HKCEE 1993
Mathematics II

93 1. If $f(x) = 10^{2x}$, then $f(4y) =$

A. 10^{4y}.
B. 10^{2+4y}.
C. 10^{8y}.
D. 40^{y}.
E. 40^{2y}.

93 2. If $s = \frac{n}{2}[2a + (n-1)d]$, then $d =$

A. $\frac{2(s-an)}{n(n-1)}$.
B. $\frac{2(s-an)}{(n-1)}$.
C. $\frac{s}{n(n-1)}$.
D. $\frac{as-n}{a(n-1)}$.
E. $\frac{4(s-an)}{n(n-1)}$.

93 3. Simplify $(x^2 - \sqrt{3}x + 1)(x^2 + \sqrt{3}x + 1)$.

A. $x^4 + 1$
B. $x^4 - x^2 + 1$
C. $x^4 + x^2 + 1$
D. $x^4 - 3x^2 - 2\sqrt{3}x - 1$
E. $x^4 + 3x^3 - 2\sqrt{3}x^2 + \sqrt{3}x - 1$

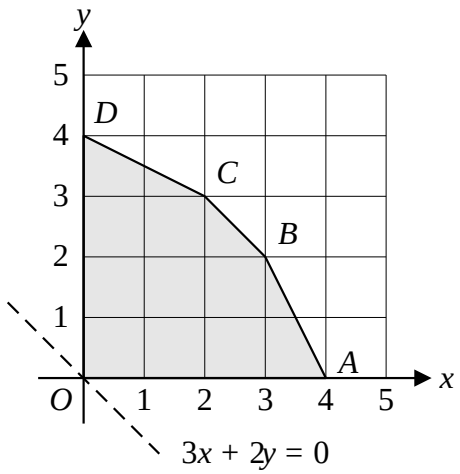
93 4. $\frac{\sqrt{a}}{\sqrt{a}-\sqrt{b}} + \frac{\sqrt{a}}{\sqrt{a}+\sqrt{b}}$.

A. $\frac{1}{\sqrt{a}-\sqrt{b}}$
B. $\frac{a+2\sqrt{ab}-b}{a-b}$
C. $\frac{\sqrt{b}+\sqrt{a}}{2\sqrt{a}}$
D. $\frac{b+2\sqrt{ab}-a}{a-b}$
E. $\frac{a+b}{a-b}$

93 5. If $3x^2 + ax - 5 \equiv (bx - 1)(2 - x) - 3$, then

A. $a = -5, b = -3$.
B. $a = -5, b = 3$.
C. $a = -3, b = -5$.
D. $a = 5, b = -3$.
E. $a = 3, b = 5$.

93 6.



Find the greatest value of $3x + 2y$ if (x, y) is a point lying in the region $OABCD$ (including the boundary).

A. 15
B. 13
C. 12
D. 9
E. 8

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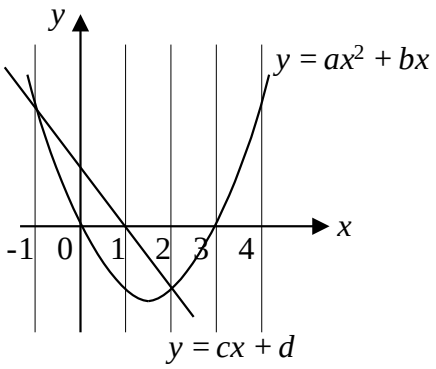
7.



The diagram shows the graphs of $y = ax^2 + bx$ and $y = cx + d$. The solutions of the equation $ax^2 + bx = cx + d$ are

A. –1, 1
B. –1, 2
C. 0, 1
D. 0, 3
E. 1, 3

93
8. If $\log(p + q) = \log p + \log q$, then

A. $p = q = 1$.
B. $p = \frac{q}{q-1}$.
C. $p = \frac{q}{q+1}$.
D. $p = \frac{q+1}{q}$.
E. $p = \frac{q-1}{q}$.

93
9. The expression $x^2 - 2x + k$ is divisible by $(x + 1)$. Find the remainder when it is divided by $(x + 3)$.

A. 1
B. 4
C. 12
D. 16
E. 18

93
10. If 3, a, b, c, 23 are in A.P., then $a + b + c =$

A. 13 .
B. 26 .
C. 33 .
D. 39 .
E. 65 .

93
11. Find the H.C.F. and L.C.M. of ab^2c and abc^3

	H.C.F.	L.C.M.
A.	a	$a^2b^3c^4$
B.	abc	ab^2c^3
C.	abc	$a^2b^3c^4$
D.	ab^2c^3	abc
E.	$a^2b^3c^4$	abc

93
12. If α and β are the roots of the quadratic equation $x^2 - 3x - 1 = 0$, find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$.

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

93
13. If the simultaneous equations $\begin{cases} y = x^2 - k \\ y = x \end{cases}$ have only one solution, find k.

A. –1
B. $-\frac{1}{4}$
C. –4
D. $\frac{1}{4}$
E. 1

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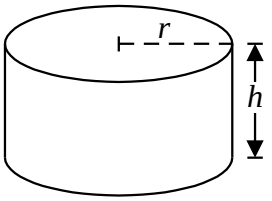
14.



The price of a cylindrical cake of radius r and height h varies directly as the volume. If r = 5 cm and h = 4 cm, the price is \$30. Find the price when r = 4 cm and h = 6 cm.

A. \$25
B. \$28.80
C. \$31.50
D. \$36
E. \$54

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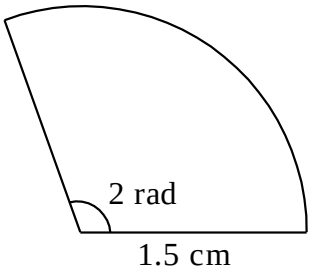
15.



Find the perimeter of the sector in the figure.

A. 2.25 cm
B. 3 cm
C. $\left(\frac{\pi}{60}+3\right)$ cm
D. 4.5 cm
E. 6 cm

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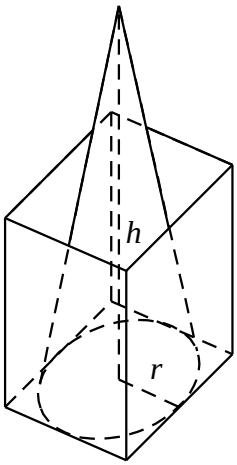
16.



In the figure, the base of the conical vessel is inscribed in the bottom of the cubical box. If the box and the conical vessel have the same capacity, find h : r.

A. $24 : \pi$
B. $3 : 1$
C. $6 : \pi$
D. $3 : \pi$
E. $8 : 3\pi$

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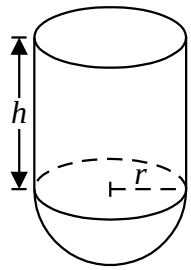
17.



The figure shows a solid consisting of a cylinder of height h and a hemisphere of radius r. The area of the curved surface of the cylinder is twice that of the hemisphere. Find the ratio
volume of cylinder : volume of hemisphere

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

93 18. A merchant marks his goods 25% above the cost. He allows 10 % discount on the marked price for a cash sale. Find the percentage profit the merchant makes for a cash sale.

A. 12.5%
B. 15%
C. 22.5%
D. 35%
E. 37.5%

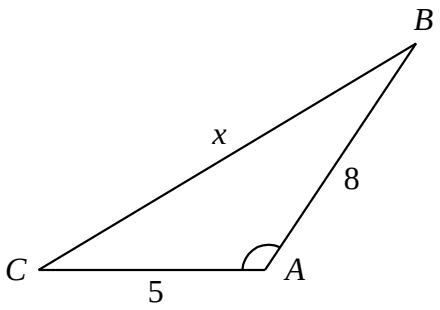
93 19. $\frac{\cos\theta}{1-\sin^2\theta}\cdot\frac{1-\cos^2\theta}{\sin\theta} =$

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

93 20. $\cos^4\theta - \sin^4\theta + 2\sin^2\theta =$

A. 0
B. 1
C. $(1-\sin^2\theta)^2$
D. $(1-\cos^2\theta)^2$
E. $(\cos^2\theta - \sin^2\theta)^2$

93 21.



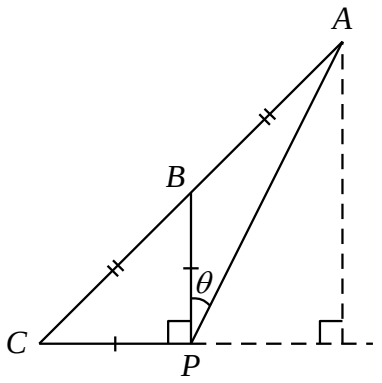
In the figure, $\cos A = -\frac{4}{5}$. Find a.

A. $\sqrt{153}$
B. $\sqrt{137}$
C. $\sqrt{89}$
D. $\sqrt{41}$
E. $\sqrt{25}$

93 22. The largest value of $3\sin^2\theta + 2\cos^2\theta - 1$ is

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

93 23.



In the figure, $AB = BC$, $BP = CP$ and $BP \perp CP$. Find $\tan\theta$.

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

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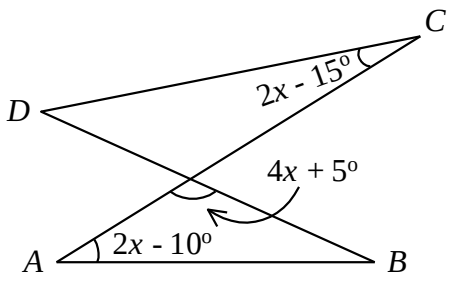
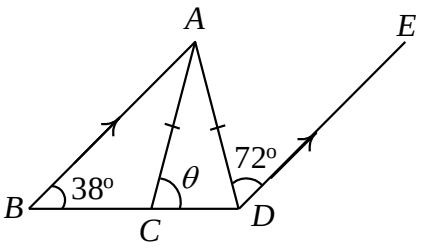
24.



In the figure, points A, B, C and D are concyclic. Find x.

A. 20^o
B. 22.5^o
C. 25^o
D. 27.5^o
E. 30^o

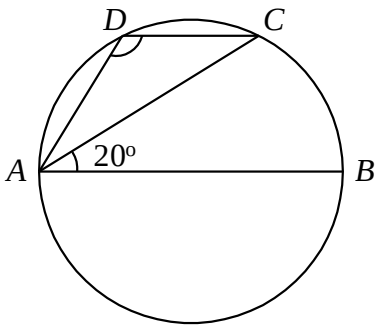
93
25.



In the figure, BA // DE and $AC = AD$. Find θ.

A. 34^o
B. 54^o
C. 70^o
D. 72^o
E. 76^o

93
26.



In the figure, AB is a diameter. Find $\angle ADC$.

A. 100^o
B. 110^o
C. 120^o
D. 135^o
E. 140^o

93
27. If the points (1, 1), (3, 2) and (7, k) are on the same straight line, then k =

A. 3 .
B. 4 .
C. 6 .
D. 7 .
E. 10 .

93
28. $A(0, 0)$, $B(5, 0)$ and $C(2, 6)$ are the vertices of a triangle. $P(9, 5)$, $Q(6, 6)$ and $R(2, -9)$ are three points. Which of the following triangles has/have area(s) greater than the area of ΔABC?

I. ΔABP
II. ΔABQ
III. ΔABR

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

93
29. A circle of radius 1 touches both the positive x-axis and the positive y-axis. Which of the following is/are true?

I. Its centre is in the first quadrant.
II. Its centre lies on the line $x - y = 0$.
III. Its centre lies on the line $x + y = 1$.

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

93
30. What is the area of the circle $x^2 + y^2 - 10x + 6y - 2 = 0$?

A. 32π

B. 34π
C. 36π
D. 134π
E. 138π

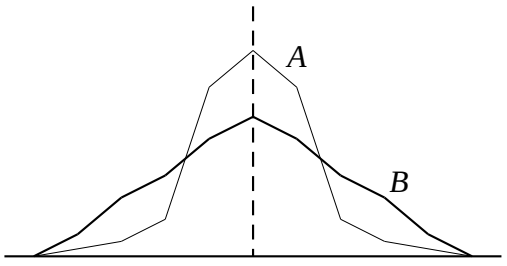
93 31. Two fair dice are thrown. What is the probability of getting a total of 5 or 10?

A. $\frac{1}{9}$
B. $\frac{5}{36}$
C. $\frac{1}{6}$
D. $\frac{7}{36}$
E. $\frac{2}{9}$

93 32. A group of n numbers has mean m. If the numbers 1, 2 and 6 are removed from the group, the mean of the remaining $n - 3$ numbers remains unchanged. Find m.

A. 1
B. 2
C. 3
D. 6
E. $n - 3$

93 33.



The figure shows the frequency polygons of two symmetric distributions A and B with the same mean. Which of the following is/are true?

I. Interquartile range of A < Interquartile range of B
II. Standard deviation of A > Standard deviation of B
III. Mode of A > Mode of B

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

93 34. If $9^{x+2} = 36$, then $3^x =$

A. $\frac{2}{3}$.
B. $\frac{4}{3}$.
C. 2 .
D. $\sqrt{6}$.
E. 9 .

93 35. If $a : b = 2 : 3$ and $b : c = 5 : 3$, then $\frac{a+b+c}{a-b+c} =$

A. –2 .
B. $\frac{5}{2}$.
C. 4 .
D. $\frac{17}{2}$.
E. 31 .

93 36.

x	Sign of f(x)
3.56	+
3.58	–
3.57	+
3.575	+

From the table, a root of the equation f(x) = 0 is

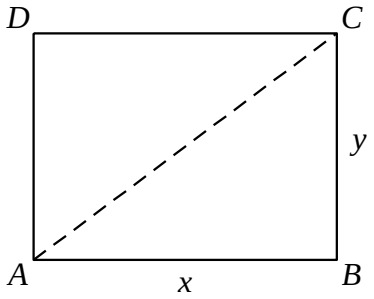
A. 3.57 (correct to 3 sig. fig.).
B. 3.575 (correct to 4 sig. fig.).
C. 3.5775 (correct to 5 sig. fig.).
D. 3.5725 (correct to 4 sig. fig.).
E. 3.58 (correct to 3 sig. fig.).

93 37. Given that the positive numbers p, q, r, s are in G.P., which of the following must be true?

I. kp, kq, kr, ks are in G.P., where k is a non-zero constant.
II. a^p, a^q, a^r, a^s are in G.P., where a is a positive constant.
III. $\log p$, $\log q$, $\log r$, $\log s$ are in A.P.

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

93 38.



In the figure, the rectangle has perimeter 16 cm and area 15 cm^2. Find the length of its diagonal AC.

A. $\sqrt{32}$ cm
B. $\sqrt{34}$ cm
C. 7 cm
D. $\sqrt{226}$ cm
E. $\sqrt{241}$ cm

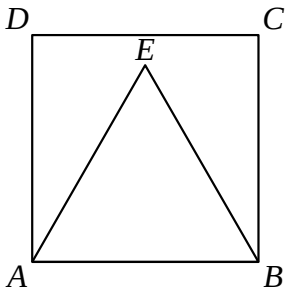
93 39. In factorizing the expression $a^4 + a^2b^2 + b^4$, we find that

A. $(a^2 - b^2)$ is a factor.
B. $(a^2 + b^2)$ is a factor.
C. $(a^2 - ab - b^2)$ is a factor.
D. $(a^2 - ab + b^2)$ is a factor.
E. it cannot be factorized.

93 40. If the solution of the inequality $x^2 - ax + 6 \le 0$ is $c \le x \le 3$, then

A. $a = 5$, $c = 2$.
B. $a = -5$, $c = 2$.
C. $a = 5$, $c = -2$.
D. $a = 1$, $c = -2$.
E. $a = -1$, $c = 2$.

93 41.

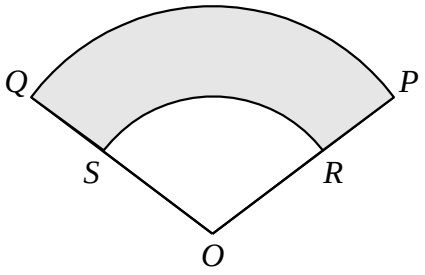


In the figure, $ABCD$ is a square and ABE is an equilateral triangle.

$\dfrac{\text{Area of } ABE}{\text{Area of } ABCD} =$

A. $\dfrac{1}{4}$
B. $\dfrac{1}{3}$
C. $\dfrac{\sqrt{3}}{8}$
D. $\dfrac{\sqrt{3}}{4}$
E. $\dfrac{\sqrt{3}}{2}$

93 42.



In the figure, the radii of the sectors OPQ and ORS are 5 cm and 3 cm respectively. $\dfrac{\text{Area of shaded region}}{\text{Area of sector } OPQ} =$

A. $\frac{4}{25}$.

B. $\frac{2}{5}$.

C. $\frac{9}{25}$.

D. $\frac{16}{25}$.

E. $\frac{21}{25}$.

93 43. Which of the following gives the compound interest on \$ 10 000 at 6% p.a. for one year, compounded monthly?

A. $\$\ 10\,000 \times \frac{0.06}{12} \times 12$

B. $\$\ 10\,000(1.06^{12} - 1)$

C. $\$\ 10\,000\left(1+\frac{0.06}{12}\right)^{12}$

D. $\$10\,000\left[\left(1+\frac{0.06}{12}\right)^{12}-1\right]$

E. $\$10\,000\left[\left(1+\frac{0.6}{12}\right)^{12}-1\right]$

93 44. Originally $\frac{2}{3}$ of the students in a class failed in an examination. After taking a re-examination, 40% of the failed students passed. Find the total pass percentage of the class.

A. $26\frac{2}{3}\%$

B. $33\frac{1}{3}\%$

C. 40%

D. 60%

E. $73\frac{1}{3}\%$

93 45. Solve $\tan^4\theta + 2\tan^2\theta - 3 = 0$ for $0^o \le \theta < 360^o$.

A. 45^o, 135^o only

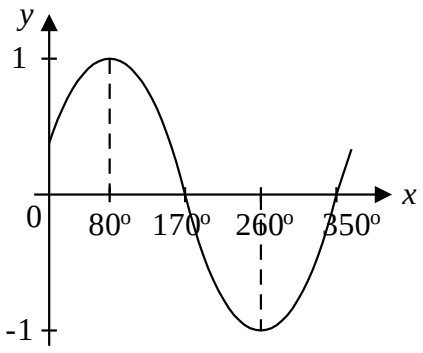
B. 45^o, 225^o only

C. 45^o, 60^o, 225^o, 240^o

D. 45^o, 120^o, 225^o, 300^o

E. 45^o, 135^o, 225^o, 315^o

93 46.



The figure shows the graph of the function

A. $y = \sin(350^o - x)$.

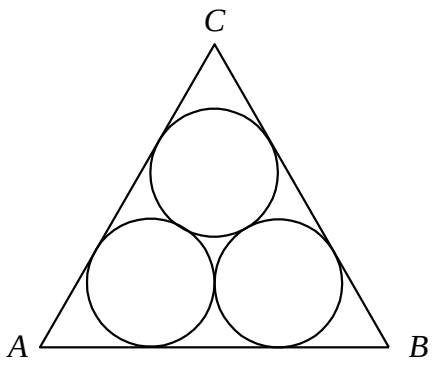
B. $y = \sin(x + 10^o)$.

C. $y = \cos(x + 10^o)$.

D. $y = \sin(x - 10^o)$.

E. $y = \cos(x - 10^o)$.

93 47.



In the figure, *ABC* is an equilateral triangle and the radii of the three circles are each equal to 1. Find the perimeter of the triangle.

A. 12

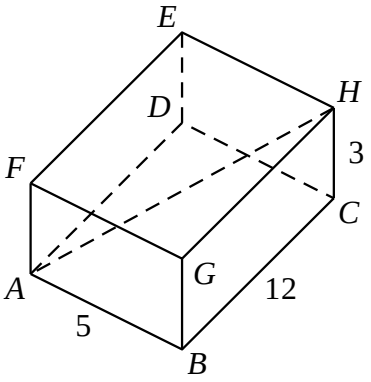
B. $3(1 + \tan 30^o)$

C. $6(1 + \tan 30^o)$

D. $3\left(1+\frac{1}{\tan 30^{o}}\right)$

E. $6\left(1+\frac{1}{\tan 30^{o}}\right)$

93
48.



In the figure, *ABCDEFGH* is a cuboid. The diagonal *AH* makes an angle θ with the base *ABCD*. Find $\tan\theta$.

A. $\frac{3}{5}$

B. $\frac{3}{12}$

C. $\frac{3}{13}$

D. $\frac{3}{\sqrt{178}}$

E. $\frac{\sqrt{153}}{5}$

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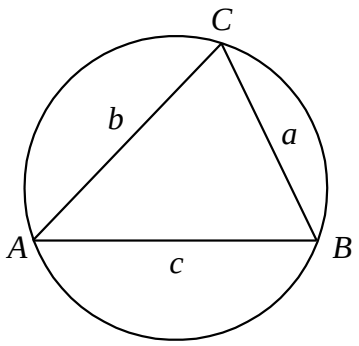
49.



In the figure, if arc *BC* : arc *CA* : arc *AB* = 1 : 2 : 3, which of the following is/are true?

I. $\angle A : \angle B : \angle C = 1 : 2 : 3$

II. $a : b : c = 1 : 2 : 3$

III. $\sin A : \sin B : \sin C = 1 : 2 : 3$

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

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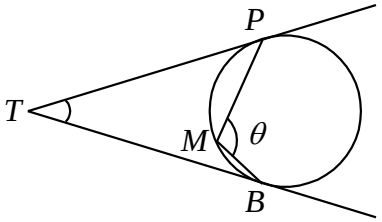
50.



In the figure, *TP* and *TQ* are tangent to the circle at *P* and *Q* respectively. if *M* is a point on the minor arc *PQ* and $\angle PMQ = \theta$, then $\angle PTQ =$

A. $\frac{\theta}{2}$.

B. $\theta - 90^{o}$.

C. $180^{o} - \theta$.

D. $180^{o} - 2\theta$.

E. $2\theta - 180^{o}$.

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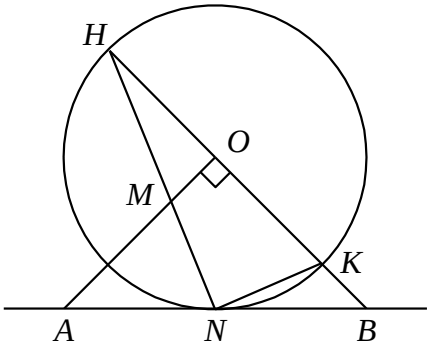
51.



In the figure, O is the centre of the circle. AB touches the circle at N. Which of the following is/are correct?

I. *M*, *N*, *K*, *O* are concyclic.

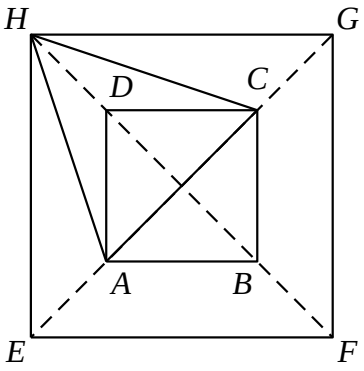
II. $\Delta HNB \sim \Delta NKB$

III. $\angle OAN = \angle NOB$

A. I only
B. II only

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

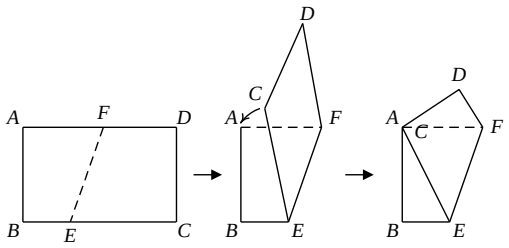
93
52.



In the figure *ABCD* and *EFGH* are two squares and *ACH* is an equilateral triangle. Find *AB* : *EF*.

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

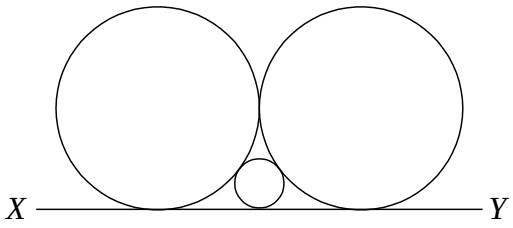
93
53.



In the figure, a rectangular piece of paper *ABCD* is folded along *EF* so that *C* and *A* coincide. If *AB* = 12 cm, *BC* = 16 cm, find *BE*.

A. 3.5 cm
B. 4.5 cm
C. 5 cm
D. 8 cm
E. 12.5 cm

93
54.



In the figure, the three circles touch one another. *XY* is their common tangent. The two larger circles are equal. If the radius of the smaller circle is 4 cm, find the radii of the larger circles.

A. 8 cm
B. 10 cm
C. 12 cm
D. 14 cm
E. 16 cm