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Form 3

Final Examination 2014-2015

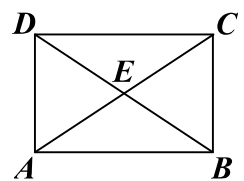
Mathematics

Paper II

INSTRUCTIONS

1. Write your examination number in the spaces provided on this cover page.
2. Write down all required information on the Multiple Choice Answer Sheet.
3. Answer all questions. Answer should be marked on the **Multiple Choice Answer Sheet**.
4. Each question carries 2 marks. The total mark is 90.
5. You should mark only ONE answer for each multiple choice question. If you mark more than one answer, you will receive No marks for that question.
6. No marks will be deducted for wrong answer.
7. The diagrams in this paper are not necessarily drawn to scale.

1. $(125^x)(5^y) =$
A. 625^{xy} . **B.** 625^{x+y} . **C.** 5^{x+3y} . **D.** 5^{3x+y} .
2. $a^2 - b^2 - 4a + 4b =$
A. $(a-b)(a+b-4)$. **B.** $(a-b)(a+b+4)$.
C. $(a+b)(a-b-4)$. **D.** $(a+b)(a-b+4)$.
3. If a and b are constants such that $4(x+3) + 2(4x-a) \equiv 10x - [bx - 2(3x+1)]$, then
A. $a = 5, b = 4$. **B.** $a = 5, b = 8$. **C.** $a = 7, b = 4$. **D.** $a = 7, b = 8$.
4. The storage capacity of a reservoir is $58\,600\,000\text{ m}^3$. Express the capacity in scientific notation, correct to 2 significant figures.
A. $590 \times 10^5\text{ m}^3$ **B.** $59 \times 10^6\text{ m}^3$ **C.** $5.9 \times 10^7\text{ m}^3$ **D.** $5.90 \times 10^7\text{ m}^3$
5. If an exterior angle of a regular n -sided polygon is 45° , then the sum of its interior angles is
A. 900° . **B.** 1080° . **C.** 1260° . **D.** 1440° .
6. The length of a line segment is measured as 8 cm correct to the nearest cm. Let x cm be the actual length of the line segment. Find the range of values of x .
A. $7.5 \leq x < 8.5$ **B.** $7.5 \leq x < 8.4$ **C.** $7.5 < x < 8.5$ **D.** $7.5 < x < 8.4$
7. $AB00000CD_{16} =$
A. $10 \times 16^8 + 11 \times 16^7 + 205$ **B.** $10 \times 16^8 + 11 \times 16^7 + 3280$
C. $11 \times 16^9 + 12 \times 16^8 + 205$ **D.** $11 \times 16^9 + 12 \times 16^8 + 3280$
8. Let a and b be non-zero numbers. If $\frac{3a+2b}{2b-a} = 3$, then $a : b =$
A. $1 : 3$. **B.** $2 : 3$. **C.** $3 : 1$. **D.** $3 : 2$.
9. The solution of $\frac{4(2x-1)}{3} > 4 - 2(x-6)$ is
A. $x < -3$. **B.** $x > 3$. **C.** $x < -\frac{26}{7}$. **D.** $x > \frac{26}{7}$.
10. In the figure, $ABCD$ is a rectangle. If $AB = 8$ cm and $AD = 6$ cm, find AE .
A. 8 cm **B.** 7 cm
C. 6 cm **D.** 5 cm



11. \$15 000 is deposited in a bank at an interest rate of 12% p.a. compounded quarterly. Find the interest after 2 years correct to the nearest \$10.
A. \$19 000 **B.** \$18 820 **C.** \$4 000 **D.** \$3 820

12. Solve $4(x-2)^2 = (x+2)^2$.

A. $x = \frac{2}{3}$ or $x = 6$

B. $x = \frac{6}{5}$ or $x = \frac{10}{3}$

C. $x = 6$

D. $x = \frac{2}{3}$ or $x = \frac{-2}{3}$

13. If $a > b$ and $c < 0$, which of the following must be true?

I. $a^2 > b^2$

II. $a + c > b + c$

III. $\frac{a}{c^2} < \frac{b}{c^2}$

A. I only

B. II only

C. I and III only

D. II and III only

14. If the radius of a circle is increased by 10%, the area of the circle will be increased by

A. 10%.

B. 21%.

C. 110%.

D. 121%.

15. The figure shows a cuboid $ABCDEFGH$.

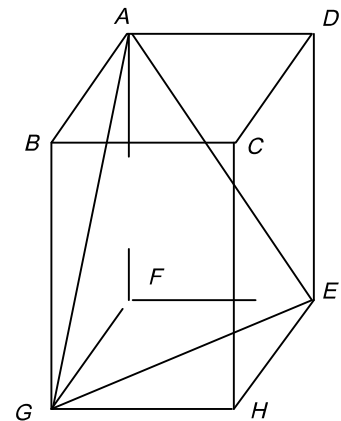
$$\frac{\text{Volume of the pyramid } AFGE}{\text{Volume of the cuboid } ABCDEFGH} =$$

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

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

C. $\frac{1}{6}$.

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



16. Ten years ago, the mean age of 11 members in a choir was 30. One of them is now leaving the choir at the age of 40. Find the present mean age of the remaining 10 members.

A. 40

B. 39

C. 30

D. 29

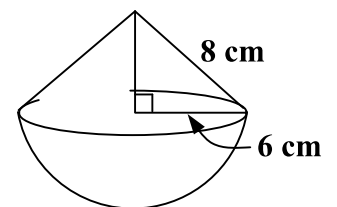
17. The figure shows a solid made of two parts adhered together: the upper part is a circular cone of base radius 6 cm and slant height 8 cm, and the lower part is a hemisphere of radius 6 cm. Find the difference of the surface areas of the upper and lower parts.

A. $24\pi \text{ cm}^2$

B. $36\pi \text{ cm}^2$

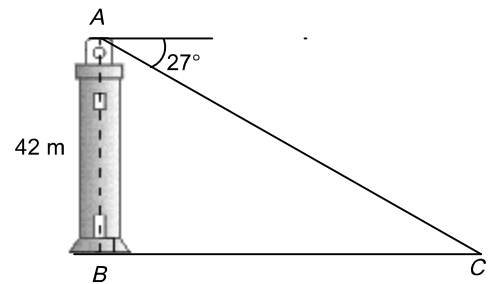
C. $72\pi \text{ cm}^2$

D. $96\pi \text{ cm}^2$



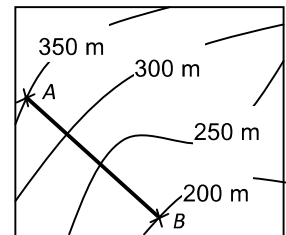
18. In the figure, AB is a tower of height 42 m. The angle of depression of C on the horizontal ground from the top A of the tower is 27° . Find the distance between B and C correct to 3 significant figures.

- A. 37.4 m B. 47.1 m
C. 82.4 m D. 92.5 m



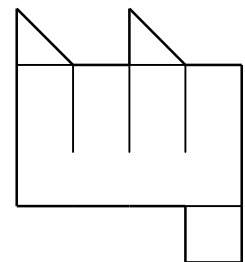
19. In the figure, the scale of the contour map is 1: 20 000. AB is a straight road, where A is on contour line 350 m and B is on contour line 200 m. AB is measured to be 1.75 cm on the map. Find the inclination of the road AB correct to the nearest 0.1° .

- A. 23.2° B. 25.4°
C. 64.6° D. 66.8°



20. The figure below shows a net of a 3-D object. Which of the following are the number of faces (F), number of vertices (V) and number of edges (E) of the object?

- A. $F = 7, V = 14, E = 19$
B. $F = 6, V = 15, E = 19$
C. $F = 7, V = 8, E = 13$
D. $F = 6, V = 8, E = 12$



21. How many planes of reflection does a regular tetrahedron have?

- A. 3 B. 4 C. 5 D. 6

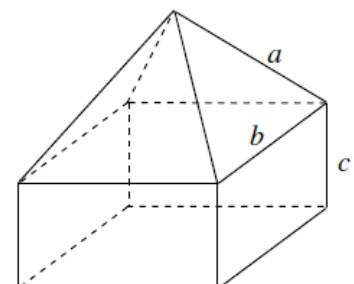
22. The equation of a straight line L is $4x + ky - 12 = 0$. If y -intercept of L is 4, find the slope of L .

- A. -3 B. $-\frac{4}{3}$ C. $\frac{4}{3}$ D. $\frac{3}{4}$

23. The solid in the figure is formed by a pyramid and a cuboid. The base of the pyramid is a square of side b . The length of the slant edge is a and the height of the cuboid is c . Which

of the following could be expressed by $b(\sqrt{3}a + b + 4c)$?

- A. Volume of the solid
B. Height of the solid
C. Total sum of the lengths of the solid
D. Total surface area of the solid

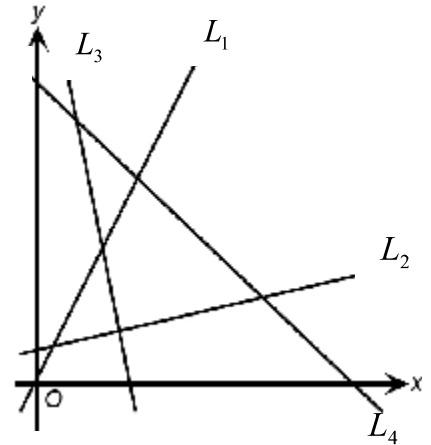


24. Three boys, Anson, Billy and Calvin of the same height are playing kites. The strings of their kites are 200 m, 150 m and 100 m long, and make angles with the ground at 30° , 45° and 60° respectively. Assume the strings are straight, which of the following is true?

- A. Anson's kite is the highest. B. Billy's kite is the lowest.
 C. Calvin's kite is the highest. D. Billy's kite is the highest.

25. In the figure, L_1, L_2, L_3 and L_4 are straight lines. If m_1, m_2, m_3 and m_4 are slopes of L_1, L_2, L_3 and L_4 respectively, which of the following must be true

- A. $m_1 > m_2 > m_3 > m_4$
 B. $m_1 > m_2 > m_4 > m_3$
 C. $m_2 > m_1 > m_3 > m_4$
 D. $m_2 > m_1 > m_4 > m_3$

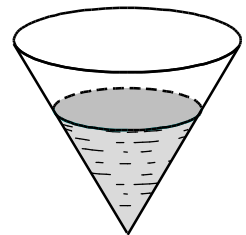


26. If the compass bearing of P from Q is $S70^\circ W$, what is the compass bearing of Q from P ?

- A. $N20^\circ E$ B. $N20^\circ W$ C. $N70^\circ E$ D. $N70^\circ W$

27. An inverted conical vessel contains 324 cm^3 of water. If the depth of water is $\frac{3}{5}$ of the height of the vessel, find the volume of water that the conical vessel can hold.

- A. $1\,500 \text{ cm}^3$ B. $1\,250 \text{ cm}^3$
 C. 750 cm^3 D. 540 cm^3



28. A box contains n red balls and 30 green balls. If a ball is randomly drawn from the box, then the probability of drawing a red ball is $\frac{1}{n}$. Find the value of n .

- A. 5 B. 6 C. 15 D. 20

29. $\{a, a, a + d, a + 3d$ and $a + 6d\}$ is a group of numbers. Which of the following must be true?

- I. The mean of the group of numbers is $a + 2d$.
 II. The median of the group of numbers is $a + d$.
 III. The mode of the group of numbers is 2.
 A. I and II only B. I and III only C. II and III only D. I, II and III

30. The surface area of a spherical soap bubble is 40 cm^2 . It expands in hot air and its radius increases by 10%. Find its increase in surface area.

- A. 0.4 cm^2 B. 4 cm^2 C. 8.4 cm^2 D. 48.4 cm^2

31. A dice is thrown 1000 times. The results are as follows:

Number	1	2	3	4	5	6
Frequency	150	84	187	143	213	223

Find the experimental probability of getting a prime number.

- A. $\frac{1}{2}$ B. $\frac{2}{5}$ C. $\frac{121}{250}$ D. $\frac{317}{500}$

32. It is given that $A(-2, 4)$, $B(6, 2)$ and $C(3, -6)$ are the vertices of a triangle. Which of the following is/are true?

I. $AB = BC$

II. AC passes through the origin O .

III. $AB \perp BC$

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

33. $A(-2, 5)$ and $B(4, -4)$ are two given points. If P is a point on line segment AB such that $AP : AB = 3 : 4$, find the coordinates of P .

- A. $\left(\frac{4}{7}, \frac{8}{7}\right)$ B. $\left(\frac{10}{7}, -\frac{1}{7}\right)$ C. $\left(\frac{5}{2}, -\frac{7}{4}\right)$ D. $\left(-\frac{1}{2}, \frac{11}{4}\right)$

34. $\cos^2 1^\circ + \cos^2 3^\circ + \cos^2 5^\circ + \dots + \cos^2 87^\circ + \cos^2 89^\circ =$

- A. 22. B. 22.5. C. 44.5. D. 45.

35. Two numbers are randomly drawn at the same time from 3 cards numbered 2, 3 and 4 to form a two-digit number. Find the probability of the two-digit number is a multiple of 3.

- A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{2}{3}$ D. $\frac{1}{2}$

36. $\frac{\tan^2 \theta}{1 + \tan^2 \theta} + \cos^2 \theta =$

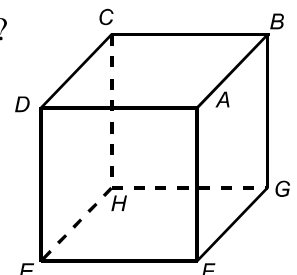
- A. 1. B. $\cos^2 \theta$. C. $1 + \tan^2 \theta$. D. $1 + \cos^2 \theta$.

37. If the point $P(7, -1)$ is rotated clockwise about the origin through 90° to Q , what is the distance between P and Q ?

- A. 5 B. $\sqrt{72}$ C. 10 D. $\sqrt{128}$

38. In the figure, $ABCDEFGH$ is a cube. Which of the following is not a right angle?

- A. $\angle ECB$ B. $\angle FDC$
 C. $\angle HEA$ D. $\angle GAE$

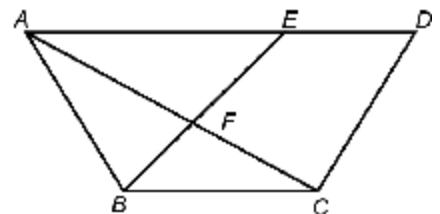


39. A coin is tossed four times. Find the probability that an odd number of heads is obtained.
- A. $\frac{1}{4}$ B. $\frac{3}{4}$ C. $\frac{7}{16}$ D. $\frac{1}{2}$
40. If A and B are acute angles such that $A + B = 90^\circ$, which of the following must be true?
- I. $\sin A = \sin B$
 II. $\sin(90^\circ - A) = \cos(90^\circ - B)$
 III. $\tan A \tan B = 1$
- A. I and II only B. I and III only C. II and III only D. I, II and III
41. The x -intercept of a straight line L is -2 , and L is parallel to the straight line passing through the points $(3, 1)$ and $(-5, -3)$. Find the equation of L .
- A. $x + y + 2 = 0$ B. $3x - y + 6 = 0$ C. $2x + y + 4 = 0$ D. $x - 2y + 2 = 0$
42. In the figure, a circular cone is cut into two parts A and B by a plane parallel to the base.



If the base area of A is $\frac{4}{9}$ that of the original cone, find the ratio of the volumes of A and B .

- A. 2 : 3 B. 8 : 19 C. 8 : 27 D. 19 : 27
43. A bag contains two white balls and three black balls. Carson draws a ball randomly from the bag. If the ball is white, he will get 3 points. If the ball is black, he will get 1 point. Find the expected value of the points that Carson will get.
- A. 3 B. 2.2 C. 2 D. 1.8
44. Given 8 rods of lengths 1, 2, 3, 4, 5, 6, 7 and 8, in how many ways can we choose 3 rods to form a triangle?
- A. 8 B. 16 C. 22 D. 35
45. In the figure, $ABCD$ is a trapezium with $AD \parallel BC$ and $AD : BC = 2 : 1$. E is a point on AD such that AC and BE intersect at F and $AE : ED = 2 : 1$. If the area of $\triangle ABF$ is 12 cm^2 , find the area of the trapezium $ABCD$.



- A. 44 cm^2 B. 51 cm^2
 C. 63 cm^2 D. 72 cm^2

END OF PAPER