2002-CE
MATH
PAPER 2

MC

HONG KONG EXAMINATIONS AUTHORITY

HONG KONG CERTIFICATE OF EDUCATION EXAMINATION 2002

MATHEMATICS PAPER 2

11.15 am – 12.45 pm (1½ hours)

Subject Code 180

1. Read carefully the instructions on the Answer Sheet and insert the information required (including the Subject Code) in the spaces provided.

2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF PAPER'** after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You should mark all your answers on the Answer Sheet.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

FORMULAS FOR REFERENCE

SPHERE	Surface area	=	$4\pi r^2$
	Volume	=	$\frac{4}{3}\pi r^3$
CYLINDER	Area of curved surface	=	$2\pi rh$
	Volume	=	$\pi r^2 h$
CONE	Area of curved surface	=	πrl
	Volume	=	$\frac{1}{3}\pi r^2 h$
PRISM	Volume	=	base area × height
PYRAMID	Volume	=	$\frac{1}{3}$ × base area × height

There are 36 questions in Section A and 18 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.

Section A

1. If $\frac{x}{1+x} = \frac{a}{1-a}$, then $x =$

   A. a.

   B. $\frac{2a}{1-a}$.

   C. $\frac{a}{1+2a}$.

   D. $\frac{a}{1-2a}$.

2. Let $f(x) = x^2 - x - 3$. If $f(k) = k$, then $k =$

   A. 1.

   B. -1 or 3.

   C. -3 or 1.

   D. $-\sqrt{3}$ or $\sqrt{3}$.

Go on to the next page

3. $2^x \cdot 8^y =$

A. 2^{x+3y}.

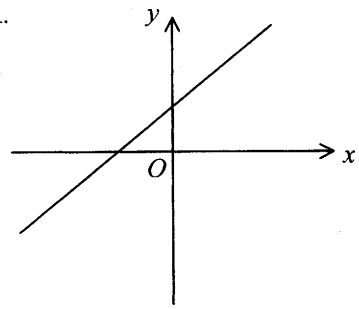
B. 2^{3xy}.

C. 16^{x+y}.

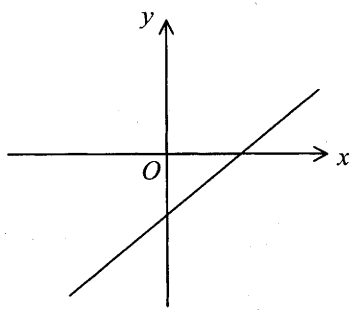
D. 16^{xy}.

4. If $a < 0$ and $b > 0$, which of the following may represent the graph of $y = ax + b$?

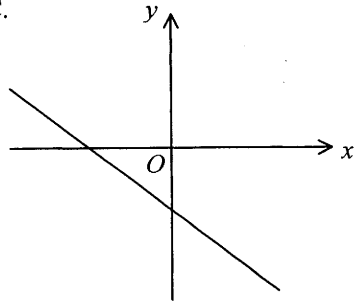
A.



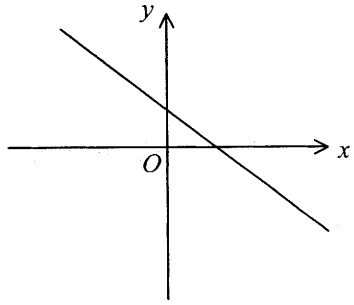
B.



C.



D.



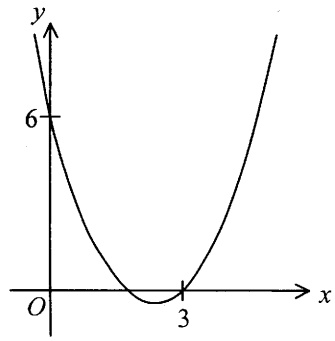
5. The figure shows the graph of $y = x^2 + bx + c$. Find b .

A. $\frac{-11}{2}$

B. -5

C. 5

D. $\frac{11}{2}$



6. If $(x+1)^2 + P(x+1) \equiv x^2 + Q$, then

A. $P = -2$, $Q = -1$.

B. $P = -2$, $Q = 1$.

C. $P = 2$, $Q = -1$.

D. $P = 2$, $Q = 1$.

7. Which of the following equations has/have equal roots?

I. $x^2 = x$

II. $x^2 + 2x + 1 = 0$

III. $(x+3)^2 = 1$

A. II only

B. III only

C. I and II only

D. I and III only

Go on to the next page

8. If $(x, y) = (-2, 1)$ is a solution of the simultaneous equations $\begin{cases} ax - by + 8 = 0 \\ bx + ay + 1 = 0 \end{cases}$, then $a =$

A. -3 .

B. 2 .

C. $\frac{9}{4}$.

D. 3 .

9. Solve $(2x-1)^2 + 2(2x-1) - 3 > 0$.

A. $0 < x < 2$

B. $-1 < x < 1$

C. $x < 0$ or $x > 2$

D. $x < -1$ or $x > 1$

10. If 1 Euro is equivalent to 6.94 H.K. dollars and 1 U.S. dollar is equivalent to 7.78 H.K. dollars, how many Euros are equivalent to 100 U.S. dollars? Give your answer correct to the nearest Euro.

A. 89

B. 112

C. 129

D. 144

11. The 10th term of an arithmetic sequence is 29 and the sum of the first 10 terms is 155 . The 2nd term of the sequence is

A. 2 .

B. 4.7 .

C. 5 .

D. 43 .

Go on to the next page

12. The simple interest on a sum of money at $r\%$ p.a. for 4 years is equal to the compound interest on the same amount at 4% p.a. for 4 years compounded half-yearly. The value of r, correct to 2 significant figures, is

A. 2.1.

B. 4.2.

C. 4.3.

D. 9.2.

13. If $2x = 3y = 4z$, then $\frac{x+y-z}{x-y+z} =$

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

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

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

D. $\frac{7}{5}$.

14. The cost price of a toy is \$100 and the marked price is \$140. If the toy is sold at 10% discount of the marked price, the profit is

A. \$26.

B. \$30.

C. \$36.

D. \$50.

15. It is given that y varies inversely as x. If x is increased by 50%, then y is decreased by

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

B. 50%.

C. $66\frac{2}{3}\%$.

D. 100%.

Go on to the next page

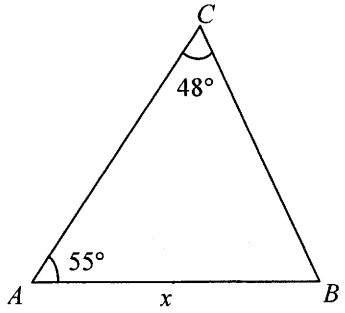
16. In the figure, $AC =$

A. $\dfrac{x \sin 77°}{\sin 48°}$.

B. $\dfrac{x \sin 55°}{\sin 48°}$.

C. $\dfrac{x \sin 48°}{\sin 77°}$.

D. $\dfrac{x \sin 77°}{\sin 55°}$.



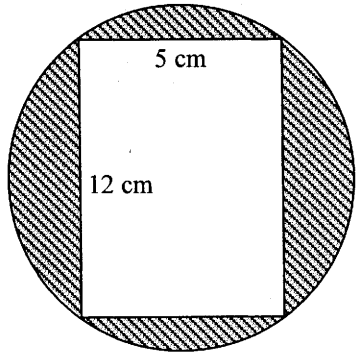
17. The figure shows a rectangle inscribed in a circle. Find the area of the shaded region correct to the nearest $0.1\ \text{cm}^2$.

A. $60.0\ \text{cm}^2$

B. $72.7\ \text{cm}^2$

C. $132.7\ \text{cm}^2$

D. $470.9\ \text{cm}^2$



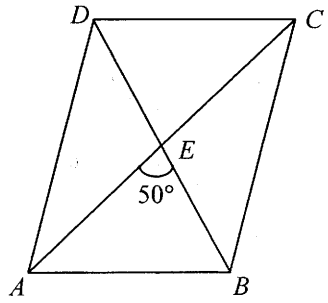
18. The figure shows a parallelogram $ABCD$ with its diagonals meeting at E. If $AE = 3$ cm and $BE = 2$ cm, find the area of the parallelogram correct to the nearest $0.1\ \text{cm}^2$.

A. $2.3\ \text{cm}^2$

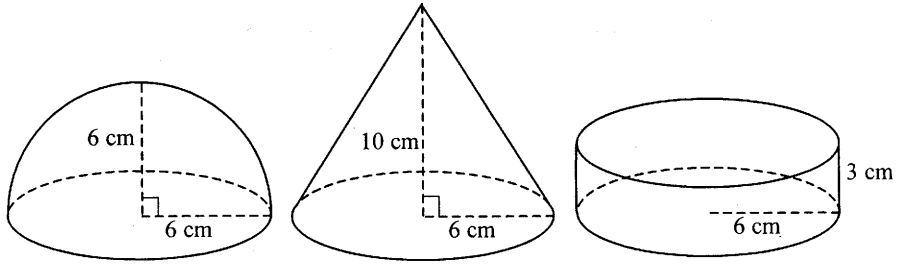
B. $7.7\ \text{cm}^2$

C. $9.2\ \text{cm}^2$

D. $18.3\ \text{cm}^2$



19. The figure shows a hemisphere, a right circular cone and a right cylinder with equal base radii. Their volumes are $a\ \text{cm}^3$, $b\ \text{cm}^3$ and $c\ \text{cm}^3$ respectively.



Which of the following is true?

A. $a < b < c$

B. $a < c < b$

C. $c < a < b$

D. $c < b < a$

Go on to the next page

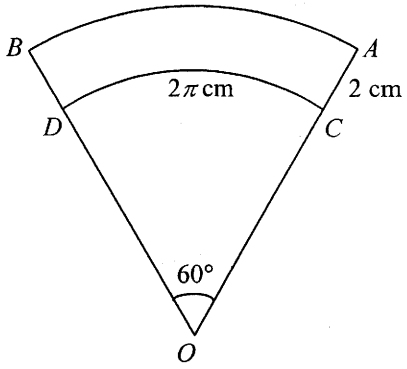
20. In the figure, OCD and OAB are two sectors. The length of $\overset{\frown}{AB}$ is

A. $\frac{8}{3}\pi$ cm.

B. $\frac{10}{3}\pi$ cm.

C. $(2\pi+2)$ cm.

D. 4π cm.



21. For $0° \le \theta \le 90°$, the maximum value of $\frac{2}{3+\sin^2\theta}$ is

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

B. $\frac{1}{2}$.

C. $\frac{2}{3}$.

D. 1.

22. If $45° < \theta < 90°$, which of the following must be true?

I. $\tan\theta > \sin\theta$
II. $\tan\theta > \cos\theta$
III. $\cos\theta > \sin\theta$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

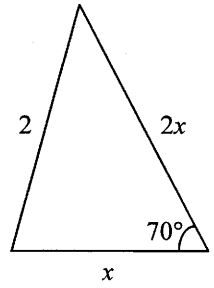
23. In the figure, find x correct to 3 significant figures.

A. 0.963

B. 1.05

C. 1.10

D. 1.57



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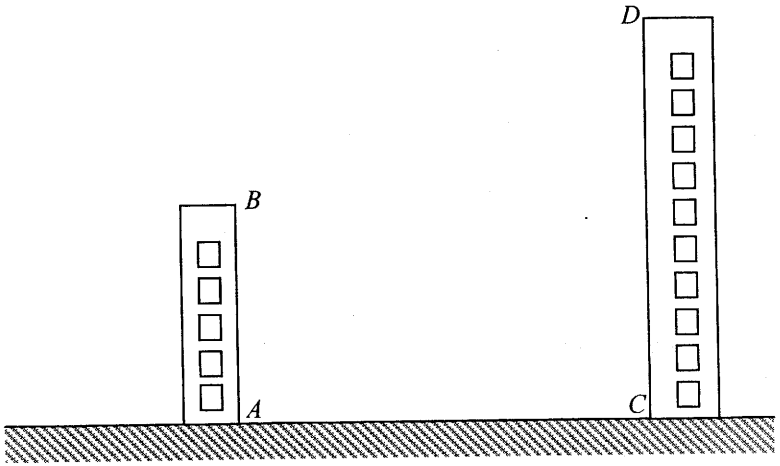
24. In the figure, AB and CD are the heights of two buildings on the same level ground. If $AB = 9$ m, $AC = 20$ m and the angle of depression of A from D is $50°$, find the angle of elevation of D from B correct to the nearest $0.1°$.



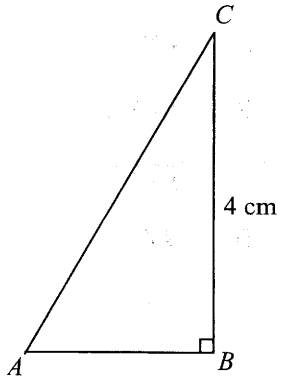
A. 21.3°

B. 24.2°

C. 36.6°

D. 53.4°

25. In the figure, $AC = 3AB$. Find AB correct to 3 significant figures.



A. 1.26 cm

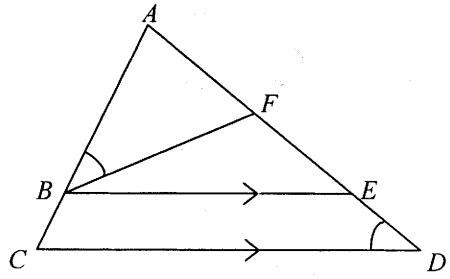
B. 1.41 cm

C. 1.79 cm

D. 2.83 cm

26. In the figure, ABC and $AFED$ are straight lines. $\angle ABF = \angle CDE$ and $BE \,//\, CD$. Which of the following triangles are similar?

I. ΔABF
II. ΔAEB
III. ΔADC



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

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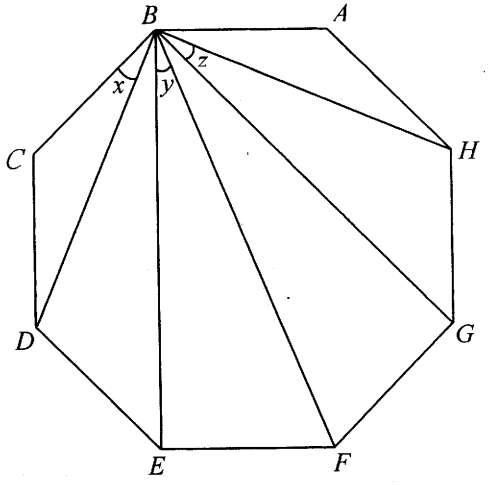
27. In the figure, $ABCDEFGH$ is a regular octagon. $x+y+z=$



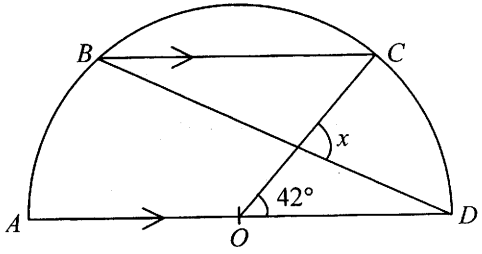
A. $60°$.

B. $67.5°$.

C. $82.5°$.

D. $90°$.

28. In the figure, O is the centre of the semicircle $ABCD$ and $BC // AD$. If $\angle COD = 42°$, then $x=$



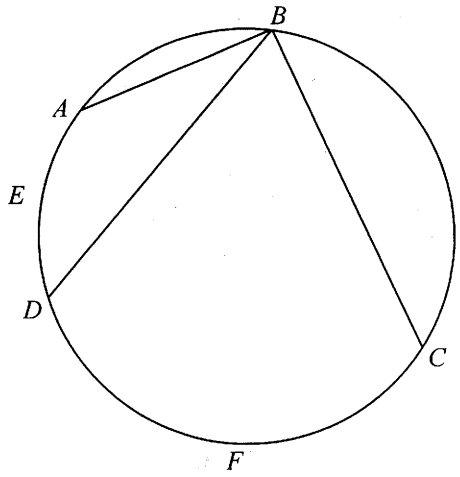
A. $48°$.

B. $63°$.

C. $84°$.

D. $90°$.

29. In the figure, $\overset{\frown}{AED} = 1$ and $\overset{\frown}{CFD} = 4$. If $\angle ABC = 100°$, then $\angle ABD =$



A. $18°$.

B. $20°$.

C. $24°$.

D. $25°$.

30. If the length of the line segment joining the points $(2, 3)$ and $(k, 1-k)$ is 4, then $k=$

A. 2.

B. 4.

C. 0 or 4.

D. -2 or 2.

Go on to the next page

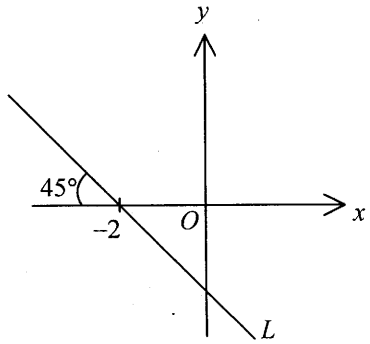
31. In the figure, the equation of the straight line L is

A. $x+y+2=0$.

B. $x+y-2=0$.

C. $x-y+2=0$.

D. $x-y-2=0$.



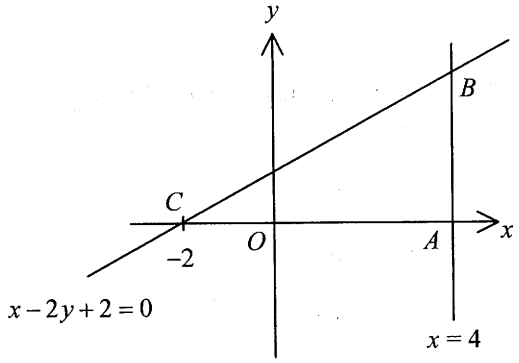
32. In the figure, the area of ΔABC is

A. 3 .

B. 8 .

C. 9 .

D. 18 .



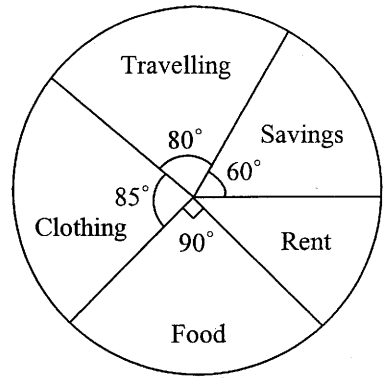
33. The pie chart below shows the expenditure of a family in January 2002. The percentage of the expenditure on Rent was

A. 12.5% .

B. 22.5% .

C. 25% .

D. 45% .



34. For the five numbers x , $x-1$, $x-2$, x , $x+8$, which of the following must be true?

I. The median is $x-2$.
II. The mean is $x+1$.
III. The mode is 2 .

A. I only

B. II only

C. I and III only

D. II and III only

Go on to the next page

35. Two numbers are drawn randomly from five cards numbered 3, 4, 5, 6 and 7 respectively. Find the probability that the product of the numbers drawn is even.

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

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

C. $\frac{7}{10}$

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

36. In a test, there are two questions. The probability that Mary answers the first question correctly is 0.3 and the probability that Mary answers the second question correctly is 0.4. The probability that she answers at least one question correctly is

A. 0.42.

B. 0.46.

C. 0.58.

D. 0.88.

Section B

37. $1-\dfrac{2x}{x-\dfrac{1}{x}}=$

A. $\dfrac{x-3}{x-1}$.

B. $\dfrac{x^2-3}{x^2-1}$.

C. $\dfrac{x^2+1}{x^2-1}$.

D. $-\dfrac{x^2+1}{x^2-1}$.

38. The remainder when x^2+ax+b is divided by $x+2$ is -4. The remainder when ax^2+bx+1 is divided by $x-2$ is 9. The value of a is

A. -3.

B. -1.

C. 1.

D. 3.

Go on to the next page

39. If $(x+1)(\sqrt{3}-1)=4$, then $x=$

A. $2\sqrt{3}-3$.

B. $2\sqrt{3}+1$.

C. $2\sqrt{3}+2$.

D. $\frac{4\sqrt{3}-1}{2}$.

40. If $\log x^2 = \log 3x+1$, then $x=$

A. 2.

B. 5.

C. 30.

D. 0 or 30.

41. The figure shows part of a page torn off from a mathematics book. According to the information shown, which of the following is a root of the equation $f(x)=0$?

Solution

Let $f(x)=$

$\because$ $f(0)=$

$\therefore$ $f(x)=0$ has only one root between 0 and 1.

Using the method of bisection,

Interval ($a<x<b$)	Mid-value (m)	Sign of $f(m)$
$0<x<1$	0.5	+
$<x<1$		+
		−
		−

A. 0.6 (correct to 1 decimal place)

B. 0.7 (correct to 1 decimal place)

C. 0.8 (correct to 1 decimal place)

D. 0.9 (correct to 1 decimal place)

42. How many different triangles can be constructed so that the lengths of the three sides are x cm, $2x$ cm and 12 cm, where x is an integer?

A. 5

B. 7

C. 9

D. 11

Go on to the next page

43. If the geometric mean of two positive numbers a and b is 100, then the arithmetic mean of $\log a$ and $\log b$ is

A. $\frac{1}{2}$.

B. 1.

C. 2.

D. 10.

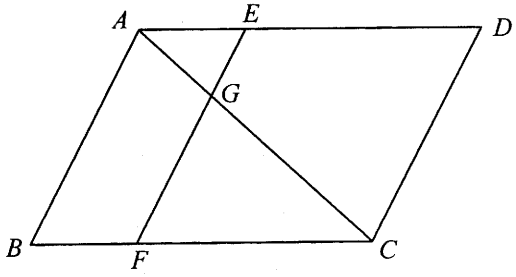
44. In the figure, $ABCD$ is a parallelogram. E and F are points on AD and BC respectively such that $AB // EF$. EF meets AC at G. If $AG:GC = 1:2$, then area of $ABFG$: area of $EGCD$ =

A. $1:2$.

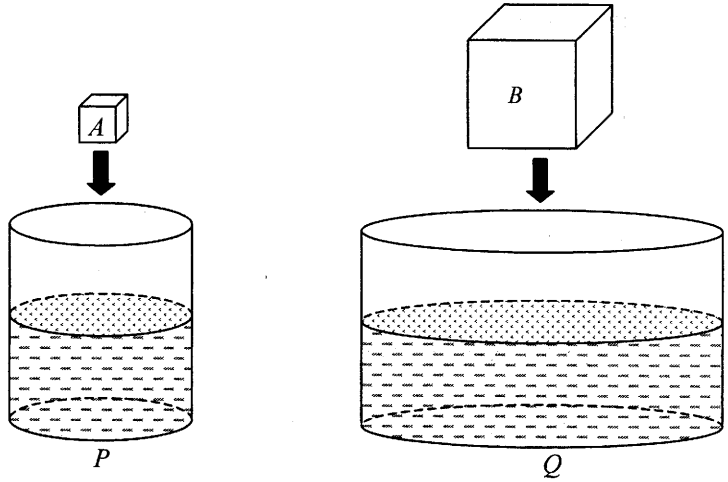
B. $1:4$.

C. $3:4$.

D. $5:8$.



45. In the figure, P and Q are two right cylindrical vessels each containing some water. The two vessels are placed on the same horizontal surface. The internal base radii of P and Q are in the ratio $1:3$. A and B are two cubes with sides in the ratio $1:2$. A and B are put into P and Q respectively. Suppose both cubes are totally immersed in water without any overflow. If the rise in water level in P is 1 cm, then the rise in water level in Q is



A. $\frac{2}{3}$ cm.

B. $\frac{9}{8}$ cm.

C. $\frac{8}{9}$ cm.

D. $\frac{8}{27}$ cm.

Go on to the next page

46. If $\sin\theta = \frac{3}{5}$ and θ lies in the first quadrant, then $\sin(90° - \theta) + \sin(180° + \theta) =$

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

B. $\frac{-1}{5}$.

C. $\frac{7}{5}$.

D. $\frac{-7}{5}$.

47. $[1 + \cos(\pi + \theta)][1 - \cos(\pi - \theta)] =$

A. $\sin^2\theta$.

B. $(1 - \cos\theta)^2$.

C. $(1 + \cos\theta)^2$.

D. $(1 - \cos\theta)(1 - \sin\theta)$.

48. For $0° \le x \le 360°$, how many roots does the equation $\tan x = 2\sin x$ have?

A. 2

B. 3

C. 4

D. 5

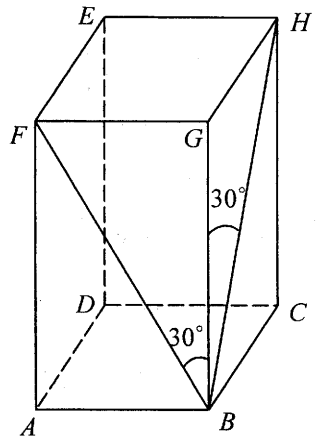
49. In the figure, $ABCDEFGH$ is a rectangular block with a square base $ABCD$. Find $\angle FBH$ correct to the nearest degree.

A. 21°

B. 41°

C. 45°

D. 60°



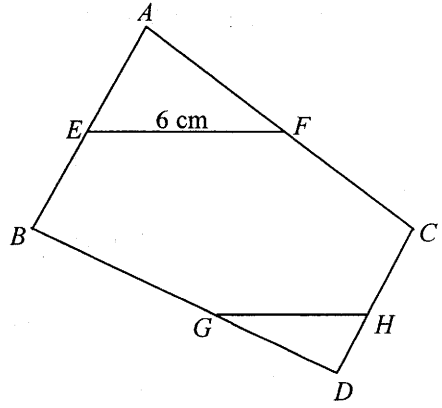
50. In the figure, E and F are the mid-points of AB and AC respectively. G and H are points on BD and CD respectively such that $\frac{DG}{GB} = \frac{DH}{HC} = \frac{3}{5}$. If $EF = 6$ cm, then $GH =$

A. 3.6 cm.

B. 4.5 cm.

C. 7.2 cm.

D. 7.5 cm.



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51. In the figure, EAF is a common tangent to the circles at the point A. Chords AC and BC of the smaller circle are produced to meet the larger circle at G and D respectively. Which of the following must be true?

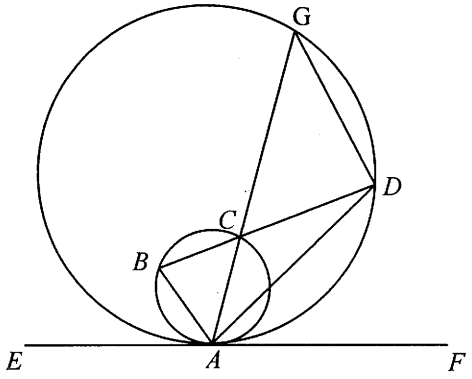
I. $\angle ADG = \angle EAG$
II. $\angle ABD = \angle AGD$
III. $\angle BAE = \angle ADB$

A. I only

B. II only

C. I and III only

D. II and III only



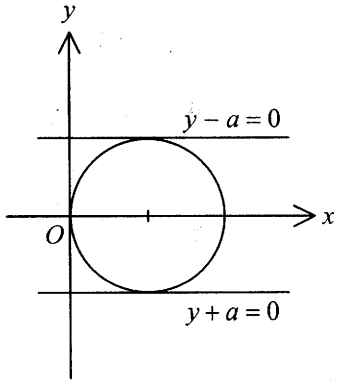
52. In the figure, $x = 0$, $y - a = 0$ and $y + a = 0$ are tangents to the circle. The equation of the circle is

A. $x^2 + y^2 = a^2$.

B. $x^2 + y^2 - 2ax = 0$.

C. $x^2 + y^2 - 2ay = 0$.

D. $x^2 + y^2 + 2ax + 2ay + a^2 = 0$.



53. The equation of a circle is given by $(x-a)^2 + (y+b)^2 = a^2 + b^2$, where $a > 0$ and $b > 0$. Which of the following must be true?

I. The centre of the circle is $(a, -b)$.
II. The circle passes through the origin.
III. The circle cuts the x-axis at two distinct points.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

54. The standard deviation of the four numbers $m-7$, $m-1$, $m+1$ and $m+7$ is

A. 2.5.

B. 4.

C. 5.

D. 10.

END OF PAPER