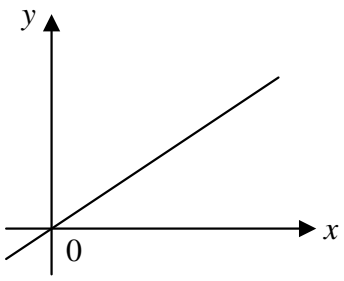
84 28. The equation of a circle is $x^2 + y^2 - 2x + 5y - 7 = 0$.
Which of the following is/are true?

I. The circle passes through the point $(-1, 1)$.
II. The centre of the circle lies in the second quadrant.
III. The circle intersects the x-axis at two points.

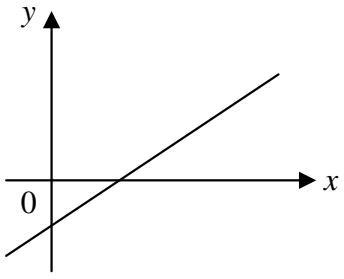
A. II only
B. III only
C. I and II only
D. II and III only
E. I, II and III

84 29. If a, b and c are positive real numbers, which of the following graphs could represent the line $ax + by + c = 0$?

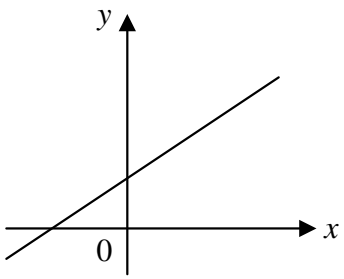
A.



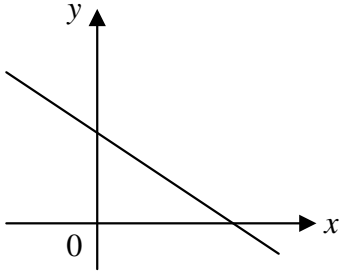
B.



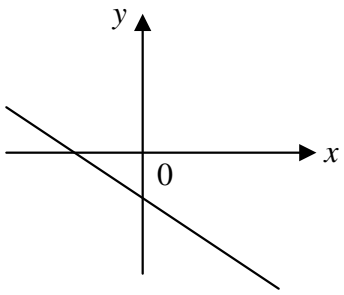
C.



D.



E.



84 30. The probability that John will win a game is $\frac{1}{3}$ and the probability that he will lose is $\frac{2}{3}$. What is the probability that, in three games, he will win any two games and lose one game?

A. $\frac{4}{27}$
B. $\frac{2}{27}$
C. $\frac{1}{27}$
D. $\frac{2}{9}$
E. $\frac{1}{9}$

84 31. Two dice are thrown. What is the probability of getting a sum of 8?

A. $\frac{1}{12}$
B. $\frac{1}{11}$
C. $\frac{5}{36}$
D. $\frac{1}{6}$
E. $\frac{2}{9}$

84 32. The standard deviation of the five numbers $a - 2d$, $a - d$, a, $a + d$, $a + 2d$, is

A. 0 .
B. d .
C. $\sqrt{2}\,d$.
D. $\sqrt{5}\,d$.
E. $\sqrt{10}\,d$.

84 33. $4x^2 - 9 \geq 0$ is equivalent to

A. $x \geq \frac{3}{2}$ or $x \geq -\frac{3}{2}$.
B. $\frac{3}{2} \leq x \leq -\frac{3}{2}$.
C. $-\frac{3}{2} \leq x \leq \frac{3}{2}$.
D. $x \geq -\frac{3}{2}$ or $x \leq \frac{3}{2}$.
E. $x \leq -\frac{3}{2}$ or $x \geq \frac{3}{2}$.

84 34. The graph of $y = x^2 + ax + b$ (a and b being constants) cuts the x-axis at (2, 0) and (h, 0), and cuts the y-axis at (0, –2). $h =$

A. –3
B. –2
C. –1
D. 0
E. 1

84 35. If a and b are non-zero real numbers and $a > b$, which of the following must be true?

I. $a^2 > b^2$
II. $\frac{1}{a} > \frac{1}{b}$
III. $a^3 > b^3$

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

84 36. If $f(x) = (\log_{10} 2x) - x$, then $f(x + 1) - f(x) =$

A. $\log_{10} 2 - 1$
B. $\log_{10} \frac{x+1}{x}$
C. $\log_{10} \frac{10(x+1)}{x}$
D. $\log_{10} \frac{x+1}{10x}$
E. $\log_{10} \frac{x+1}{x} - 2x$

84 37. If $a \neq \pm 1$, then $1 + a^2 + a^4 + \ldots + a^{2n} =$

A. $\frac{1-a^{2n}}{1-a}$
B. $\frac{1-a^{2n}}{1-a^2}$
C. $\frac{1-a^{2n+1}}{1-a}$
D. $\frac{1-a^{2n+1}}{1-a^2}$
E. $\frac{1-a^{2n+2}}{1-a^2}$

84 38. Which of the following must be geometric progression(s)?

I. $\log_{10}3, \log_{10}9, \log_{10}27, \log_{10}81$

II. 0.9, 0.99, 0.999, 0.9999
III. 1, −3, 9, −27

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

84 39. a, b, c are positive numbers such that $\frac{a}{b} = \frac{b}{c} = k$ (k being a constant), which of the following must be true?

I. $b^2 = k^2$
II. $\frac{a+b}{b+c} = k$
III. $\frac{a}{c} = k^2$

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

84 40. Last year, a man saved 10% of his income. By how much per cent must his income be increased if his expenditure increased by 20% and he wants to save 20% of his income?

A. 50%
B. 35%
C. 30%
D. 20%
E. 15%

84 41. The external and internal radii of a hollow metal sphere are 4cm and 3 cm respectively.

$$\frac{\text{Volume of metal}}{\text{Volume of the enclosed empty space}} =$$

A. $\frac{1}{27}$
B. $\frac{1}{3}$
C. $\frac{4}{3}$
D. $\frac{37}{27}$
E. $\frac{64}{27}$

84 42. A solid metal sphere of volume 252 cm^3 is melted and recast into 3 smaller solid spheres whose radii are in the ratio 1 : 2 : 3. The volume of the smaller sphere is

A. 5 cm^3 .
B. 7 cm^3 .
C. 14 cm^3 .
D. 18 cm^3 .
E. 28 cm^3 .

84 43. The base radii of two right circular cylinders are in the ratio 2 : 3. If the two cylinders have the same height, what is the ratio of their curved surface area?

A. 2 : 3
B. 4 : 9
C. 8 : 27
D. $\sqrt{8} : \sqrt{27}$
E. None of the above.

84 44. The greatest value of $\frac{3}{4 + 2\cos\theta}$ is

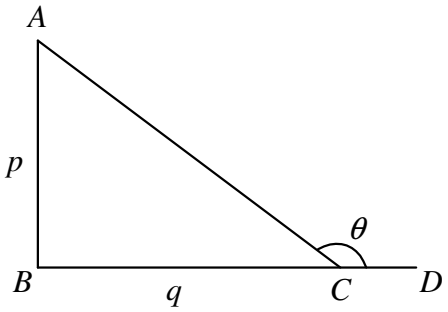
A. 3 .
B. $\frac{3}{2}$.
C. $\frac{3}{4}$.
D. $\frac{3}{5}$.
E. $\frac{1}{2}$.

84 45. If $0^o \le \theta < 360^o$, the number of roots of the equation

$2 \sin \theta + \dfrac{1}{\sin \theta} = 3$ is

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

84 46.



In the figure, $\angle B = 90^o$ and BCD is a straight line. If $AB = p$ and $BC = q$, then $\cos \theta =$

A. $\dfrac{p}{q}$

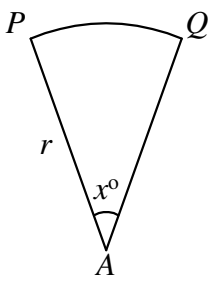
B. $\dfrac{p}{\sqrt{p^2 + q^2}}$

C. $\dfrac{q}{\sqrt{p^2 + q^2}}$

D. $\dfrac{-p}{\sqrt{p^2 + q^2}}$

E. $\dfrac{-q}{\sqrt{p^2 + q^2}}$

84 47.



In the figure, the radius of the sector is r and $\angle POQ = x^o$. If the area of the sector is A, then $x =$

A. $\dfrac{2A}{r^2}$

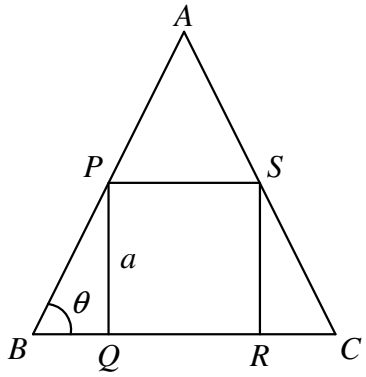
B. $\dfrac{360A}{r^2}$

C. $\dfrac{360A}{\pi r^2}$

D. $\dfrac{180A}{r^2}$

E. $\dfrac{180A}{\pi r^2}$

84 48.



In the figure, $PQRS$ is a square inscribed in ΔABC. $AB = AC$ and $PQ = a$. $AB =$

A. $a(\sin \theta + \dfrac{1}{2} \cos \theta)$

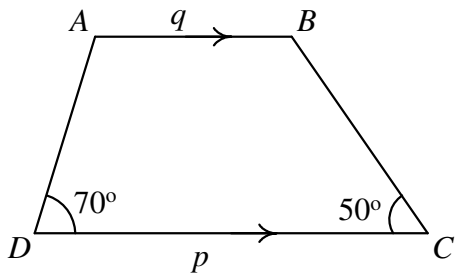
B. $a(\sin \theta + \dfrac{1}{2} \sin \theta)$

C. $a(\dfrac{1}{\sin \theta} + \dfrac{1}{2 \cos \theta})$

D. $a(\dfrac{1}{\cos \theta} + \dfrac{1}{2 \sin \theta})$

E. $\dfrac{2a}{\sin \theta}$

84
49.



In the figure, AB // DC. $AB = q$ and $DC = p$. $BC =$

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

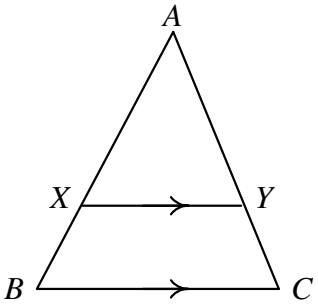
B. $\dfrac{(p+q)\sin 70^\circ}{2\sin 50^\circ}$

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

D. $\dfrac{(p-q)\sin 70^\circ}{\sin 50^\circ}$

E. $\dfrac{(p-q)\sin 50^\circ}{\sin 70^\circ}$

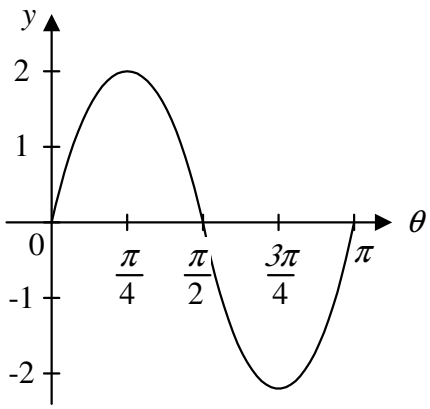
84
50.



In the figure, XY // BC. $AX : XB =$ 2 : 1. If the area of the trapezium $BCYX = 20$, then the area of $\Delta ABC =$

A. 80
B. 60
C. 45
D. 40
E. 36

84
51.



The figure shows the graph of $y = a \sin k\theta$. What are the values of the constant a and k?

A. $a = 1$ and $k = 1$
B. $a = 1$ and $k = 2$
C. $a = 1$ and $k = \dfrac{1}{2}$
D. $a = 2$ and $k = 2$
E. $a = 2$ and $k = \dfrac{1}{2}$

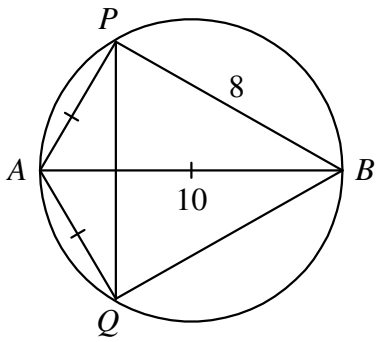
84
52.

In ΔABC, $BC = a$, $AC = b$, $AB = c$ and $a > b > c$. Which of the following must be true?

I. $\angle A > \angle B > \angle C$
II. $b + c > a$
III. $\angle B + \angle C > \angle A$

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

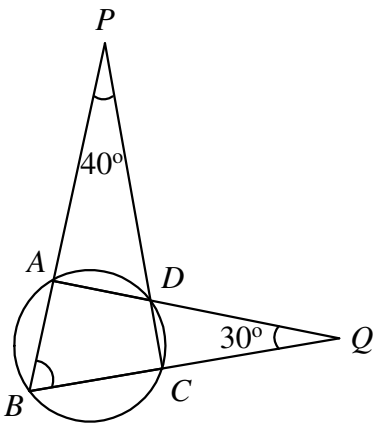
84
53.



In the figure, AB is a diameter of the circle. $AP = AQ$. $AB = 10$ and $BP = 8$. $PQ =$

A. 5
B. 6
C. 6.4
D. 8
E. 9.6

84
54.



In the figure, the chords BA and CD, when produced, meet at P . The chords AD and BC, when produced, meet at Q. $\angle B =$

A. 35^o
B. 40^o
C. 45^o
D. 50^o
E. 55^o