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.
Choose the best answer for each question.

Section A

1. If n is a positive integer, then $3^{2n} \cdot 4^n =$

   A. 6^{2n} .

   B. 6^{3n} .

   C. 12^{2n} .

   D. 12^{3n} .

2. $\dfrac{1}{n+3} - \dfrac{1}{3-n} =$

   A. $\dfrac{6}{9-n^2}$.

   B. $\dfrac{6}{n^2-9}$.

   C. $\dfrac{2n}{9-n^2}$.

   D. $\dfrac{2n}{n^2-9}$.

3. $(x+x)(y+y+y) =$

   A. $6xy$.

   B. $2x+3y$.

   C. x^2y^3 .

   D. $6x^2y^3$.

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4. Let x be the smaller one of two consecutive integers. If the sum of the squares of the two integers is less than three times the product of the two integers by 1, then

A. $x^2+(x+1)^2=3x(x+1)-1$.

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

C. $3\left(x^2+(x+1)^2\right)=x(x+1)-1$.

D. $3\left(x^2+(x+1)^2\right)=x(x+1)+1$.

5. Which of the following statements about the graph of $y=(x+1)^2-4$ is true?

A. The coordinates of the vertex of the graph are $(-1,4)$.

B. The equation of the axis of symmetry of the graph is $x=1$.

C. The x-intercepts of the graph are -1 and 3.

D. The y-intercept of the graph is -3.

6. The solution of $15\geq 4(x+2)-1$ is

A. $x\leq -2$.

B. $x\leq 2$.

C. $x\geq -2$.

D. $x\geq 2$.

7. The price of 6 oranges and 3 apples is \$42 while the price of 8 oranges and 5 apples is \$60. Find the price of an apple.

A. \$3

B. \$4

C. \$5

D. \$6

8. Let $f(x) = x^2 - ax + 2a$, where a is a constant. If $f(-3) = 29$, then $a =$

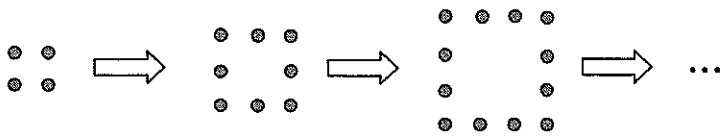
A. -38.

B. -20.

C. -4.

D. 4.

9. In the figure, the 1st pattern consists of 4 dots. For any positive integer n, the $(n+1)$ th pattern is formed by adding 4 dots to the nth pattern. Find the number of dots in the 9th pattern.



A. 36

B. 40

C. 81

D. 100

10. If the bus fare is increased from \$4 to \$5, then the percentage increase of the fare is

A. 20%.

B. 25%.

C. 80%.

D. 125%.

11. A sum of \$30 000 is deposited at an interest rate of 12% per annum for 4 years, compounded monthly. Find the amount correct to the nearest dollar.

A. \$44 400

B. \$47 206

C. \$48 141

D. \$48 367

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12. Express $\sqrt{2007}$ as a decimal correct to 5 significant figures.

A. 44.790

B. 44.799

C. 44.79955

D. 44.800

13. Let a and b be non-zero numbers. If $7a+5b=3a+8b$, then $a:b=$

A. $3:4$.

B. $4:3$.

C. $10:13$.

D. $13:10$.

14. It is given that y is partly constant and partly varies directly as x. When $x=2$, $y=17$ and when $x=4$, $y=11$. Find the value of x when $y=5$.

A. -3

B. 6

C. 8

D. 112

15. A and B are two points on a map. If the bearing of A from B is $110°$, then the bearing of B from A is

A. $070°$.

B. $250°$.

C. $290°$.

D. $340°$.

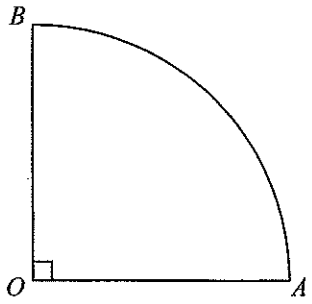
16. In the figure, OAB is a sector with centre O. If the perimeter of the sector OAB is 12 cm, find OA correct to the nearest 0.01 cm.

A. 3.36 cm

B. 3.91 cm

C. 4.31 cm

D. 7.64 cm



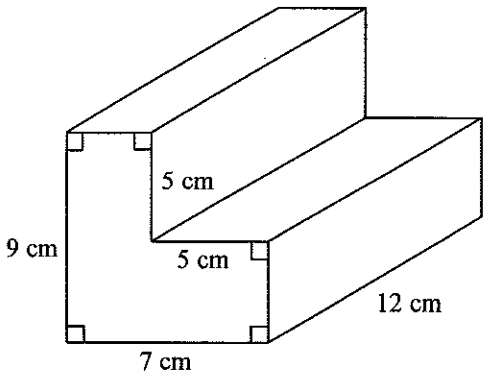
17. In the figure, the volume of the right prism is

A. 456 cm^3.

B. 540 cm^3.

C. 552 cm^3.

D. 636 cm^3.



18. If a solid metal hemisphere of radius r is melted and recast into 3 identical solid right circular cones of height h and base radius r, then $r:h=$

A. $2:3$.

B. $3:2$.

C. $3:4$.

D. $4:3$.

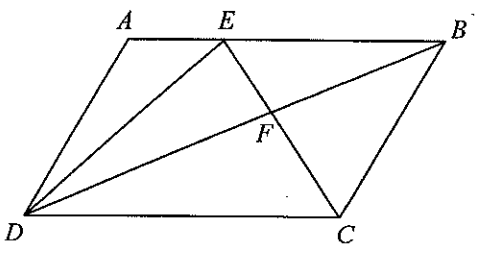
19. In the figure, $ABCD$ is a parallelogram. E is a point lying on AB. If EC and BD intersect at F, then the ratio of the area of ΔDEF to the area of ΔCBF is

A. $1:1$.

B. $1:2$.

C. $2:1$.

D. $2:3$.



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20. If x and y are acute angles such that $x+y=90°$, which of the following must be true?

I. $\sin x=\cos y$
II. $\sin(90°-x)=\cos(90°-y)$
III. $\tan x \tan y=1$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

21. $\dfrac{\cos A}{\sin A}+\dfrac{\sin A}{\cos A}=$

A. 1.

B. $1+\tan^2 A$.

C. $\sin A \cos A$.

D. $\dfrac{1}{\sin A \cos A}$.

22. Solve the equation $\sin\theta=\sqrt{3}\cos\theta$, where $0°\le\theta\le 90°$.

A. $\theta=0°$

B. $\theta=30°$

C. $\theta=45°$

D. $\theta=60°$

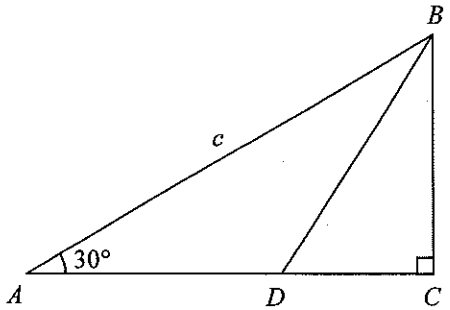
23. In the figure, ABC is a right-angled triangle. BD is the angle bisector of $\angle ABC$. If $AB=c$, then $CD=$

A. $\dfrac{c}{\sqrt{3}}$.

B. $\dfrac{c}{2\sqrt{3}}$.

C. $\dfrac{\sqrt{3}c}{2}$.

D. $\dfrac{\sqrt{3}c}{4}$.



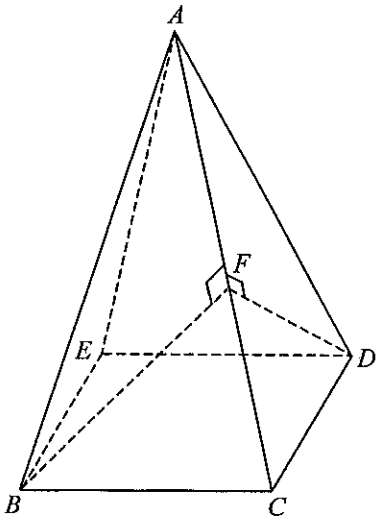
24. In the figure, $ABCDE$ is a right pyramid with the square base $BCDE$. F is a point lying on AC such that BF and DF are perpendicular to AC. The angle between the plane ABC and the plane ACD is

A. $\angle ACB$.

B. $\angle BAD$.

C. $\angle BCD$.

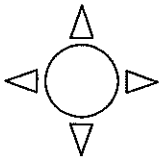
D. $\angle BFD$.



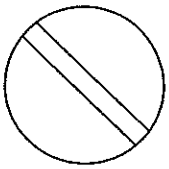
25. Which of the following plane figures have rotational symmetry?

I.

II.



III.



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

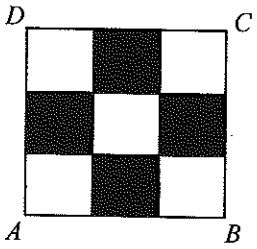
26. In the figure, the square $ABCD$ is divided into nine identical squares and four of them are shaded. The number of axes of reflectional symmetry of the square $ABCD$ is

A. 2.

B. 4.

C. 5.

D. 8.



27. If the sum of the interior angles of a convex n-sided polygon is 4 times the sum of the exterior angles of the polygon, then $n =$

A. 4 .

B. 6 .

C. 8 .

D. 10 .

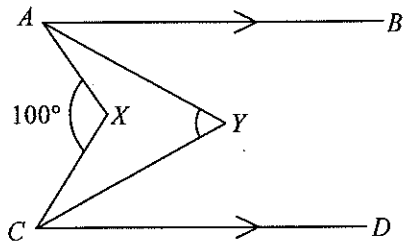
28. In the figure, AY and CY are the angle bisectors of $\angle BAX$ and $\angle DCX$ respectively. If $\angle AXC = 100°$, then $\angle AYC =$

A. $40°$.

B. $50°$.

C. $60°$.

D. $80°$.



29. If the point $(3,-2)$ is rotated clockwise about the origin through $90°$, then the coordinates of its image are

A. $(2,3)$.

B. $(3,2)$.

C. $(-2,-3)$.

D. $(-3,-2)$.

30. If the rectangular coordinates of the point A are $(-1,1)$, then the polar coordinates of A are

A. $(1,135°)$.

B. $(1,225°)$.

C. $(\sqrt{2},135°)$.

D. $(\sqrt{2},225°)$.

31. Find the equation of the straight line which is perpendicular to the straight line $x+2y+3=0$ and passes through the point $(1,3)$.

A. $x+2y-7=0$

B. $x-2y+5=0$

C. $2x+y-5=0$

D. $2x-y+1=0$

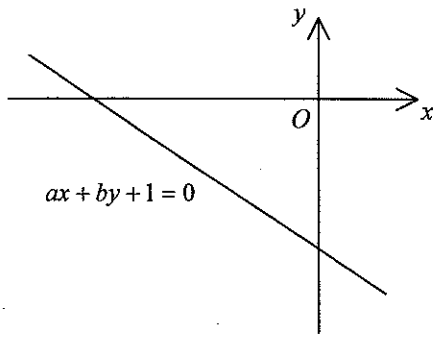
32. The figure shows the graph of the straight line $ax+by+1=0$. Which of the following is true?

A. $a>0$ and $b>0$

B. $a>0$ and $b<0$

C. $a<0$ and $b>0$

D. $a<0$ and $b<0$



33. Two numbers are randomly drawn at the same time from five cards numbered 1, 2, 3, 4 and 5 respectively. Find the probability that the sum of the numbers drawn is a multiple of 3.

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

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

C. $\frac{9}{20}$

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

34. If the mode of the seven numbers 8, 7, 1, 3, 7, a and b is 8, then the median of the seven numbers is

A. 3.

B. 6.

C. 7.

D. 8.

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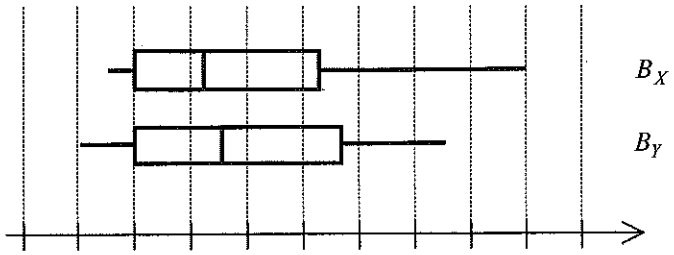
35.



In the figure, B_X and B_Y are the box-and-whisker diagrams for the distributions X and Y respectively. Let μ_1, q_1 and r_1 be the mean, the interquartile range and the range of X respectively while μ_2, q_2 and r_2 be the mean, the interquartile range and the range of Y respectively. Which of the following must be true?

I. $\mu_1 < \mu_2$
II. $q_1 < q_2$
III. $r_1 < r_2$

A. I only

B. II only

C. I and III only

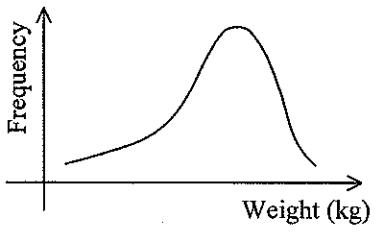
D. II and III only

36. The stem-and-leaf diagram below shows the distribution of the weights (in kg) of some students.

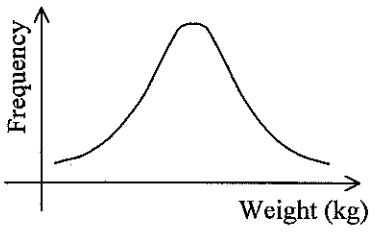
Stem (tens)	Leaf (units)							
3	6							
4	2	4	5	7	8	9		
5	2	3	4	5	5	6	7	8
6	1	2	3	6	7			
7	0	5	8					
8	4	7						
9	3							

Which of the following frequency curves may represent the distribution of their weights?

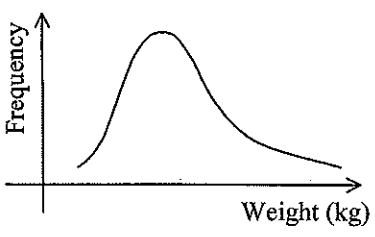
A.



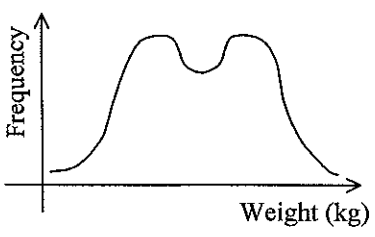
B.



C.



D.



Section B

37. If $a>0$, then $\frac{3\sqrt{a}}{2}-\frac{a}{\sqrt{4a}}=$

A. 1.

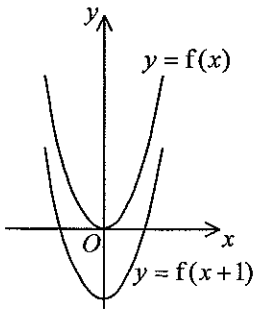
B. $\frac{\sqrt{a}}{2}$.

C. $\sqrt{a}$.

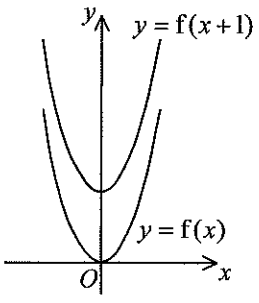
D. $2\sqrt{a}$.

38. Which of the following may represent the graph of $y=\mathrm{f}(x)$ and the graph of $y=\mathrm{f}(x+1)$ on the same rectangular coordinate system?

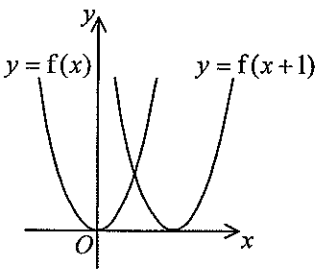
A.



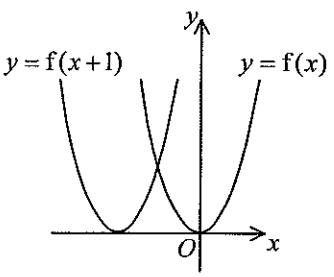
B.



C.



D.



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39. Which of the following is the greatest?

A. 500^{3000}

B. 2000^{2500}

C. 2500^{2000}

D. 3000^{500}

40. Let $f(x)$ be a polynomial. If $f(x)$ is divisible by $x-1$, which of the following must be a factor of $f(2x+1)$?

A. x

B. $x-3$

C. $2x-1$

D. $2x+1$

41. $ABCDE70000_{16} =$

A. $10(16^9)+11(16^8)+12(16^7)+13(16^6)+14(16^5)+7(16^4)$.

B. $10(16^{10})+11(16^9)+12(16^8)+13(16^7)+14(16^6)+7(16^5)$.

C. $11(16^9)+12(16^8)+13(16^7)+14(16^6)+15(16^5)+7(16^4)$.

D. $11(16^{10})+12(16^9)+13(16^8)+14(16^7)+15(16^6)+7(16^5)$.

42. If $p=q^2-12q+6=2q-7$, then $p=$

A. 1 or 13.

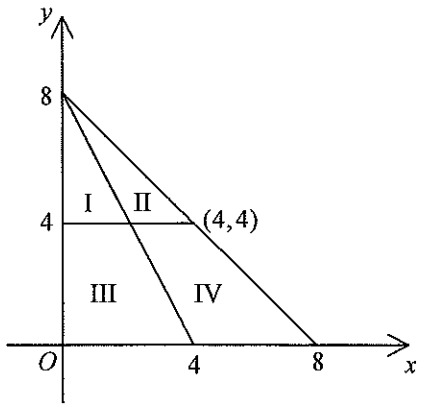
B. -1 or -13.

C. -5 or 19.

D. -9 or -33.

43. Which of the regions in the figure may represent the solution of

$$\begin{cases} y \geq 4 \\ x+y \leq 8 \\ 2x+y \geq 8 \end{cases} ?$$



A. Region I

B. Region II

C. Region III

D. Region IV

44. Let a_n be the nth term of an arithmetic sequence. If $a_1 = a_2 - 6$ and $a_1 + a_2 + \cdots + a_{28} = 1624$, then $a_1 =$

A. -52.

B. -26.

C. -23.

D. 139.

45. The sum of all the positive terms in the geometric sequence $4, -2, 1, \ldots$ is

A. 8.

B. $\frac{8}{3}$.

C. $\frac{16}{3}$.

D. $\frac{16}{5}$.

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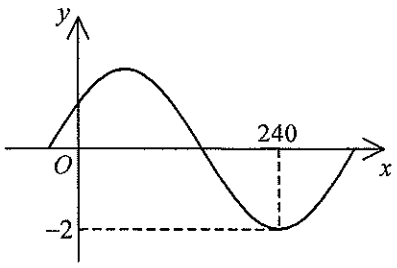
46. Let k be a constant and $-90° < \theta < 90°$. If the figure shows the graph of $y = k\sin(x° + \theta)$, then

A. $k = -2$ and $\theta = -30°$.

B. $k = -2$ and $\theta = 30°$.

C. $k = 2$ and $\theta = -30°$.

D. $k = 2$ and $\theta = 30°$.



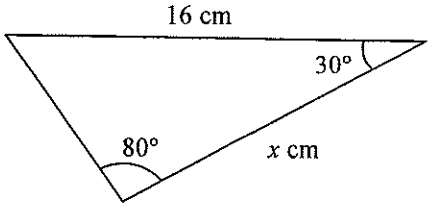
47. In the figure, find x correct to the nearest integer.

A. 14

B. 15

C. 16

D. 17



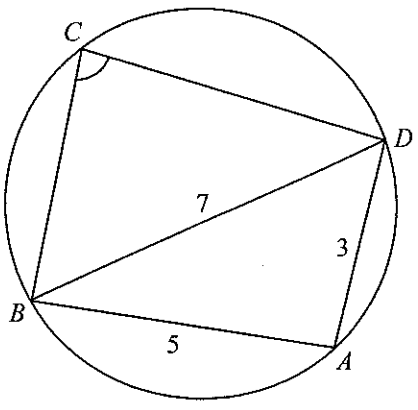
48. In the figure, A, B, C and D are points lying on the circle. If $AB = 5$, $AD = 3$ and $BD = 7$, then $\angle BCD =$

A. 60°.

B. 85°.

C. 95°.

D. 120°.



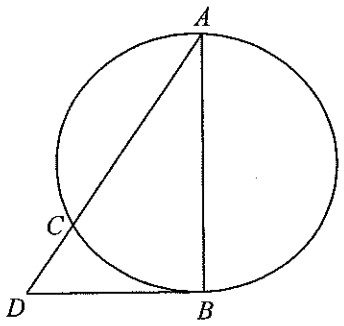
49. In the figure, A, B and C are points lying on the circle. AB is a diameter of the circle. DB is the tangent to the circle at B. If ACD is a straight line with $AC = 4$ and $CD = 2$, then $AB =$

A. $2\sqrt{6}$.

B. $4\sqrt{3}$.

C. $4\sqrt{6}$.

D. $8\sqrt{3}$.



50. If ΔABC is an obtuse-angled triangle, which of the following points must lie outside ΔABC ?

I. The centroid of ΔABC
II. The circumcentre of ΔABC
III. The orthocentre of ΔABC

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

51. A circle C touches the y-axis. If the coordinates of the centre of C are $(-3, 4)$, then the equation of C is

A. $(x-3)^2+(y+4)^2=9$.

B. $(x-3)^2+(y+4)^2=16$.

C. $(x+3)^2+(y-4)^2=9$.

D. $(x+3)^2+(y-4)^2=16$.

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52. Let a be a constant. If the circle $x^2 + y^2 + ax - 6y - 3 = 0$ passes through the point $(-2, 3)$, then the area of the circle is

A. 8π.

B. 10π.

C. 16π.

D. 55π.

53. A bag contains 8 black balls and 5 white balls. If two balls are drawn randomly from the bag one by one without replacement, then the probability that the two balls are of the same colour is

A. $\frac{14}{39}$.

B. $\frac{19}{39}$.

C. $\frac{89}{156}$.

D. $\frac{89}{169}$.

54. One letter is chosen randomly from each of the two words 'CUBE' and 'CONE'. Find the probability that the two letters chosen are different.

A. $\frac{1}{4}$

B. $\frac{3}{4}$

C. $\frac{1}{8}$

D. $\frac{7}{8}$

END OF PAPER